WATER RESOURCE: ITS USE, CONSERVATION AND MANAGEMENT IN PAKUR DISTRICT, JHARKHAND.

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Abstract:

Water is most precious natural resource on this Earth. It is an essential part of civilized modern life. It is used in drinking, bathing, washing, irrigation, industrial and a host of other works. Availability of water is both from surface water as well as ground water. In the modern age, the use of water in different purposes has accelerated to such an extent that its scarcity has posed a major problem to be faced by the dwellers in the urban and rural areas.

Pakur District is situated in Santhal Pargana division of Jharkhand state. It is a part of Rajmahal Highlands. The terrain is undulating made up of hard rocks, mostly granitic and basaltic; the amount of surface water & groundwater is very limited. Therefore the use and demand of water in so many purposes has drawn the attention of Planners, administrators, Scientists to chalk out the strategy and planning for conservation & management of these vital resources which is often called the 'Elixir of life'.

The main purpose of this research paper is to find out the potentials of Ground Water resources, its use and management in the district as a whole in different ways and also to suggest some measures for its conservation.

Keywords: Resource, Conservation, Management, Groundwater, Hard rock,Terrain, essential, potential.

Introduction

Water is precious natural resource, a basic human need and major national asset. The scope of water whether water is abundant or scarcity, safe or polluted, favourable or disastrous, impact has seen on standard of human life. The total water resource available is 12.5 BCM (APPX.) Of surface water along with the groundwater recharge annually. If we check total water balance than that amount is more than annual demand or expenditure of the district. So scarcity of water denotes that the conservation and management techniques used in the district should be overviewed. The management of groundwater resource is discussed with the support of aquifers, wells, other water bodies maintaining the balance between discharge and recharge and its quality for best utilization in different sectors of economy.

Objectives

The main objective of the present Paper is assess the conservation & management of groundwater resources in Pakur district which includes the occurrence of groundwater, water availability, estimation of future requirements of surface and groundwater. In this regard the following are the major objectives of the present Paper:

- To study the geological and physiographical characteristics of the study area influencing the occurrence of groundwater.
- To describe some demographic conditions related to groundwater consumption.
- To assess the groundwater resources of the study area in terms of its present utilization pattern in different sectors of economy..
- To assess the conservation and management for groundwater in the study area.

Methodolgy

This present paper is based on government offices reports, some primary observations, researches conducted by the research scholars, review of related literatures, websites, Published reports and articles by different states, central government, local bodies and NGO's secondary data collected. All data sources have been applied to have a conception of the water conservation and management problem
in the study area.

Groundwater Development In Hard Rocks

All the igneous and metamorphic rocks which named granite, quartzite, schist, basalt, gneisses, khondolites, gabbros', dolerites, etc can be kept in this group. The terrain having some hard rocks lack of primary porosity and is generally moderatly populated and economically backward areas in which governments take steps to fulfill and encourage people and small farmers for dig wells, small tanks etc . The water holding capacity of these hard rocks is based on the development of secondary porosity in these rocks. That depends on nature and extent of geological structure, climates and tectonic processes. Internal and external processes of the Earth also accelerate the porosity in the rocks. In these areas too much variation is found at place to place in the same rock also. It may be caused by different hydraulic force working one place to other. The development of groundwater resources for irrigational and domestic use is like a key factor in the economic saving of huge extent of hard rock areas. In these areas farmers want to assure about irrigational supply for their crops and a continuous drinking water supply facilities. In these hard rock terrain observation and estimation of groundwater discovering acceptable places for placing dug wells and bore wells or small tanks or dobha and planning for long term supportable for the wells, are the main problems.

Study Area (Pakur District)

The district Pakur,is located between 21^0 58'N to 25^0 18' N and 83^0 22' E to 87^0 58' E in the north eastern part of the state of Jharkhand, is surrounded by Sahibganj, Dumka, Godda, and state of West Bengal. This hilly district structured by rajmahal trap's rock type, alluvium, Laterite and Gondawana have the geological formation, with geographical area of 1805.59 Sq. km.The district posses as 9.00422 lakh population. The district is rich in natural resources like Coal, Forest resource etc. The area and population of district are 2.27% & 2.83% of the state respectively. After the formation of the district in 1994, insufficiency of water is continuously widened, people of the district often desire to settle near water resource of the region. Almost all major rivers become dry in the district most of year while shows the scarcity of water. Groundwater level is continuously decreasing due to over exploitation of water in crop producing area in the district. Because of falling groundwater table, people are making deeper hand pump or boring gradually. While recharging rate of underground water is much lesser than withdrawal of water. It is a hilly region and an emerging district, having a monoculture (mostly paddy) agriculture. Due to cultivation surface soil continue to be used and degraded, so food grain production is always become lesser than previous year. Area of Agricultural land is also gradually decreasing due to roads, factories, construction of houses and urbanization. Besides the soil degradation and erosion also help to decrease agricultural production. The inflated rate of urbanization and industrialization of the district, water demand has increased for the sector of agriculture, industry, and for urban areas. Therefore the use of this natural resource should be reasonable for enhancing socio-economic condition of this district.

Geology Of Pakur

This is 24th district of state of Jharkhand; most part of the distirct is identified undulating topography enclosed by basaltic flows of Rajmahal trap. And other geological formation of the district laterite, alluvium and gondwana rocks . Eastern part of the district covers alluvium deposit while western part covers Gondwana formation and rest part occurs laterites, and some other geomorphological structure like rolling pan plain having ancient ridges and resistant lava plateau of Rajmahal found in southern part. These southern plateau uplift a general height and almost cover all the district. Pakur is largely covered by forest and small

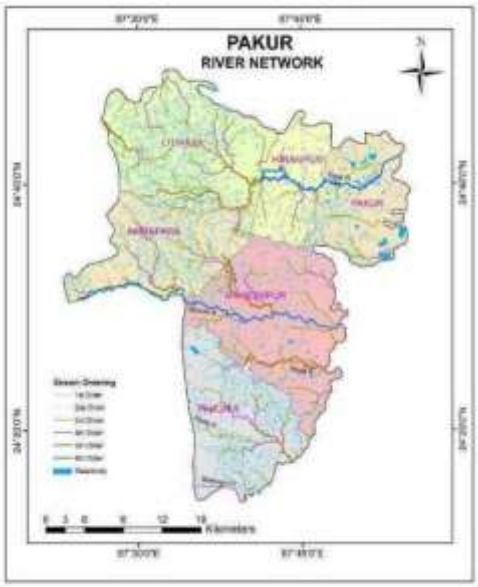
hills, a part of parasnath hills spreads in chhotanagpur plateau and Santhal Pargana. So, geographically Pakur has a basaltic trap and sedimentary beds, Quartz and hard rock of granitic gneisses are also found in some parts of the district. And topographically Pakur is divided into the hilly area, the rolling area and the alluvial area of these three parts. The hilly area is made North corner of the district up to the Southwest border with the state of West Bengal. In the North and North Eastern part of the district, having a narrow strip of alluvial soil, between the Ganga feeder canal and the loop line of Eastern Railway, is very fertile area. And in the last rest part is covered by rolling plain, is less beneficial for agricultural activities. The main rivers flowing are Bansloi, Brahmani, Torai and Gumani in the district.

Water Demand Of The District For Various Sectors (Present):

Based on calculation it reflects that total current water requirement is 0.450 BCM.

Sector	2015	2020	Existing	gap
Domestic	0.0237	0.0256	0.0213	0.0053
Agriculture	0.1933	0.2884	0.0577	0.2307
livestock	0.0088	0.0098	0.0063	0.0035
Industrial	0.1008	0.1260	0.1008	0.0252
Total	0.3256	0.4509	0.1861	0.2648

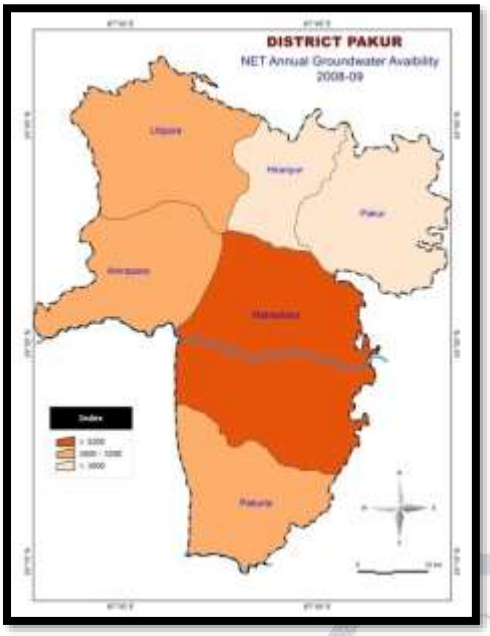
Source: District Census Handbook Pakur, (District Irrigation Plan Pakur 2016

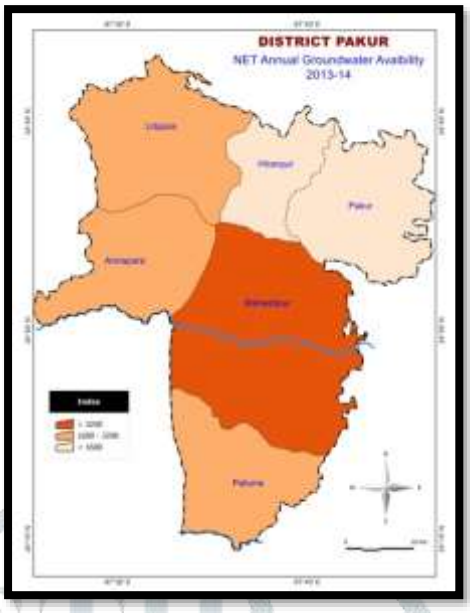


Availability Of Water Resource And Drainage:

Pakur district receives an annual rainfall of 1399 mm, and maximum rainfall occures during the rainy season. It varies from 2.5mm.-337.8mm., where August month receives maximum and December month receives least rainfall every year from south-west monsoon but here , regional distribution is variable on account of the deposition of hill ranges. So the district encounters extreme seasonal variation in monthly rainfall. Humid and sub humid climate is found in the district although a hot dry summer, a good rainy season, and cool winter season is experienced here. The temperature goes high up to 40.70^{0C} during summer and lowest up to 2^{0c} in winter. Here in the the district the rainfall, the relief, hill slopes, forests and waste lands cause a significant percentage of surface flow. In this region the geology don‘t permit heavy infiltration of rainfall because of hard rock terrain. so natural recharging of groundwater is very less about 10-11% of the surface flow. In this district there are three major river basins and other small streams

draining out the district's water. The rivers are mostly rain fed. Here in the district less seepage of groundwater is found in such hard rock terrain. Due to more slopes of streams quick discharge of surface flow.





Groundwater Availability In The District:

The total surface water available in the district is 12095.15 ham. And is in "safe" category in all blocks. Out of which only 1969.37 ham. Of water is being utilized for irrigation, drinking water and industries. Thus the district is utilizing only 14.025 percent of total water resources is 10970.21 ham.

Calculation *Of* Water Stored

Stored water in BCM	0.0903
Stored water in mine pits	0.0488
Total surface water	0.1391
Total ground water	0.1265
Total water available	0.2656

Source: District Census Handbook Pakur, (District Irrigation Plan Pakur 2016)

BLOCKS	Net Annual Groundwater Availability		
	2008	2013	2018
Litipara	2490.57	2485.62	2390.94
Amrapara	1806.92	1682.11	1553.95
Hiranpur	1333.84	1245.91	1157.77
Pakur	1723.55	1597.82	1465.02
Maheshpur	3904.56	3885.37	3865.51
Pakuria	1909.15	1787.94	1660.96
Total	13168.58	12684.77	12095.15

Source: Based on Groundwater information booklet, Pakur Distric, 2008 and 2013

Detail Of Groundwater Resources And Stage Of Ground Water Development In Pakur District As On 31st March 2018 (In Hectare Meters)

S. No	Blocks	Net Annual Ground Water Avaibility	Gross Ground water Draft For Irrigation	Gross Ground Water Draft For Domestic And Industrial Water Supply	Gross Ground Water Draft For All Uses (4+5)	Allocation For Domestic & Industrial Requirement Supply Upto Next 25 Years	Net Ground Water Availbility For Future Irrigation Development (3-4-7)	Stage of Ground Water Development (6/3X100)%	**Categorization For Future Gw Developmentt Safe/Critical/ Overexploitation**
1	2	3	4	5	6	7	8	9	10
1	Litipara	2390.94	67.64	273.96	341.6	239.77	2083.53	14.285	Safe
	Amrapara	1553.95	56.11	162.62	218.73	143.26	1354.58	14.075 %	Safe
3	hiranpur	1157.77	3.76	200.7	204.46	154.27	999.74	17.65%	Safe
4	Pakur	1465.02	174.17	603.24	777.41	475.87	814.98	53.06%	Safe
5	Maheshpur	3865.51	221.27	507.6	728.87	530.88	3113.36	18.86%	Safe
6	pakuria	1660.96	30.12	267.28	297.4	169.51	1461.3	17.90%	Safe
	total	12095.15	553.07	2015.4	2568.47	1713.56	9827.52	22.63%	safe

Source: Groundwater information booklet, Pakur District, 2008 and 2013, & Pakur Irrigation Report2016.

Hydrogeological Set-Up

Groundwater development in hard rock terrain has particular importance. The different geological formation presents multiple groundwater condition in the area. The search for groundwater, its development and management is a significant problem to be considered with. entire Pakur district, that is Hydro geologically divided into two parts, one is hard rock part and other is soft rockFor getting details of groundwater, some essential information about nature and extent of aquifers, depth, form and slope of water, recharge and discharge of groundwater in relation to morphology is essential. Groundwater in the area is recharged mainly by the atmospheric precipitation. The groundwater is generally not improved by seepage of river water because rivers are discharge in nature. Whereas the fluctuation and depth of water table depends on geomorpholgical features, Litology and Rainfall. There is 75% part of the district covered by crystalline igneous and metamorphic rocks of Precambrian age. It is seen that in majority, most of the aquifers are formed by hard rocks. laterites and reverine sands form good aquifers near river bank, while the Archian and Precambrian covres entire areas, which has very low porosity due to its nature and here permeability is very low. In later through fracture, fissures, joints and weathering of the rocks porosity and permeability is developed. By the hydrogeological view groundwater in any area is controlled by a topographical setting, thickness of weathered zone, size extent, openness and interconnection of joints and fractures.In Pakur 19% of total groundwater and surface water is being utilized for irrigation (TABLE), Industryand other domestic uses. Therefore the combine water management is crucial for sustainable economic development.

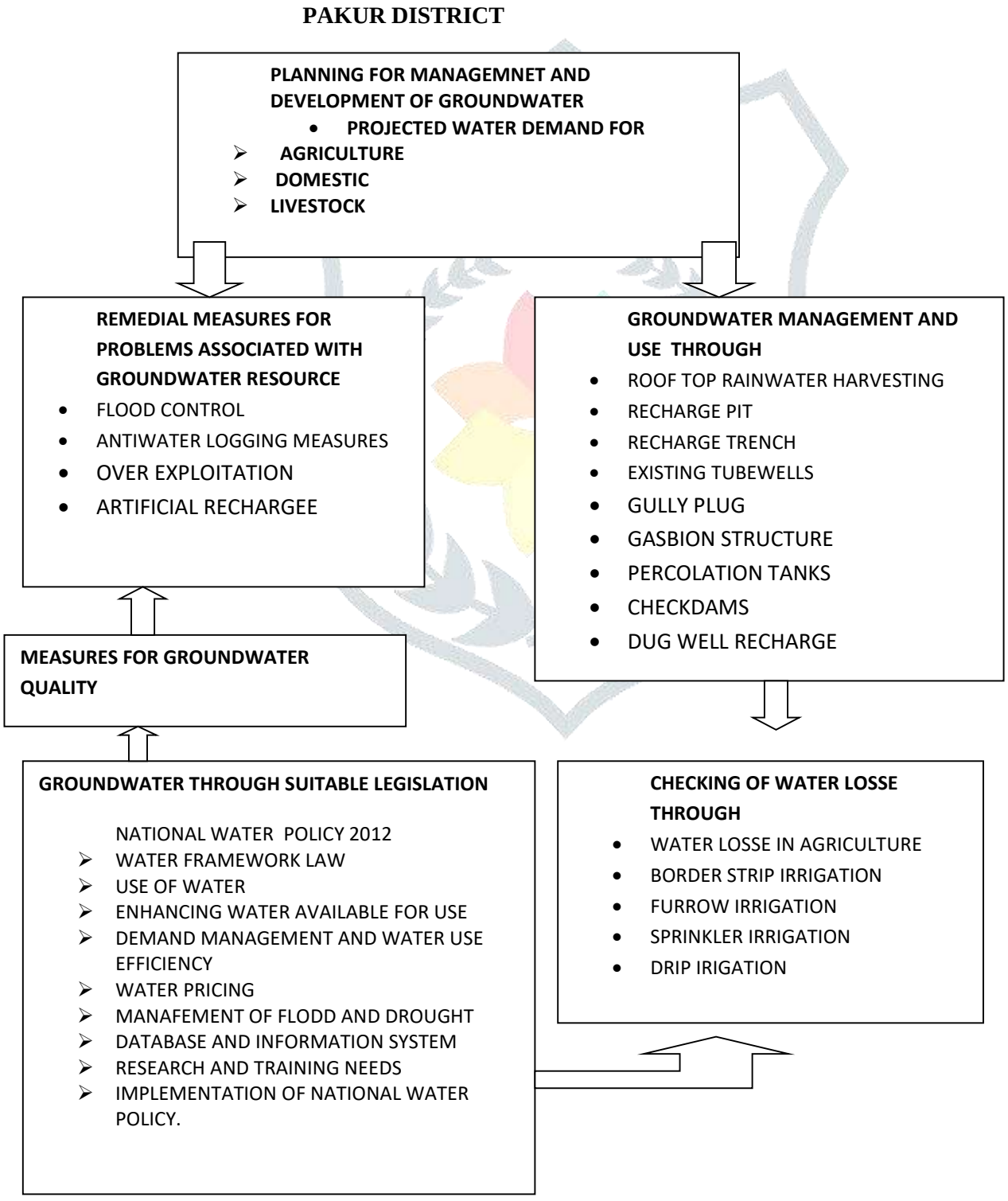
Water Conservation And Artificial Recharge

In regard of increasing effect on development of groundwater resources, there is an urgent demand to enhance the depleting groundwater resources. This gets enhancement through natural recharge can be enhancement in a increased scale through artificial recharge. Artificial recharge structures, depends on the topographic features, hydrological and hydrogeological conditions of the

area. From this point of view, Pakur district may be divided into two parts – 1) Western part of the district which is having undulating topography with hills is suitable for check dam, gabion structures and contour bunding and trenching 2) Middle and eastern part is suitable for percolation tanks and nala bunds

Water Resource Management

Accelerated urbanization and Industrialization in this emerging district Pakur has increased the demand of water in all round. Pakur district utilizing 19% of total water resources at present and rest 81% remains unutilized. So that is why, the conservation and adequate water resource management is necessary. The management and reuse of irrigational water will adequately help water resource management in the district. In the hilly area of the district, where the slope is high the plantation of green vegetation is required. The Conservation of Water by maximum surface and groundwater development without loss is required. To increase the natural supply the recharge is also required in the following style.



Artificial Recharge By River Basin Channel, Trench,Pit Metod.

i. Construction of chek dams, recharge well in suitable areas.

ii. Rain harvesting techniques should be applied in township and shadow zone.

Recommendations For Water Resource Management In Pakur Jharkhand.

- Identifi
- cation of water scareu area.
- Development of watershed area.
- Study of soil types.
- Recycling of used water
- Assessment of water requirement in industry and agriculture.
- Identification of recharge discharge area.
- Identification of potential aquifer zone.
- Study of secondary porosity in hard rock.
- The sedimentation of major river basin and possibility of disilting should be explored.

A Need Of Challenges For The District --

- To overcome the inadequacy of surface water to meet our demands.
- To arrest decline in groundwater levels.
- To enhance availability of groundwater at specific place and time and utilize rain water for sustainable development.
- To increase infiltration of rainwater in the subsoil which has declared drastically in urban areas due to paving of open area?
- To improve groundwater quality by dilution.
- To improve agriculture production.

CONCLUSION

‘’Each drop of water is precious, Government is committed to giving high priority to water security.It will complete the long pending irrigation projects on priority and launch the “Pradhan Mantri Krishi Sinchayi Yojna”(PMKSY) with the motto of “hark het ko pani” and “Per Drop, More Crops’. The groundwater is not more widely and easily available than surface water in study area due to bad aquifer zone under the surface. Groundwater fluctuation occurs mainly due to variation in local rainfall and pumping by means of groundwater irrigation. Therefore, problems related with groundwater resources have been tried to identify and discuss in present paper with spatial variation of groundwater conservation and management, along with their characteristics, recharge from surface water; decline and fluctuation of groundwater table due to over-exploitation. The main objective of the present study is to assess the conservation and management of groundwater resources in Pakur District. To put it absolutely Pakur district has a total water demand of 0.45BCM, in the district 0.186 BCM water is already available in existing water bodies. The district needs to create additional water storage of 0.265 BCM. For meeting the requirement district has put a plan to construct mare than 4400 ponds, 5500 davas,345 check dams etc to improve groundwater recharge. The plan also has been prepared to promote drip irrigation and sprinkler irrigation using water saving measures like mulching to reduce wastage of agricultural byproducts and improve the water use efficiency. Sector wise water gap is biggest for agriculture followed by industry. Other sectors like live stock require 0.003 BCM, domestic domestic water demand stands at 0.005 BCM. Here is an assumption that domestic water requirement will grow at 20% keeping in mind the decadal population growth.

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