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Efficient Water Management: River Linking Project, Tube Well Drilling And Ground Water Recharge Best Practice (Under Jjm & Npp)

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ABSTRACT

A multipurpose river valley projects, involving storage of water by the construction of Dam across the River, can cause several effects on the environment of the area.

Excessive tube well drilling can lead to Ground water depletion, affecting Local aquifer systems and water Tables.

River Valley projects and tube well drilling have become essential components of Modern Water management Strategies, providing Irrigation, Drinking Water, and Hydroelectric Power .However these activities have for-reaching environmental consequences, including alterations to river hydrology, sedimentation and ground water depletion.

The study investigates the cumulative environmental impacts of river valley projects and tube well drilling on local ecosystems, Field observations, remote sensing, and hydrological modeling were employed to assess changes in river morphology, groundwater levels, and water quality.

Results indicate significant alterations to river hydrology with decreased water flows and increased sedimentation. Tube well drilling has led to substantial groundwater depletion, affecting local aquifer systems. Water quality with increased concentrations of pollutants and decreased dissolved oxygen level.

The need of sustainable water management practices, incorporating environmental considerations into river valley project planning and tube well drilling regulations. Recommendations include implementing efficient irrigations systems, monitoring ground water levels, and enforcing environmental impact assessments to mitigate the adverse effects of these activities.

The object of 'JAL JEEVAN MISSION,-HAR GHAR JAL' is to provide drinking water to all the house as well as to provide pure drinking water in many public places like SCHOOL, ANGANWADI, HEALTH AND WELLNESS CENTRE, COMMUNITY SANITATION & TOILET COMPLEX, CATTLE POND etc. under Jal Jeevan mission, Gram panchayats have been entrusted with the responsibility of preparing, implementing and maintaining the village action plan.

Keywords: River valley projects, Jal Jeevan mission projects, Tube well drilling, environmental impact, water managements, sustainability, Ground water recharge Mechanism , Jal Jeevan mission, water supply etc.

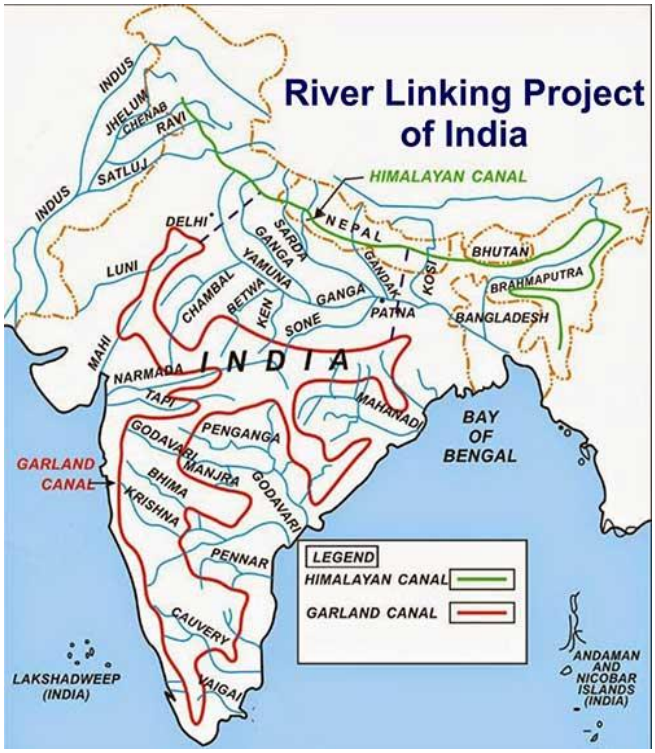
Introduction

The increasing demands of water and energy have led to the widespread adoption of river valley projects and Tube well drilling. While these projects aim to provide water and energy security, they also pose significant environmental risks. River valley projects, including dam and reservoirs, alter the natural flow of rivers, affecting aquatic ecosystems and disrupting sediment transport.

The Environmental impacts of these projects are far-reaching and can have devastating consequences on local ecosystems and communities .some of the key environmental concerns associated with river valley projects and tube well drilling include.

A Tube well is a type of water well it is commonly used in rural and agricultural areas to pump water for drinking & irrigation, Tube well are popular, reliable source of water and its effectiveness depends on the groundwater level and quality. Tube well drilling, on the other hand, can lead to ground water depletion, land subsidence water pollution.

The Need for sustainable Management as the demand for water and energy continues to grow, it is essential to adopt sustainable management practices that minimize the environmental impacts of river valley projects and tube well drilling .This requires a comprehensive understanding of the environmental risks associated with these (River valley & Tube well drilling) projects and the development of effective mitigation strategies



.Rain water Harvesting & conservation ,is the activity of direct collection of Rain water .The Rain water so collected can be stored for direct use or can recharged into the Ground water. Any man made scheme or facility that adds water to an aquifer may be considered to be an artificial recharge system.

Lot of techniques available to recharge ground water reservoir but we will discuss here only "Recharge of ground water by deep drilling as per Jal Jeevan Mission Guideline.

Environmental Impact of River valley Projects

Some of these impacts may Adversely Affect the ecology and environment, while most others may prove beneficial to the Environment as mention below—

Positive Impacts--Among the favorable positive beneficial impact of a dam project on environment

- Net improvement in public health
- The overall increase in wood production
- Excellent habitat for fisheries and water liking birds
- Development of tourism and recreation
- Improvement micro-climate
- Overall improved oxygen production
- Development of sanctuaries and wild life
- Employment
- Area development
- Increase per capita income
- Development of Transportation
- Development of Infrastructure
- Business development

In totally ,it can be stated that the multipurpose water resource projects ,do not by themselves, cause any environmental degradation and do generally justify their nature of being in environmental –harmony.

Negative Impacts— among the adverse negative environment impacts

- Loss of wild life habitat (flora & Fauna)
- Loss of valuable forest & agricultural land
- Loss of religious sites
- Loss of adventure sports and river rafting
- Displacement of people coming in the submergence zone of the dam.
- Growing pressure of civilization and industrialization on nearby area
- Post project effect, like salinity and water-logging of irrigated land
- Reservoir induced seismicity
- Water pollution and contamination.
- Adverse impacts of fisheries
- Alteration of Natural river flows and sediment transport.
- Disruption of aquatic ecosystems and habitats.
- Ground water depletion and land subsidence.
- Loss of biodiversity and ecosystem services.
- Submergence of the ancient monuments
- Deforestation

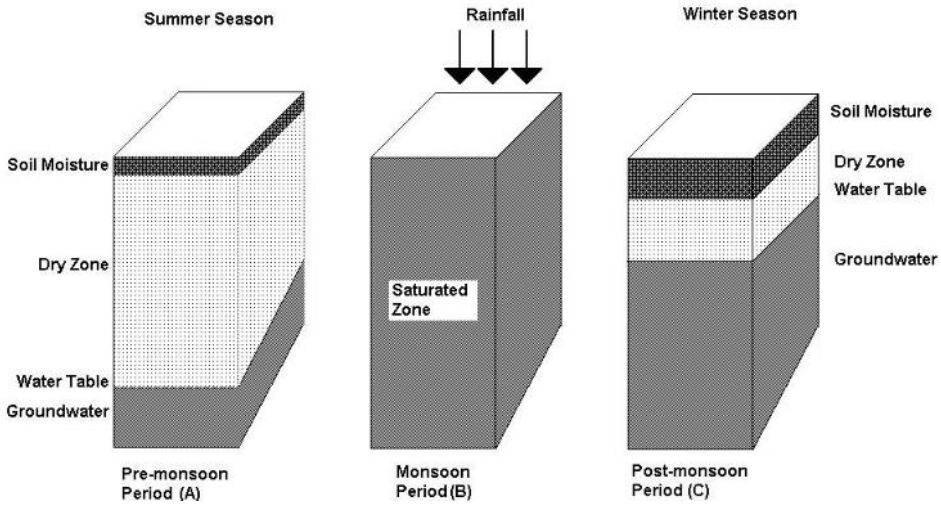
Environmental Impact of Tube well

The origin of all source of water is rainfall, water can be collected as it fall as rain before it reaches the

ground or as surface water when it flow over the ground or is pooled in lakes or ponds or as ground water when it percolates into the ground and flows or collects as groundwater or from the
Sea into which is finally flows. The quality of water varies according to the source as well as media through it flows.

If water precipitate then microorganisms and other suspended matters in the air are entrapped but ordinarily the impurities are not significant

Tube well are tubular wells drilled in to permeable layers to facilitate abstraction of ground water through suitable strainers into the well extending over the required ranger or range of the water bearing strata . A Tube well is a type of water well that is drilled into an underground aquifer to Access water & Tube well useful for obtaining water from shallow & deep well as aquifers are constructed.



Schemstic diagram depicting the process of groundwater recharge in an unconfined granular aquifer with deep water table

Characteristics of Tube well—

- Deep drilling
- Narrow diameter
- Steel or pvc pipes
- Screening and Filtering

Use of tube well—

- Drinking water
- Irrigation
- Industrial Processes
- Construction work
- Power project & Heavy projects

Positive impact of tube well—

- Reliable water supply
- Low Maintenance
- High Yield
- Soft water
- Non polluted water

- Minerals in Natural water
- Natural temperature
- Suitable for Drinking water for village & urban water supply projects

Negative Impact of tube well

- **Ground water depletion—**Over-extraction of ground water from tube well can lead to decrease in the water table, causing land subsidence and saltwater instruction.
- **Water pollution**—tube well can be contaminated by nearby source of pollution, such as agriculture runoff, sewage, and industrial waste.
- **Loss of natural recharge—**Tube well can disrupt the natural recharge process of ground water, leading to a decrease in the water table.
- Wastage of water at the time of tube well development over pumping
- Most of the open bore well are dangerous for living beings as human beings and animals can get hurt or even get trapped in the open bore well which can result death
- Small kids or small size animal can fall in the bore well while moving near open bore well and can slip at the bottom due to slippery soil on bore well boundaries.
- Open bore well can contaminate the water table which pollutes drinking water
- Toxic gases can come out from open bore well which can result death due to suffocation
- If water pressure in the open bore well is more, it get flood the nearby area.
- Maintenance challenges
- Pumping costs
- Clogging and corrosion
- High initial cost

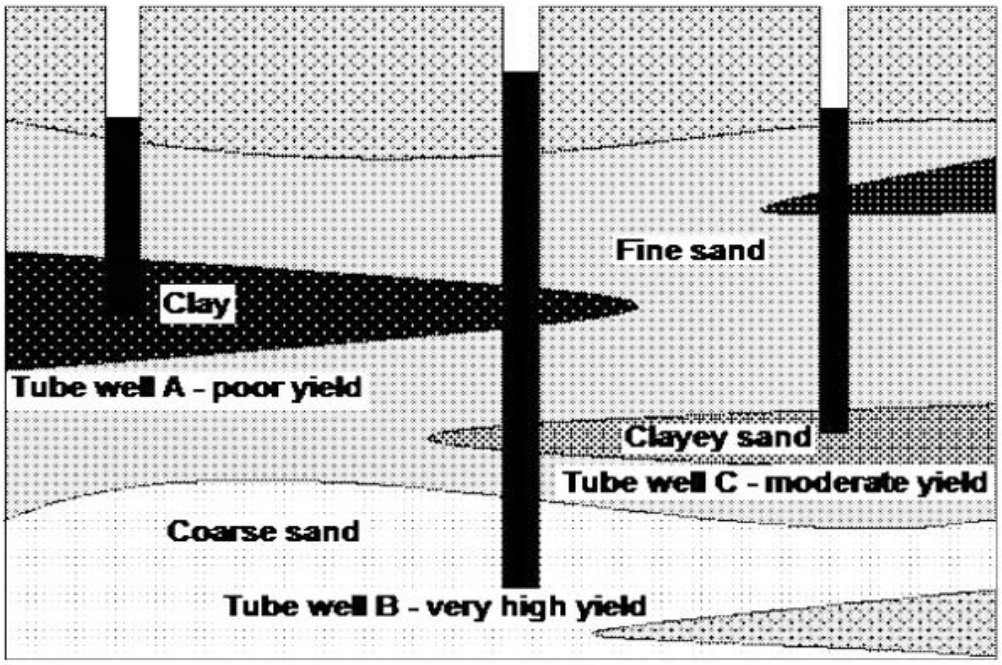
Development of tube well

Tube well are developed to increase their specific capacity, prevent sanding and obtain maximum economic well life.

Development means the stabilization of the walls of the well adjacent to the screen by the process which removes the fine particles from the formation immediately surrounding the well screen, leaving coarser particle to contact and surround the screen.

Object of well development---

- To unclog the water bearing formation
- To increase the porosity and permeability of the water bearing formation
- To stable the sand formation around a screened well , so that the well may yield sand free water
- Surging cycle to break down bridging



Tube well yield dependency on soil strata

Tube well development Method

- Tube well development by surging
- Tube well development by pumping
- Tube well development by compressed air
- Backwashing technique
- Tube well development by jetting
- Tube well development by chemical use

How to Prevent Tube well Failure

- Regular maintenance
- Proper water Extraction
- Monitoring water levels
- Quality water analysis
- Professional Installation
- Trained Operating staff
- Remove problem quickly

Life of Tube well and Reason for its Failure

A normal tube well lasts for about 15 to 30 years in Northern India.it may fail due to two main reason.

A--Incrustation— the incrustation of the well pipe occurs due to the deposition of alkali salts on the inside walls of the pipe.

The incrustation can be reduced—

- By reducing the drawdown and hence the pumping rate
- By using screens having larger of opening

- By using such type of materials
- By properly maintaining and periodically cleaning the well screens

B--Corrosion— the well pipe is gradually destroyed by the corrosion due to the action of acidic waters on the pipe materials.

The corrosion can be reduced---

- By reducing drawdown and the pumping rate
- By using thicker pipe
- By using corrosion resistant coatings on the pipe
- By using corrosion resistant material for pipe
- By reducing the flow velocity by increasing the percentage of open area or by the diameter of the well pipe.

C--Common Reason

- Over pumping
- Pump malfunction
- Sediment accumulation
- Casing damage
- Improper installation
- Geological Change
- Water Quality Issue
- Due To settle down Pea gravel
- Inclined Drilling
- Quality of pea Gravel
- Use of Aggregate in place of Pea Gravel
- Improper Development by compressor & pumping as per specified time frame
- Proper Soil testing & correct Reporting
- Carefully Preparation of strata chart
- Carefully site Selection
- Lowering left after drilling

Cause of submersible pump Failure in Tube well

- Reverse rotation
- Dry run
- Running on the right of the curve
- Specific gravity
- Cable damage
- Dead load
- Not allowing for discharge piping
- Jammed impeller
- Voltage flections
- Wrong & Careless operation
- Starting too Frequently

- Lack of Regular interval service

Recharge structure ---

The basic purpose of artificial recharge of ground water is to restore supplies from aquifers depleted due to excessive ground Water development and usages. The aquifer best suited for artificial recharge are those aquifers which absorb large quantity of water and do not release the same too quickly.

Steps Taken

- By CENTRAL GROUND WATER BOARD (CGBW) has prepared document as MASTER PLAN FOR ARTIFICAL RECHARGE TO GROUND WATER—2013 which provides information about area specifics artificial recharge techniques to augment the ground water resources on the bases of availability of source and capability.
- The national water policy—2012
- CGWA has been constituted under "The Environment (protection) act –1986
- CGWA has issued advisories to promote & adopt artificial recharge ground water.
- CGWA has taken up Aquifer Mapping and Management Program (NAQUIM)
- Model Building Bye Laws—2016
- Watershed development projects by WDC
- The ministry of rural development in consultation and agreement with ministry of water resources ,RD & GR & the ministry of agriculture & farmers "Welfare has developed an actionable framework for Natural Resources Management (NRM) as titled "MISSION WATER CONSERVATION ,,

Rain Water harvesting

Rain water harvesting can be defined as activity of direct collection of rain water and storage of rain water as well as other activities aimed at harvesting and conserving surface and ground water, prevention of loss through evaporation and seepage & other Hydrological studies and engineering inventions aiming at most efficient utilization of the Rain water towards best use for the humanity.

Factors affecting selection of Recharge Structure

There are various factors which affect the choice of Recharge structure

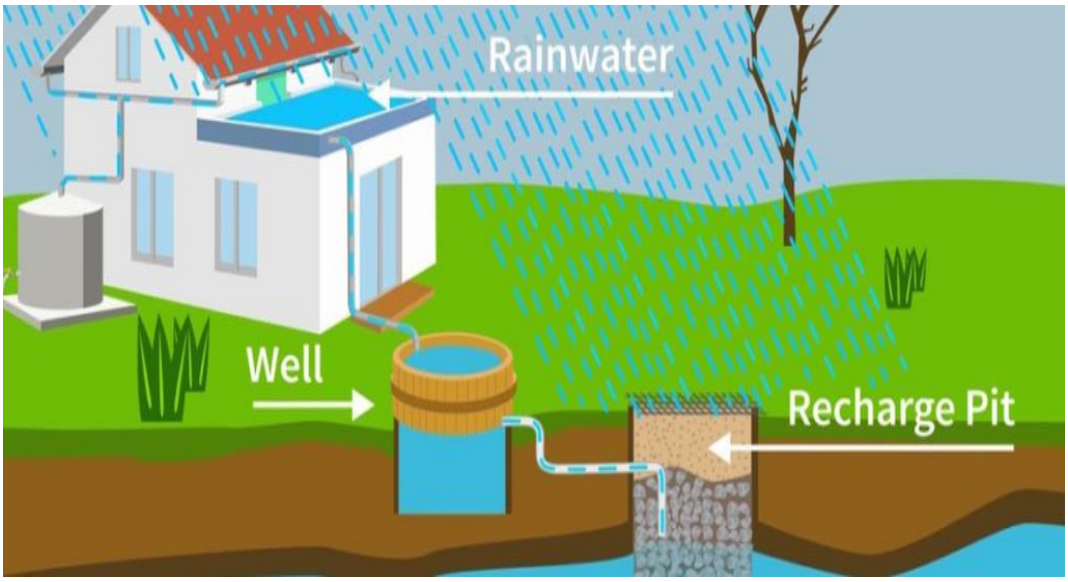
- Pattern of rainfall in the area
- Topography of the area and terrain profile
- Land use and vegetation
- Type of soil and soil depth
- Hydrological & hydrological conditions of the area
- Amount of surface runoff available for ground water recharge
- Environmental Impact assessment (EIA) of the proposed groundwater recharge technique
- Socio-economic conditions of the habitants in the area
- Availability of infrastructure facilities

Artificial Groundwater recharge techniques

1-Direct methods

A-Surface (spreading) Techniques

- Flooding
- Ditch & furrows



Recharge Pit

- Recharge basin
- Stream Modification /augmentation

B-Runoff conservation Structures

- Counter bunds and counter trenches
- Gully plugs Naala bunds, check dams
- Percolation ponds
- Bench Terracing

C-sub-surface techniques

- Recharge wells or injection wells
- Gravity head recharge wells
- Recharge pits & shafts

2-Indirect methods

- Induced recharge from surface water
- Modification of aquifer
- Bore-blasting

3-Combination method

- Sub-surface dykes (Bandharas)
- Fracture sealing cementation (To arrest Sub-surface flows)

4-Various type of recharge structure are

- Recharge through Abandoned dug well
- Recharge through hand pumps

- Recharge pit
- Recharge through trench
- Gravity head recharge tube well
- Recharge shaft

5-Hydro fracturing

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