DECENTRALIZED SURFACE WATER TREATMENT: ISSUES AND CHALLENGES

A thesis submitted towards partial fulfilment of
the requirements for the degree of
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Jadavpur University

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I hereby declare that this thesis contains literature survey and original research work by the undersigned candidate, as a part of my Master of Water Resources & Hydraulic Engineering degree during academic session 2018 – 2019.

All information in this document has been obtained and presented in accordance with academic rules and ethical conduct.

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LIST OF ABBREVIATIONS AND SYMBOLS

PBVM	_	Paschim Banga Vigyan Mancha
ADF	_	African Development Fund
BOD	_	Biological Oxygen Demand
BGS	_	British Geographical Survey
CAO	_	Chief Administrative Officer
CNN	_	Cable News Network
DBPs	_	Disinfection By- Products
DDCBS	_	District Directorate of Community Based Services
DDHI	_	District Directorate of Health Services
DDHS	_	District Directorate of Health Services
DDT	_	Dichlorodiphenyltrichloroethane
DEO	_	District Education Officer
DWD	_	Directorate of Water Development
DWO	_	District Water Office
EHD	_	Environmental Health Division
EIAs	_	Environmental impact Assessments
GAC	_	Granular activated carbon
GWR	_	Ground water Rule
HAA	_	Halo acetic Acids
IFRC & RCS	_	International Federation of Red Cross & Red Crescent Societies
JMP	_	Joint Monitoring Program for Water Supply and Sanitation
LVEMP	_	Lake Victoria Environmental Management Project
MAAIF	_	Ministry of Agriculture , Animal Industry and Fisheries
MCLs	_	Maximum contamination limits
MDGs	_	Millennium Development Goals
MoES	_	Ministry of Education Sports
MoH	_	Ministry of Health
MWE	_	Ministry of Water and Environment
NEMA	_	National Environment Management Authority
NGOs	_	Non-Governmental Organizations
NHP		National Health Policy
NTUs		Nephelometric Turbidity Units
NWDR		Uganda National Water Development Report

NWP	National Water Policy
NWSC	National Water and Sewerage Corporation
PCBs	Polychlorinated Biphenyls
PEAP	Poverty Eradication Action Plan
POPs	Persistent organic pollutants
PRC	Performance Review Committee
PVC	Poly Vinyl Chloride
RWSS	Rural Water Supply and Sanitation
SDWA	Safe Drinking Water Act
SODIS	Solar water Disinfection
SWAP	Sector-Wide Approach to Planning
THMs	Trihalomethanes
TOC	Total Organic Carbon
U. S. EPA	United States Environmental Protection Agency
UBOS	Uganda Bureau of Statistics
UNEP	United Nations Environment Programme
UNICEF	United Nations Children ' s Fund
URCS	Uganda Red Cross Society
URN	Uganda Radio Network
USGS	United States Geographical Survey
UWSS	Urban Water Supply and Sanitation
WEAU	Water Aid – Uganda
WFP	Water for Production
WHO	World Health Organization
WRAP	Would wide Responsible Accredited Production
WUGs	Water user groups

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ABSTRACT

About 20 % of people on earth lack the access to safe drinking water, a condition that resulted in the death 2.2 million people in 2004, as per the records of "UNO". Safe drinking water uses a prime concern among the developing countries in the World. Polluted water plays significant role in taking numerous lives in these localities, for which a number of efforts are being made for accessing safe purified drinking water. Fortunately, efficient and cheap water purification systems are being utilised are being tried to be accused worldwide for easy access to clean water. Hooghly River is the main source of potable surface water for the Hooghly river basin areas inhabitants.

In the following project we had tried to develop a low cost water purification technique using the basis ideas of "decentralized of surface water treatment – issues and challenges" and also developing a domestic filter, some locally available filter material such as paddy soil, river sand, rice husk, and soil for making container of the soil filter and try to improve the methodology using the "UV" filter, "RO" filter and Activated carbon filter mechanism. Main focus was control of "iron" "pH", "turbidity", "TDS", "EC", "Arsenic" etc. By variation of mixing ratio of filter candles materials such as river sand, paddy soil, and rice husk gives different results in different ratios which proved to give the best result to control or reduce or removal of "iron" "pH", "turbidity", "TDS", "EC", "Arsenic" etc, and also was having the cheapest material cost. A soil made filter with locally collected paddy soil and rice husk from remote village (*locally it is called dheki area*) was prepared which also proved to be effective for reduce /removal of turbidity, but may be due to rigorous use of the filter or any manufacturing defect, there were crack developed on its surface and was discarded for any further use. With the surface water supply is being contaminated with bacteria and suspended solids so proper treatment with sustainable methodology should be adopted for the city of Kolkata. As we know groundwater availability as well as quality is getting reduced day by day at a greater extent which may due to huge rate of extraction in an uncontrolled manner.With the above background, the objectives of the present investigation include the seasonal assessment of surface water quality in the remote areas as well as remaining areas, identifying the nature and extent of problematic pollutants, evaluation of water quality using statistical Modelling. The present study focused on the traditional methods of water purification techniques and the application of locally available plant materials in the turbidity treatment of highly turbid water samples, deals with the general introduction about the

research work. It briefly explains the availability and percentage distribution of water, water pollution, different type of pollutants and the various methods of water treatment. The significance of the research problem and the major objective of the work are also quantitatively mentioned. The topography, geology, climate, agriculture and the major environmental issues related to the Hooghly river basin deals with the monitoring programme of the water quality parameters of the Hooghly river basin. Detailed study of the turbidity measurements of the river water, ponds and during the pre-monsoon, monsoon and post-monsoon seasons has been done during my research work. The chapter further deals with the literature survey on the use of coagulants in water treatments, turbidity treatment with natural coagulants and impact of pH on coagulation flocculation process. The chapter is concluded with the detailed analysis of the findings and the results of the present study. The overall objective of the research work is to evaluate low cost sustainable decentralized surface water treatment plant at field level and also to develop and eco-environment friendly model of removal of turbidity and bacteria at a great extent with some issue and challenges. The following Scopes of my research work are formulated as given below:

To analyse physico-chemical and bacteriological quality of drinking water in the study area,

To study the physical survey of existing surface water treatment installed at different locations in West Bengal.

To collect water samples from individual surface water treatment plants of three different months to assess the physic-chemical and bacteriological parameters .

To evaluate the performance of existing 5 No's surface water treatment plants .

To carry out socio – economic survey of individual levels using a questionnaire format to increase the awareness in rural area with social acceptability .

To develop a low cost model which helps to remove mainly turbidity, iron , pH, arsenic as well as to some extent total coli form .

To adopt some strategies plan to mitigate the water crisis problem in a very sustainable manner.

CHAPTER-1

INTRODUCTION

1.1 General:

Drinking safe water has a decisive impact on diarrheal diseases prevention (WHO-2004). The most admitted guideline is the complete absence of Pathogens at the water of use. Diarrheal can be caused by wide range of micro-organisms through various ways of transmission, ingestion of contaminated food or be verge contracts between, individuals, direct or indirect contact with faces. It has been established in many studies that for comprehensive and lasting impact on community health need an integrated approach on sanitation and public health. Now-a-days a burning problem has been found in regard to water that are noticed in several newspaper, mass media etc. It was the 19th may at "the Hindu" patrika becomes very alarming in regard to the mankind, especially in community people, poorest people, in very remote area.

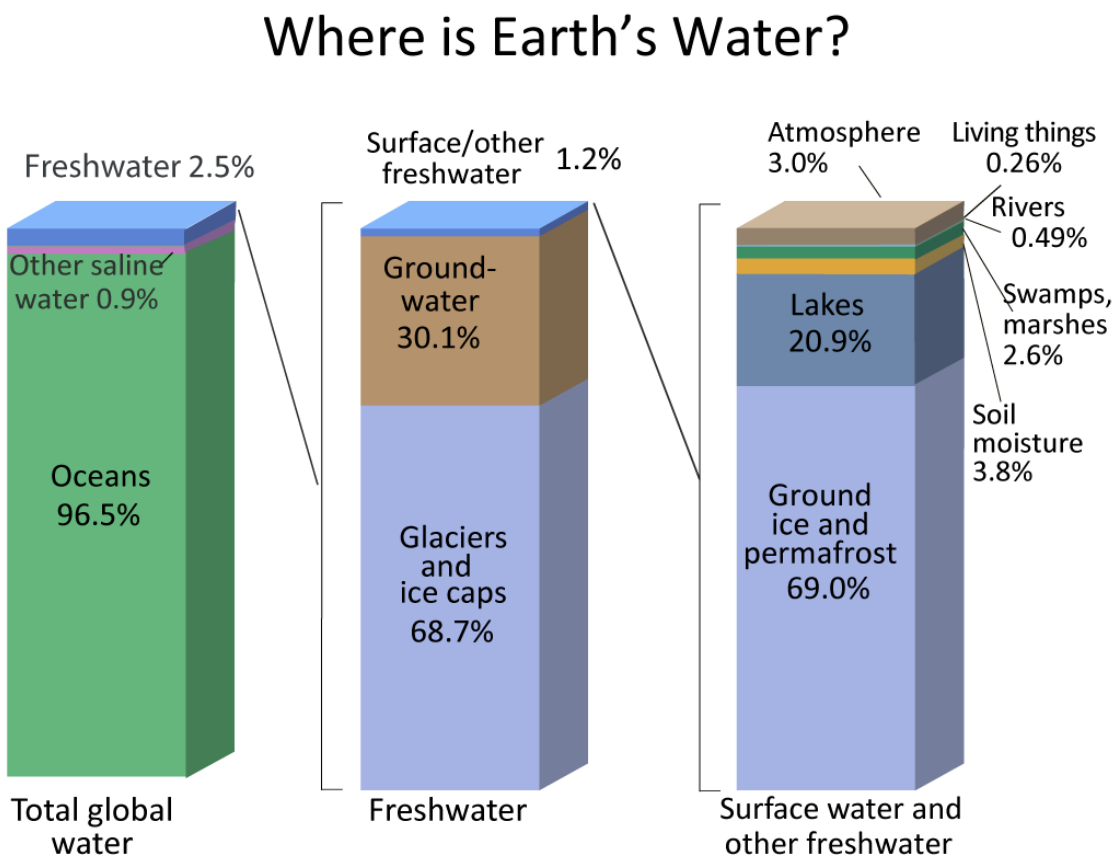


Figure 1.1 Water distributions in the earth

Table 1.1 Water related diseases and preventive strategies

Classification	Transmission	Examples	Preventive Strategies
Preventive Strategies Water - bone (Waterborne diseases can also be washed)	Disease of transmitted by indigestion (Faecal Oral route)	• Diarrhoea • Cholera • Typhoid • Hepatitis (A & B)	• Improve quality of drinking water • Prevent casual use of other unimproved sources. • Improve sanitation.
Water washed (water scare)	• Infections of the intestinal track • Skin or eye infections • Infections caused by lice or mites	• Scabies • Trachoma • Conjunctivitis • Amoebiasis • Giardiasis	• Increase water quality • Improve accessibility& reliability of domestic water supply. • Improve hygiene& sanitation.
Water Based	The pathogen spends part of its lifecycle in an animal which is water based. The pathogen is transmitted by indigestion or by penetration of the shin.	• Guinea worm • Schistosomiasis	• Decrease need of contact with infected water. • Control vector host populations. • Improve quality of water(for some types) • Improve sanitation
Water Related Insect	Vector Spread by insects that breed or bite near water.	• Malaria • Filariasis • River blindness	• Improve surface water management • Destroy insect breeding sites. • Use mosquito netting. • Use insecticides.

(Source: IS: 10500 & WHO)

The uneven distribution of the water amount across the territory and the pollution-spread have weakened the territory and the water and sanitation scenario of the nation. From the point of view of water resources availability, Russia ranks second in the world after Brazil. However, the uneven distributions of the water amount across the territory and the pollution – spread have weakened the water and sanitation scenario of the nation. The most weakness is extremely uneven distribution. The Environment (Protection) Act. Was passed by the Parliament. Under both these Acts, the states and the Central Government developed environmental norms. The problems are much gravier and dense at backward villages, backward rural arrears and the places surrounded by poor and under developed people.

Centralised water supply is impossible due to population growth, lack of resources, and un-supportive legal framework. Centralised water supply is often considered the optimal water supply system, since it provides the most convenient service. However, in 2008, only 57% of the global population got its drinking water from a large-scale piped connection in the user's dwelling, plot, or yard. In developing regions, this percentage was only 49% (WHO-2008)

Moreover, large distribution networks have high maintenance costs and are often prone to failures because of poor operation and maintenance. Failure of centralised systems to provide clean, adequate drinking water depends on a number of technical (see also intermittent supply and leakage control), economic, and legal factors. Because of the large amount of infrastructures (e.g. treatment plants, pipes, etc.) are needed so there are many situations where it may not be possible to connect the whole population to the centralised supply system.

Especially in developing or transition countries, high population growth in urban areas often leads to the establishment of informal settlements which remain disconnected from supply lines, as providing centralised supply is not technically or economically feasible. Moreover, as these settlements are frequently illegal, the government has no obligation to provide water and sanitation services. Furthermore, centralised water treatment and distribution facilities are often poorly maintained and fall into disrepair, so that even when users are connected to the centralised supply network, the quality and quantity of water may be unreliable (see also intermittent water distribution). Multiple Water Needs of Rural Households Rural water supply schemes in India are generally designed for domestic uses. However, the multiple water use priorities of poor rural households in order to reduce their hardship and enhance food production, health and income mean that in water-scarce areas, domestic water use can

run into conflict with productive water use. The failure of water supply agencies to design a water supply system for multiple uses results in communities not being able to realize the full potential of water as a social good. This chapter identifies various domestic and productive water requirements of rural households. Thereafter, a composite index which captures the vulnerability of rural households to problems associated with lack of water for multiple needs was assessed for three selected regions of Maharashtra, each representing a different agro-ecological and socioeconomic setting. Centralised drinking water systems serve millions of households around the world. However, these systems do often not reach the poorest or the most remote populations and quality and quantity of water provided are often unreliable due to poor operation and maintenance. Decentralised supply systems offer the possibility to provide safe drinking water where centralised supply systems are not feasible due to technical, economical or institutional reasons (e.g. in rural communities or informal settlements). Decentralised water supply refers to the small-scale purification and distribution of water .

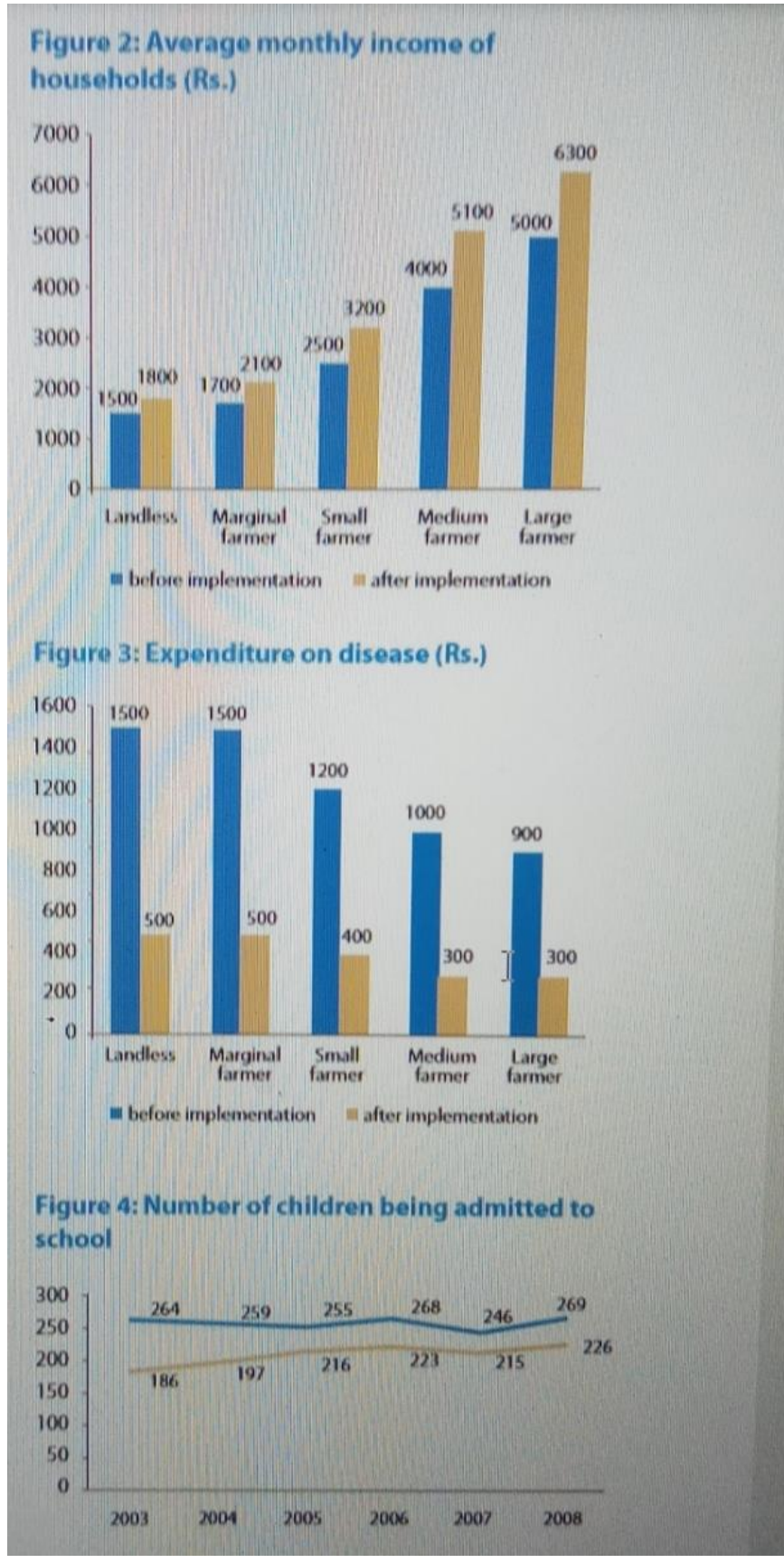


Figure 1.2 (Reference:-wsp water sanitation program)

Table 1.2 THE PERCENTAGE DISTRIBUTION OF WATER ON EARTH

Water source	**Water volume (in km^3)**	**Fresh water (in %)**	**Total water in %age.**
Oceans , Seas and Bays	1.338000	_	**96.5**
Ice caps , Glaciers and Permanent snow	24064	**68.7**	1.74
Ground water	23,400	_	1.7
Fresh	10,530	**30.1**	**0.76**
Saline	12,870	_	**0.94**
Soil Moisture	16.500	**0.05**	**0.001**
Ground ice and Permafrost	300	**0.86**	**0.022**
Lakes	176	_	**0.013**
Fresh	91	**0.26**	**0.007**
Saline	85	_	**0.006**
Atmosphere	12.900	**0.04**	**0.001**
Swamp water	11.470	**0.03**	**0.0008**
Rivers	2.120	**0.006**	**0.0002**
Biological water	1.120	**0.003**	**0.0001**
Total	1,386,000.0	_	**100**

The choice of decentralised supply system depends on the local context and includes such factors as ease of use, maintenance needs, dependence on other utilities (e.g. electricity, fuel supply), and cost Centralised drinking water systems serve millions of households around the world. However, these systems do often not reach the poorest or the most remote populations and quality and quantity of water provided are often unreliable due to poor operation and maintenance. Decentralised supply systems offer the possibility to provide safe drinking water where centralised supply systems are not feasible due to technical, economical or institutional reasons (e.g. in rural communities or informal settlements). Decentralised water

supply refers to the small-scale purification and distribution of water. Decentralised treatment systems fall into three main categories: point-of-use systems (POU), point-of-entry systems (POE), and small-scale systems (SSS). POU and POE systems are designed for individual households while SSS can provide for community water supply, for emergency water supply in camps, or to purify water for sale in water kiosks. The choice of decentralised supply system depends on the local context and includes such factors as ease of use, maintenance needs, dependence on other utilities (e.g. electricity, fuel supply), and cost. Viable alternative where centralised systems are not feasible due to technical, economical or institutional reasons. 1.2 WATER: -Water is the most abundant compound in nature. It covers 75% of the earth surface. About 97.3% of water is contained in the great oceans that are saline and 2.14% is held in ice-caps and glaciers in the poles, which are also not useful. Barely the remaining 0.56% found on earth is in useful form for general livelihood and an average of 8.4 million litres (2.2 million gallons) for each person on the earth

Water is an indispensable and one of the most critical, scarce, and precious and replenishes able natural resource of our planet, which cannot be created (Prasad, 2008). It is most essential for eco-sustainability. It is a clear, colourless, odourless, and tasteless liquid, H2O, essential for most plant and animal life and the most widely used of all solvents. Freezing point 0°C boiling point 100°Cspecific gravity (4°C)available of safe drinking water is very important and is likely to become critical scarce in the coming decades due to increasing demand, rapid growth of urban population, development of agriculture and industrial activities especially in semi-arid regions (Hajalilou, B., & Khaleghi, F., 2009). Water resources are of importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physic-chemical and biological characteristics (Venkatesharajuet.al. 2010).

After the origin of life in water everything of living organisms is sustained by water. Not only biotic components, abiotic components on the Earth depend on water. Water is not only essential to life but is predominate inorganic constituent of living matter forming nearly three quarters of the weight of a living cell. In living tissue water is the medium for many biological reactions and extraction processor of inorganic nutrients photosynthetic ingredients and minerals etc. are transported in aqueous medium. In short water is essential for life and plays a unique role virtually as medium in all biological process. Water quality includes all physical, chemical and biological factors that influence the beneficial use of water. Physical-

chemical analysis is the prime consideration to assess the quality of water for its best utilization like drinking, irrigation, fisheries, industrial purpose etc. and helpful in understanding the complex processes, interaction between the climatic and biological processes in the water.

1.2 Water:-

Natural Water Cycle: - The continuous movement of water between the earth and the atmosphere is the hydrological cycle. Water vapour from water and land surfaces and from living cells circulates through the atmosphere and falls as rain or snow. When it reaches the earth, water either flows into streams and then into oceans or lakes, or it enters, or infiltrates the soil. Some water becomes soil moisture, which may evaporate directly or move up through the roots of plants and be released by leaves. Some water percolates downward, accumulating in the so-called zone of saturation to form the groundwater reservoir, the upper surface of which is the water table. Under natural conditions, the water table rises in response to inflowing water and then declines as water drains into natural outlets such as wells and springs. Can be deployed faster than centralised drinking water treatment and supply systems. Reduced risk of recontamination or poor maintenance and operation in smaller networks. It is easier to include the informal market and small-scale businesses from the sector. Improves microbial water quality and reduces contamination risk between treatment and use High self-responsibility required from the households/communities Difficult to monitor correct operation and maintenance (O&M) of technologies Each household should be provided with knowledge on O&M of the system Some technologies are costly

Surface waters (Lakes, rivers, Pond and reservoirs) Groundwater (wells).

It is the major biogeochemical cycle controlled by the solar (sun) energy that causes water to evaporate and rise in the form water vapour, and then it condenses into water droplets. (Reference-11)

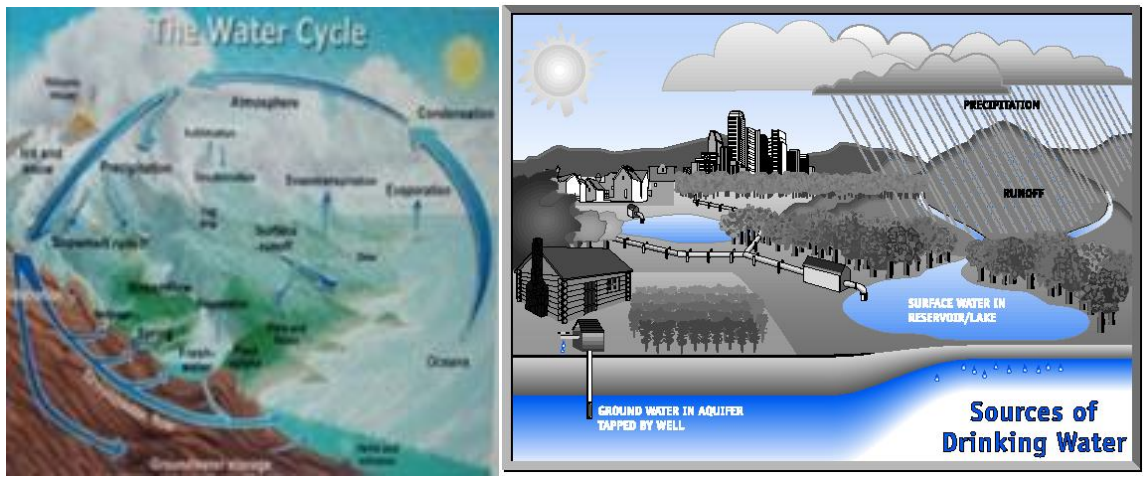


Figure 1.3. Reference:-9 WATER CYCLE

Water is a most precious natural resource in our planet. Nnitrate is relatively non toxic but it is reduced to nitrite in gastrointestinal tract by bacteria which is toxic. It is absorbed in blood and it reacts with haemoglobin leading to a diseases met haemoglobin anaemia (blue baby syndrome). Methanolglobin does not act as oxygen carrier leads to cyanosis and hypoxia, (US National Research Council 1995), nitrate reacts with gastric juice to form nitrosamines and these Nitrosamines are responsible for carcinoma24. The guideline value for nitrate of 50mg/litre as nitrate is based on epidemiological evidence for met haemoglobin anaemia in infants, which results from short-term exposure and is protective for bottle-fed infants and, consequently, other parts of the population

Fluoride is an essential ion for human beings. Small concentration of F- inessential for normal mineralization of bones and the formation of dental enamel 25, 26.Fluoride in drinking water has both positive and negative effects on human health. Excess of fluoride affects every system of the body. Fluorine being a highly electronegative element has extraordinary tendency to get attracted by positively charged ions like calcium. Hence the effect of fluoride on mineralized tissues likes bone and teeth leading to developmental alternations is of clinical significance as they have highest amount of calcium and thus attract the maximum amount of fluoride that gets deposited as calcium–Fluor apatite crystals. Tooth enamel is composed principally of crystalline hydroxyl apatite. Under normal conditions, when fluoride is present in water supply, most of the ingested fluoride ions get incorporated into the appetite crystal lattice of calciferous tissue enamel during its formation. The hydroxyl ion gets substituted by fluoride ion since Fluor apatite is more stable than hydroxyapatite.Thus, a large amount of fluoride gets bound in these tissues and only small

amounts excreted through sweat, urine and stool. The intensity of fluoridise is not merely dependent on the fluoride content in water, but also on the fluoride from other sources, physical activity and dietary habits.

Dental fluorosis is characterized by discolouration, decay, early falling cavity formation, periodic diseases and tarter formation. Due to isomorphic substitution, F- mainly gets deposited in joints of the neck, knee, pelvis and shoulder and makes it difficult to move or walk. Skeletal fluorosis characterized by painful arthritic changes, joint stiffness, restriction of spine movement, osteoscleorosis, ostiophytosis, ostioporosis and calcification of interosseous membrace, ligaments and tendons 27. In non-skeletal fluoridise manifestation include anaemia due to decrease in RBC count and increased destruction and reduced heamoglobin., Fluoride in minute quantity is an essential component for normal mineralization of bones and formation of dental enamel However, its excessive intake13may result in slow, progressive crippling scourge known as fluoridise. There are more than 20 developed and developing nations that are endemic for fluorosis. These are Argentina, U.S.A., Morocco, Algeria, Libya, Egypt, Jordan, Turkey, Iran, Iraq, Kenya, Tanzania, S. Africa, China, Australia, New Zealand, Japan, Thailand, Canada, Saudi Arabia, Persian Gulf, Sri Lanka, Syria, India, etc. In India, it was first detected in Nellore district of Andhra Pradesh in 1937.Since then considerable work has been done in different parts of India to explore the fluoride laden water sources and their impacts on human as well on animals. At present, it has been estimated that fluoridise is prevalent in 17 states of India. The safe limit of fluoride in drinking water is 1.0 mg/L.

The endemic fluoridise in India is largely of hydro geochemical origin. It has been observed that low calcium and high bicarbonate alkalinity favour high fluoride content in groundwater. Water with high fluoride content is generally soft, has high pH and contains large amount of silica.

1.3 Present Senario of Water Resources and Quality.

Since the quality of water affects our lives in many ways. So water must be of good quality. For most human uses domestic as well as commercial quality of water is as important as its quantity. It must be substantially free of salinity, plant and animal wastes and bacterial contamination to be suitable for human consumption. Water quality may have a great influence on the ability of aquatic plants and animals to exist and growing a stream, lake, pond and river. Polluted water can be reason for the closing of both commercial and sport fishing areas and restricting the recreational use of water bodies14, 15. The ability of water bodies to clean themselves has affected by the sheer quantity of waste generated by ever increasing population16, 17. With population growth and increased pressure on natural systems many regions are now subject to water stress about by numerous human activities. Water quality can have great influence on the ability of aquatic organisms to exist and to grow in a stream, pond or lake. It is well-known that pollution of water causes adverse effect on plant and animal species. The environmental variability also strongly influences the population.

pollutant with equal concentration in food. An environmental perspective, pollutants are classified as a Degradable and none gradable

Degradable pollutants: These pollutants can easily degrade due to biological and Natural process.E.g.: sewage waste ,vegetables ,plants etc. Slowly degradable pollutants: Pollutants that needs years for degrade and remain in an unchanged condition for decades or more time degrade.E.g.: organic synthetic chemicals, plastics, synthetic polymers and pesticides. on-degradable pollutants: Those pollutants that remain unchanged in environment and cannot be degraded and by natural process . E.g.: Heavy metals i.e. Lead, chromium, Arsenic, mercury etc.

are difficult to identified acid rain is the example of non identify able source for pollution. Cause of water Pollution:

There are several classes of water pollutants. (1) disease-causing pollutants:

Microorganism like Protozoa, Bacteria and Viruses which are consider as a pathogen are penetrates in to water from sewage waste , Human and animal body waste. Ecolibacteria are mostly found in human waste. These bacteria are responsible for fooddigestion in human

body. Small amount of those bacteria produces no harmful effect but higher number of those bacteria in water can increase the possibility of disease.(2)aerobic degradation of waste. Organic waste that can be degraded by bacteria with consuming oxygen. Higher organic degradation leads more consumption oxygen by aerobic bacteria.ir results the decrease of oxygen level in water. Lower they gen concentration in aquatic ecosystem creates adverse effect on aquatic biology.(3) plant nutrients: Water soluble plants nutrients like phosphate, Nitrates and potassium are responsible of excessive growth of aquatic plants. Algae are growing drastically with consuming micronutrients. Eutrophication of aquatic plants causes the taste of water. Consumption of oxygen by aquatic plants drags down the oxygen concentration; lower oxygen in water is harm full for fish and other living creatures. The use of excess quantity of fertilizers and pesticide in a field pollute the water, soil and air. Eutrophication is results of excess use of fertilizer .pesticides use can cause the high concentration of synthetic chemicals in water. Pesticides in water can which introduced into the aquatic food cycle. Pesticides are consumed by the phytoplankton and plants. Those plants are consumed by the fish hence pesticide contamination transfer from aquatic plants to fish and further transforms from fish to humans food cycle.(4) Inorganic chemicals: water soluble salts and metal complex cause a toxic and carcinogenic effect of earth's lie cycle. High concentration of metal salts in aquatic ecosystem makes the water unsuitable to live for aquatic creatures; also high concentration of metal complex makes the water unhealthy for human consumption. (5) Organic chemical: it includes pesticides, chemicals, paints, refined crude oil, petroleum fuels, detergents, coolants, etc which can contaminate the environment eco system. Sources of organic contaminants can be classified as an industrial effluent, refineries, emission from vehicles, transformer oil, etc.plant. In primary treatment plant flow is reduce in such a way that all the suspended solid material settled down followed by the chlorination process to kill the bacteria and then release the effluent. Primary treatment process reduces the 30 % of Biological oxygen demand and 65% of solids.

Water Quality and Environment:

Millions of people around the world, mostly in the developing countries are losing their lives every year from water borne disease18.The quality of water is of vital for mankind because of directly linked with human welfare. Water quality characteristic of aquatic environment arise from a multitude of physical, chemical and biological interactions. The water bodies like river, lakes, dams and estuaries are continuously subject to a dynamic state of change with respect to the geological characteristics. Thesis demonstrated by continuous circulation,

transformation and accumulation of energy and matter through the medium of living thing and their activities. Generation of water supply determines the kinds and amounts of its impurities. Ground water obtained from Bore water mostly contains high concentrations of dissolved minerals. This water is generally clear and colourless due to rock and sand filtration. It also may contain different solution including chemical, detergents and industrial wastes. It is now known that such forms of pollution may travel quite some distance in water. Shallow wells provide water with varying amounts of mineral impurities. There is also the danger that water source contaminate with human and animal biological waste. Surface water contains many impurities like Clay, sand, muddy and silt which produces the cloudy appearance of water. Its run-off passes over agricultural land surface water can be polluted by absorbing chemical and toxic waste from various industries. Where water flows through the swamp land, water persists objectionable taste, odour and plant colour. During the flood period these swamps may discharge their decayed vegetation, colour and micro-organisms into river and stream. Bore well water and large lakes alone provide water that consistency depends on seasonal variation. Smaller water bodies, open well water and springs often observed seasonal-even daily variations in their mineral content. When condensation of water vapours accurse sufficiently, it comes into contact with gases in the surrounding air, carbon dioxide, nitrogen and oxygen. Atmospheric dust of silica, iron oxides and other minute articles combined with dust and cause the pollution. In falling, moisture absorbs amounts of the atmospheric gases because these are partially soluble in water. The colder water dissolves the more of the surrounding gaseous content. Water dissolves the CO2 and produced produce carbonic acid.

Generally when such water reaches the earth it is slightly acidic, corrosive and relatively soft. After water reaches the ground, dissolves more carbon dioxide from the earth surface. It has the opportunity to seep into the soil and pass through limestone stratum, the acid condition due to the carbon dioxide will be neutralized. At the same time the water will get a large amount of mineral content. Carbonic acid reacts with insoluble calcium carbonate to produce soluble calcium carbonate. Water, the most vital resources for all kinds of life on this planet is also the resources, adversely affected both qualitatively and quantitatively by all kinds of human activities on land, in air or in water. A large number of parameters signifying the quality of waters in various uses have been proposed. A regular monitoring of some of them not only prevents diseases and hazards but also checks the water resources from going further

polluted. Measurement of water quality indicators can be helpful to determine, and control the changes in water quality, and finding the quality of water for human consumption.

Water Conservation: -

Water conservation has became of prime objective corresponds to healthy eco system. Deforestation and urban development restrict the water conservation cycle in an environment. There are many regions which are depending on well water sources and consumption of water reduces the water table level at that region. It's become vital to refill the water sources also need to develop a new and sustainable methodology for water conservation. It is human and planet requirement to improve our water sources and finding new direction to control the pollutants in water resources. As deforestation cause the desertification which led the extensive change in climate. After the monsoon season, it is observed that water table of ground and surface eater drop down this affects the water ecology system as well as the human food chain. Traditional systems of conservation of water is traditionally have been used in India for many generations. This traditional of water conservation need to regenerate for Sustainable environment.

Rain water Harvesting:

Rain water is a natural water cycle produces natural source of water. Ground water and surface water ecosystem is depends on rain water. As water resources are observed in an adverse condition it is required to develop a rain water harvesting system. Artificial ponds, digging wells and Natural ponds become very useful for rain water conservation. Water requirement are increasing day by day also the water quality contamination reduces the available source of water. In future rain water harvesting can become a major source of water.

Aquatic ecosystems:

The aquatic ecosystem involves a pond, Marin water, river water, Lake Water eco system. Aquatic ecosystem provides a great source of food, Minerals, and aquatic plants. Aquatic ecosystem has a great impact on earth's life cycle. Polluting aquatic system can cause serious damage on aquatic and earth life

Pond Ecosystem:

Generally pond eco system established during monsoon season, rest of the months most of the pond foundry. Monsoon affects the most in pond ecosystem. During the monsoon season Algae and other aquatic plants starts growing and provides food stock for living creatures. Small creatures like worms, snail and other microorganisms prefer to live on ground surface while some creatures like frogs, crabs lived in water. As the pond fills in the monsoon many aquatic creatures and plants became a part of food cycle. Algae are found the bottom place and fish are found at the highest the food chain.

Lake Ecosystem:

A lake ecosystem can be defined as huge pond ecology. Sun energy has consumes by the algae and plants for the growth which results the high algae density in lake ecosystem that algae has become a part of food chain of lake biological cycle. Algae and other plants has consume by the small fish and microorganism as a energy source, that small fish has eaten by the large fish it is the lake life cycle process. Penetration of micronutrients in water can cause the significant growth of algae and aquatic plants, that plants consumes the Co2 and Produce the Oxygen, that oxygen was used by the fish and other living creatures. Dumping of pollutants and human waste in lake can reduce the Dissolved oxygen level in water

Stream and River ecosystems:-

Streams and river water contributes the major part in aquatic eco system. Stream and river water flow also affect the living cycle of aquatic plants and creatures. Some creatures prefers to live in deep and dark part of river water, salmon fish needs a constant flow of water to travel to various locations they are the part of lowing water ecosystem. Many water creatures need a pure and clear water to live and prefer to lay down the eggs in clear water. Seasonal variations can make the high impact on river and stream water cycle which affects the life cycle of aquatic creatures and plants. The growth of fauna and flora community is depends on the river water quality and its geographical conditions.

1.4 STUDY AREA:-

1. North 24 Parganas(Madhusudankati)/Source-Pond Water.

2. .Bolepur Mirzapur /Source-Pond Water.

3. .North 24 Parganas (Hingalganja)/Source-Pond Water.

4. Development of domestic filter.

5. Howrah WTP (Eastern Railway)/ Source-Ganga river Water.

6. ChitpurWTP(Eastern Railway)/ Source-Ganga River Water.

CHAPTER -2

SIGNIFICANCE OF THE STUDY

Significance of the study

The supply of pure and safe drinking water is inadequate in the town areas of various places and almost non-existent in the rural areas. The people living in the villages mostly use tube well and ring well water for their drinking and cooking purposes. The urban people use municipal supply water besides tube well and ring well water. In some parts people use water from ponds, streams and rivers as well. Some of these may be safe for use while others may not be safe for drinking purposes. As a result scarcity as well as chemical and bacteriological contamination of water affect a large number of people. Again proper sanitation and sewage disposal system do not exist in different areas. So outbreak of water borne diseases such as typhoid, dysentery, infectious hepatitis, encephalitis, cholera, skin diseases etc. are very common among the people of the district Malaria is a common disease due to stagnant water bodies in different areas. The problem has been accentuated much by the absence of proper medical facilities to fight the menace of unsafe and contaminated drinking water. All the water borne diseases has therefore very much affected the people in different areas.

Lack of properly trained persons, absence of equipment's and other infrastructural facilities and feeble public awareness have resulted in a very slow growth of environmental awareness in different areas. The few studies undertaken so far have revealed that the contamination level of water bodies is worrisome. The present work has been undertaken with a view to further strengthen the data base on drinking water quality so that concerned strategies can be adopted at the planning level to keep the contamination of water bodies at minimum.

CHAPTER-3

OBJECTIVE AND SCOPE OF WORK

OBJECTIVE AND SCOPE OF WORK

Following are the different objectives:-

The main objective of this study is to suggest appropriate ways to improve the drinking-water quality all the rural as well as urban areas.

The first and second objectives of the research are to analyse and assess the problems of current water sources across the different areas.

To provide safe drinking water in different areas especially to the rural community.

To monitor the physical, chemical and biological quality of drinking water in the study area.

Laboratory testing for water disinfection. Rapid field test for bacteriological quality of drinking water.

Reduced risk of recontamination or poor maintenance and operation in smaller networks.

It is easier to include the informal market and small-scale businesses from the sector.

Improves microbial water quality and reduces contamination risk between treatment and use.

To grow high self-responsibility in the households/communities.

To study physical, chemical and microbial parameters of water samples from different water treatment plants sources and some other sources.

To identify locally available natural coagulants for the turbidity treatment of drinking water samples.

To investigate suitable plant materials with excellent adsorption efficiency for the treatment of water contaminated with heavy metal ions.

To generate a database for the drinking water quality in the study area

A major aim is to provide a steady, sustainable safe drinking water supply instead of heavily chemical and bacteriological contamination water.

To Identification of potential pollution sources and evaluation of their nature and extent.

To find out strategies for protecting the natural quality of drinking water sources for sustainable human development.

The present study focused on the traditional methods of water purification techniques and the application of locally available plant materials in the contamination treatment of highly contaminated water samples. It also investigated the adsorption efficiency.

The scope of this project is to study the existing water filtration methods, and use the knowledge to design a Low cost water filtration technique. This water filtration system will focus on cutting down the cost while maintaining filter effectiveness. By providing affordable water filters for the rural and remote areas, will greatly improve people's quality of living, and reduce the risk of any waterborne diseases. Development of a soil made filter with rice husk including other locally available materials (River sand, paddy soil) and studying the efficiency of removal of contamination. Our target is to proper utilise of rainwater and also provide awareness of rainwater harvesting throughout country.

The following Scopes of my research work are formulated as given below:

To analyse physico-chemical and bacteriological quality of drinking water in the study area,

To study the physical survey of existing surface water treatment installed at different locations in West Bengal.

To collect water samples from individual surface water treatment plants of three different months to assess the physic-chemical and bacteriological parameters .

To evaluate the performance of existing 5 No's surface water treatment plants .

To carry out socio – economic survey of individual levels using a questionnaire format to increase the awareness in rural area with social acceptability .

To develop a low cost model which helps to remove mainly turbidity, iron , pH, arsenic as well as to some extent total coli form .

To adopt some strategies plan to mitigate the water crisis problem in a very sustainable manner.

CHAPTER-4

LITERATURE REVIEW

LITERATURE REVIEW

There are many more research scholars and scientists have worked on decentralized of surface water treatment, developed of domestic filter. And published lot of articles. Some research and articles on decentralized of surface water treatment, developed of domestic filter.

1. P. Laurent et al.(2005); It stated that solar disinfection process can be effective in destroying most classes of waterborne pathogens. However, reaching this effective disinfection depends on several parameters such as sensitivity of the microorganisms to inactivation by heat and by UV radiation, colour and turbidity of the water, type of material and volume of bottle, oxygen concentration in the water. Controlling these parameters and evaluating the real effectiveness of the treatment seems challenging, especially when measurement tools are absent. If turbidity is higher than 30NTU a reduction by sedimentation, filtration may be necessary (as well as equipment to measure turbidly).

2. Wagelin (1996), in his Surface Water Treatment by roughing filters, has mentioned the design criteria, construction and operation manual. The raw water runs a horizontal direction from the inlet component, through a series of differently graded filter material separated by perforated wall, to the filter outlet. Filter material also ranges between 20-40 mm size, and is usually distributed as course, medium, and fine fraction in three subsequent filter compartments.

3. **The World commission on Water Report (World Water Vision, 2000)** stated "Where services are free, the result is inevitably politicized of the concerned agent inefficiency, lack of accountability, capture of the subsidies by influential groups, and a view cycle of poor quality services, water rationing , and insufficient resources for operation maintenance , and investment. In almost all cases, the poor end up without access to water.

4. Water resources have been the most exploited natural system, since man strode the earth. As a result of increasing industrialization urbanization , civilization and other developmental activities , our natural water system is being polluted by different sources. The pollutants coming as a waste to the water bodies are likely to create nuisance by way of physical appearance, odour , taste , quality and

render the water harmful for utility. So there is an urgent need for the rapid monitoring of the quality of water resources. Rapid increase of industrialization , urbanization , and population increase in the last few decades have caused a dramatic increase in the demand for river water, as well as significant deteriorations in water quality throughout the world .

5. Reviews made in the journals and publications reveal that Hydro geochemistry study on river basin will be helpful for monitoring the water quality in the basin.

6. Statistical analysis of water quality parameters in Rookie was reported by Garb et al (1990).

7. Statistical methods such as regression analysis , multivariate analysis , Bayesian theory , pattern recognition and least square approximation models have been applied to a wide range of disciplines (Buntine and Weigend 1991).

8. Regression models are useful especially when only limited data i.e. receiving water quality and low data are available in the developing countries like India. Chandrasekhar and Satya prasad (2003) successfully made a Regression model in study Krishna river basin .

9. Reviews made in the journals and publications reveal that statistical study on water quality will be helpful as rapid method of water quality monitoring and prediction.

10. The quality of water is described by its physical , chemical and microbial characteristics . But if some correlations are possible among these parameters then significant ones would be useful to indicate the quality of water.

11. Some of the indices have since been incorporated into water quality indices and used by agencies such as the National Sanitation Foundation (NSF) (Ashamed et at 2004).

12. Sinha and Ritesh (2006) find the WQI for drinking water at Hasanpur , J.P Nagar for 10 different sites, and concluded that the water is severely contaminated at almost all the sites of sampling. In recent years, ANNs have

been used intensively for prediction and forecasting in a number of water - related areas, including water resource study (Lion get al 1999) , Muttil and Chau 2006, EI-Shafie et al 2008), oceanography (Makarynskyy 2004) and environmental science and river water quality (Grubert 2003) land slide mapping (Vahidnia et al 2010).

13. Diamantopoulos et al (2007) made a study to estimate the missing monthly values of water quality parameters in rivers using Cascade Correlation Artificial Neural Network (CCANN). Three – layer CCANN models were developed to predict the monthly values of some water quality parameters in rivers by using monthly values of other existing water quality parameters as input variables . The monthly data of some water quality parameters and discharge , for the time period 1980 – 1994 , of Axios River , at a station near the Greek –

14. FYROM borders and for the time period 1980 – 1990 , of Strymon River , at a station near the Greek – Bulgarian borders , were selected for their study. The training of CCANN models was achieved by the cascade correlation algorithm which is a feed-forward and supervised algorithm. Kalman's learning rule was used to modify the ANN weights. The choice of the input variables introduced to the input layer was based on the stepwise approach. The number of nodes in the hidden layer was determined based on the maximum value of the correlation coefficient . The final network architecture and geometry were tested to avoid over – fitting. The selected CCANN models gave very good results for both rivers and seem promising to be applicable for the estimation of missing monthly values of water quality parameters in rivers.

15. Muluye and Coulibaly (2007) have done a study on seasonal reservoir inflow forecasting with low frequency climatic indices a comparison of data – driven methods. This study investigates the potential of using data –driven methods namely Bayesian Neural Networks (BNN) Recurrent Multi-Layer perception (RMLP) . Time-Lagged Feed -Forward Networks (TLFN), and conventional Multi – Layer perception's (MLP) to forecast seasonal reservoir inflows of the Churchill Falls watershed in north-eastern Canada . A climate variability indicator was used as additional information to historical inflow time series in order to predict seasonal reservoir inflows. The prediction results showed that

the Bayesian neural network model was best able to capture the additional information provided by the ESNO series, and provided improved predictions in spring and summer seasons relative to the same model using only reservoir inflows .Similarly , time-lagged feed-forward networks and recurrent multi –layer perception showed some improved forecast skill in spring when the ENSO index series were used but generally provided superior performance overall. The conventional multi-layer perception appears unable to capture relevant information from the ENSO series regardless of the season. However, when only historical flow series are used all the selected data-driven methods provide very competitive forecast performances.

16. Mohsen and Zahra (2007) have made a study on the application of ANNs for temperature forecasting . In their study , the application of ANNs to study the design of short-term temperature forecasting (STTF) Systems for Kermanshah city, west of Iran was explored. The important architecture of neural networks , named Multi- Layer Perceptron's (MLP) to model STTF systems, was used . The study based on MLP was trained and tested using ten years' (1996 – 2006) meteorological data. The results show that MLP network has the minimum forecasting error and can be considered as a good method to model the STTF systems.

17. Akhtar et al (2009) made a study in river flow forecasting with ANNs using satellite –observed precipitation pre-processed with flow length and travel time information in Ganges river basin. Their study explores the use of flow length and travel time as a pre- processing step for incorporating spatial precipitation information into ANN models used for river flow forecasting Spatially distributed precipitation is commonly required when modelling large basins, and it is usually incorporated in distributed physically - based hydrological modelling approaches . However , these modelling approaches are recognised to be quite complex and expensive , especially due to the data collection of multiple inputs and parameters , which vary in space and time . On the other hand , ANN models for flow forecasting are frequently developed only with precipitation and discharge as inputs, usually without taking into consideration the spatial variability of precipitation. Full inclusion of spatially distributed inputs into

ANN models still leads to a complex computational process that may not give acceptable results. The pre-processed rainfall was used together with local stream flow measurements of previous days as input to ANN models for flow forecasting are frequently developed only with precipitation and discharge as inputs, usually without taking into consideration the spatial variability of precipitation. Full inclusion of spatially distributed inputs into ANN models still leads to a complex computational process that may not give acceptable results. The pre-processed rainfall was used together with local stream flow measurements of previous days as input to ANN models. A comparative analysis of multiple ANN models with different hydrological pre-processing was presented in their study. The ANN showed its ability to forecast discharged 3 days ahead with an acceptable accuracy. Within this forecast horizon , the influence of the pre-processed rainfall is marginal, because of dominant influence of strongly auto –correlated discharge inputs. For forecast horizons of 7 to 10 days , the influence of the pre-processed rainfall is noticeable , although the overall model performance deteriorates . The incorporation of remote sensing data of spatially distributed precipitation information as pre- processing step showed to be a promising alternative for the setting-up of ANN models for river flow forecasting.

18. Holger (2010) has made a detailed review on the methods used for the development of neural networks for the prediction of water resource variables in river systems . In their study , the steps in the development of ANN models are outlined and taxonomies of approaches were introduced for each of the steps . In order to obtain a snapshot of current practice, ANN development methods were assessed based on the taxonomies for 210 journal papers that were published from 1999 to 2007 and focus on the prediction of water resource variables in river systems. The results obtained indicate that the vast majority of studies focus on flow prediction, with very few applications to water quality.

19. Yunchao and Zhongren (2006) have made a research on the integration of ANN with GIS in uncertain model of river water quality. ANN is capable of modelling highly nonlinear relationships and can be trained to accurately generalize when presented with new, unseen data. In previous researches , the

ANN models have been used in the prediction of water quality for this reason . However, few of the ANN models have undertaken a research of visually simulated result at present. In their research paper they presented a study, which integrates GIS with the feed-forward back propagation network (BPN), to create a GIS-BPN-based , visual river water quality uncertain model.

CHAPTER-5

PERFORMANCE EVALUATION OF DECENTRALIZED SMALL SCALE SURFACE WATER TREATMENT:- SOME CASE STUDY.

5(a) Objectives:-

To provide safe drinking water to the rural community with the following strategies.

(i) Cost effective treatment of water from surface water (pond, river, cannels, lakes etc.).

(ii) Training and capacity building of the local workers.

(iii) Creation of local management, infrastructure for operation.

5(b) Methodology:-

Creating a drinking water production activity:-

In west Bengal and other states in the planes of river Ganga in eastern India, the annual rainfall is quite satisfactory and there are many perennial and sustainable water sources like pond, canals in the rural area. Unfortunately, these are often abused by human behaviours and as a result get heavily contaminated, resulting in epidemics of diarrheal diseases and endemicity of the same in the community. In our project, it is proposed that a number of such water bodies could be used to create a drinking water production unit. A low cost and community friendly treatment process as described later in page no---would be used to treat the water so that it become totally safe and other domestic use.

5(c) Guaranteeing water quality at the point of use:-

A comprehensive water treatment system required to designed with a view to adapt drinking water production sites design to a certain number of constrains –which were presented above –in order to guarantee water quality at the point of use instead of focusing only on the water source.

A comprehensive water treatment system is install is require in each village which, because the quantity of water treated every day is able to adapt to the best raw water source available –through appealing to a well-trained team to install each treatment unit, analysing different raw water sources before installation, and changing raw water source if need be.

Water treatment and bottle filing up processes are require to analyse a quality control procedure including frequent bacteriologic analysis during all site's lifetime duration.

Water is transported to the client's homes in sealed 20-litres bottles.

Water storage is well taken care of in bottles that have been disinfected beforehand by a well –trained operator, instead of random storage in whatever container is available.

Persistent water purification is obtained by using a minimal quantity of silver ions.

Attention is paid to producing water with a taste that people as well as to making bottle handling easier so as to maximise consumer's satisfaction.

5(d) Ensuring Sustainability:-

Ensuring sustainability of safe drinking water production capacities consists in the two following imperatives:

On one hand, transforming a Community Based Organisation (CBO) into a real entrepreneur able to purify every day the quantity of water that is necessary to meet consumers' needs while respecting a treatment process guaranteeing perfect water quantity under WHO's standards, but also able to diffuse key hygiene messages in the village, where water supply is maintained.

On the other hand, reaching as soon as possible a production level that makes sales high enough even with very low service charges –to cover for all operating costs including the entrepreneur's income.

5(e) Implementation process:-

(i) Selection of site and obtaining of land.

(ii) Sensitization and Awareness generation.

(iii) Water quality analysis.

(iv) Design of treatment process.

(v) Construction and Operation.

(vi) Safe water distribution among community people.

CHAPTER 5.1

MADHUSUDANKATI WTP

5.1.1 Background:-

Diarrheal can be caused by wide range of micro-organisms through various ways of transmission, ingestion of contaminated food or be verge contracts between, individuals, direct or indirect contact with faces. It has been established in many studies that for comprehensive and lasting impact on community health need an integrated approach on sanitation and public health. Now-a-days a burning problem has been found in regard to water that are noticed in several newspaper, mass media etc. It was the 19th may at "the Hindu" patrika becomes very alarming in regard to the mankind, especially in community people, poorest people, in very remote area.

The problems are much gravier and dense at backward villages, backward rural arrears and the places surrounded by poor and under developed people. Due to non-awareness of hygienic system of the uneducated and backward classes.

I being a student of Masters of Engineers in " Water Resources and Hydraulic Engineering" decided to work for the "surface water treatment based on community people". I have decided to find out the cause, reasons, of contaminated water and methods to prevent from these dangers, am submitting my projection "surface water treatment based on community people". For supplying low cost safe drinking water to the community people, it would be better if the raw water sources are perennial surface water and collect through rain water harvesting process because it has no effect on partially sediment.

I want to details work; specially how to reduce more cost by various ways like as reducing the water loss viz. evaporation loss & transpiration loss and kept some more special view related at the time of my thesis work. Centralised water supply is impossible due to population growth, lack of resources, and unsupportive legal framework. Centralised water supply is impossible due to population growth, lack of resources, and unsupportive legal framework. Centralised water supply is often considered the optimal water supply system, since it provides the most convenient service. However, in 2008 (according to WHO), only 57% of the global population got its drinking water from a large-scale piped connection in the user's dwelling, plot, or yard. In developing regions, this percentage was only 49%,.

Moreover, large distribution networks have high maintenance costs and are often prone to failures because of poor operation and maintenance. Failure of centralised systems to provide clean, adequate drinking water depends on a number of technical (see also intermittent supply

and leakage control), economic, and legal factors. Because of the large amount of infrastructure (e.g. treatment plants, pipes, etc.) needed, there are many situations where it may not be possible to connect the whole population to the centralised supply system, such as in rural areas where populations are dispersed over large surface areas. Especially in developing or transition countries, high population growth in urban areas often leads to the establishment of informal settlements which remain disconnected from supply lines, as providing centralised supply is not technically or economically feasible. Moreover, as these settlements are frequently illegal, the government has no obligation to provide water and sanitation services. Furthermore, centralised water treatment and distribution facilities are often poorly maintained and fall into disrepair, so that even when users are connected to the centralised supply network, the quality and quantity of water may be unreliable (see also intermittent water distribution).Multiple Water Needs of rural Households rural water supply schemes in India are generally designed for domestic uses. However, the multiple water use priorities of poor rural households in order to reduce their hardship and enhance food production, health and income mean that in water-scarce areas, domestic water use can run into conflict with productive water use. The failure of water supply agencies to design a water supply system for multiple uses results in communities not being able to realize the full potential of water as a social good. This chapter identifies various domestic and productive water requirements of rural households. Thereafter, a composite index which captures the vulnerability of rural households to problems associated with lack of water for multiple needs was assessed for three selected regions of Maharashtra, each representing a different agro-ecological and socioeconomic setting. Summary

Centralised drinking water systems serve millions of households around the world. However, these systems do often not reach the poorest or the most remote populations and quality and quantity of water provided are often unreliable due to poor operation and maintenance. Decentralised supply systems offer the possibility to provide safe drinking water where centralised supply systems are not feasible due to technical, economical or institutional reasons (e.g. in rural communities or informal settlements). Decentralised water supply refers to the small-scale purification and distribution of water. Decentralised treatment systems fall into three main categories: point-of-use systems (POU), point-of-entry systems (POE), and small-scale systems (SSS). POU and POE systems are designed for individual households while SSS can provide for community water supply, for emergency water supply in camps, or

to purify water for sale in water kiosks. The choice of decentralised supply system depends on the local context and includes such factors as ease of use.

5.1.2 Source Water-pond:-

Situated at north 24 Parganas district in West Bengal state. Madhusudankati, it is a small remote village of Ghaighata block, Situated 60 Km, north of Kolkata and 14 km of Bangladesh boarder. The activities of this scheme is to cover five other more village areas viz. Brishnapur, Faridkati, Tegharia, Jhikra, and Taltala Where 3600 Households are living and equipped 11 No's schools. The average income in between Rs.3500/- Rs.5500/- in a month and 90% Village peoples are farmers developing wealth of its block, improving health and education gets help from this drinking water treatment project.

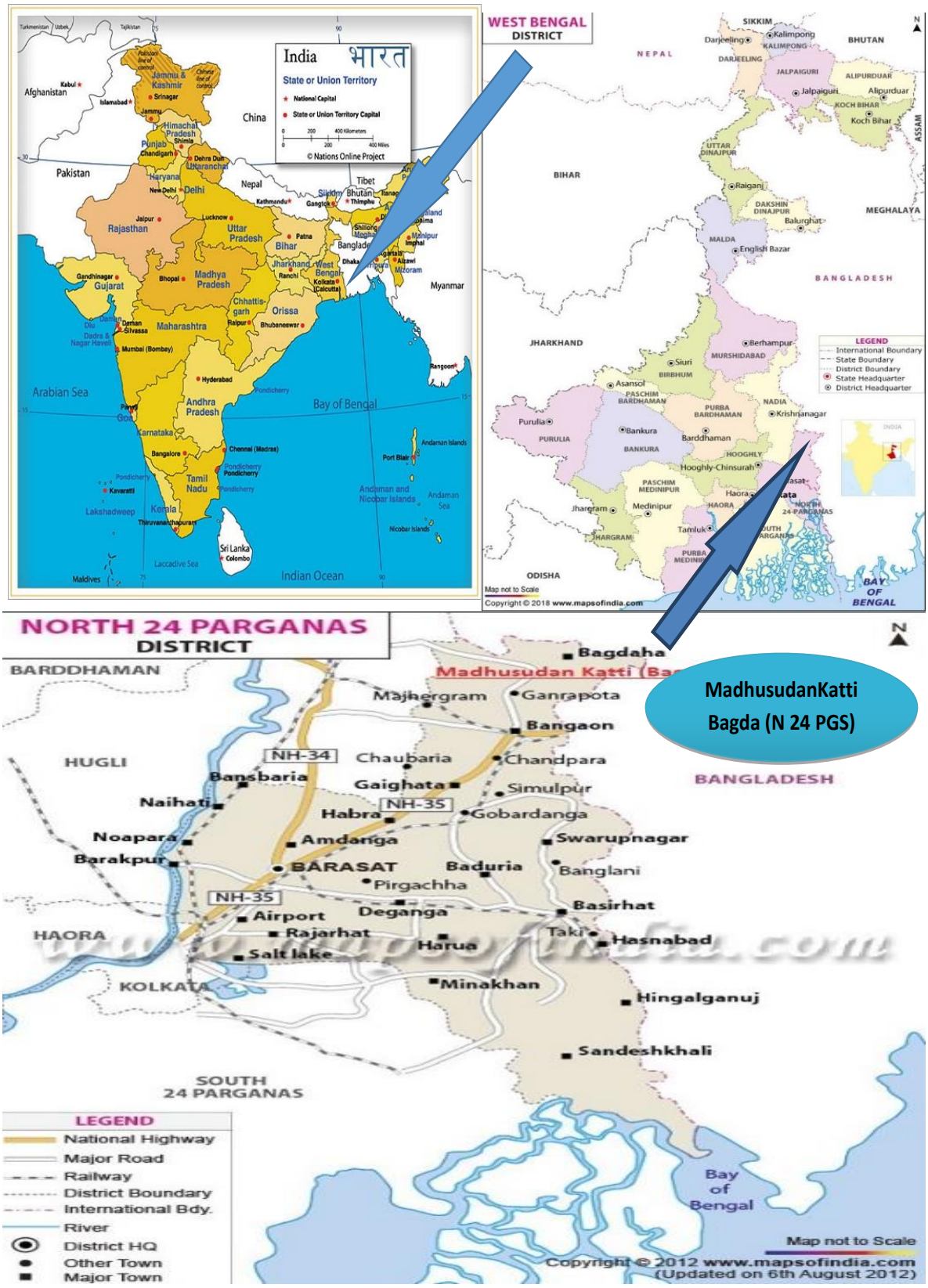
In view of Arsenic prone area of this locality, this plant has provided safe drinking water to the residents as a whole. Initially with financial and logistic support from (NCDC) ground water treatment and this treated water is supplied @ 0.50/- per litre for Arsenic patients school and Anganwari institutions which helps to obtaining Arsenic and bacteria free water.

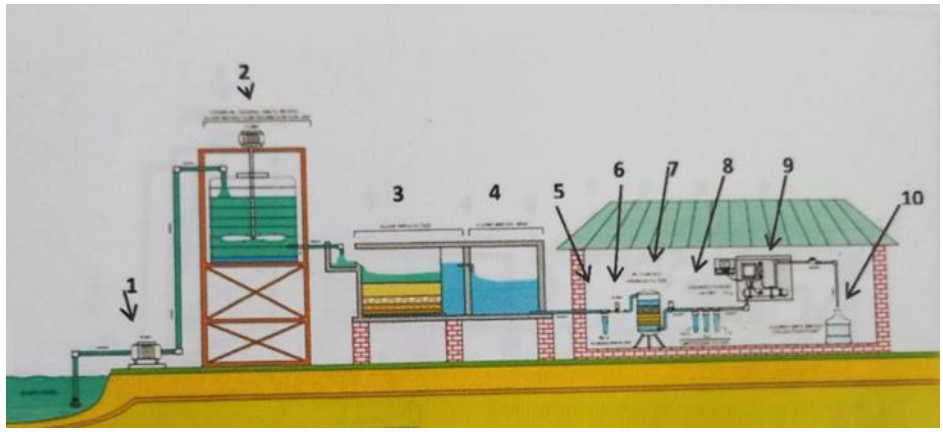
At present due to enhance demand, this project, rain water harvesting project (i.e. pond water) treated widely and distributing to the operational area includes vicinity @ 0.75/- per litre. It has get world fame.

y under WHO's standards, but also able to diffuse key hygiene messages in the village, where water supply is maintained.

On the other hand, reaching as soon as possible a production level that makes sales high enough even with very low service charges –to cover for all operating costs including the entrepreneur's income.

Fig 5.1.1-North 24 Parganas (Madhusudankati)

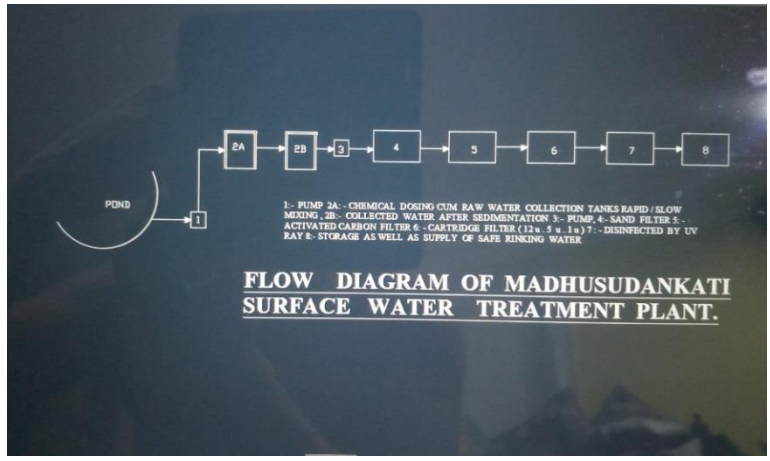




Reference-International Academy of Environmental Sanitation & Public Health

(Journal of SISSO, Delhi)

Layout Plan Of Madhusudnkati WTP



Flow Diagram

Raw Water Collection Reservoir

Figure 5.1.2

Flocculation Tank & Slow Sand Filter

Activated Carbon Filter

Figure 5.1.3

UV Ray & Iron Treatment for Bacteria Free & Iron Control

Madhusudankati Laboratory for Periodical Checking

Bottling Processes of Treated Water

Figure 5.1.4

Man who are the Patients Of Arsenacosis, Gastic & Skin Cancers Etc. At MadhusudanKati.

Distribution Car Of Treated Water

Administrative Building of Madhusudankati

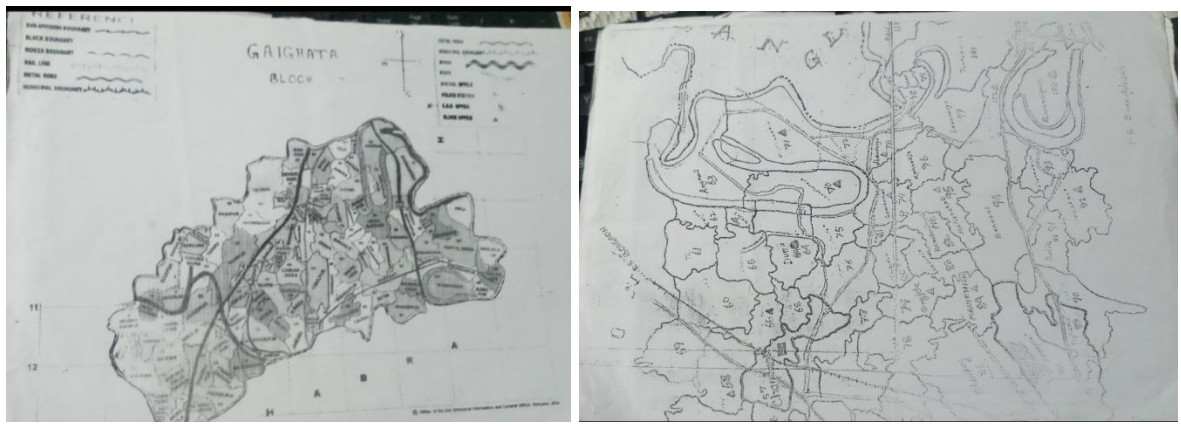
Figure 5.1.5

5.1.3 PROCESS OF PURIFICATION (North 24 Parganas /Madhusudankati):-

Raw water (i.e. pond water) is collected through pump which is situated at the bank of the supplied pond. Generally the raw water is collected at evening time. Water is collected in two numbers tank each of 5000 litre capacities i.e. collected 10,000 litres every day. Alum is added with this collected pond's raw water @ 120gm per 5000 litres raw water. After adding alum it then coagulation completion by manually (by handle moving) up to 50 minutes to 60 minutes, handle is fitted with tank. After completion of coagulation function then waited 6 to 8 hrs, for sedimentation at night time.

At dawn i.e.4 am now this sediment water begins under remaining treatment. This sediment water first entered into the slow sand filter (SSF) then this filtered water is entered into the activated carbon filter, before entering activated carbon filter I had taken sample for testing. (Say sample v).

I have taken raw water (pond water) sample for testing and obtaining result, Turbidity of pond is 19.5 ntu, Turbidity after getting alum and allows sedimentation of 8 hrs. And turbidity after slow sand filters. After completion of activated carbon filter then it is passed through Cartridge filter entering three different units' viz.12micro, 5 micro, and 1micro in capacity. After passing these 03 units then this water is passes through UV Ray (German made machine) then this treated water is safe drinking water and collected in storage for supply. Every day supply generally 8000litres.



Location Map Of Madhusudankati.

Table 5.1.1

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW (i.e. POND WATER).

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:--MADHUSUDANKATI.

DATE: 18. 12.2018

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.96	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	190	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0	Nephelometric	14.8	
7.	IRON, (as FE) mg/l	1.0	No relaxation	Photometric	0.0370	
8.	MANGANESE, mg/l	0.2	1.0	Photometric	0.002	
9.	TOTALHARDNESS (as CaCo3) mg/l	300	600	Titration method	205	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.2

LABORATORY TESTING REPORT

TYPE OF WATER:-PURIFIED WATER.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:--MADHUSUDANKATI.

DATE: 18. 12.2018

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.58	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	160	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0	Nephelometric	0.39	
7.	IRON, (as FE) mg/l	1.0	No relaxation	Photometric	0.0360	
8.	MANGANESE, mg/l	0.2	1.0	Photometric	0.002	
9.	TOTALHARDNESS (as CaCo3) mg/l	300	600	Titration method	165	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.3

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW (i.e. POND WATER).

TESTED FROM:-PASCHIM BANGA VFIGYAN MANCHA.

SAMPLE COLLECTED FROM:--MADHUSUDANKATI.

DATE: 25. 01.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.92	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	90	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0	Nephelometric	19.5	
7.	IRON, (as FE) mg/l	1.0	No relaxation	Photometric	0.03720	
8.	MANGANESE, mg/l	0.2	1.0	Photometric	0.004	
9.	TOTALHARDNESS (as CaCo3) mg/l	300	600	Titration method	188	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.4

LABORATORY TESTING REPORT

TYPE OF WATER:-COAGULATION/FLOCULTION (i.e. AFTER ADDING ALUM).

TESTED FROM:-PASCHIM BANGA VFIGYAN MANCHA.

SAMPLE COLLECTED FROM:-MADHUSUDANKATI.

DATE: 25. 01.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation			
5.	DISSOLVED SOLIDS, mg/l	500	2000			
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0		1.19	
7.	IRON, (as FE) mg/l	1.0	.No relaxation			
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.5

LABORATORY TESTING REPORT

TYPE OF WATER:-SAMPLE COLLECTED AFTER SLOW SAND FILTERATION.

TESTED FROM:-PASCHIM BANGA VFIGYAN MANCHA.

SAMPLE COLLECTED FROM:--MADHUSUDANKATI..

DATE: 25. 01.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation			
5.	DISSOLVED SOLIDS, mg/l	500	2000			
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0		4.17	
7.	IRON, (as FE) mg/l	1.0	.No relaxation			
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.6

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-PASCHIM BANGA VFIGYAN MANCHA..

SAMPLE COLLECTED FROM:--MADHUSUDANKATI.

DATE: 25. 01.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.66	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	300	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0		0.41	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.0370	
8.	MANGANESE, mg/l	0.2	1.0	Photometric	0.001	
9.	TOTALHARDNESS (as CaCo3) mg/l	300	600	Titration method	152	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	.No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.7

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-MADHUSUDANKATI.

DATE:-05.04.19.

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.72	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	324	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.08	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.8

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-MADHUSUDANKATI.

DATE:-05.04.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.72	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	324	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.08	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.1.9

PUBLIC HEALTH ENGINEERING DTE.

BARASAT DIVISION LABORATORY

GOVERNMENT OFWEST BENGAL

BACTERIOLOGICAL TEST REPORT

Sl. No.	Block Name	G.P. Name	Mouza (with Jl. No.)	Habitation / Description / Landmark	Depth of T/W	Date of collection & Testing	Date of Completion	Test RESULTS CFU of Total CFU of Coli forms at 37Thermotorerean c per 100ml	Coliforms at 37	REMARKS
1	Gaighata	Sutio	Madhusudankati	Madhusudankati S.K.U.S Ltd.	Pond Water	8/4/2019	9/4/2019	0	0	-

Sample Collected & supplied to the Lab.- By Party

Note: Minimum limits as per CL. 3.2.1 of IS-10500.2012

a) Throughout any year, 95% of sample should not contain any coli form organisms in 100ml.

b) No sample should contain Coli form Organisms & E. Coil in 100ml.

c) Coli form organisms should not be detectable in 100ml of any two consecutive samples.

Table 5.1.10

PUBLIC HEALTH ENGINEERING DTE.

LABORATORY

BARASAT DIVISION

(CHEMICAL TEST REPORT)

SL. NO	Block Name	Mouza with J. L. No. G. P. Name	Habitation Description Land Mark	Dep th of T/W	Date of Collection	Date of Testing	TEST RESULTS								REMARKS
							As mg/ ltr	Fe mg/ ltr	pH	Total Hardness (as $CaCO_3$)	Turbidity	Cl mg/ ltr	Mn mg/ ltr	TDS mg/ ltr	
1	Gaighata	Madhusudankati Shutia	Madhusudankati S. K. U. S.		8.4.19	9.4.19	BDL	BDL	7.26	150	0.02	14.2	0.10	180	Pond

Drinking water specification : IS : 10500.2012

Sl. No.	Parameter	Desirable limit	Permissible limit in Absence of alternate source
1	As	0.01 mg/l	No. relaxation
2	Fe	0.30 mg/l	1.0 mg/l
3	Cl	250 mg/l	1000 mg/l
4	pH	6.5 – 8.5	No. relaxation
5	TDS	500 mg/l	2000 mg/l
6	Mn	0.10 mg/l	0.30 mg/l
7	Turbidity (NTU) Max	1	5
8	Total Alkalinity	200 mg/l	600 mg/l
9	Total Hardness (as $CaCO_3$)	200 mg/l	600 mg/l

Note :Water Sample is collected by the party.
Laboratory is not liable for source of the water sample.

BDL – Below detection Limit.

CHAPTER-5.2

Mirzapur/ (Bolepur)--WTP

BIRBHUM DISTRICT

MIRZAPUR(BIRBHUM DISTRICT) --WTP 5.2.1
Source-Pond Water:-

Situated at Bhirbhum district in West Bengal state.Mirzapur (Bhirbhum) , it is a small remote village of Mirzapur (Bhirbhum)168Km, north of Kolkata and about 10 km of Shantiniketan.The activities of this scheme is to cover four other more village areas viz. Bahadurpur, Binuria, Islampur, and Lohagar, Where 1800 Households are living and equipped 5No'sschools.The average income in between Rs.2500/- - Rs.3500/- in a month and 99% Village peoples are farmers developing wealth of its block, improving health and education gets help from this drinking water treatment project.

In view of Arsenic prone area of this locality, this plant has provided safe drinking water to the residents as a whole. Initially this treated water is supplied @ 0.50/- per litre for Arsenic patients school and Anganwari institutions which helps to obtaining Arsenic and bacteria free water.

At present due to enhance demand, this project, rain water harvesting project (i.e. pond water) treated widely and distributing to the operational area includes vicinity @ 0.75/- per litre.

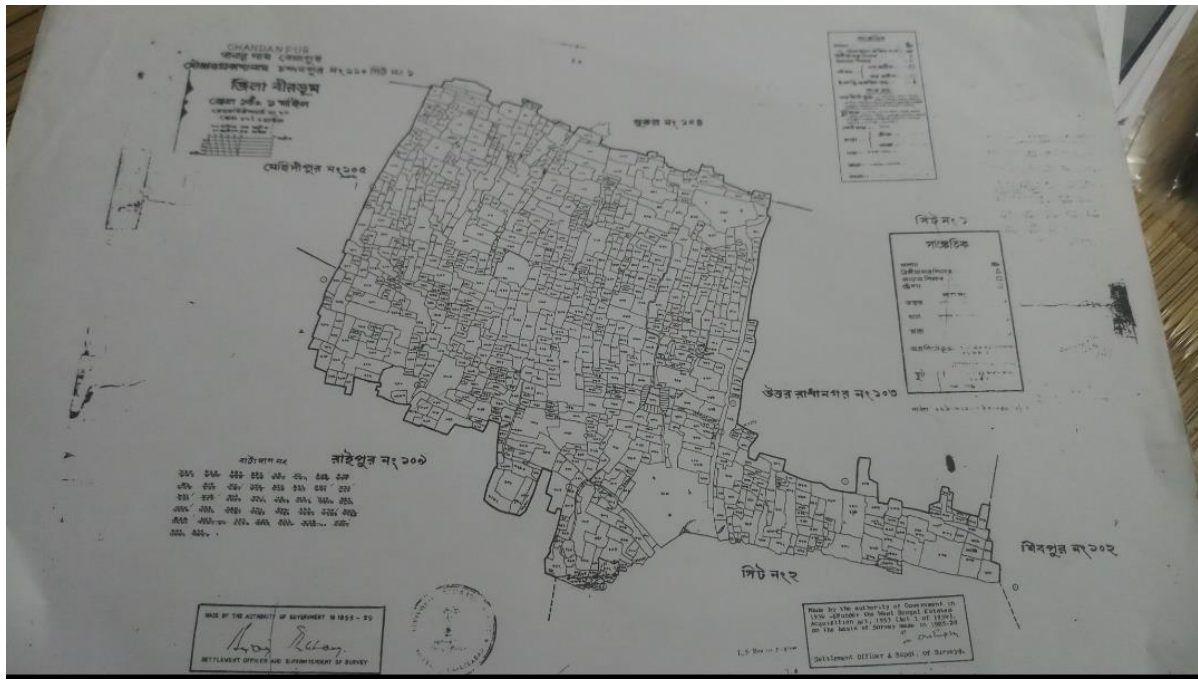


Figure-5.2.1

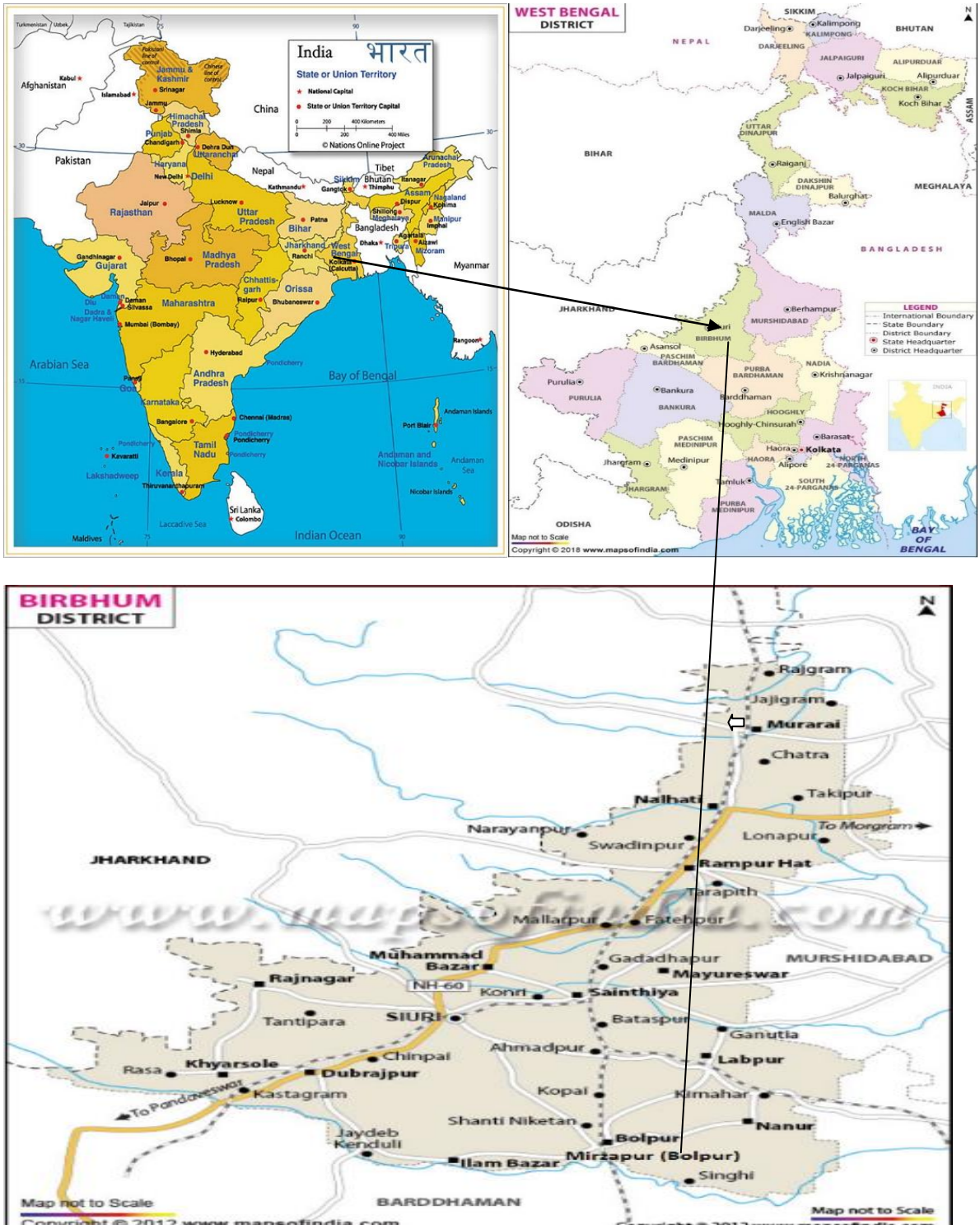
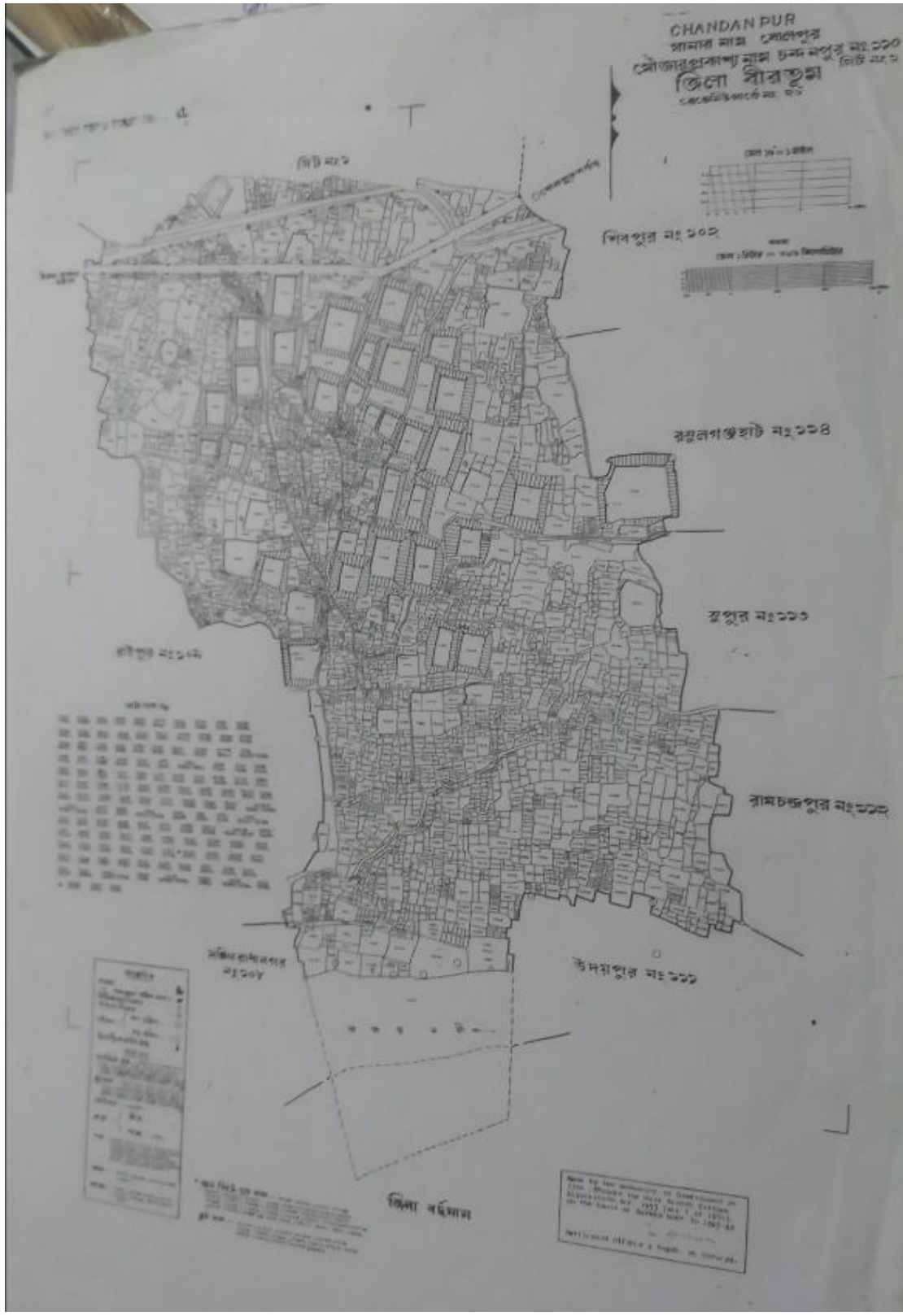

India
भारत
State or Union Territory
National Capital
State or Union Territory Capital
© Nations Online Project
WEST BENGAL
DISTRICT
LEGEND
International Boundary
State Boundary
District Boundary
State Headquarter
District Headquarter
Map not to Scale
Copyright © 2018 www.mapsofindia.com
BIRBHUM
DISTRICT
JHARKHAND
MURSHIDABAD
BARDDHAMAN
Rajgram
Jajigram
Murarai
Chatra
Nalhati
Takipur
Narayanpur
Swadinpur
Lonapur
To Mongram
Rampur Hat
Tarapith
Mallarpur
Fatehpur
Muhammad Bazar
Gadadhapur
Mayureswar
Rajnagar
NH-60
Konri
Sainthiya
Tantipara
SIURI
Bataspur
Ganutla
Ahmadpur
Chinpal
Labpur
Rasa
Khyarsole
Dubrajpur
Kopai
Kimahar
To Panchmoni
Kastagram
Shanti Niketan
Nanur
Jaydeb Kenduli
Bolpur
Mirzapur (Bolpur)
Ilam Bazar
Singhi
Map not to Scale

Figure-5.2.2



Location map Of Mirzapur Wtp

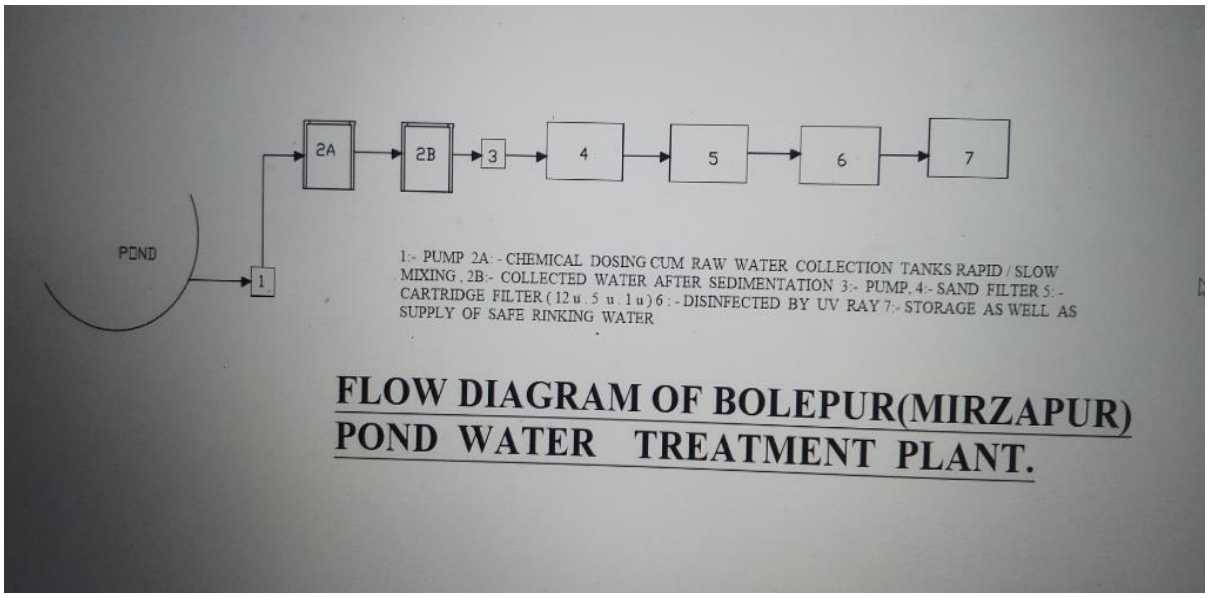
Figure-5.2.3

5.2.2 PROCESS OF PURIFICATION MIRZAPUR (BHIRBHUM):-

Raw water (i.e. pond water) is collected through pump which is situated at the bank of the supplied pond. Generally the raw water is collected at evening time. Water is collected in two numbers tank each of 5000 litre capacities i.e. collected 10,000 litres every day. Alum is added with this collected pond's raw water @ 120gm per 5000 litres raw water. After adding alum it then coagulation completion by manually (by handle moving) up to 50 minutes to 60 minutes, handle is fitted with tank. After completion of coagulation function then waited 6 to 8 hrs.for sedimentation at night time.

At dawn i.e.4 am now this sediment water begins under remaining treatment. This sediment water first entered into the slow sand filter (SSF) then this filtered water is entered into the activated carbon filter, before entering activated carbon filter I had taken sample for testing.

I have taken raw water (pond water) sample for testing and obtaining result, Turbidity of pond is 19.5 n 0tu, Turbidity after getting alum and allow sedimentation of 8 hrs. And turbidity after slow sand filters. After completion of activated carbon filter then it is passed through Cartridge filter cantering three different units viz.12micro, 5 micro, 1micro in capacity. After passing these 03 units then this water is passes through UV Ray (German made machine) then this treated water is safe drinking water and collected in storage for supply. Every day supply generally 8000 litres.



Layout Plan

Figure-5.2.4

Various unit of Treatment Plant

Figure-5.2.5

Sand Filter

Figure-5.2.6

Source of Water/Pond Water

Bottling process

Figure-5.2.7

Mirzapur WTP situated at a this remote village

Figure-5.2.8

Table 5.2.1

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-MIRZAPUR (BOLEPUR).

DATE:-24.11.2018

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
C. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.96	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	350	
D. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0	Nephelometic	11.78	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.41	
8.	MANGANESE, mg/l	0.2	1.0	Photometric	0.195	
9.	TOTALHARDNESS (as CaCo3) mg/l	300	600	Tritation method	310	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.2

LABORATORY TESTING REPORT

TYPE OF WATER:- WATER AFTER.TREATED

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:- MIRZAPUR (BOLEPUR

DATE:-24.11.2018

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation		7.01	
5.	DISSOLVED SOLIDS, mg/l	500	2000		310	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0	Nephelomeetric	2.5	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.310	
8.	MANGANESE, mg/l			Photometric	0.160	
9.	TOTALHARDNESS (as CaCo3) mg/l	200	600	Titration	260	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	.No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.3

PUBLIC HEALTH ENGINEERING DTE.

BARASAT DIVISION LABORATORY

GOVERNMENT OF WEST BENGAL

BACTERIOLOGICAL TEST REPORT

Sl. No.	Block Name	G.P. Name	Mouza (with Jl. No.)	Habitation / Description / Landmark	Depth of T/W	Date of collection & Testing	Date of Completion	Test RESULTS		REMARKS
1	Bhirbhum	Mirzapur	Mirzapur	Bolepur	Pond Water	2/1/2019	3/1/2019	0	0	-

**Sample Collected & supplied to the Lab. By : _ Party

Note : Minimum limits as per CL . 3.2.1 of IS-10500.2012

a) Throughout any year, 95% of sample should not contain any coli form organisms in 100ml.
b) No sample should contain Coli form Organisms & E. Coil in 100ml.
c) Coli form organisms should not be detectable in 100ml of any two consecutive samples.

Table 5.2.4

PUBLIC HEALTH ENGINEERING DTE.

LABORATORY

BARASAT DIVISION

(CHEMICAL TEST REPORT)

SL. NO	Block Name	Mouza with J. L. No. G. P. Name	Habitation Description Land Mark	Depth of T/W	Date of Collection	Date of Testing	TEST RESULTS								REMARKS
							As mg/ltr	Fe mg/ltr	pH	Total Hardness (as $CaCO_3$)	Turbidity NTU	CT mg/ltr	Mn mg/ltr	TDS mg/ltr	
1	Bholepur	Mirzapur	Bolepur		2/1/19	3/1/19	BDL	BDL	7.51	170	0.75	12.5	0.15	185	Pond

Drinking water specification : IS : 10500.2012

Sl. No.	Parameter	Desirable limit	Permissible limit in Absence of alternate source
1	As	0.01 mg/l	No. relaxation
2	Fe	0.30 mg/l	1.0 mg/l
3	Cl	250 mg/l	1000 mg/l
4	pH	6.5 – 8.5	No. relaxation
5	TDS	500 mg/l	2000 mg/l
6	Mn	0.10 mg/l	0.30 mg/l
7	Turbidity (NTU) Max	1	5
8	Total Alkalinity	200 mg/l	600 mg/l
9	Total Hardness (as $CaCO_3$)	200 mg/l	600 mg/l

Note :Water Sample is collected by the party.
Laboratory is not liable for source of the water sample.

BDL – Below detection Limit.

Table 5.2.5

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-PASCHIM BANGA VIGYAN MANCHA.

SAMPLE COLLECTED FROM:- MIRZAPUR/(BHIRBHUM)

DATE:-01.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	8.07	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	330	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0		12.6	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.4020	
8.	MANGANESE, mg/l	0.2	1.0		0.239	
9.	TOTALHARDNESS (as CaCo3) mg/l	300	600		280	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.6

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-PASCHIM BANGA VIGYAN MANCHA.

SAMPLE COLLECTED FROMMIRZAPUR/(BHIRBHUM)

DATE:-01.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.65	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	305	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0		2.9	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.305	
8.	MANGANESE, mg/l	0.2	1.0		0.245	
9.	TOTALHARDNESS (as CaCo3) mg/l	300	600		190	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.7

LABORATORY TESTING REPORT

TYPE OF WATER: RAW WATER AFTER FLOWCULATION AND SEDIMENTATION.

TESTED FROM:-PASCHIM BANGA VIGYAN MANCHA..

SAMPLE COLLECTED FROM: -MIRZAPUR/(BHIRBHUM)

DATE:-01.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	NA	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	NA	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0		1.19	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	NA	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.8

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-MIRZAPUR/(BHIRBHUM)

DATE:-24.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	8.02	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	320	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.083	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	.01	No relaxation	Photometric	.005	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.9

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-MIRZAPUR/(BHIRBHUM)

.

DATE:-24.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.72	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	324	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.08	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.10

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-MIRZAPUR/(BHIRBHUM)

DATE:-06.03.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.96	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	360	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.03	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	.No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.2.11

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-MIRZAPUR/(BHIRBHUM)

DATE:-06.03.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.65	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	225	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.028	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

CHAPTER-5.3

SAJALDHARA WATER PROJECT

AT HINGALGANJ(AT NORTH 24 PGS)

SAJALDHARA WATER PROJECT HINGALGANJ SAMOBAY KRISHI SAMITI.

5.3.1 Introduction:-

Source of water two consecutive ponds, if any water crisis arise, then water is Pumped from available pond & other pond is recharged through ground water by lifting Shallow machine (pump). Now this water is tested for arsenic (as 0.05mg/l.) &fluoride (f 1.0-1.5mg/l) from outside laboratory.

Cost of the project:

This pond water project cost is around Rs.14lakh/- – 15lakh/- and with a production capacity of 8000 lit/ day. After purification, water is home delivered in 20 litres bottle which are cleaned and sealed and sterilized by the project staff. The water is available at the rate of 50p/lit, which means Rs10/- for 20 lit. The water supplied to Community is bacteriologic ally and chemically safe for drinking. The laboratory test results reveal that the quality of treated water is safe for the human consumption (as per ISO 10500: 1991). The water is also supplied at free of cost to primary schools, anganwadi centres', and arsenic patients. The villagers / consumers are showing great interest and the acceptance for this drinking water which is rather cheap and easily available.

5.3.2 North 24 Parganas (Hingalganj) /Source-Double Pond Water:-

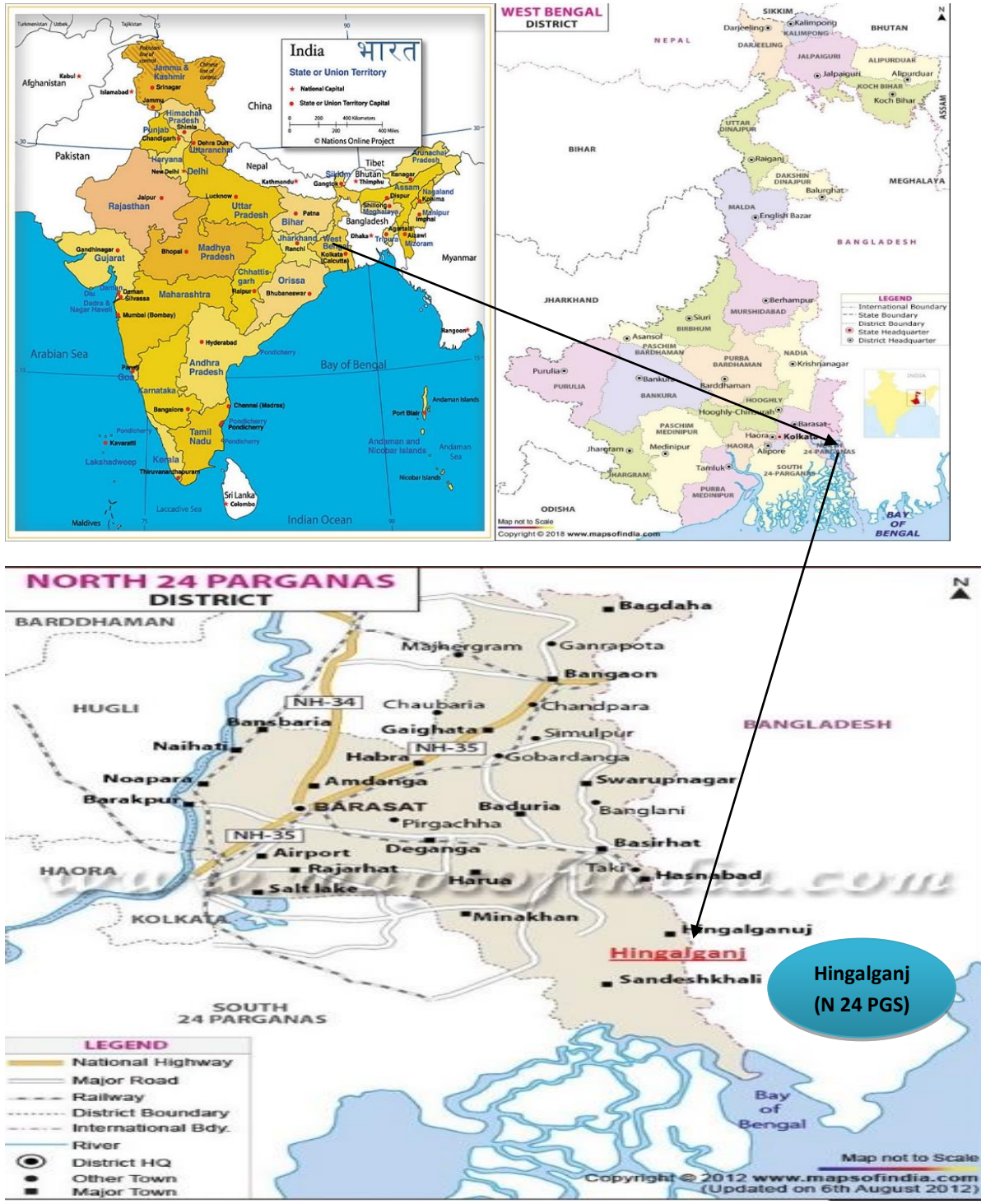
Situated at North 24 parganas district in West Bengal state Hingalganj , it is a small remote village of Situated about 128Km, north of Kolkata and about 0.5 km from Bangladesh. The activities of this scheme is to cover four other more village areas viz. Sandeshkhali, Barunhat, Rameshwarpur etc, Where 1700 Households are living and equipped 4 No's schools. The average income in between Rs.2500/- - Rs.3500/- in a month and 99% Village peoples are farmers developing wealth of its block, improving health and education gets help from this drinking water treatment project.

In view of Arsenic prone area of this locality, this plant has provided safe drinking water to the residents as a whole. Initially this treated water is supplied @ 0.50/- per litre for Arsenic patient school and Anganwari institutions which helps to obtaining Arsenic and bacteria free water.

At present due to enhance demand, this project, rain water harvesting project (i.e. pond water) treated widely and distributing to the operational area includes vicinity @ 0.50/- per litre.

5.3.3 Process of Purification:-

Raw water (i.e. pond water) is collected through pump which is situated at the bank of the supplied pond. Generally the raw water is collected at evening time. Water is collected in two numbers tank each of 5000 litre capacities i.e. collected 10,000 litres every day. Chlorine is added during the collected pond's raw water after that alum is added with this collected pond's raw water @ 120gm per 5000 litres raw water. After adding alum it then coagulation completion by manually (by handle moving) up to 50 minutes to 60 minutes, handle is fitted with tank. After completion of coagulation function then chlorine and "RO" chemicals are added with this partially treated water, then it is passed through Cartridge filter entering three different units' viz.12micron, 5 micron, and 1micron in capacity. After passing these 03 units then this water is finally treated by "RO" Unit I have taken raw water (pond water) sample for testing and obtaining result, Turbidity of pond is 19.5 ntu , Turbidity after getting alum i.e. Flocculation and sedimentation. then this treated water is safe drinking water and collected in storage for supply. Every day supply generally 8500litres.and collected in a treated water storage tank for distribution through 20 litre bottle.


India
भारत
State or Union Territory
National Capital
State or Union Territory Capital
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WEST BENGAL
DISTRICT
LEGEND
International Boundary
State Boundary
District Boundary
State Headquarter
District Headquarter
Map not to Scale
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NORTH 24 PARGANAS
DISTRICT
BARDDHAMAN
HUGLI
HAORA
KOLKATA
SOUTH
24 PARGANAS
BANGLADESH
Bagdaha
Majhergram
Ganrapota
Bangaon
Chaubaria
Chandpara
Bansbaria
Gaighata
Simulpur
Naihati
Habra
Gobardanga
Noapara
Amdanga
Swarupnagar
Barakpur
BARASAT
Baduria
Banglani
Pirgachha
Airport
Deganga
Basirhat
Rajarhat
Taki
Hasnabad
Salt lake
Harua
Minakhan
Hingalganj
Sandeshkhali
Hingalganj
(N 24 PGS)
NH-34
NH-35
NH-35
LEGEND
National Highway
Major Road
Railway
District Boundary
International Bdy.
River
District HQ
Other Town
Major Town
Bay
of
Bengal
Map not to Scale
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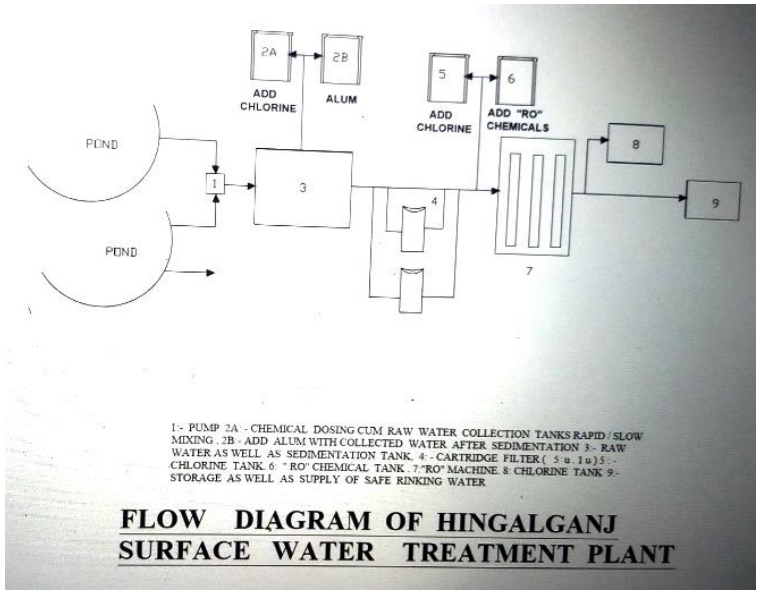
Figure-5.3.1



Layout Plan

Underground recharge process by wastage water

Figure-5.3.2

Pond for supply raw water

Chlorination of raw water

Figure-5.3.3

RO Unit of north 24 Parganas (Hingalganj)

Distribution car

Figure-5.3.4

Table 5.3.1

TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-HINGALGANJ POND RAW WATER.

DATE:-25.12.2018

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
C. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	8.15	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	310	
D. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	3.04	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l				0.0045	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.3.2

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:--HINGALGANJ

DATE:-25.12.2018

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.95	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	225	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.01	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	1.0	No relaxation		BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.3.3

PUBLIC HEALTH ENGINEERING DTE.

BARASAT DIVISION LABORATORY

GOVERNMENT OF WEST BENGAL

BACTERIOLOGICAL TEST REPORT

Sl. No.	Block Name	G.P. Name	Mouza (with Jl. No.)	Habitation / Description / Landmark	Depth. of T/W	Date of collection & Testing	Date of Complition	Test RESULTS		REMARKS
1	Sandeshkhali	Hingalganj	Hingalganj J.L.No-03	SreeChaytanya Mission	Pond Water	10/1/2019	11/1/19	0	0	-

**Sample Collected & supplied to the Lab. By : _ Party

Note : Minimum limits as per CL . 3.2.1 of IS-10500.2012

a) Throughout any year, 95% of sample should not contain any coli form organisms in 100ml.
b) No sample should contain Coli form Organisms & E. Coil in 100ml.
c) Coli form organisms should not be detectable in 100ml of any two consecutive samples.

Table 5.3.4

PUBLIC HEALTH ENGINEERING DTE.

LABORATORY

BARASAT DIVISION

(CHEMICAL TEST REPORT)

SL. NO	Block Name	Mouza with J. L. No. G. P. Name	Habitation Description Land Mark	Depth of T/W	Date of Collection	Date of Testing	TEST RESULTS								REMARKS
							As mg/ltr	Fe mg/ltr	pH	TDS Hardness (as $CaCO_3$)	Turbidity (NTU)	Cl mg/ltr	Mn mg/ltr	Total hardness	
1	Sandeshkhali	Hingalganj J.L.-03	Sree Chaytanya Mission		10/1/19	11/1/19	BDL	BDL	7.25	35	0.18	11.2	0.18	165	Pond

Drinking water specification : IS : 10500.2012

Sl. No.	Parameter	Desirable limit	Permissible limit in Absence of alternate source
1	As	0.01 mg/l	No. relaxation
2	Fe	0.30 mg/l	1.0 mg/l
3	Cl	250 mg/l	1000 mg/l
4	pH	6.5 – 8.5	No. relaxation
5	TDS	500 mg/l	2000 mg/l
6	Mn	0.10 mg/l	0.30 mg/l
7	Turbidity (NTU) Max	1	5
8	Total Alkalinity	200 mg/l	600 mg/l
9	Total Hardness (as $CaCO_3$)	200 mg/l	600 mg/l

Note :Water Sample is collected by the party.
Laboratory is not liable for source of the water sample.

BDL – Below detection Limit.

Table 5.3.5

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-PASCHIM BANGA VIGYAN MANCHA.

SAMPLE COLLECTED FROM: - HINGALGANJ

DATE:-08.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	8.21	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	340	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0	Nephelometri	20.6	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	5.009	
8.	MANGANESE, mg/l			0.208		
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.3.6

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-PASCHIM BANGA VIGYAN MANCHA.

SAMPLE COLLECTED FROM:-HINGALGANJ .

DATE:-08.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.72	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	305	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.06	
8.	MANGANESE, mg/l	1.0	5.0	Nephelometri	.208	
9.	TOTALHARDNESS (as CaCo3) mg/l	200	600	Titration	140	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.01	.No relaxation	Photometric	BDL	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.3.7

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-PASCHIM BANGA VIGYAN MANCHA.

SAMPLE COLLECTED FROM:-HINGALGANJ

DATE:-08.03.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.6	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	3 640	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU	1.0	5.0	Nephelometric	5.87	
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.0811	
8.	MANGANESE, mg/l	0.1	0.3	Photometric	0.333	
9.	TOTALHARDNESS (as CaCo3) mg/l	200	600	Titration Method	460	
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l	0.001	No relaxation	Photometric	0.004	
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.3.8

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-PASCHIM BANGA VIGYAN MANCHA.

SAMPLE COLLECTED FROM:-HINGALGANJ

DATE:-08.03.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.39	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	225	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.08	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

CHAPTER-5.4

DEVELOPMENT OFDOMESTIC FILTER

5.4.1 Objectives:-

The scope of this project is to study the existing water filtration methods, and use the knowledge to design a **Low cost water filtration technique**. This water filtration system will focus on cutting down the cost while maintaining filter effectiveness. By providing affordable water filters for the rural and remote areas, will greatly improve people's quality of living, and reduce the risk of any waterborne diseases therefore saving lives. The basic objectives of the project are as follows. Removal of iron from water by using different candle like filter media which are at a low cost Development of a Soil made filter with clay and rice husk and studying the efficiency of removal of turbidity, Ph, TDS, ARSENIC, Iron and some extent of Total coli-form, designing a simple household setup for water filtration focusing on removal of iron and turbidity . Analysis of filtration effectiveness in removal of iron for different filter media

5.4.2 Development of Filter process:-

Collection Of Paddy Soil: - ON 23rd November 2018, I went to Madhyampur rail Station and collected paddy soil from paddy field , the paddy field situated just 10-12 minutes walking distance from Madhyampur rail Station and 62 Km. far from Sealdah station .02 Bags i.e. about 25-30 kg plough paddy soil with some foreign materials like kankar, brick khoa,stones pieces, few roots of paddy plants. In my house collected soil dried by sunshine up to 2nd dec-2018.That dry soil in converted into dust with the help of wooden hammer.

From south Barasat pal Para (just next station is joy agar) I made with the help of potter and 02no's Filters capacities of 5 litres, and 20 litres, these two filter containers made by loam soils please see reference figures no's 1 and 2. Filter Candles making process as given below:-

From south Barasat pal Para (just next station is joy agar) I made with the help of potter and 02no's Filters candles measuring diameter 4 inches (10 cm) and 5 inches (12.5 cm)respectively and height 6 inches (15 cm) and 7 inches (17.5 cm) respectively. And materials using River sand, Husk, paddy soil with the ratio of 1:2:5. As per ratio by weight the materials are mixed very well on 4th dec.-2018.This dried mixer is now making paste with the help of clean water required accordingly wait 24 hrs.for rotten the materials with water. On 5th dec.-2018 I made 02 no's candles as above given measurements. Candles dice of 4

inches (10 cm) was made from Johnson rain water pipe and 5 inches (12.5 cm) from Tata's short piece. After making these two no's candles, it is dried in shaded area otherwise crack create by the direct sun ray. After 5 days candles are openoutfromtheir respective dice and again dried for 10 days. On Dec. 24th these candles are bring to the potter home for burning, before place it in the kiln these two candles are covered with gunny bags and also cover gunny bags are again cover with light clay soils, for withheld any crack during completion of burning. The two pair's containers also made very cautiously, before making soil filter container raw material i.e. soil paste is made like as aata making before making good bread. Soil filter container was dried 12 days in a shaded place for withheld crack. On 2nd January 2019 it is placed in the kiln for burning and after 36 hrs., these materials i.e. two candles and four no's soil filter container are become ready for using filter.

After bring all this soil filter arrangement from potter home at my home first two candles are fitted according their sizes with the help of sanitary m-seal paste. Now filter tap is fitted one in each bottom container with well water tight sealed. The tap is fitted 2 inches height from bottom of the storage container.

After 24 hrs.i.e.On 6th Jan.-2019 after washing very clearly, I started filter work, and firstly I given Kent purified water as raw water. Filter started at 7 am and completed filter at 16.20 pm

I.e. Time taken 9 husband 20 minutes for 20 litres filtering works, i.e. filtering rate is 2.15 litres/hr. Next day for testing 5litter filter works started at 7am and completed at14.25pm i.e. completion of 5 litre filtering works for 7 hrs. 25 minutes i.e. filtering rate is 0.67 litre/hr.

Some leakage found from lower storage container from both the container and for that again I go to potter's home and asked regarding that leakage then he suggested me for fresh making.

Again I determined for making another 6 no's fresh soil filter container measuring 20litres, 15 litres and 5 litres from two separate potters. Accordingly from south Barasat pal Para (just next station is joy agar) I gave 3 pairs in three different sizes to the previous potter and another 3 pairs in three different sizes to the another one new potter and 06no's Filters candles measuring diameter 4 inches (10 cm) and 5 inches (12.5 cm) 6 inches (15 cm) respectively 2 no's of each type and height 6 inches (15 cm),6 inches (15 cm) and 7 inches (17.5 cm) respectively 2 no's of each type respectively . And materials use River sand, Husk, paddy soil with the ratio of 1:2:4 for first 3 no's and another 3 no's candles made with

the material's ratio are 1:2:5. As per ratio by weight the materials are mixed very well on 10th jan-2019.This dried mixer is now making paste with the help of clean water as required accordingly wait 24 hrs. For rotten the materials with water. On 11th jan.-2019 I made 06no's candles as above given measurements. Candles dice of 4 inches (10 cm) and5 inches were made from Johnson rain water pipe and 5 inches (12.5 cm) from Tata's short piece. After making these two no's candles, it is dried in shaded area otherwise crack create by the direct sun ray. After 5 days candles are open out from their respective dice and again dried for 10 days. On Jan. 24th-2019 these candles are bring to the potter home for burning, before place it in the kiln these two candles are covered with gunny bags and also cover gunny bags are again cover with light clay soils, for withheld any crack during completion of burning. The 06 pair's containers also made very cautiously to avoid water leakage as previous, before making soil filter container raw material i.e. soil paste is made like as aata making before making good bread. Soil filter container was dried 12 days in a shaded place for withheld crack. On 2ndFebruary 2019 it is placed in the kiln for burning and after 36 hrs., these materials i.e. two candles and four no's soil filter container are become ready for using filter.Two of which measuring 5 litres and another one measuring 15 litres are running in

Jadavpur laboratory for experiment purpose. There are several days. I have taken various data during experiment in various dates, the experimental data and its relevant result have been plotted .

Four of which measuring 8litres and another one measuring 15 litres, 5 litres, 10vlitres are running at my home for experiment purpose. There are several days. I have taken various data during experiment in various dates, the experimental data and its relevant result have been plotted at page no….. These testing were done from Jadavpur University, paschal banga bigyn mancha and Bijoygarh public health Engineering.

5.4.3 Filtration Model Development:-

Here we have manufactured a simple cylindrical filtration tube as shown in figures below with the Following dimension of candles.

Three types of Candle measurement which I have used.

Height of candle= 17.50cm

Internal diameter of candle = 10cm

Outer diameter of candle = 12 cm

(1) Height of candle= 17.5cm

(2) Internal diameter of candle = 15cm

Outer diameter of candle = 17 cm

(3) Height of candle= 17.50cm

Internal diameter of candle = 12.5 cm

Outer diameter of candle = 14.5 cm

Following dimension of candles.

Some of the various types of Candle measurement which I have used.

(1) Height of Container both top and bottom.= 30cm

Internal diameter of Container both top and bottom = 45 cm

Outer diameter of Container both top and bottom = 47 cm

(2) Height of Container both top and bottom.= 30cm

Internal diameter of Container both top and bottom = 32.5 cm

Outer diameter of Container both top and bottom =34.5 cm

(3) Height of Container both top and bottom.= 45 cm

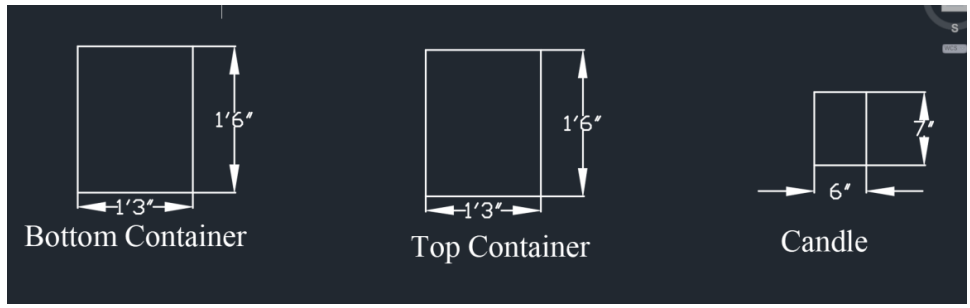
Internal diameter of Container both top and bottom = 37.5 cm

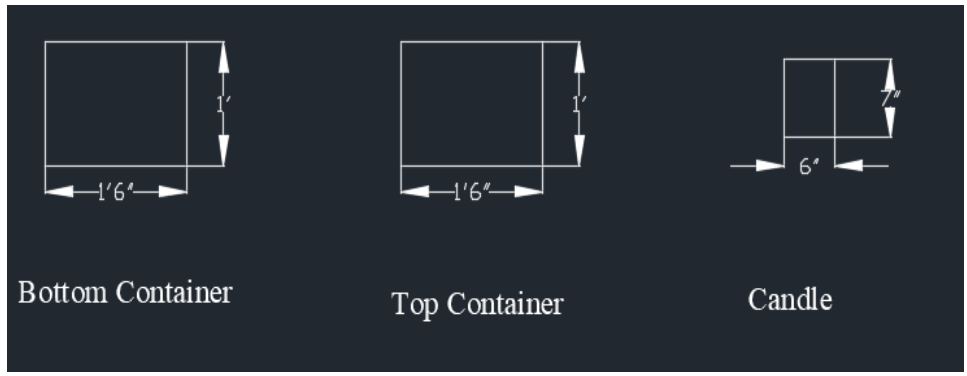
Outer diameter of Container both top and bottom = 39.5 cm

Top of the cylinder was covered with a perplex sheet of 1 inch thickness .

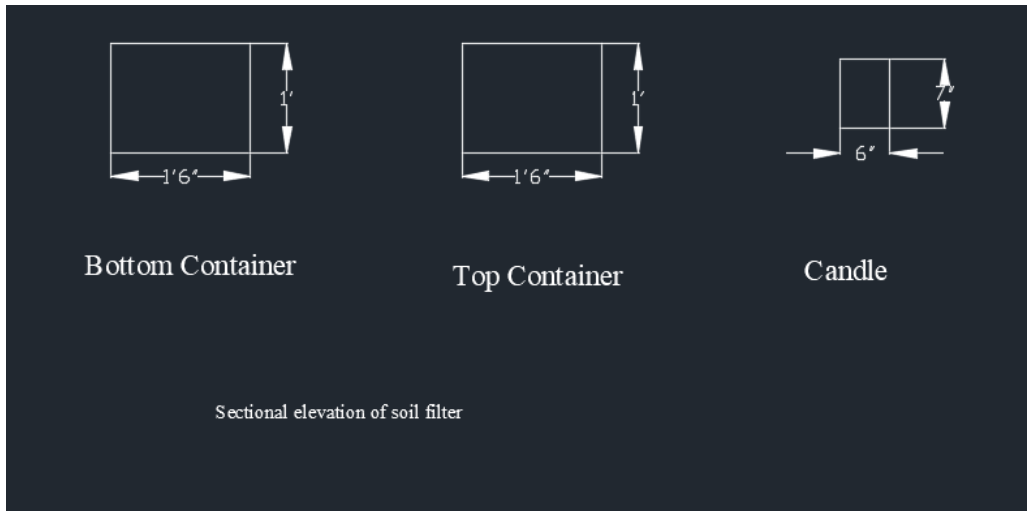
A hole of 2 cm diameter was made to connect with the inlet pipe.

Then after filtration, the filtered water was collected through the conical part in a beaker or any pot.



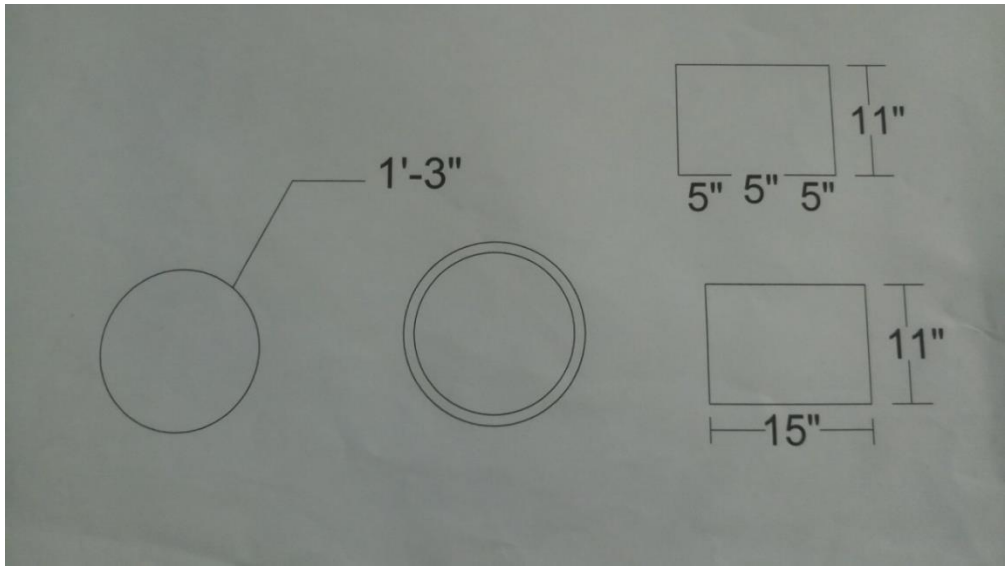


Domestic filter--Figure-5.4.1



Soil Filter -Figure-5.4.2

Filter is ready for working- Figure-5.4.3



Soil Filter, Figure-5.4.3a

Table 5.4.1

5.4 .4 Costing of filter:-

(a) 8 litre capacity.

Here we have provided a crude chart for the cost of all the adsorbent media we have used for experimentation excluding the labour cost, maintenance cost and energy cost.

Sl. No.	Ingredient	Percentage by weight.	Weight in kg	Unit price/kg in Rs.	Cost(Rupees)
1.	Paddy soil.	62.5	1.3	0	0
2.	River sand	12.5	0.3	15	4.5
3.	Rice husk	25	0.6	20	12
4.	Filter Tap	-	One piece	35	35
5.	8 litre capacity Filter upper & lower part all completed including labour and burning cost etc.	-	One piece	150	150

Total cost Rs.201.5/-

Say Rs.200/- per Filter of 8 litres in capacity.

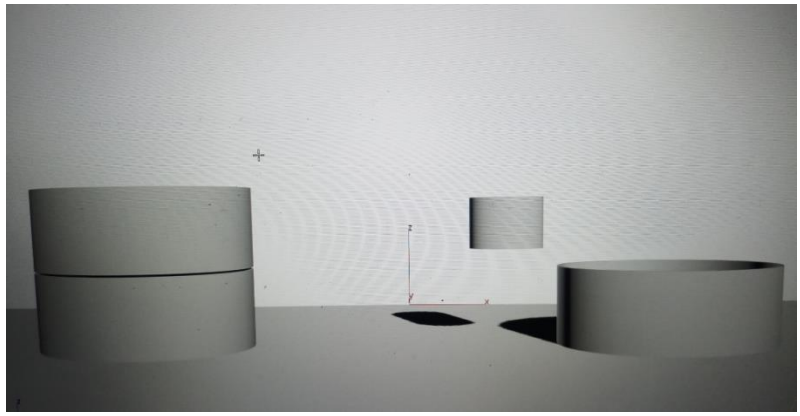
(b) 15 litre capacity.

Here we have provided a crude chart for the cost of all the adsorbent media we have used for experimentation excluding the labour cost, maintenance cost and energy cost.

Sl. No.	Ingredient	Percentage by weight.	Weight in kg	Unit price/kg in Rs.	Cost(Rupees)
1.	Paddy soil.	62.5	1.3	0	0
2.	River sand	12.5	0.3	15	4.5
3.	Rice husk	25	0.6	20	12
4.	Filter Tap	-	One piece	35	35
5.	15 litre capacity Filter upper & lower part all completed including labour and burning cost etc.	-	One piece	225	225

Total cost Rs.276.5/-

Say Rs.275/- per Filter of 15 litres in capacity.



Container for Filter

FILTER CANDLE- Figure-5.4.4

Soil dice for making filter container.

FILTER CANDLE Figure-5.4.4a

Table 5.4.2

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-JADAVPUR CAMPUS TAPS WATER.

DATE:-25.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.72	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	330	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.06	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.4.3

LABORATORY TESTING REPORT

TYPE OF WATER: FILTERED.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-JADAVPUR CAMPUS TAPS WATER.

DATE:-25.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.60	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	204	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.05	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.4.4

LABORATORY TESTING REPORT

TYPE OF WATER:-RAW.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-BARASATSUPPLYWATER.

DATE:-18.04.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.47	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	370	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	RON, (as FE) mg/l	1.0	.No relaxation	Photometric	.08	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
12.	FECAL OLIFORM Per 100 ml.					

Table 5.4.5

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED.

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-BARASATSUPPLYWATER.

DATE:-18.04.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	7.40	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	421	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.07	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					

Table 5.4.6

COMPARISION OF FILTERING QUALITY TEST BY USING DIFFERENT TYPE OF FILTER'S CANDLE.

sl. no.	param eters	unit	candle's materials ratio(1:2:5)		candle's materials ratio(1:2:4)		candle's materials ratio(2:3:5)		permissi ble limit is:10500	Rema-rks
			A	B	A	B	A	B		
BARASAT HOUSE WATER TESTED FROM PASCHIM BANGA VIGYAN MANCHA ON 11.01.2019.										
1.	pH	--	7.11	6.71	7.11	7..25	7.11	7.11	No Relaxation	
2.	TDS	mg/l	70	70	70	68	70	75	200	
3.	Arsenic	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.01	
4.	T-hardness	mg/l	52	52	52	46	52	58	600	
5.	iron	mg/l	0.058	0.027	0.058	0.075	0.058	0.070	1.0	
6.	Manganese.	mg/l							1.0	
7.	Turbidity.	ntu	0.63	0.22	0.63	0.34	0.63	0.38	5	
8.	Total coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
10.	Faecal coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
BARASAT HOUSE WATER TESTED FROM JADAVPUR UNIVERSITY LABORATORY ON 20.01.2019										
1.	pH	--	7.09	6.65	7.10	7.42	7.11	7.25	No Relaxation	
2.	TDS	mg/l	70	67	70	70	54	70	200	
3.	Arsenic	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.01	
4.	T-hardness	mg/l	50	46	52	50	50	52	600	
5.	iron	mg/l	0.058	0.030	0.052	0.067	0.058	0.058	1.0	
6.	Manganese.	mg/l							1.0	
7.	Turbidity.	ntu	0.63	0.21	0.63	0.08	0.63	0.66	5	
8.	Total coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
10.	Faecal coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
TESTED FROM BIJOYGARH P. H. E. LABORATORY BY JADAVPUR POND WATER ON12.03.19										
1.	pH	--			8.I0	8.23			No Relaxation	
2.	TDS	mg/l			1465	70			200	
3.	Arsenic	mg/l			BDL	BDL			0.01	
4.	T-hardness	mg/l			-	-			600	
5.	iron	mg/l			0.014	0.058			1.0	
6.	Manganese.	mg/l							1.0	
7.	Turbidity.	ntu			2.65	0.63			5	
8.	Total coliform	per 100ml.			-	-			No Relaxation	
10.	Faecal coliform	per 100ml.			-	-			No Relaxation	

A=raw water sample, and B= treated water sample.

As per our available above test result, we can observe that filter material ratio (1;2;5) shows poor negative performance in case of "iron "and "pH", remaining parts are ok.

Table 5.4.7

COMPARISION OF FILTERING QUALITY TEST BY USING DIFFERENT TYPE OF FILTER'S CANDLE.

. no.	param eters	unit	candle's materials ratio(1:2:5)		candle's materials ratio(1:2:4)		candle's materials ratio(2:3:5)		permissible limit is:10500	rema-rks
			A	B	A	B	A	B		
TESTED BARASAT POND WATERFROM JU LABORATORY ON 13.04.19										
1.	pH	--	8.36	7.41	8.26	8.49	8.36	8.11	No Relaxation	
2.	TDS	mg/l	97	90	97	74	97	102	200	
3.	Arsenic	mg/l	.01	BDL	.01	BDL	.01	BDL	0.01	
4.	T-hardness	mg/l	-	-	-	-	-	-	600	
5.	iron	mg/l	0.715	0.242	0.715	0.758	0.715	0.712	1.0	
6.	Manganese.	mg/l							1.0	
7.	Turbidity.	ntu	7.66	1.95	7.66	0.63	7.66	0.63	5	
8.	Total coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
10.	Faecal coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
TESTED BARASAT POND WATERFROM PASCHIM BANGA VIGYAN MANCHA ON 14.05.19										
1.	pH	--	8.32	7.78	7.11	7.11	7.11	7.11	No Relaxation	
2.	TDS	mg/l	90	87	70	70	70	70	200	
3.	Arsenic	mg/l	0.01	0.005	BDL	BDL	BDL	BDL	0.01	
4.	T-hardness	mg/l	52	52	52	52	52	52	600	
5.	iron	mg/l	0.058	0.058	0.058	0.058	0.058	0.058	1.0	
6.	Manganese.	mg/l							1.0	
7.	Turbidity.	ntu	7.66	1.84	0.63	0.03	0.63	0.75	5	
8.	Total coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
10.	Faecal coliform	per 100ml.	-	-	-	-	-	-	No Relaxation	
TESTED FROM BIJOYGARH P. H. E. LABORATORY BY JADAVPUR POND WATER ON 12.05.19										
1.	pH	--			8.08	78.17			No Relaxation	
2.	TDS	mg/l			1472	1386			200	
3.	Arsenic	mg/l			BDL	BDL			0.01	
4.	T-hardness	mg/l			BDL	BDL			600	
5.	iron	mg/l			0.014	BDL			1.0	
6.	Manganese.	mg/l							1.0	
7.	Turbidity.	ntu			2.59	01.63			5	
8.	Total coliform	per 100ml.			146	20			No Relaxation	
10.	Faecal coliform	per 100ml.			5	2			No Relaxation	

A=Raw water sample, and B= Treated water sample

Based on available above result , we can concluded the soil made Filter maintain well function, for domestic level water treatment.

5.4.5 FILTERING CAPACITY:-

1. For material mixing ratio (1:2:4) by weight, i.e. 1=River sand, 2=Rice husk and 4=paddy soil.

(a) 1st. trial on12.01.19 for 8 litre water filtering time taken 9 hrs. and 20 min.

Filter rate = 8/9.33=0.86 litre/hr.

(b) 2nd. trial,on 20.02.19 for 8 litre water filtering time taken 10 hrs. and 30 min.

Filter rate = 8/10.5=0.76 litre/hr.

(c) 3rd. trial,on29.01.19 for 8 litre water filtering time taken 11 hrs. and 15 min.

Filter rate = 8/11.15=0.71 litre/hr.

2. For material mixing ratio (1:2:5)by weight, i.e. 1=River sand, 2=Rice husk and 5=paddy soil.

(a) 1st. Trial on14.01.19 for 8 litre water filtering time taken 9 hrs. and 30 min.

Filter rate = 8/9.33=0.84 litre/hr.

(b) 2nd. trial,on 22.01.19 for 8 litre water filtering time taken 10 hrs. and 15 min.

Filter rate = 8/10.5=0.78 litre/hr.

(c) 3rd. trial,on 09.02.19 for 8 litre water filtering time taken 11 hrs. and 40min.

Filter rate = 8/11.15=0.68 litre/hr.

3. For material mixing ratio (2:3:5)by weight, i.e. 2=River sand, 3=Rice husk and 5=paddy soil.

(a) 1st. Trial on15.02.19 for 8 litre water filtering time taken 7 hrs. and 30 min.

Filter rate = 8/7.5=1.07 litre/hr.

(b) 2nd. trial, on 28.02.19 for 8 litre water filtering time taken 8 hrs. and 25 min.

Filter rate = 8/8.41=0.95litre/hr.

(c) 3rd trial, on 03.04.19 for 8 litre water filtering time taken 9 hrs. and 10min.

Filter rate = 8/9.163=0.871 litre/hr.

CHAPTER-5.5

Howrah WTP (Eastern Railway)

In Brief Process of Purification:-

One complete water treatment plant requires the following process starting from the source of water up to the distribution zone

(i) Intake work including pumping plant.

(ii) Plain sedimentation.

(iii) Sedimentation with coagulation .

(iv) Filtration.

(v) Miscellaneous treatment plant.

(vi) Disinfection

(vii) Clear water reservoir.

(viii) Pumps for pumping the water in service reservoirs (if elevated)

(ix) Elevated or underground service reservoir.

The following points should be kept in mind while giving layout of any treatment plant:

(i) All the plant should be located in order of sequence, so that water from one process should directly go into next process.

(ii) If possible all the plants should be located at such elevations that water should flow from one plant to next under its force of gravity only.

(iii) All the treatment units should be arranged in such a way that minimum area is required , it will also insure economy in its cost.

(iv) Sufficient area should be occupied for future extension , in the beginning.

(v) Staff quarters and office should also be provided near the treatment plants, so that operators can watch the plants easily.

(vi) The site of treatment plant should be very neat and give very good aesthetic appearance.

The Treatment processes directly depend on the impurities present in water. For removing various types of impurities the following treatment process are used.

	Impurity	Process used for removal
1	Floating matters as leaves, dead animals etc.	Screening
2	Suspended impurities as silt, clay , sand etc.	Plain sedimentation
3	Fine suspended matter.	Sedimentation coagulation
4	Micro-organism and colloidal matters.	Filtration
5	Dissolved gases, tastes and odours.	Aeration and chemical treatment
7	Pathogenic bacteria	Disinfection

The character and degree of treatment will directly depend upon the nature of water or indirectly on the source. The water of surface sources generally contains large amount of impurities therefore, they will require all the treatments stated above. Mostly screens are fixed in the intake works, therefore , it is not necessary to have separate screening plant. Sometimes the water of lakes or impounding reservoirs are free from suspended matter, therefore it will require filtration and disinfection only. Ground waters which are usually clear may require only disinfections and chemical treatment for the removal of pathogens, iron removal , softening etc. Sometimes ground water contains dissolved hydrogen sulphide which gives very bad odour, and require its removal .

The following points should be kept in mind while giving layout of any treatment plant:

(i) All the plant should be located in order of sequence, so that water from one process should directly go into next process.

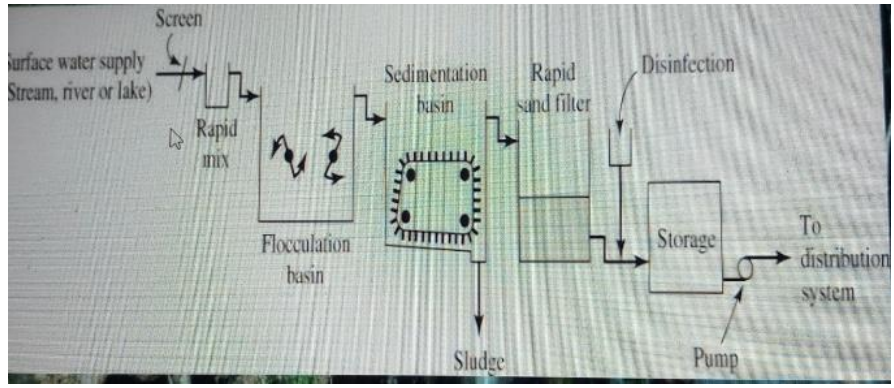
(ii) If possible all the plants should be located at such elevations that water should flow from one plant to next under its force of gravity only.

(iii) All the treatment units should be arranged in such a way that minimum area is required , it will also insure economy in its cost.

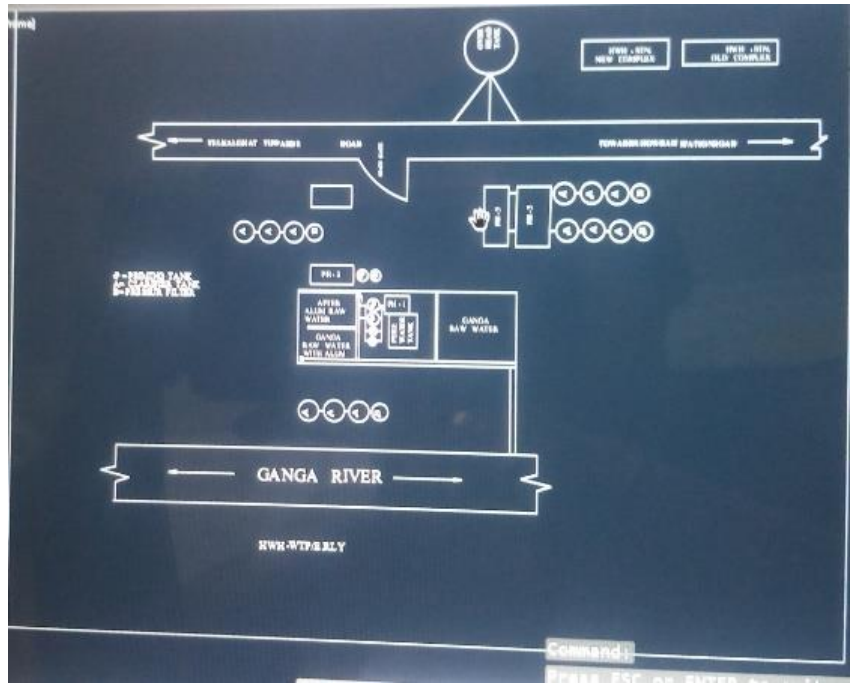
(iv) Sufficient area should be occupied for future extension , in the beginning.

(v) Staff quarters and office should also be provided near the treatment plants, so that operators can watch the plants easily.

(vi) The site of treatment plant should be very neat and give very good aesthetic appearance.



a. Howrah WTP (Eastern Railway)/ Source-Ganga river Water.



b. Layout Plan

C. 3D-VIEW OF HOWRAH WTP-E.RLY.- Figure-5.5.1(a+b+c)

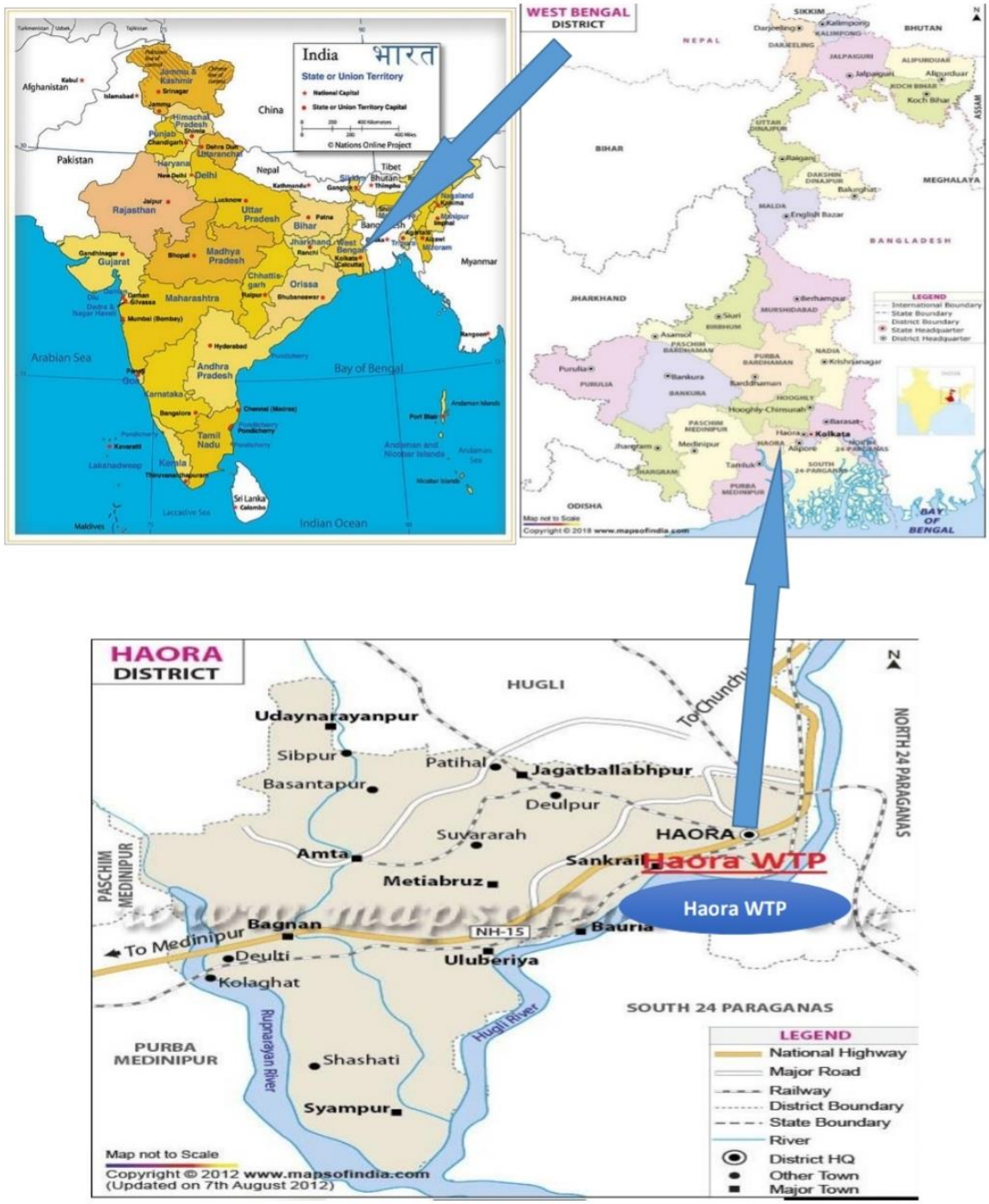

India
भारत
State or Union Territory
WEST BENGAL
DISTRICT
HAORA
DISTRICT
HUGLI
Udaynarayanpur
Sibpur
Patihal
Jagatballabhpur
Basantapur
Deulpur
Suvararah
HAORA
Amta
Sankrail
Haora WTP
Metiabruz
Haora WTP
PASCHIM MEDINIPUR
NORTH 24 PARAGANAS
To Medinipur
Bagnan
NH-15
Bauria
Deulti
Uluberiya
Kolaghat
SOUTH 24 PARAGANAS
PURBA MEDINIPUR
Shashati
Syampur
Rupnarayan River
Hugli River
LEGEND
National Highway
Major Road
Railway
District Boundary
State Boundary
River
District HQ
Other Town
Major Town
Map not to Scale
Copyright © 2012 www.mapsofindia.com
(Updated on 7th August 2012)

Figure-5.5.2

a.Hooghly river intake for Howrah WTP/E.Rly.

b. Sedimentation Pond- Figure-5.5.3(a+b)

Two no's adjacent reservoir one of its raw water mixed with alum & another one is sedimentation reservoir.

Raw Water/Pump House

Intake of raw water Figure-5.5.4

PRIMING TANK

CLAFIER

Pressure filter(HWH-WTP) Figure-5.5.5

Table 5.5.1

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-HOWRAH WATER TREATMENT PLANT /E.Rly.

DATE:-4.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.92	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	395	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.035	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
2.	FECAL OLIFORM Per 100 ml.					

Table 5.5.2

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-HOWRAH WATER TREATMENT PLANT /E.Rly.

DATE:-12.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.85	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	356	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.02	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
2.	FECAL OLIFORM Per 100 ml.					

Table 5.5.3

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-HOWRAH WATER TREATMENT PLANT /E.Rly.

DATE:-12.03.2019

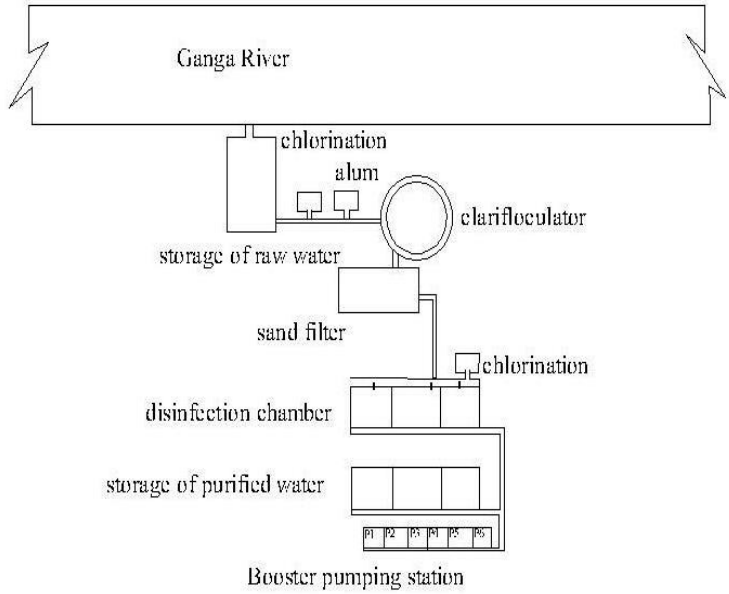
	DESIRABLE LIMIT	PERMISSIBLE LIMIT
P^H	6.5 to 8.5	NO RELAXATION
IRON	0.3 mg/l	0.3mg/l
TOTAL HARDNESS	200mg/l	600mg/l
ARSENIC	0.01mg/l	0.05mg/l
TC		0/100ml
FC		0/100ml

Sample Details HOWRAH WATER TREATMENT PLANT /E.Rly.

SL. NO	SOURCE	P^H	IRON (mg/l)	TOTAL HARDNESS (mg/l)	As (mg/l)	TC	FC
1	AFTER FILTER	7.24	0.027	325	BDL	< 2	< 2
2	TANK	6.86	0.1453	264	BDL	< 2	< 2

CHAPTER-5.6

CHITPURWATER TREATMENT PLANT/(E.Rly)



CHITPUR E.RLY. WATER TREATMENT PLANT (2.5 MGD)

CLARRIFIER -Figure-5.6.1


India
भारत
State or Union Territory
National Capital
State or Union Territory Capital
© Nations Online Project
WEST BENGAL
DISTRICT
LEGEND
International Boundary
State Boundary
District Boundary
State Headquarter
District Headquarter
Map not to Scale
Copyright © 2018 www.mapsofindia.com
Chitpur Eastern Railway WTP
Chitpur WTP
Belur Water Treatment Plant
Belur Drinking Water Treatment Plant
SG Aquatech
Tala Tank underground Reserver
Eastern Railway Water Treatment Plant
Raw water pumping station & jetty mayer...
Batty & Company Private Limited
RD AQUA ENTERPRISE
N.K Industries
Horizon Marketing Groups
Aquatreat Engineering Private Limited
Triplex India

Figure-5.6.2

Chitpur WTP (Eastern Railway)/ Source-Hooghly river Water

5.6.1 Introduction:-

The Treatment processes directly depend on the impurities present in water. For removing various types of impurities the following treatment process are used.

	Impurity	Process used for removal
1	Floating matters as leaves, dead animals etc.	Screening
2	Suspended impurities as silt, clay , sand etc.	Plain sedimentation
3	Fine suspended matter.	Sedimentation coagulation
4	Micro-organism and colloidal matters.	Filtration
5	Dissolved gases, tastes and odours.	Aeration and chemical treatment
6	Softening	Permutit method
7	Pathogenic bacteria	Disinfection

The character and degree of treatment will directly depend upon the nature of water or indirectly on the source. The water of surface sources generally contains large amount of impurities therefore, they will require all the treatments stated above. Mostly screens are fixed in the intake works, therefore , it is not necessary to have separate screening plant. Sometimes the water of lakes or impounding reservoirs are free from suspended matter, therefore it will require filtration and disinfection only. Ground waters which are usually clear may require only disinfections and chemical

treatment for the removal of pathogens, iron removal , softening etc. Sometimes ground water contains dissolved hydrogen sulphide which gives very bad odour, and require its removal .

5.6.2 Process Of Purification:-

- Drinking water sources are subject to contamination and require appropriate treatment to remove disease-causing agents. Public drinking water systems use various methods of water treatment to provide safe drinking water for their communities. Today, the most common steps in water treatment used by community water systems (mainly surface water treatment) include: Coagulation and Flocculation

  Coagulation and flocculation are often the first steps in water treatment. Chemicals with a positive charge are added to the water. The positive charge of these chemicals neutralizes the negative charge of dirt and other dissolved particles in the water. When this occurs, the particles bind with the chemicals and form larger particles, called floc.
- Sedimentation

  During sedimentation, floc settles to the bottom of the water supply, due to its weight. This settling process is called sedimentation.
- Filtration

  Once the floc has settled to the bottom of the water supply, the clear water on top will pass through filters of varying compositions (sand, gravel, and charcoal) and pore sizes, in order to remove dissolved particles, such as dust, parasites, bacteria, viruses, and chemicals.
- Disinfection

After the water has been filtered, a disinfectant (for example, chlorine, chloramines) may be added in order to kill any remaining parasites, bacteria, and viruses, and to protect the water from germs when it is piped to homes and businesses.

Disinfection .

Water may be treated differently in different communities depending on the quality of the water that enters the treatment plant. Typically, surface water requires more treatment and filtration than ground water because lakes, rivers, and streams contain more sediment and pollutants and are more likely to be contaminated than ground water.

Some water supplies may also contain disinfections by-products, inorganic chemicals, organic chemicals, and radio nuclides. Specialized methods for controlling formation or removing them can also be part of water treatment.

Fact Sheet Series on Drinking Water Treatments External.

Natural sediments filter water by using gravity. The heavier materials in the water settle to the bottom, while the lighter sedimentation floats at higher levels in the fluid. The EPA report, "Water on Tap: What You Need to Know," states that sedimentation filtering is frequently used with flocculation in a process called coagulation filtering. The first step, flocculation, removes larger particles by adding iron salts and alum, or synthetic organic polymers, which bond together to form floc. Once the floc has attracted the large dirt elements to bond with the materials, the water is allowed to be stagnant while the process of sedimentation takes place. The advantages of sedimentation filtering include the low cost.

Sand Filtration

Water filtration using sand offers the option of either slow or pressure processing. Slow processing moves the water through the sand at approximately 2 L per minute. Pressurized sand filtration pumps the water at 40 L per minute through the same amount of sand. The sand offers an inexpensive filter but does little to remove bacteria from the water. The National Drinking Water Clearinghouse fact sheet, "Tech Brief: Slow Sand Filtration," notes that sand filters require large fields for processing, "quantities of filter media, and manual labour for cleaning." The sand must also be cleaned periodically to keep it pure. The fact sheet states that this method of filtration is a "simple and reliable process."

Oxidation Aeration

Oxidation injects air into the water to filter impurities. Aeration devices capture the water from ponds and divert it into nozzles to shoot the water into the air. Large aeration ponds filter water over time in an expensive process that reduces the amount of odour, as well as dissolving pollution in the form of gases. The EPA states that an advantage to this process is that "contaminants that easily turn into gasses, such as gasoline components and radon, are removed." The downside to this water treatment technique is the amount of pollutants that enter the water from the air around the oxidation ponds. The EPA notes that this process is often combined with other filtering systems to remove contaminants untouched by the aeration.

Intake Water Connected With Solution Of Alum & Chlorine.

POWER CONTROL ROOM

Figure-5.6.3

Overhead Storage Tank & Storage After Purification Before Distribution

Figure-5.6.4

Alum & Chlorination Room

Alum & Chlorination Room

Figure-5.6.5

Intake Water Pressure Gauge

Pump House-Figure-5.6.6

5.6.3. Utility of Chitpur WTP

Purified water is essential for living a healthy life as such everyone should have access to it.Drinking water conditions have great impacts on people's everyday life, especially in the rural and remote areas where access to safe drinking water is very crucial. Surface water often is the only source, thus water contaminations are difficult to avoid due to rigorous and reckless use of surface water. Unsafe drinking water may result in fatal diseases. Statistics shows that these diseases resulted in ninety percent of all deaths of children under five years old in developing countries, due to low immunization of children to infections. Despite of fulfillment of requirement of drinking water standards, the municipal water in used in developing countries is being improved and cost efficient water filtration techniques are being developed commonly used to improve taste or to eliminate any undesired matters. Various types of filters have been designed to be more suitable for the rural areas of the countries, but the cost as well as the filter effectiveness is still not satisfactory and further improvement is still required. Drinking water is being the biggest issue nowadays in India. Most of the people in the rural areas are not able enough to use water filters or buy mineral water bottles. To overcome this problem many efforts have been done due to which cleaning water may become an affordable commodity. Every house hold should be able to develop its own drinking water purification system; this should be the aim of development of any low cost water purification technique. In this context a number of contributions that has been made where the filter media varies from a layer of simple cotton cloth to composite nano materials. Some of the typically used water filtration methods in India have been discussed here. In some of the rural areas of Karnataka, women use cotton cloth layers for water filtration. This method is very cheap, cost effective in removal of sediments or any suspended solids, but may be not completely suitable for drinking purpose. Some places people are using simple plastic bottles with open end, inside which a layer of bone char followed by a layer of sand and a layer of pebble on both sides of the bone char layer is being used through which water will be passed for filtration. This kind of filtration process is capable of removing sediment and microbes effectively from water.

Solar distillation and solar sterilization are the recent but convenient technologies developed as a low cost water filtration process. In this process water filled clean plastic bottles are left in sun for several hours so that the UV radiation and the heat generated will be able to kill the microbes present in water causing many water borne diseases. Now these methods are improvised by using thermal indicators inside the bottle letting the users know when it will be

safe to drink the water. But despite of being cheap and effective, this method is a function of availability of solar light. So maybe not abundantly used in water purification process. In comparison with solar sterilization, the solar distillation technique is even capable of purifying muddy water or salty water through the process of evaporation and condensation. Among widely used naturally occurring adsorption media, bamboo charcoal provided with base gravel layer also is very effective in purifying water with the advantages of being low coat, environment friendly and requires minimum maintenance. Activated carbon, silver beds, charcoal, sand is being widely used in portable filters for disinfection and filtration of water. Bone char is proved to be very efficient in removing heavy metal ion s from water, the excess amount of which can cause many fatal renal and cardiac diseases and high blood pressure. Ceramic filters provided with saw dust or rice husk in the shape of pots are very much efficient in microfiltration which removes suspended solids and microbes to great extents. The main disadvantage is for small house hold purpose where pressure filtration is not an option; it has to be used for gravity filtration and thus the rate of filtration will be very much less and the filter requires continuous maintenance.

Recently IIT M has developed an effective low cost water filtration model specifically meant for rural areas which uses a cheap plastic mesh which is capable of removing 98 percent of impurities from water including pathogens. The cost of the filter is somewhat Rs 700 to 800 and very easy for reuse. Another recent development of IIT M is development of composite nonmaterial used as a filter media which capable of removing toxic metal ions as well as killing the pathogens. The filter is worth rupees Rs 500 excluding the cartridge. Another attractive feature of this filter media is that the cartridge can be reused by simply boiling in water or rubbing with lemon juice which is easily available in common households. India's largest company Tata Group has developed a very cheap water filter known as "Swach", cost of which is less than Rs1000. It uses nano-technology for filtration and silver particles for eradicating bacterial contamination.

Table 5.6.1

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:- CHITPUR WATER TREATMENT PLANT /E.Rly.

DATE:-4.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
C. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.90	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	315	
D. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	0.024	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
2.	FECAL OLIFORM Per 100 ml.					

Table 5.6.2

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-CHITPUR WATER TREATMENT PLANT /E.Rly.

DATE:-5.02.2019

SI. NO.	SUBSTANCES/PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMIT	METHODOLOGY	TESTED RESULT	REMARK
A. PHYSICAL PARAMETERS :-						
1.	COLOUR.					
2.	ODOUR.					
3.	TASTE.					
4.	PH.	6.5-8.5	No relaxation	Electrometric	6.75	
5.	DISSOLVED SOLIDS, mg/l	500	2000	Electrometric	290	
B. GENERAL PARAMETERS:-						
6.	TURBIDITY, NTU					
7.	IRON, (as FE) mg/l	1.0	.No relaxation	Photometric	.035	
8.	MANGANESE, mg/l					
9.	TOTALHARDNESS (as CaCo3) mg/l					
C.TOXIC SUBSTANCES:-						
10.	ARSENIC mg/l					
D.BACTERIOLOGICAL QUALITY:-						
11.	TOTAL OLIFORM Per 100 ml.					
2.	FECAL OLIFORM Per 100 ml.					

Table 5.6.3

LABORATORY TESTING REPORT

TYPE OF WATER:-TREATED

TESTED FROM:-JADAVPUR UNIVERSITY LABORATORY.

SAMPLE COLLECTED FROM:-CHITPUR WATER TREATMENT PLANT /E.Rly.

DATE:-25.02.2019

	DESIRABLE LIMIT	PERMISSIBLE LIMIT
P^H	6.5 to 8.5	NO RELAXATION
IRON	0.3 mg/l	0.3mg/l
TOTAL HARDNESS	200mg/l	600mg/l
ARSENIC	0.01mg/l	0.05mg/l
TC		0/100ml
FC		0/100ml

Sample Details CHITPUR WATER TREATMENT PLANT /E.Rly.

SL. NO	SOURCE	P^H	IRON (mg/l)	TOTAL HARDNESS (mg/l)	As (mg/l)	TC	FC
1	AFTER FILTER.	6.95	0.021	312	BDL	< 2	< 2
2	TANK	6.82	0.195	236	BDL	< 2	< 2

CHAPTER -6

CONCLUSION AND RECOMMENDATION

6.1Conclusions With Recommendation :-

I have got helped to investigate appropriate procedure to improve the quality of drinking water for build up a healthy and prosperous human society through the depth review of Literature. The present investigation regarding decentralization water treatment system provides benefits of all sections of people in a society of a country .Study was conducted to investigate various parameters of surface water like pond and river water of the villages located in the vicinity of Hooghly river and some remote area of West Bengal. Water samples were collected from three small sites, i.e., North 24 Pagans, Bolepur, Howrah, Kolkata, chitpur etc. From each site surface water samples were collected in different time in different type of testing. Sometime Parameters such as pH, total dissolved solids, electrical conductivity and were measured on the spot using water analysis kit where kits were available as well as in working condition. Other few parameters such as magnesium, chloride, Arsenic and microbial parameters were analyzed in the laboratory at PHE Department in W. B, P.B.V.M , and Jadavpur University Laboratory. Information about the health status of inhabitant of study area was also collected using survey method. Average values of pH, total dissolved solids, chloride, Iron, Arsenic etc's periodical tested done. It is recommended that water analysis should be carried out from time to time to monitor the rate and kind of contamination. It is need of human to expand the awareness among the people to maintain the cleanliness of water at their good quality and purity to achieve a healthy life. Those diseases out breaks can be reduced by proper treatment of water at both municipal corporation household activity levels.

Low cost filtration can provide some degree of protection against polluted surface water treatment. As coagulation pre-treatment is not required, slow sand filtration has little Maintenance cost no chemical cost. If the raw water has a high concentration of suspended Particles or algae, physical pre-treatment processes micros trainers can be used to prevent Clogging of the filter and maintain a reasonable filter run period. These were the quality and characteristics of soil filter that removed few parameters, i.e. some hazardous elements at much extent in fresh surface water of studied period.

Soil filter used in the experiment is also very cost effective. The cost of the soil made filter is becoming low due to low material cost. The only difficulty is filtration is very slow as water is filtered under gravity. Due to soil made filter and its candle developed some cracks on its surface during drying under shaded area and also during burning period for insufficient labour which is unexpected. The size of rice husk must not be dust like and river sand used in

the filter especially regulates the rate of filtration. The soil of course should be paddy soil for no single action whether community participation, education regarding Clinical sign and symptoms, awareness, legislation, traditional water harvesting systems, reliance on market forces, conservation and development activities like Management systems (at domestic and community level) will itself alleviate the crisis in India for success.

Effects of good filtration and river sand as course size. If the size could have even smaller then the pore size also could be reduced and enhancing the quality of filtrate but reducing the rate of filtration.

The unique experience of this type of decentralised water treatment project has successfully create an immense impact in reducing water and excreta related diseases ,water borne diseases affected people.

Moreover, through providing competency based operators training to local youths for ensuring smooth operation and maintenance of the plant, the local rural community members are assured of safe and protected source of drinking water at a very nominal cost, ensuring water entrepreneurship. The surface water source is treated by alum coagulation, sedimentation, filtration, micro filtration, and finally the UV Tubes. Water is home delivered by 20 litres bottles which are cleaned and sealed by the project staff after bottling. The water is at home at a very nominal cost to local pre-primary, primary, higher secondary and anganwadi centre. It was also supplied totally free of cost to villagers where there are available of water borne diseases. Moreover, due to free access to the plants, the local user groups get acquainted with the various components of the plants, the testing facilities for quality control. This motivates them in using the treated water and the awareness level gets multiplied. At the home delivery of water reaches in the morning the community members are refrained from using contaminated water. Few Surface water treatment methods has reviewed and discussed. It is clear that the using needs smaller footprints compared with other methods and the processes also only need simpler equipment. Raw water first enter into the flocculation tank where alum is adding and completing flocculation function with the help of hand stirring , clarifier where it is usually flash mixed with a polymer flocculent and then gently agitated with a separate mixer. The water then flows downward through the inlet chamber in the centre of the unit and enters the plate rack through side-entry plate slots. This cross-current entry method reduces the risk of disturbing previously settled solids. As the liquid flows upward, the solids settle on the inclined, parallel plates and slide into the sludge hopper at the bottom. Further thickening of the sludge is achieved in the hopper due to

compression of the sludge, as is the case with a conventional clarifier. Popularize the awareness programmes among the public, especially farmers at different levels, which is required be made effective so as to attain self sufficient water resources development.

Public health, it is one of the prime responsibility of the government. To ensure hygienic water the government should encourage the "NGO"s and other related organisations play an active role. The media has also can play an active role by awakening the public about various contaminants of water pollution and the fatal consequences in the human health. A complete mechanism should be there to ensure proper drinking water among the people. The "PPO" model can also be attempted to solve such a large problem.

Water is considered as a lifeline of human body from various diseases. Water purification is very much necessary. It is not possible to centralise the water purification of the entire country. In order to protect the human from the diseases arising out of polluted water "decentralisation of Surface water treatment –issues and challenges" is very much required. It is needless to mention that the structure of the human society varies from place to place, culture to culture etc. Decentralization of water treatment plant ensures the proper system of water treatment and also ensures pollutant free water for all sections of people.

The issue of decentralization of water treatment process is very much significant in present scenario, the poor and weaker sections of the society can get the opportunity of having pollutant free water either by free of cost or by very low cost. Decentralization of water purification is more essential for poor and urban areas. In fact decentralization water treatment system provides benefits of all sections of people in a society of a country. As per the whole survey we have proposed a Low Cost Water Purifier for rural area using. It has applications to be placed at rural areas or the transport station at very low cost. This system is capable of providing purified water in adequate quantity. It can be placed at the community uses also. This system reduces the complexity of the circuit and it also reduces the manual work and also keeps us away from deceases.

Ultimately our suggestion to development of any low cost water filtration model should be to operate with minimum energy, minimum maintenance, cost effective, environment friendly, implementable with ease and can be developed from local artisans. This will subsequently inspire the people to put hygiene in to habit and of course will help in the social and economic growth of the country.

Survey report regarding increasing Of Awarness-1

General Information

1. Name of the village

2. Name of the Block and subdivision

3. Population pattern - general / SC / ST

4. Economic condition:

(a) Nos. of family living below poverty line.

(b) Nos. of family living above poverty line.

5. Source of water generally used.

6. Availability of Public Water Supply scheme Yes/No

7. Common diseases / ailments generally occurring in these areas.

8. Number of Public Health Centres / hospitals.

9. Number of Medical stuff

i) No. of Doctors.

ii) No. of Pharmacists.

iii) No. of Nurses.

10. Whether the facility provided by Medical Deptt. is satisfactory Yes / No.

11. Was any awareness programme undertaken by Govt./ Pvt. organization to educate the people about water pollution problem Yes / No.

Survey report regarding increasing Of Awarness-2

(1) Name of the respondent

(2) Age

(3) Sex

(4) Qualification

(5) Occupation

(6) Do you know about the causes of water pollution Yes/No.

(7) Do you have any idea about the quality of drinking water Yes/ No.

(8) Do you know about the diseases caused by contaminated drinking water Yes / No.

(9) Present status of health

a) Normal Yes / No

b) If no, whether suffering from any chronic disease Yes /No.

(10) Have you suffered any of the following diseases

i) Cholera ii) Typhoid

iii) Dysentery iv) Diarrhoea

v) Malaria vi) Jaundice

vii) Skin disease viii) Fluorosis

ix) Arsenocosis

(11) Whether any of the above mentioned diseases became epidemic Yes/No.

02 no's survey reports were prepared on few villages in the Hingalganj, Madhusudhankati area according to above format (kept at page no and then checking awareness percentage whether increase or not and we observed that the result became very good. Therefore for increasing awareness survey is one of the important work.

6.2 SCOPE FOR FUTURE WORKS :-

The modelling of development of domestic filter study can be utilise for the determine of water quality parameters. A study on surface water treatment quality can be carried out.The modeling study can be extended for the various other water quality parameter with low cost.

A study on surface water treatment quality movement can be carried out.

A detailed study on consumptive use of surface water can be carried out.

As research is an unending process there is always scope for improvements to the solutions provided for any problem. With the experience gained during the investigation carried out and also taking into consideration some of the constraints the following aspects have been suggested which have a potential for further study. The water quality assessment studies carried out analysis. A study by including this would give rise to better results in analyzing groundwater quality of the study area. The water quality assessment studies carried out for more number of years can give rise to better results in assessing surface water quality of the study area. Maximum removal capacity for a certain amount of composite should be determined by continuously passing water from it and analysing the parameters of permeates. Removal capacities of the composites can also be studied at different flow rates of water from the column to analyse the effect of flow rate on pollutant removal capacities of the composites and to standardize a particular flow rate for water treatment .The scope of this project is to study the existing water filtration methods, and use the knowledge to design a Low cost water filtration technique. This water filtration system will focus on cutting down the cost while maintaining filter effectiveness. By providing affordable water filters for the rural and remote areas, will greatly improve people's quality of living, and reduce the risk of any waterborne diseases. Development of a soil made filter with rice husk and studying the efficiency of removal of turbidity Designing a simple household setup for water filtration focusing on removal of iron and turbidity Cost estimation of all the adsorption media used as well as the ceramic filter Analysis of filtration effectiveness in removal of iron for different filter media. Our target is to proper utilise of rainwater. To provide awareness of rainwater harvesting throughout country. To monitor the physical, chemical and biological quality of drinking water in the study area. To correlate the principal contaminants with the common ailments in the district.

To generate a database for the drinking water quality in the study area. Identification of potential pollution sources and evaluation of their nature and extent. To find out strategies for protecting the natural quality of drinking water sources for sustainable human development (stress would be given to develop a low cost drinking water treatment process).

6.3-ISSUES:-

Water is considered as a lifeline of human body from various diseases. Water purification is very much necessary. It is not possible to centralise the water purification of the entire country. In order to protect the human from the diseases arising out of polluted water "decentralisation of Surface water treatment –issues and challenges" is very much required. It is needless to mention that the structure of the human society varies from place to place, culture to culture etc. Decentralization of water treatment plant ensures the proper system of water treatment and also ensures pollutant free water for all sections of people.

The issue of decentralization of water treatment process is very much significant in present scenario, the poor and weaker sections of of the society can get the opportunity of having pollutant free water either by free of cost or by very low cost. Decentralization of water purification is more essential for poor and urban areas. In fact decentralization water treatment system provides benefits of all sections of people in a society of a country.

6.4- CHALLENGES:-

The utility of decentralised water treatment is beyond any doubt. Every section of many people like Doctors, Engineers, Economists, Administrators effort etc have affirmed and confirmed that there is no compromise of water treatment plant in decentralised form. In spite of immense and doubtless need, the Government plays a very sleep short process. Adequate fund are not arranged for the process of decentralised water treatment plant. No actions are found on the part of the government regarding public awareness .Though few "NGO"s are taking initiative but it is found that the role of "NGO" IS INADEQUITE. The optimum benefit couldn't not be achieved due to inadequate actions of "GO"s and "NGO"s. Some of the "NGO"s paying their attention but due to acute crisis of found and manpower they can't deliver the proper action.

The decentralised water treatment plant process for the benefit of mankind is more than theory than in practice. The myth of the decentralised water treatment plant for poor and weaker section is a dream than reality till today.

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APPENDIX

Drinking Water Quality Standards in India
As per BIS(10500-2012

Sl. No.	Characteristic	Desirable Limit **	permissible Limit	Unit.
1	Turbidity (NTU), max ,	1	5	NTU
2	Colour (Hazen Unit)	10	10	Hazen
3	Taste and odour	Unobjectionable	Unobjectionable	--
4	P^H value	6.5	8.5	--
5	Total dissolved solids	500	2000	mg/l
6	Hardness as $CaCO_3$	300	300	mg/l
7	Chloride as Cl	250	1000	mg/l
8	Sulphate as SO_4	200	400	mg/l
9	Fluoride as F	1.0	1.5	mg/l
10	Nitrates as NO_3	45	No Relaxation	mg/l
11	Calcium as Ca	75	200	mg/l
12	Magnesium as Mg	30	100	mg/l
13	Iron as Fe	0.3	1.0	mg/l
14	Manganese as Mn	1.0	1.0	mg/l
15	Copper as Cu	0.3	1.5	mg/l
16	Zinc as Zn	0.05	15	mg/l
17	Phenolic compounds	5	0.002	mg/l
18	Anionic detergents as MBAS	0.001	1.0	mg/l
19	Mineral oil	0.2 0.5	No Relaxation	mg/l

20	Arsenic as As	0.01	No Relaxation	mg/l
21	Cadmium as Cd	0.003	No Relaxation	mg/l
22	Chromium as Hexavalent Cr.	0.05	No Relaxation	mg/l mg/l
23	Lead as Pb Table No – 1.1	0.01	No Relaxation	mg/l
24	Table No – 1.1	0.01	No Relaxation	mg/l
26	Selenium as Se	0.001	No Relaxation	mg/l
27	Mercury as Hg Total Coli form (CFU/100ml)	Absent	Absent	CFU/100ml
	Radio activity			
28	Gross alpha activity (u Cl / ml)	10^{-8}	10^{-8}	
29	Gross beta activity (u Cl / ml)	10^{-7}	10^{-7}	