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Groundwater importance -re charge techniques to Increase ground water level

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Abstract: The water which is stored in the pores of the soil strata by infiltration is known as groundwater. Therefore the groundwater may define as all the water present below the earth surface. Aquifer is an underground geological formation which contains sufficient amount of water and required amount of water can be extracted economically using water wells. Groundwater is an important natural resource, but like many of our other resources it's affected by the surrounding environment and human activities. It provides us with much of the water that we use for drinking water, household uses, crop irrigation, Mining and many other things. In fact, over 1/3 of Earth's population relies on for its needs. Ground water tapped through wells placed in water bearing soils and rock beneath the surface of the earth. Ad equated time is needed to allow replacement of underlying ground water resources (aquifers);also such areas must be properly managed in ordered to prevent water soluble waste products stored these areas from identifying and polluting the underground supply. Groundwater recharge is increasing in popularity as groundwater resources are being depleted and saltwater intrusion is becoming a greater threat to coastal communities. Although the primary objective of this technology is to preserve or increase groundwater resources, artificial recharge has been used for many other beneficial purposes. Cultural considerations and socio-economic concerns often affect the selection of a recharge method and site. The availability of land, land uses in adjacent areas, public attitude and legal requirements generally play a role in defining the acceptability of artificial recharge in a given setting. In urban areas, where land availability, costs and uses in adjacent areas may impose restrictions injection wells, shafts or small pits requiring highly controlled water supplies and little land area may be preferable to larger scale, surface spreading recharge methods. Surface recharge facilities generally require protected property boundaries, regular maintenance and continuous surveillance if they are to be accepted by the public.

Introduction

The water which is stored in the pores of the soil strata by infiltration is known as groundwater. Therefore the groundwater may define as all the water present below the earth surface. Aquifer is an underground geological formation which contains sufficient amount of water and required amount of water can be extracted economically using water wells. It is the process by which the ground water is improved at a rate much higher than those under natural condition of percolation.

Groundwater is an important natural resource, but like many of our other resources it's affected by the surrounding environment and human activities.

It provides us with much of the water that we use for drinking water, household uses, crop irrigation, mining and many other things. In fact, over 1/3 of Earth's population relies on groundwater for its needs.

Groundwater pollution comes from many sources, and this happens when harmful substances get into the soil. When it rains, water washes over the substances in the ground and carries them down into aquifers below, much like hot water does when you pour it over a filter full of coffee.

Agriculture pollutes groundwater as fertilizers, pesticides, and herbicides soak into the ground. Nitrates from the fertilizers are especially dangerous in drinking water because they've been linked to various cancers, miscarriages, and birth defects. Manufacturing industries are also major culprits. There are often many different toxic chemicals involved in manufacturing the products that we use, and if not properly disposed of they may leach into the ground, soaking down into the groundwater below. Underground storage tanks, like septic tanks, can also leak sewage waste, oil, and toxic chemicals into the ground. Ground water are a renewable resource.

Ground water tapped through wells placed in water bearing soils and rock beneath the surface of the earth. Adequate time is needed to allow replishment of underlying ground water resources (aquifers);also such areas must be properly managed in ordered to prevent water soluble waste products stored these areas from identifying and polluting the underground supply.

Objectives

1. To study the need and significance of ground water.
2. To examine the issues in. the ground water.
3. To analyze the status of recharge techniques of ground water.
4. To bring public awareness on increasing ground water level.

Methodology

The methodology is used in this study with the help of the data from secondary sources.

Increase Methods of Ground Water Level

Contrary to belief, rainwater harvesting is not costly

Mathematically speaking, rainwater harvesting (RWH) reduces the flow of rainwater to the oceans. It is nothing but to check the flow of rainwater and store it in convenient places using appropriate technology, which can be used for agriculture, gardening or drinking purpose. The water collected through harvesting can be directed to bore wells so as to recharge the the ground water level. Rainwater harvesting is not new, it is in our culture and tradition and we are doing it since ancient times. Housing societies can easily calculate how much rainwater their roofs can collect by measuring the terrace in square meter and multiplying it by 0.5 cubic meter of rain. For example, if you tell people that your rooftop is capable of collecting 1lakh liter of water in a season, people find it acceptable and are ready to invest in the harvesting system. The understanding is that is a costly procedure. This water can be used for many purposes besides recharging the bore wells and also for drinking purpose if it is filtered.

RWH is a viable option when groundwater level is decreasing

Rainwater harvesting is important for cities. Today, no one actually knows that how much groundwater is being extracted through bore wells in the cities. Through the construction policy, PMC has made it mandatory for all the housing societies and commercial premises to have the rainwater harvesting system. However, on the other hand, it has also been made compulsory for these societies to have bore wells. When we talk about groundwater, we have to consider the aquifers. The groundwater is not an unlimited supply of water, it has its limitations. It is also not necessary that the water percolates into the ground. What is happening right now is that we are drilling bore wells without knowing if the groundwater is actually available or not. It is important to know that the aquifers of the ground are absorbing water or not. Using water from rainwater harvesting for watering gardens or drinking purposes is not being done because it becomes a costly affair.

Recycling water in urban areas is the need of the hour

Artificial water harvesting is required because; the natural process of harvesting is being obstructed in the cities due to concretization. The natural recharging of groundwater is blocked by altering the earth's surface by asphalting, concretization and construction. For example, when any road is blocked for repairs, we create a bypass for the traffic to flow. However, we are not doing the same when we are blocking the natural harvesting process of rainwater. Few years back, there was news that in Delhi, due to asphalting the roads and over-concretization, all the bore wells in the city had gone dry. Rainwater harvesting is important because trees get water that percolates into the ground. , the bore wells in most of the housing societies have run dry because there is no room left for natural harvesting. However, besides rainwater harvesting, it is also important to recycle water in urban areas. I have restored to rainwater harvesting in my garden because if we recharge the groundwater, the trees will get water and remain alive and green.

Our streams and rivers should not be reduced in size

Due to concretization and encroachment, natural rainwater harvesting is not taking place and groundwater is getting depleted on a larger scale. We have to ensure that we have our streams and rivers in their natural sizes, with no interventions being carried out by the civic and private bodies. The Storm water drain system designed in our city are all obsolete. Soil is the fastest absorber of water and if we plant trees along the side of the roads, water can be easily absorbed into the ground. It is the best way of storm water harvesting. We have to redesign our storm water drain system — they have already been given to the PMC more than two years back. Making rainwater harvesting mandatory for all housing societies is a good step. However, while implementing the system, the builders have to consider the water carrying capacity of each area and then decide what kind of tenement density should be allowed.

New residential complexes have resorted to rainwater harvesting

Rain water harvesting is the need of the hour. The demand for water is increasing with urbanization and crowding of the cities. There are a lot of residential complexes, especially the new ones that have taken up rainwater harvesting. As the water cost is increasing and the natural sources are getting polluted and depleted, the industries too, are realizing the need for conserving and tapping rainwater in their premises. The government laws are one of the reasons why companies are opting for installing the rainwater harvesting system. However, they are also doing this to improve their brand name and earning goodwill from their customers. In the past few years, there has been an increase in the number of commercial complexes such as offices, hospitals and educational institutions that have taken up rain water harvesting project and are benefited from it.

Importance of Artificial Recharge

Direct surface recharge techniques are among the simplest and most widely applied methods. Subsurface ground water recharge conveys water directly into an aquifer without the filtration. To maximize storage(long-term & seasonal) Water quality improvement through dilution Preventing saline-water intrusion & land subsidence Reducing reduction volumes from river flow Controlling effects of climate change. Where ground water quality is poor and there is where availability of water from wells and hand pumps is inadequate during the lean months. Where substantial part of the aquifer has already been de-saturated. i.e. regeneration of water in wells and hand pumps is slow after some water has been drawn. Where ground water levels are declining due to over-exploitation. .

Subsurface Groundwater Recharge Methods: A variety of methods have been developed and applied to

artificially recharge groundwater reservoirs in various parts of the world. Generally these methods are classified as surface and subsurface ground water recharge ration that occurs when water percolates naturally through an un saturated zone.

Direct Surface Groundwater Recharge

With direct ground water recharge water moves from storage aboveground to the aquifer via soil percolation. Most of the existing large-scale artificial recharge schemes in Western countries make use of this technique, which typically employs in filtration basins (spreading basins) to enhance the natural percolation of water into the ground. Field studies of spreading techniques have shown that, of the many factors governing the amount of water that will enter the aquifer, the area of recharge and length of time that water is in contact with soil are the most important . In general direct surface recharge systems based on percolation have relatively low construction costs and are easy to operate and maintain.

Spreading Basins

This method involves surface spreading of water in basins that are excavated in the existing terrain. For effective artificial recharge, highly permeable soils are required and maintenance of the water layer above the soil surface is necessary. Recharge in spreading basins is most effective where there are no impending layers between the land surface and the aquifer and where clear water is available for recharge. In addition this method tolerates more turbid water than any well recharge methods does.

Ground water recharge in trenches

Shafts can have circular, rectangular, or square cross sections and may be backfilled with porous material enhancing the percolation process and preventing the stagnation of the water (which can lead to insect breading). The shaft may end above the water table or reach below the water table and serve as hydraulic connector.

Ditches

Ditches are similar to spreading basins but they have a different shape. A ditch can be described as a long narrow trench, its bottom width being less than its depth. A ditch system can be designed to suit the topographic and geologic conditions that exist at a given site. Water fills up in the ditches and percolates naturally through the soil.

Other Recharge Techniques

Another method of artificially recharging ground water is to use permeable pavements, which allows water surface runoff (e.g. storm water) to trickle underground, rather than allowing it to pool on the surface and evaporate. Flood irrigation of surface water applied to surrounding farmlands is also a vital source of ground water recharge. As agricultural land is converted to urban use, identifying sites for additional ground water recharge is essential to keep water supplies balanced water consumption of urban areas are generally lower, but impact of deep percolation from flood irrigation is lost.

Advantages

- May provide a ‘drought-proof’ water supply from groundwater.
- Technology is easy to understand and operate.
- Groundwater recharge collects water during wet season for use in dry season, when demand is highest.
- In many river basins, surface water runoff is controlled due to aquifer recharge, resulting in less sedimentation problems .Recharge with less-saline surface waters or treated effluents improve the quality of saline aquifers, facilitating the use of the water for agriculture and livestock.

Disadvantages

- Discharge of nutrients and micro-pollutants may negatively affect the receiving soil and aquifer.
- Introduction of pollutants may have long-term impacts.
- Potential of groundwater contamination from injected surface water runoff, especially from agricultural fields and road surfaces.
- Recharge can degrade the aquifer unless quality control of the injected water is adequate.
- Unless significant volumes can be injected into an aquifer, groundwater recharge may not be economically feasible.
- During the construction of water traps, disturbances of soil and vegetation cover may cause environmental damage to the project area.

Conclusion:

Groundwater recharge methods are particularly useful in areas with aquifers with long retention times, where water and groundwater resources are heavily utilized and acute problems with dropping watersheds, soil salinisation, saltwater intrusion in coastal areas or water scarcity in general exist. The effectiveness of discharge into an aquifer will depend entirely on the quality and quantity of the water to be infiltrated, local environmental conditions and legal regulations.

While surface injection methods require relatively flat or gently sloped lands, topography has little effect on subsurface recharge methods. Aquifers best suited for artificial recharge are those that can absorb and retain large quantities of water. In temperate humid climates the following alluvial areas are best suited for artificial recharge: areas of ancient alluvium, buried fossil riverbeds and alluvial fans interlinked by main valley and tributaries. In arid zones, recent river alluvium may be more suitable. Coastal dunes and deltaic areas are also often very favorable areas for artificial recharge schemes. The physical, chemical and biological quality of recharge water also affects the selection of the recharge method. If suspended solids are present, surface application techniques tend to be more efficient

than sub-surface techniques that can result in clogging of injection wells. Water containing toxic chemicals or chemicals that could reduce aquifer porosity or recharge capacity must be pre-treated if used for artificial groundwater recharge.

Cultural considerations and socio-economic concerns often affect the selection of a recharge method and site. The availability of land, land uses in adjacent areas, public attitude and legal requirements generally play a role in defining the acceptability of artificial recharge in a given setting. In urban areas, where land availability, costs and uses in adjacent areas may impose restrictions injection wells, shafts or small pits requiring highly controlled water supplies and little land area may be preferable to larger scale, surface spreading recharge methods. Surface recharge facilities generally require protected property boundaries, regular maintenance and continuous surveillance if they are to be accepted by the public.

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