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Groundwater risk perception issue of Payradanga: A study

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Abstract
Groundwater (or ground water) is the water present beneath Earth's surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. Groundwater is often cheaper, more convenient to collect than the surface waters. Groundwater provides largest storage of usable water resources over the world. Underground reservoirs contain far more waters than the surface water bodies and groundwater are almost free from pollution. Payradanga is god gifted with the aquatic feature. Groundwater is more near to the surface easy to pull up. So, almost every households of Payradanga use pump machine to store the water in the tanks just situated over the roof of the house. The agricultural fields of Payradanga also utilize water heavily with the help of shallow machine. Shallow machine and pumps drag and pull the water continuously over a particular point. In the present circumstances Payradanga is burst out of population. Continuously unplanned use of groundwater deteriorating the advantage of getting water from underground as well as these activities now polluting water by increasing the effect of arsenic in ground water. This paper overviews the groundwater perception issue of Payradanga and a swell as risk of overuse of groundwater which may affect people of Payradanga.

Keywords: Ground water, Arsenic, Extraction rate, Drainage density

1. Introduction

Ground water is stored in, and moves slowly through, moderately to highly permeable rocks called aquifers. The word *aquifer* comes from the two Latin words, *aqua*, or water, and *ferre*, to bear or carry. Aquifers literally carry water underground. An aquifer may be a layer of gravel or sand, a layer of sandstone or cavernous limestone, a rubbly top or base of lava flows, or even a large body of massive rock, such as fractured granite, that has sizable openings. In terms of storage at any one instant in time, ground water is the largest single supply of fresh water available for use by (http://pubs.usgs.gov/gip/gw/gwgip.pd). Groundwater is very important issue in the present context of Payradanga. It is god-gifted artegio type condition. So, groundwater is fairly more smoothly available in Payradanga. Water is available through tube well only with the help of 2 or 3 pipes whereas in Chakdah or Ranaghat the groundwater is available only with the help of 30 or 32 types. This type of distinction forces me to do work on hydrology of Payradanga.

2. Study Area

Payradanga is located in West Bengal and it is under the Nadia District. It is a suburban area in Nadia District. Over the areas it has burst to population. Payradanga is located Between Ranaghat and Chakda located 23.18 ^{0}N and 88.58 ^{0}E.It is the place proximity to Ganges.

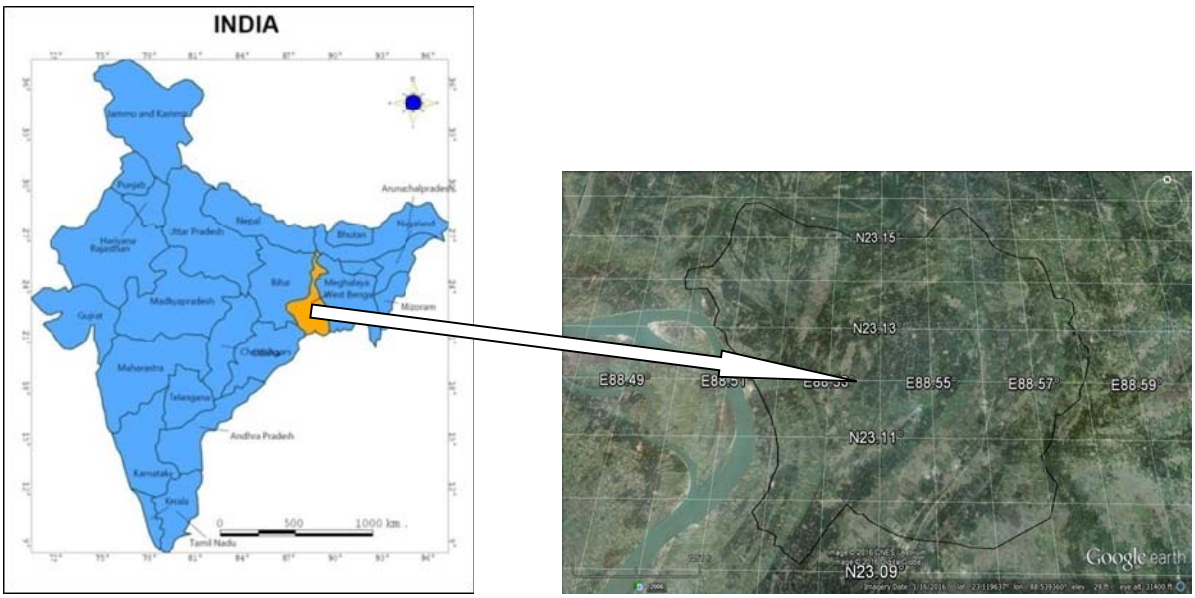

Fig 1: Location Map

3. Methodology

The methodology of my study is geographically based on data collection and its representation with the help of GIS and cartographic techniques. The data has been quantitative as well as qualitative particularly on the status of hydrology. Quantitative data have to be generated through the field study and remote sensing and GIS for future planning. Methodology for this particular field work may be designated as a work of regional planning under geography of migration study.

3.1. Use of satellite images

The satellite image of 2015 of Payradanga downloaded by GLOVIS and EARTH EXPLORER and also DEM has been used to analyze the hydrologic pattern of study area.

3.2. Use of GIS techniques

The GIS techniques have been used to make the proper representation of data sets in maps. ARCGIS10.2.2.1 software has been used.

4. Results and Discussions

4.1. Drainage Pattern of Payradanga

The drainage pattern of Payradanga is specifically dendritic. The drainages over surface is not much pronounced in the present time. But there is evidence that rivers have blown over Payradanga. The surface drainage and their direction help us to investigate the flowing direction of groundwater. There are another specific pattern of surface water drainage system. There are hardly any pond can be created on the soil of Payradanga. Because the soil is too much porous that the soil is incapable to retain moisture.

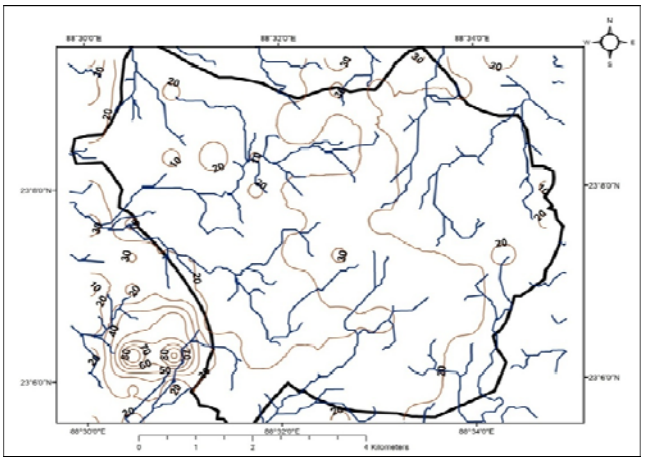

Fig 2: Drainage and direction of rivers

From the drainage pattern of Payradanga it is almost clear the surface water is flowing from northwest to north east part. Following this pattern groundwater is flowing by following this fashion.

4.2. Drainage density

Drainage density first used by Horton (1945) has been extensively utilized in many hydrological studies. Again Gray (1965) [2] noted that "The pattern and arrangement of the natural stream channels determine the efficiency of the drainage system. Other factors being constant, the time required for water to flow a given distance is directly proportional to length" (Gregory & Walling, 1968, also cited in Gray, 1965) [6, 2]. Drainage density determines no. of drainage/sq. km. Drainage density value helps to determine the ground water drainage condition.

From the drainage density value it is almost clear that in Payradanga drainage density values varies from 1.17 to 473 almost. The pronounced drainage condition gives a feedback of rich groundwater conditions.

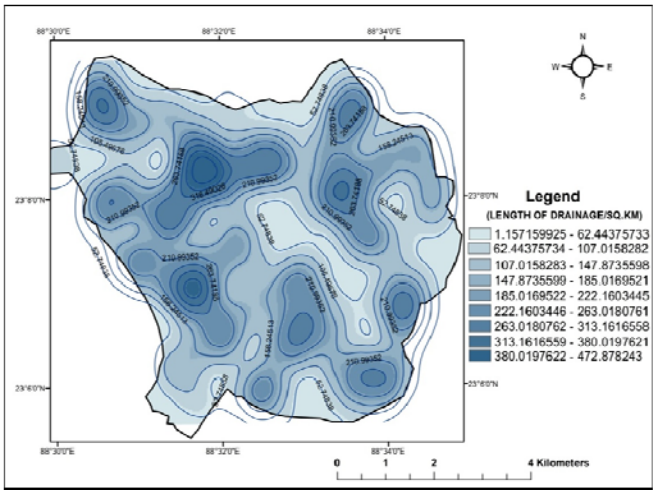

Fig 3: Drainage Density

4.3. Groundwater extraction rate

Groundwater extraction rate varies over Payradanga with a rate between 260 to 420 million liters per sq. km per year. In the following table the rate of extraction of groundwater has been discussed:

Table 1: Groundwater extraction rate

Groundwater extraction rate	Places
<260	Baidyapur
	Chandrapur
	Tatla
	Belgharia
	Kushuria
	Kayetpara
260-320	Gilapol
	Ghora gaccha
	Nandighat
>320	Pritinagar
	Jagapur
	Uttar Ghugia
	Baninagar
	Patuli
	Paschim Putkhali
	Par niamatpur

(Data collected from BDO office, Habibpur)

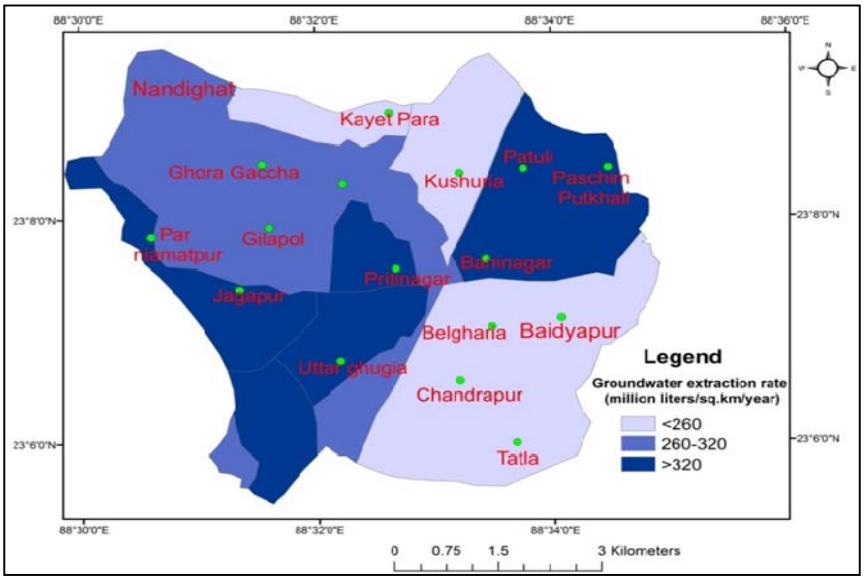

Fig 4: Groundwater Extraction Rate

4.4. Rapid use of Ground Water

Ground water use is huge in Payradanga specifically for household and agricultural purposes. As there is no alternative water sources for Payradanga people becomes bold in using the groundwater resources in specifically unplanned way.

4.4.1. Agricultural use

According to Nadia District Gazetteer, 2014 [7] about 50% people in Payradanga is directly engaged or interested in agriculture. This percentage is remarkably low with respect to the overall percentage of Nadia District. The Payradanga is under the tract known as Kalantar and the soil which is bearing here is basically sandy loam in nature which is incapable of holding moisture. In earlier days when the land making by the river Ganges were going on than the condition were different. Then the moisture holding capacity of soil was high so that the rate of production of crops was sufficient. The crops with them bearded the coating of silt which ensured the excellent outturn of crops. This type of enrichment of soil has been no longer takes place as frequently as it is used to and as the very light manuring which is applied is insufficient to compensate for the loss occasioned to the soil by cropping.

In these circumstances the surface waters have no enough potential to irrigate the land. So, the pressure directly exerts on the groundwater. Pump driven shallow is so popular and it is capable to drag the groundwater up and by small canals in the fields the dragged waters are scattered in the field. Continuous dragging of water from a particular position in the field becomes dangerous. Effect of Arsenic and fluoride is continuously increasing now a day. The recent estimates say that about 40% of the total usage of groundwater of Payradanga is done over agricultural land (Nadia district Gazetteer, 2014) [7].

4.4.2. Domestic Use

About 60 % ground water is used in domestic purposes in Payradanga (Nadia district Gazetteer, 2014) [7]. Actually there is no alternative source of water in Payradanga. The people are helpless they are forced to use the ground water for domestic water. As the population of Payradanga is increasing day by day people becomes bold in using the ground water. Almost every household makes a pumping system and make water tank in the roof. The pumps are usually motor driven so that are able to drag water from underground and store it into the roof following a particular pipe line.

Continuous drag water from a particular zone leads to the problem of arsenic a well as Fluoride. The Payradanga is already under arsenic problem as reported by SOES (http://www.soesju.org/arsenic/wb3.htm).

5. Risks for overuse of groundwater

5.1. Risk of arsenic pollution

The reported work done by SOES on arsenic estimation on every District of West Bengal suggests that in Payradanga is already an arsenic-prone area. The detailed work of SOES on arsenic estimation of Payradanga is given below:

Table 1: Sufferings of people of Payradanga due to Arsenic

Block	Total sample analyzed	Distribution of total samples in different arsenic concentration (mg/L) ranges							% of Samples with As >10mg/L	% of Samples with As >50mg/L	Max. conc. mg/L samples with As >1000mg/L
Ranaghat-I (Payradanga Portion)	1310	511	76	691	20	7	3	2	55.2	2.4	566

(**Source:** http://www.soesju.org/arsenic/wb3.htm)

Sufferings from Arsenic start with the Blackfoot disease. It is the endemic peripheral vascular disease. Typical clinical symptoms and signs of progressive arterial occlusion mainly found in the lower extremities, but in rare cases, the upper

extremities might also be involved (Tseng CH, 2005). WHO determines the maximum level of arsenic in drinking water is 0.05 mg/l (http://www.who.int/en/). The level of arsenic in Drinking water is seriously high causing Blackfoot disease. On the basis of Melissa Padhan's cross-sectional study done on 2297 households of 37 arsenic affected villages in all the 17 blocks in the district of Nadia, West Bengal, selected by statistically sampling method, prevalence rate of arsenicosis was found to be 15.43% out of 10469 participants examined. Payradanga is under the Ranaghat-I block so only 2o participants were examined. The probable number of people affected with arsenical skin lesion in the district appears to be 0.14 million (Mellisa Pradhan, 2015) [8]. Again according to the statistics of 2015 collected from BDO office, Habibpur about 200 people in Payradanga affected by arsenic. So, this number is not a mere one actually. Need to pay serious attention about the groundwater resources of Payradanga and seriously need to develop some alternative water sources as soon as possible (data collected from BDO office Habibpur, 2015). Majority of the population living in the arsenic affected villages is of low socio-economic condition, inadequate education and are engaged in agricultural farming or physical labour. Observe the skin lesions to be mild in majority (87.5%) of the cases. Hence, supply of arsenic free water will help in amelioration of symptoms in these people about 38% of the water sources, some of which are public tube wells and piped water supply system, were found to be contaminated with arsenic in the district. It is therefore an urgent need to make arrangement for availability of safe water source among the arsenic affected people in the district. Many of the people in the affected villages are not aware of contamination of their home tubewells with arsenic. Awareness generation and motivation of the people for testing their drinking water sources for arsenic are also important to prevent further exposure of arsenic to these people. Arsenic affected people with severe skin lesions and systemic manifestations like lung disease, neuropathy etc are having unbearable suffering. These people are very poor and live in distant villages where hospital facilities are not easily available. Arrangement for free treatment of these patients in state referral hospitals and free transport facility from their villages could help a lot in alleviating the suffering of these people. Out of 10469 participants examined, prevalence rate of arsenicosis was found to be 15.43%. Out of 0.84 million people suspected to be exposed to arsenic, 0.14 million people are estimated to be suffering from arsenicosis in the district. Highest level of arsenic in drinking water sources was found to be 1362 µg/l, and in 23% cases it was above 100 µg/l. Majority of the population living in the arsenic affected villages were of low socio-economic condition, inadequate education and were farmers or doing physical labour. Chronic lung disease was found in 207 (12.81%) subjects among cases and 69 (0.78%) in controls. Peripheral neuropathy was found in 257 (15.9%) cases and 136 (1.5%) controls (Mellisa Pradhan, 2015) [8].

5.2. Risk of fluoride pollution

Fluoride pollution in Payradanga is not much pronounced in comparison to Arsenic. Fluoride causes the disease named fluorosis.

Fluorosis is the cosmetic condition that affects the teeth. It's caused by overexposure to fluoride during the first eight years of life. This is the time when most permanent teeth are being formed. After the teeth come in, the teeth of those affected by fluorosis may appear mildly discolored. For instance, there may be lacy white markings that only dentists can detect. In more severe cases, however, the teeth may have:

1. Stains ranging from yellow to dark brown
2. Surface irregularities.
3. Pits that are highly noticeable (http://www.webmd.com/children/fluorosis-symptoms-causes-treatments also cited in Dutta *et al.,* 2014) [1].

6. Conclusion

Nature is our mother. Payradanga is a gift of nature mother in the context of groundwater resources. Human must check the use of groundwater for their own interest. Otherwise their existence might be in danger. Unplanned lifting of water and wastage of water may lead to the serious shortage of water for agriculture and drinking purposes for Payradanga. Because without groundwater there is hardly any alternative water source for the people of Payradanga. Here seriously need to formulate the alternative water sources as soon as possible. Simultaneously the awareness campaign about the risk of the overuse of the groundwater resources is urgently necessary. People of Payradanga as well as local Panchayet should think about unplanned, unresisted use of groundwater and must formulate way to check it. They can initiate water tax to resist the wastage of water.

7. Acknowledgement

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8. References

1. Dutta AS, Chakraborty A, Dalal De SS, Lahiri SC. Fluoride Contamination of Underground Water in West Bengal, India Research Report Fluporide 2014; 47(3):241-248.
2. Gray DM. Physiographic Characteristics and the Runoff Pattern proc of Hydol Symp. No.4, Research Watersheds, National Research council of Canada 1965, 147-164.
3. Horton RE. Erosional development of streams and drainage basins: hydrophysical approach of quantitative morphology Geological Society of American Bulletin. 1945; 56(3):275-370.
4. http:/www.soseju.org/arsenic/wb3htm.
5. http:/pubs.usgs.gov./gip/gw/gwgip.pd.
6. Gregory KJ, Walling DE. The variation of Drainage Density within a catchment, International Association of Scientific Hydrology, Bulletin 1968, 13:261-268: DOI 10.1080/02626666809493583.
7. Nadia District Gazetteer, 2014.
8. Pradhan Mellisa. Arsenic contamination of ground water and its health impact, 2015. (https://prezi.com/aZsl9Uz_abmb/arsenic-contamination-of-ground-water-and-its-health-impact).