CHAPTER – I

INTRODUCTION

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1.1 INTRODUCTION

Water is very useful and plays significant role in our life. Water that has excellent natural quality, is pathogen-free, color-free, turbidity-free, and is suitable for direct consumption without treatment. Ground water is becoming more significant as surface water becomes more contaminated. It has unique qualities that makes it especially suitable for the supply of public water[1]. To survivel, very important source for global population is the ground water and is very useful for the living organism but supplies are diminishing and it is not being preserved from degradation[2]. Groundwater overdraft has caused ecosystem damage, soil subsidence, salt water intrusion, well, spring, and canal drying up, change in groundwater quality, and finally damage to the aquifers[3]. Reviewing and assessing the variables affecting surface and groundwater as well as suggesting solutions to the crisis are urgently needed.

Ground water quality and ground water tables are continuously reducing because of the agriculture and urbanization waste, industrial waste, raising the possibility of quality deterioration and contaminating the aquifers that supply potable ground water. Pesticides and insecticides have been overused and heavily applied, contaminating the subsurface environment and rendering many sources unusable[4]. When contaminants spread over large areas of the aquifer, ground water becomes unfit for use in a variety of applications. Soil salinity is one of the most crucial elements that influences agricultural production, particularly in irrigated arid areas. Anthropogenic and geological processes are also attributes for the huge level of arsenic mineral and fluoride in the potable and ground water[5].

In coastal areas, salt water intrusion pollutes aquifers that supply potable ground water. A shortage of drinking water, a reduction in the amount of land planted, a decrease in the yield per hectare, and risks to human and animal health have all been brought on by the rise in salinity. Seawater intrusion into the water table has been caused by excessive groundwater extraction in coastal areas, which has been primarily supported by agricultural growth[6]. The regulation of the natural discharge is appropriate as groundwater development proceeds. To account for natural discharge during non-monsoon seasons, some consideration for future development must be given when calculating the amount of groundwater available[7]. Rainwater harvesting is a valuable alternative and supplemental water resource method that has regained importance. Before it is lost as

surface runoff, rainwater can be collected and stored on the surface or in subsurface aquifers using the rainwater harvesting technique. One can use the enhanced resource whenever it is needed. A variety of methods and tactics may be investigated when a rainwater harvesting system is developed.

An ancient technique for gathering water that is crucial to the local and regional hydrological cycle is rainwater harvesting[8]. It is primarily used in dry environments, and several nations have acknowledged it as a practical decentralized water supply[9]. Aquifers can be replenished either naturally or artificially. Rainwater or surface water will inevitably percolate into shallow and deep aquifers if an aquifer recharges naturally. By using a properly designed and built structure to transfer runoff water from the Earth's surface to an aquifer that is accessible at any depth, rainwater harvesting can artificially boost recharge[10]. Alternative methods for collecting rainfall in densely populated cities and coastal areas include collecting water in reservoir and ponds, using bore hall were to recharge ground water sources and direct infiltration. These methods are in addition to individual rainwater harvesting systems. Infiltration describes the process by which water from irrigation or rainfall enters the soil. If permeable soil is not available, water can be injected directly into aquifers through trenches, wells, and shaft in unsaturated zones for artificial recharge. The determination of infiltration rates of the soil is necessary to check the adequate permeability and absence of polluted areas[11]. The design of a harvesting of rain water body depends on the lithology, hydrometry, and land use of the particular location. Rain water harvesting has been neglected due to the improvements in the technological which, paved and built urban areas in many developed countries which resulted in reduction of groundwater recharge area. Industrial, agricultural, and urban wastes that leach or are injected into underlying aquifers have an increasing negative impact on the quality of ground water. It has been demonstrated that pollution can spread widely over many years after entering the subsurface environment. Therefore, areas of groundwater aquifer and render groundwater supplies unfit for use in drinking water and other applications. In the nation's largest cities and towns, the rate of ground water depletion and the decline in its quality are causes for concern. The quality and quantity of ground water are significantly impacted by the local climate, topography, geological formations, and use and abuse of this essential resource. The quantity and quality of ground water are both improved by the use of harvested rainwater[12]. Harvesting rainwater is an environmentally friendly way to address the global water crisis and could support

water management plans. Utilizing cutting-edge artificial recharge techniques, ground water restoration might help to partially alleviate the water crisis[13]. Remote sensing and geographic information systems (GIS) are being used to locate a suitable location for rainwater harvesting with the potential for ground water recharge[14]. To choose an appropriate location for artificial recharge, influencing factors must be identified, and spatial maps for each factor must be produced in a GIS platform[15]. An influential factor could be the land use, slope, depth to groundwater infiltration rate, and quality of alluvial sediments[16]. In the GIS environment, a runoff potential map can be created to supplement water collection systems[17]. The overall procedure entails digitizing charts and ground data, setting up a coordinate and projection system, creating surface maps from point data, interpreting the findings, and discussing them. Anywhere in India, a coastal groundwater basin can have its groundwater potential zones delineated[18].

The vast coastline of India is the foundation of the country's economy, and oil refineries are typically found there. These facilities frequently pollute the soil and groundwater. Some of the country's most potential aquifer systems are found in the coastal region. Assessing the sustainability of coastal groundwater is crucial for groundwater management because it is vulnerable to overuse and contamination[19]. It is challenging to manage groundwater systems effectively, as it is in many developing countries, due to a lack of hydrogeological data. Among the aquifers impacted by saltwater intrusion, those near the coast are the most productive. The use of suitable conceptual groundwater models facilitates the accurate evaluation of groundwater safety in coastal aquifers[20]. An efficient way to determine the potential zones, analyses, and evaluation of the ground water recharge capacity in coastal and industrial locations can be achieved through integrated modelling methodology.

1.2 REFINERIES OVERVIEW

An oil refinery is a type of processing plant used to turn crude oil into petroleum products like gasoline, diesel, and heating oils. Soil and groundwater are contaminated as a result of potential petroleum product leaks at various stages of the petroleum refinement process. The environment may be significantly harmed by such activities, necessitating quick remediation and the adoption of suitable preventative measures. Here are just a few examples of the myriad ways that oil refineries harm the environment.

On-site Activities That Pollute the Water

Crude oil is processed in an oil refinery to create petroleum products like gasoline, diesel, and heating oils. Potential petroleum product leaks at different stages of the petroleum refinement process contaminate the soil and groundwater. Such activities could cause significant environmental harm, necessitating prompt remediation and the adoption of suitable preventative measures. The numerous ways oil refineries harm the environment are just a few of them, as shown in the following examples.

Hydrocarbon Movement on the Ground Surface

Spilled or leaking substances are drawn downward by gravity, where they may be absorbed before they reach the water table. Faster than water, lighter oils penetrate the soil more readily than heavier ones. The water table can be contaminated by an oil spill even if it is far from it. The pollution may be concentrated on the water's surface by precipitation or may be carried to the water table by heavy rains that raise the water table. Because they are lighter than water, hydrocarbons at the water's surface will change in concentration as the water table does. The solubility of the product's components also affects how severe the pollution is because lighter fractions have more soluble components than heavier fractions.

Hydrological Characteristics of Soil Formation

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Effects of Human Interference on Groundwater Movement

Land management is the primary factor in determining whether to stop or permit ground water to flow into the underlying aquifers. On industrial sites, large-scale terrain modification happens for a variety of reasons related to industry needs. With such a change in land use and cover, followed by high levels of human activity, ground water flow is stopped and the chance for ground water recharge is diminished. Refineries cause

land disturbance, so spilled material finds its own path and is more likely to spread contaminants to nearby areas[21]. Building construction, sealing of the ground surface, installing underground services, and the impact of pumping from building sumps are some of the factors that influence the terrain characteristics. The refinery area's hydrological and hydrogeological conditions determine the contamination hotspots. Consequently.

Area of Storage

In addition to large tanks at "tank farms," smaller drums, and bulk storage, there are storage options for feedstocks and finished goods (typically additives and finished products only). Tank farms frequently have a large number of tanks inside of product- contained bunds. Bunds should also be used in these locations where drums are frequently stored, even if only temporarily. The likelihood of contamination in the chosen area is influenced by the storage tank's quality, the bund's structural soundness, and its age.

Product Transfer and Loading and Unloading

The majority of refineries are situated on or near the coast, and feedstocks are frequently moved by pipeline or ship. When products are moved, there is a noticeable possibility of spills and leaks. Oil interceptors may not have always been present in these areas, and tank flushing may have previously occurred uncontrollably[22]. The main source of leakage is the making and breaking of connections, even though loading gantries for rail and road may be present (even though pipelines are now used for the majority of product transport). Spills would have quickly soaked into the ground because rail loading gantries are typically constructed on highly permeable ballast. These areas should receive adequate attention, especially on older sites where redevelopment could obscure earlier practices.

Waste Disposal Areas

Process waste (oily sludge from tanks and wastewater treatment, used catalysts, furnace linings, and ash), acid tar, construction waste, scrap metal, and office, canteen, and clinical waste are just a few of the sources of on-site solid waste[23].

Demolition of Rubble and Asbestos

When older refinery structures are demolished, the surrounding soils may become contaminated with asbestos, particularly if the material is recycled on-site. However, any structure built before the late 1980s might have contained asbestos. The primary sources are boiler houses and structures with plumbing and boilers. As a result, asbestos may be found

everywhere on the property, though old boiler sites are the most likely places to do so.

1.3 MOTIVATION

After studying and considering the aforementioned issues, it has been found that the globe is very closed to available limit of potable water supply because population growth and economic pressure. Groundwater pollution is a result of untreated sewage, mobile community sanitation systems, farm runoff, and industrial waste. About 25% of the people in India live along the length of the nation's coastline. Coastal aquifers are among the most productive, but saltwater intrusion contaminates them. Most oil refineries are located near the coast[24]. An oil refinery is a type of processing plant used to turn crude oil into petroleum products like gasoline, diesel, and heating oils. Potential petroleum product leakage in underground pipes and surface tanks during different steps of petroleum elaboration in oil refineries frequently contaminate soil and groundwater. The industrial and coastal nature of the region led to saline water intrusion, numerous process operations, and the contamination and depletion of potable ground water aquifers. Such activities might have a very bad effect on the environment, calling for quick remediation and the adoption of appropriate preventative measures.

1.4 GROUND WATER MODEL

In order to estimate habit recovery and to check ground water right, we often use the ground water model. Depending on the goals the researchers were trying to achieve the goals, they put the different assumptions for the different modeling purpose. For the habited recovery, they were assuming conservative measurement of the flow recover because of the unavailability of estimation of predicted mean habitations. Area marked in the modelling for the survival of given habited were projected and they are actually not available and also may not be adequate time to given remedy conditions. When the water rights established during modeling which may conversely, under marked of depletion cause legal harms because users may be imposed by senior users imposing rights. Because of above inequality, it is necessary to create purpose of model before it is implemented for any type of the work.

Ground water is the one of the sources of the water in the India for drinking purpose. Most of the population in the India are reliable on the ground water as the portable water. Water irrigation services are there in the city region may not available in the

rural area but they are mostly using the tube well as the one of the sources of the water for the drinking purpose. Free charge and fresh source of water body is help in the maintaining good human health, surface water is only the source of good quality water for drinking purpose. Good water quality water and safety water is only the ground water and the surface water may be contaminated with the minerals and other impurities which is dangerous for the health which create problem such as hair loss, diarrhea, nail loss, disorder figures, mottle teeth, lungs irrigation, liver damage, cardiovascular disorder, nervous system damage, neurological problems, paralysis and cancer etc. Rain water falling in the river is the important source of the ground water and gets after that it gets mixed with industrial waste and ration of dissolved oxygen to ion is there hypothetical. These types of contaminated water may create serious difficulties for the humane being as well as primary bodies for the water. Peoples in the developing country are very aware about this type of contaminated waters in terms of economic and technological problems.

Life is so important and therefore, one cannot compromise with the quality of water so far. Everything was happening in the water and water are very useful to keep atmosphere temperature below certain limits by preservation. All living and aquatic life gets diminishes without water. Water requirement is very important in the industrial development as well as hydroelectric power generator, industrial procedure and for the wild life etc. therefore, water is the very important component in the monitoring the life cycle and climate condition[25]. Climate is the physical armed forced and it is mostly associated with the environment. Man relive on the water need is the portable water. Earth depends mainly on the rain water to protect the clean water on the surface but sometimes randomLy in the rain fall may cause drought or disaster flood. Clean water is the primarily requirement of the human being but in order to get this rain water in clean and portable way is very challenging task as the rain water is contaminated with many minerals and other industrial waste.

1.5 SOURCES OF FRESH WATER

Small part of country generally possesses good source of the water in comparison to rest of the large part of the country where scarcity of water resources is there. Number of water bodies are there in the form of the tube well. Water shortage area were crops development causing problem for the growth enlargement because of the insufficient amount of water supply. Its therefore very important that the equal water distribution in the earth surface

and main water sources are as follow[26].

1. River water
2. Rain water
3. Ground and surface water

Rain water is available only in the monsoon season there after its gets missing for the certain months so only few months source of water is rain water during rainy season. Ponds and Lakes containing rain water is also gets fall in to the continuous in the rivers and little rain water may gets hold by the surface in the form of surface water. Lake containing rain water is very useful for the long period of time. In India, number of natural lakes are there but it is not sufficient to hold the rain water and therefore it also required to constructed artificial lakes[27]. Rivers are the big sources of the water few rivers are charged by rain water and few rivers are charged by melting of snow from the mountain hilly region[28]. Surface water is defined as the water hold by the soil inside it. At preset we are using more than 25 percentage of the surface water. This water body is useful for the agriculture. Requirement of this type of sources is reduced because of the it's excess use and also agriculture are is reduced because of the population. Total surface area of earth is occupied with 71 percentage sea water and remaining parts were fresh water and life is there. Water sources are mainly divided in to two categories such as salty water and fresh water. According to NATA, 2006, the fresh water is the water which having salt concentration is less than 0.5ppm. Physicochemical parameters of the fresh water may get affected and alter because of the mineral's contaminations, sewage mixing agriculture and industrial waste contamination etc.[29].

Surface water is the one of the important storages of water in the India. India in the rural and urban parts are mainly reliable on the surface portable water. Portable water body is the tube well which is free from the pollution and clean water bearing source[30]. Fresh and clean water is very primary requirement of the human being for sustaining their health. Surface water is only the tremendous source of the portable water by now a day surface water gets contaminated by melting of minerals and solvents as well as heavy trace metals which contaminated water and may seriously causing problems such as hair loss, diarrhea, nail loss, disorder figures, mottle teeth, lungs irrigation, liver damage, cardiovascular disorder, nervous system damage, neurological problems, paralysis and cancer etc. [31]. The level of nitrate was checked in the region were sample collected in the monsoon and

was found to be decreases in the season winter and summer than the desirable limits for the remote area were water used for the drinking purpose. Total dissolved solid is also more than the desirable expected limit which may also create problem like kidney stone. Reason for these is that the salinity of water may causses several alterations and also change the several parameters of the water. In 1972, peoples have worked to store the fresh water requirement and in 1996 amongst the 16204 countries the total number of schemes for fresh water was established are less than 200. 1974 system was included harmLess portable water state wise. Now in presence ecofriendly agency controls water chemical contaminations and government has concern more on important of humane life's value and make the policy for the fresh water rights for peoples.

Why freshwater requirement is the emerging challenge:

1. Present treatment may not sufficient
2. Shifting geographically and increasing in the population
3. Progress gets weakened and speculation in the study.

Water is the very useful for the animals, human and plants. Water is area based depending on the micro vegetation and micro wild life. Generating settings for the dangerous significant. Drinking water is the one of the most evolving as one which cause sparing of life spam. The social body bearing 70 percentage waters. Prediction data said the in the year 2030 were more than 45 countries facing the scarcity of portable water and its big challenge for getting fresh water. At presence Ethiopia, Kenya, India, Nigeria and other four countries are facing scarcity of in coming next 15 years. Few large populated countries like China facing scarcity of water at present due to population. It is necessary to think on this direction to avoid such problem in the future so its required to arrange necessary water storage body sources.

Because of the improper water administration, dangerous waste may fall in to water, improper waste disposal, industrial influents disposal etc. which may create people's hygiene problem in every part of the world. Number of peoples are loss their life because of water born diseases commonly called cholera, typhoid and schistosomiasis harm. Wastage and contaminated water supply is also very serious issue for the atmosphere and environment conservation is concern. Fresh and clean water is the expectation of every people in the earth for their survival.

Water falling globally is very important for the population growth, environment protection, urbanization developments, aquatic life sustainable etc. most of the nations are aware regarding the requirement of fresh and clean water and they all are comes forward and making steps toward fresh and clean water policy. In the international agenda, fresh water availability is the highest priority for the country. Fresh water requirement for the mankind is the big challenge as it has been supplying near to extinct or almost getting over.

In most of the nations, now a day ponds and river are the sources for the dumping of industrial waste, untreated poisonous dumped and hazardous chemicals that spread on the surface of the earth. Community residing in the said area are depends on the ground water availability which may create problems as the increasing in the population and day by day peoples need is also increases. Increasing in the population in the any developed country may facing problems now a day for the availability of water.

The shortage of availability of fresh and clean water is the problems of most of the nations in terms of humane life and growth of population vegetations. Impure and contaminated water are the serious and big problem for the peoples who are residing in the country in the world. Poisonous water, aquatic scarcity over 12 million population in every year may have dangerous issue regarding health problems and over many states have create law regarding policy for the not polluting water or to preserve the fresh water without any kind of contaminations. Progress in the transparent way at internationally, most of the country have made policy and plan for the fresh water requirement for the future generations.

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