

Remote Sensing and GIS Based Ground Water Potential Mapping of Kangshabati Irrigation Command Area, West Bengal

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Abstract

The Remote Sensing and GIS tools have opened new paths in land and water resource studies, presently. Satellite images are increasingly used in ground water exploration because of their utility in identifying various geomorphic features. In the present study, all the prepared thematic data layers such as slope, relief, soil, geology, geomorphology, drainage, land use and 'NDVI' are integrated using the Spatial Analyst Tool in Arc GIS 9.2 implying weighted overlay methods to delineate the Ground Water Potential Zones in Kangshabati Irrigation Command Area (KICA). In weighted overlay analysis rank value assigned for each class of all thematic data layers according to their influence on ground water hydrology and factor weighted values are assigned according to analytical hierarchy process (AHP). Finally, an accuracy study is being performed in ERDAS Imagine Software by ground truth verification of 30 training sites with GPS readings for major land use/ land cover information which states the overall classification accuracy of the present study is 86.66%.

Keywords: RS & GIS; Overlay analysis; Ground water potentiality; Accuracy assessment

Introduction

Ground water is a dynamic and replenishing natural resource, which forms the core of the ecological system. But in hard rock terrains, availability of Ground Water is of limited extent. Agriculture is the main stay in India because 69 % of the total population depends on it. Poor knowledge about this resource, due to its hidden nature and its occurrence in complex subsurface formation is still a big obstacle to the efficient management of this important resource. The varying nature of ground water potentiality and agricultural drought is a recurrent phenomenon in the western part of West Bengal. Now a day's Agricultural drought is also a frequent phenomena in West Bengal. It occurs when soil moisture and rainfall are inadequate during the growing season to support the healthy crop growth to maturity and cause extreme crop stress and wilt. Such condition is the outcome of lowering of ground water level and its less accessibility to various activities. The study of ground water potentiality of Kangshabati Irrigation Command Area (KICA) will exhibit a clear idea about the spatial distribution of ground water and will contribute the knowledge to formulate and execute a suitable plan to improve agriculture and others allied activities.

The integrated remote sensing and GIS based study has facilitated to delineate the ground water potential zones by analyzing various phenomena related to land and water resources. According to Saraf et al. [1] GIS helps to integrate conjunctive analysis of large volumes of multidisciplinary data, both spatial and non-spatial. Jones [2], Sinha et al. [3], Chi and Lee [4], Bahuguna et al. [5] and Kumar et al. [6] studied and also integrated different thematic data layers such as topography, lithology, geological structures, depth of weathering, extent of fractures, slope and drainage pattern with the help of geographic information techniques to delineate ground water potential zones. The Digital Elevation Model (DEM) provides different thematic data layers namely slope, drainage, relief, structural features etc. which are obtained more easily, less subjective and provides more reproducible measurements than traditional manual techniques applied to derive topographic maps [7]. Over the last two decades, digital representation

of topography has facilitated a lot to analyze various surfaces and sub-surface geomorphic and geo-hydrologic features at different scales. In the field of geologic and geographic research RS and GIS has brought a new horizon by measuring and evaluating topographic data set more conveniently. The geographic information system is very much helpful in delineation of ground water prospect and deficit zones [8,9]. In the present study of preparing the ground water potential mapping of Kangshabati Irrigation Command Area (KICA), various thematic maps namely slope, relief, soil, drainage, geology, geomorphology and land use/land cover were reclassified on the basis of weightage assigned and brought into the 'raster calculator' function of spatial analyst tool for integration. The weightage for different thematic data layers are assigned considering the work done by Rao and Jugran [10] and Krishnamurthy et al. [11]. But at the time of integration of all the data layers a simple arithmetical model is adopted by averaging the weightage.

The Study area

The Kangshabati Irrigation Command Area (KICA) is bounded on the North by Birbhim district, South by Purba Medinipur district, East by Haora and Hoogly districts of West Bengal and West by Singhbhum district of Jharkhand. The command area lies at Latitude of 20°00'00"E to 23°10'00"N and Longitudes of 86°10'00"E to 87°10'00"E (Figure 1) with an aerial extent of 9632.3 km². Command area covers Survey of India Topo-sheet 73 I, 73 J, 73 M and 73 N at 1:250,000 scales which includes 13 blocks of Bankura, 21 Blocks of Midnapur and 1 Block of Hoogly districts (Figure 2) in the State of West Bengal.

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Received November 21, 2011; Accepted December 11, 2011; Published December 20, 2011

Citation: Mondal S (2012) Remote Sensing and GIS Based Ground Water Potential Mapping of Kangshabati Irrigation Command Area, West Bengal. J Geogr Nat Disast 1:104. doi:10.4172/2167-0587.1000104

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Data Source and Methodology

To carry out the study and to prepare ground water potential map assessing the accuracy remote sensing data, others ancillary data, GIS Software (ERDAS IMAGINE 9.0, ARC MAP 9.1), Mathematical Software (MATLAB), and GPS are used in the right sense. The specifications of the satellite and others ancillary data are in detail in the following Table 1. The specifications of the satellite and others ancillary data used in the present study are in detail in the following Table 1.

Creation of thematic data layers

Slope Map, Relief Map, Geological Map, Geomorphological Map and Drainage Density Map: At first the corresponding Topo-sheets are georeferenced to the Projection - U.T.M. Spheroid: WGS - 84, Datum: WGS - 84, and Zone - 45. Then it is digitized at 10 m interval to generate DEM. The slope and relief map are derived from DEM. The collected soil map, geological map, and geomorphological map from NATMO and GSI are rectified with the help of corresponding

toposheet by double image rectification in ERDAS Imagine (9.0). The study area is dominated by Lateritic soil, Older and Younger Alluvial soil, Red Gravel soil and Red Sandy soil. The area is classified into four individual geological units i.e. Fine & Medium Sands, Unconsolidated Sands, Silt and Clay, Fragment of Peebles & Boulder, Granite Gneiss, Quartzite and Mica Schist. The different types of Geomorphological features are found in the study area such as Floodplains, Upland Plains, Badlands, Duricrust, Paradeltaic fan surfaces, Pediments, Pediplains, Ridges and Hills. Drainage network is delineated by using satellite images to visualize the areas of sheet flow/channel flow and the area is classified into different drainage density classes, viz. very high, high, moderate, low and very low. After the extraction of different blocks of the study area from the satellite image (FCC) with the help of AOI tools in the ERDAS IMAGINE software a supervised classification is carried out to obtain various land use/land cover classes i.e., cropland, wet land, barren land, dense forest, degraded forests, and sandbank etc. These pre-field classifications are made to plan the field survey for land use/ land cover data collection.

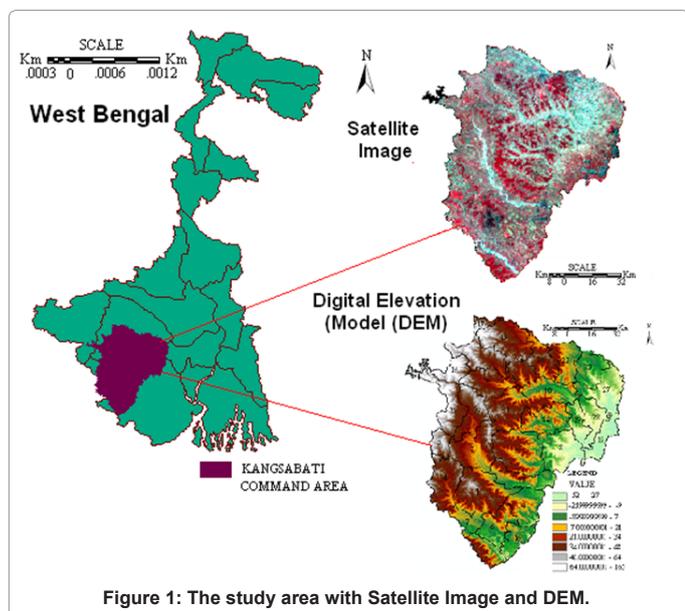


Figure 1: The study area with Satellite Image and DEM.

It is universally accepted that satellite derived NDVI is an important index to assess crop stage /condition. Crop condition at any given time during its growth is influenced by complex interactions of weather, soil moisture, and soil and crop types. The analysis of NDVI is regarded as the rough estimation of vegetation amount present and ground water prospect over the space. The NDVI map is prepared from the Land sat TM images of the year 2010. The NDVI involves a non-linear transformation of visible or red (R) and near infrared (NIR) bands of satellite images (Rouse et al., Jackson et al. [12] and Tucker et al.). NDVI value is derived using the following equation.

$$\text{NDVI (\%)} = (\text{NIR}-\text{R}) / (\text{NIR}+\text{R}) * 100 \dots \dots \dots \text{(Equation 1)}$$

Based on the % NDVI values command area is classified into i.e. i) >+100%, +100 to -100 and ii) < -100 that can be treated as mild drought, moderate drought and severe agricultural drought condition in the area.

To estimate prioritized factor/criteria rating value, Analytical Hierarchy Process (AHP) after Saaty [13] is applied developing a consistent couple comparing matrix (Table 2) in which each factor is rated against every other one by assigning a relative dominant value ranging between 1 and 9 using MATLAB Software quantifying consistency ratio (CR) of the matrix.

Ground Truth verification: The field survey was carried out over a 2-day period at the beginning of 22nd May 2010. Field work encompasses a thorough study of the area in the satellite imagery, SOI topo-sheets and the classified (supervised) imagery to ensure representative site identification for land use/ land cover data collection. Major land use/ land cover information in the area were obtained from different geographical locations. Total of 30 training sites with GPS readings for various land use/ land cover information have been collected for accuracy assessment.

Application of the model to delineate ground water potential zones

The Ground Water Potential Zones are obtained by integrating all the entire thematic maps in a linear combination model (Equation 2) using the spatial analyst tool in Arc GIS 9.2. During the weighed overlay analysis the ranking values are assigned for each classes of individual thematic map according to the influence of the different parameters on ground water potentiality (Table 3).

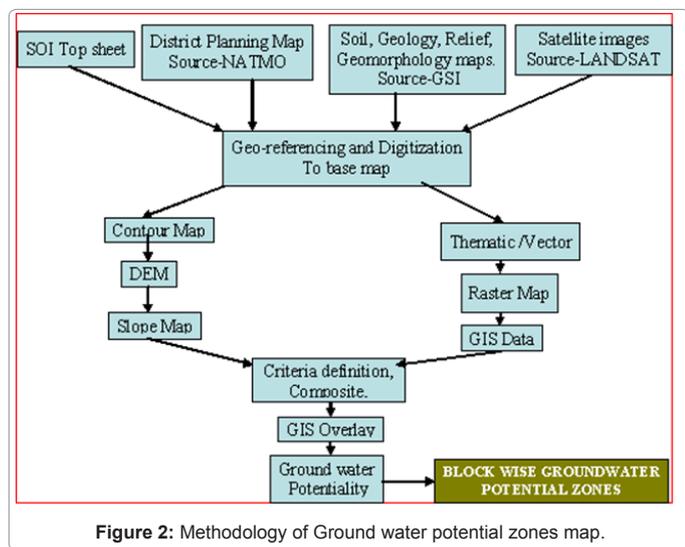


Figure 2: Methodology of Ground water potential zones map.

Satellite Data Specification					
LANDSAT 7	PATH	ROW	DATE – OF - PASS	SENSOR-LANDSAT TM	
	139	44& 45	26 th November 2007	Spatial Resolution	30M
			11 th October 2007	Radiometric Resolution	8 BIT
			20 th November 2009	SWATH (Km.)	185
			8 th October 2009	Temporal Resolution	16 DAYS
			Spectral Bands (µm)	B:0.45-0.52; G: 0.52-0.61; R: 0.63-0.69; NIR: 0.77-0.90; SWIR: 1.55-1.75; TIR: 10.5-12.5; MIR: 2.09-2.35; PAN: 0.52-0.90	
Ancillary Data Used					
DATA	SOURCE				
Toposheets	Survey of India toposheets of West Midnaore region - at scale 1:250,000(toposheets no: 73 J,73 N,73 M)				
District Planning Map	National Atlas Thematic Mapping Organization.				
Geomorphology Map	Geological survey of India				
Soil Map	Geological survey of India				
Geology Map	Geological survey of India				
District Statistical Handbook, 2007	Bureau of Applied Economics & Statistics				
LANDSAT TM, path – 139, row – 44 & 45	ftp://ftp.glcf.umd.edu/glcf/Landsat/WRS2/p139/r044/L5139044_04420061117.TM-GLS2005/				

Table 1: Satellite and Ancillary Data Source.

Factors	1	2	3	4	5	6	7	8	Rating
1) NDVI	1	1/2	1/3	1/4	1/5	1/6	1/7	1/9	0.024
2) Relief	2	1	1/2	1/3	1/4	1/5	1/6	1/8	0.031
3) Soil	3	2	1	1/2	1/3	1/4	1/5	1/7	0.048
4) Slope	4	3	2	1	1/2	1/3	1/4	1/6	0.069
5) Drainage	5	4	3	2	1	1/2	1/3	1/5	0.103
6) Geology	6	5	4	3	2	1	1/2	1/4	0.146
7) Geomorphology	7	6	5	4	3	2	1	1/3	0.205
8) Land use	9	8	7	6	5	4	3	1	0.378
Consistency Ratio-0.037									

Table 2: Couple Comparing Matrix and Prioritized Factor Rating Value.

Ground Water Potentiality Index Value (M) = Slope*0.069+Relief*0.031+Geomorphology*0.205+ Geology*0.146+Soil*0.048+Drainage Density*0.103+Land use/land cover*0.378+NDVI*0.024.....(Equation 2)

Result and Discussion

Ground Water Potentiality Zones

Kangshabati Irrigation Command area is divided into 4 ground water potential zones (Figure 3) i.e. excellent, good, moderate and poor on the basis of ground water potentiality index value which ranges between 0.425 and 5.545. Most of the area of the Blocks Ghatal (15), Binpur – I (2), Kotalpur (23), Joypur (22), Midnapore (13), Garbeta (10) and Chandrakona – I (28), are experiencing excellent ground water potentiality. Middle part of the Kangsabati Command area consisting the blocks of Garbeta – II (11), Salboni (9), Keshpur (8), Garbeta – III (12), Jhargram (1) Jamboni (4), Khatra (19), Onda (18), Taldangra (20), and Raipur (25), are being treated as moderate to good Ground Water potential condition (Figure 4). Poor Ground Water Potential Condition is found in the blocks Keshpur (8), Kharaghpur II (14), Keshiary (16), and Garbeta –III (12). It is assumed that the Command area is characterized as Good to Excellent Ground Water (Table 4). North Eastern and South Central part are providing Good Ground Water Potentiality due to the existence of adequate drainage networking system.

Slope and Ground water potentiality

The Eastern and Northern parts of the area with gentle slope contribute good to excellent ground water potentiality which covers the blocks of Joypur (22), Kotalpur (23), Goghat (27), Chandrakona - I (28), Chandrakona - II (29), Binpur - I (2), Midnapore (13), Kharagpur –II (14), Keshpur (8), Ghatal (15), Garbeta - I (10), and Salboni (9). In between sloping code 0.94 to 3.00 and 3.00 to 6.00 within the blocks of Onda (18), Bankura (17), Taldangra (20), Garbeta - II (11), Garbeta - III(12), Jhargram (1), Jamboni (4), Sankrail (6), Gopiballavpur (7) blocks are registered with moderate to good ground water potentiality (Figure 5a). The blocks of Khatra (19), Raipur (25), and Binpur - II (3) with slope coding value of between 6.00 to 11.00 and 11.00 to 24.00 are experienced as moderate to low ground water potentiality.

Relief and Ground Water Potentiality

Kangsabati Command area is divided into four elevation zones (Figure 5b).The range of elevation of the area is 190m. So, there is a little variation in elevation in the study area. Extreme eastern part of the area is falling under the elevation of below 50 m and is convening the blocks of Kotalpur (23), Goghat (27), Chandrakona – I (28),Ghatal (15),Chandrakona – II (29), Garbeta– III (12), Keshpur (8), Midnapore (13), Kharagpur (14),Keshiary (16), Gopiballavpur (7) and Sank rail

Sl no.	Criteria	Classes	Rank	Weights (%)
1	Land use	Dense Forest	6	0.378
		Scrubs	5	
		Open Forest	2	
		Dense Forest	3	
		Mixed Forest	4	
		Barren Land	1	
		Crop Land	7	
2	Geomorphology	Wet Land	2	0.205
		Flood Plains	6	
		Upland Plains	4	
		Bad Land	2	
		Duricrusts	1	
		Para deltaic Fan Surface	3	
		Pediments & Pedi plains	5	
3	Geology	Ridges & Hills	2	0.146
		Fine and Medium Sands	6	
		Silt & Clay	5	
		Fragment of Peebles & Boulders	4	
4	Drainage Density	Granite Gneiss, Quartzite & Mica Schist	3	0.103
		High	2	
		Moderate	4	
5	Slope	Low	6	0.069
		<10 m	5	
		10 - 50 m	3	
		50 - 100 m	2	
6	Soil	>10 m	1	0.048
		Lateritic Soil	2	
		Older & Younger Alluvial	5	
		Red Gravel Soil	1	
7	Relief	Red Sandy Soil	3	0.031
		<10m	3	
		10-50m	2	
		50-100m	1	
8	NDVI	>100m	1	0.024
		>+100	3	
		+100 to -100	2	
		< -100	1	

Table 3: Assigned Class Rank and Factor Weightage to all criteria.

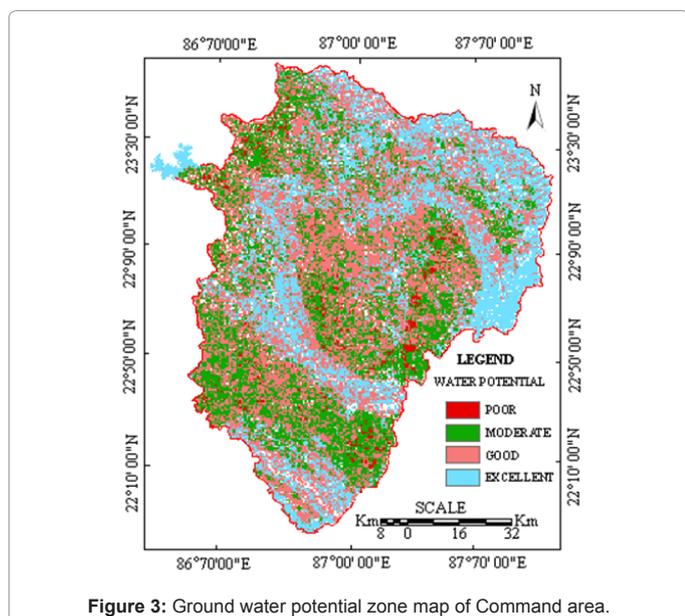


Figure 3: Ground water potential zone map of Command area.

(6). Blocks Onda (18), Bishnupur (26), Garbeta – II (11), Sarenga (24), Salboni (9), Binpur – I (2), Jhargram (1), Jamboni (4) and (5) are characterized by moderate 50 to 100 m elevation zone part of (17), Taldangra (20), Simlapal (21), Sarenga (24), Raipur (25), Binpur –II (3), and Khatra (19) are situated above 100 m elevation (Table 5).

Soil and Ground water Potentiality

Kangshabati Irrigation Command Area is dominated by laterite soil. Laterite dominated blocks of the command area are Nayagram (80%), Salboni (80%), Garbeta – II (70%), Garbeta – III (90%), Onda (70%), Bishnupur (95%), Simlapal (60%), Taldangra (60%), and Jhargram (60) Where the ground water potentiality is moderate to low level (Figure 5c). Older alluvial soil offers excellent ground water potentiality. Red and Yellow soil of Raipur, Khatra and Taldangra. Red gravelly soil of Jamboni, Binpur – I, and Binpur – II and Red sandy soil of Raipur and Binpur –II experiences low ground water potential condition. Younger alluvial soil which is covering the blocks of Ghatal, Bankura, Chandrakona –II, Goghat, Kotalpur and some parts of Chandrakona –I, Joypur and Taldangra contributes excellent ground water potentiality.

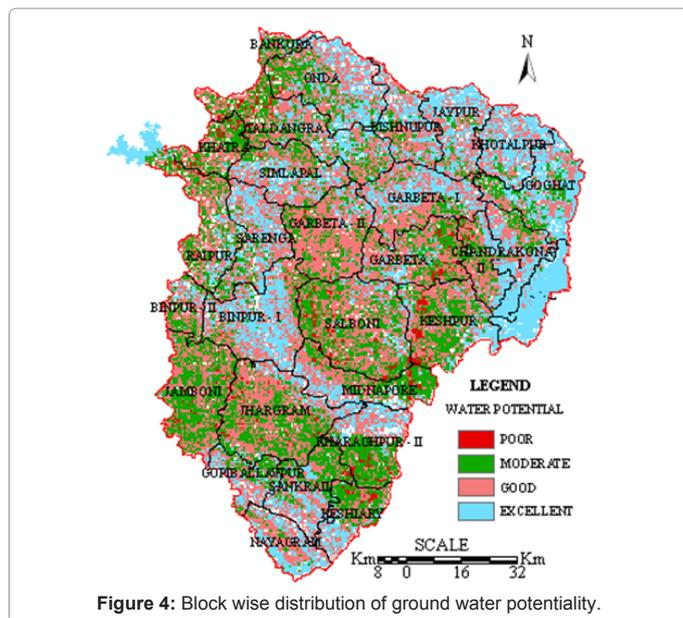


Figure 4: Block wise distribution of ground water potentiality.

Groundwater prospects zone	Area (km ²)	Area (%)
Excellent	29.41	27.74
Good	38.64	36.45
Moderate	30.54	28.87
Poor	7.75	7.31

Table 4: Groundwater Prospect Analysis.

Geology and Ground Water Potentiality

Geologically the Irrigation Command Area is Grouped into four categories i.e. Fine and Medium Sands, fragments of Pebbles-Boulders and Gravels, Granitic gneiss, Quartzite-mica schist and unconsolidated sand-silt-clay (Figure 5e). Fine and medium sand and Unconsolidated sand-silt-clay are associated with good to excellent ground water potential condition which is covering the blocks of Binpur -II (2), Midnapore (13), Keshpur (8), Ghatal (15), Chandrakona - II (29), Chandrakona - I (28), Kotalpur (23), Joypur (22), Bishnupur (26), Onda (18), Taldangra (20), Simlupal (21), Sankrail (6), and Gopiballavpur (7). This condition is followed by % of aerial coverage of fragments of

pebbles, boulders and gravel and Granite gneiss.

Geomorphology and Ground Water Potentiality

Geomorphologically the study area is classified into seven units such as badlands, duricrusts, flood plains; Para deltaic fan surface, pediments and Padi plains, ridges and hills and upland plains (Figure 5d). Upland plain is spread out all over the area and more than 60 % area of Taldangra (20), Jhargram (1), Sarenga (24), Raipur (25), Bishnupur (20), Goghat (27), Joypur (22), Simlupal (21), 90 % area of Garbeta - II (11), 80 % area of Jamboni and Salboni (9) with good ground water potentiality (Table 6). Badland topography is found in Binpur-I, Keshpur, Salboni, Garbeta-II, Garbeta-III and Midnapore where the ground water potentiality is low. Flood plains area exhibit an excellent ground water potentiality which found along three main channel in the Kangsabati Command area. The area covered by duricrusts with low ridges and hills in Kharagpur II, Keshiary, Chandrakona - I and Goghat are with low ground water potentiality.

Drainage Density and Ground Water Potentiality

Drainage density is high in the Western part of Irrigation Command Area covering 80% of Jhargram, Raipur, Khatra and Simlupal; 90% of Jamboni, 60% of Binpur II, Salboni, Garbeta II, Taldangra and Sarenga. High drainage density more confluence points, active channel erosion and consequently soil loss from the area. So, Western and South Western part of Kangsabati area are dominated by soil erosion. On the other hand East and South East and North East marginal part covering the blocks of Sankrail (80%), Kharagpur-II (60%), Ghatal (60%), Keshiary (80%), Chandrakona (85%), and Goghat (65%) are attributed as low drainage density and good ground water potentiality (Figure 5f). Middle and Southern part shows moderate level of drainage density with moderate ground water potentiality.

Land use / cover and Ground Water Potentiality

Kangsabati irrigation Command area which classified in to major eight Land use pattern i.e. crop land, Scrub forest, Dense forest, Open forest, Medium dense forest, Mixed forest, Barren land, Wet land, Gully, River, and Sand bank etc. The maximum area is dominated by dense forest which is 23.44 % of the total dense forest area, (Table 7). The middle most part is basically covered by dense forest, Medium dense forest and Open forest. Extreme Eastern and south Eastern part of the area is experienced as the land of Dry crops, Scrub forest, mixed

Area in (%)	Block with elevation of <10 m	Block name in elevation of 10 - 50 m	Block name in elevation of 50 - 100 m	Block name in elevation of >100 m
5	Jamboni	Bishnupur	Gopiballavpur	Sarenga
15	Keshpur	-	Sank rail	Bankura & Onda
20	Chandrakona I & II	Jhargram & Garbeta – II	Khatra	Taldangra & Simlupal
30	Goghat	-	Garbeta - I	-
35	-	Binpur – I	Garbeta – I & Midnapore	-
40	-	Salboni	Joypur	Raipur
45	-	-	Kharagpur - II	-
60	-	Kharagpur – II & Joypur	Raipur, Binpur - II & Salboni	-
65	-	Garbeta - III	Nayagram	-
70	-	Goghat	-	-
80	-	Chandrakona I & II	Taldangra, Onda Garbeta - II & Jhargram	Khatra
85	-	Sank rail & Keshpur	Bankura & Onda	-
95	-	Gopiballavpur	Sarenga, Jamboni, & Bishnupur	-
100	Ghatal	Keshiary	-	-

Table 5: Block wise distribution of Elevation Zones.

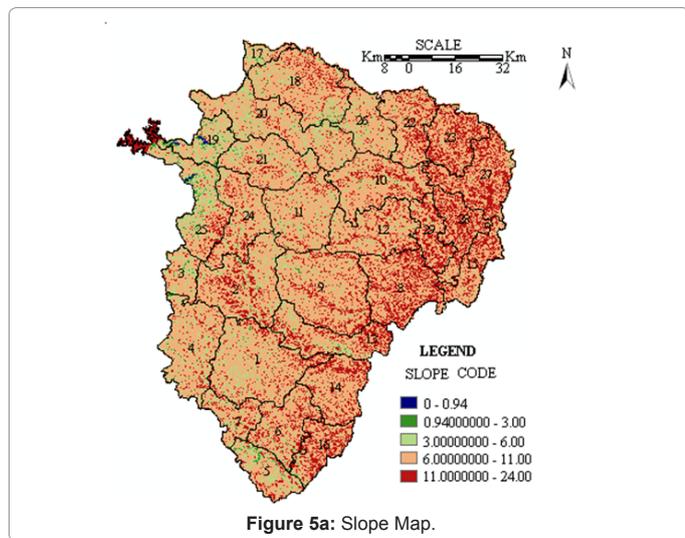


Figure 5a: Slope Map.

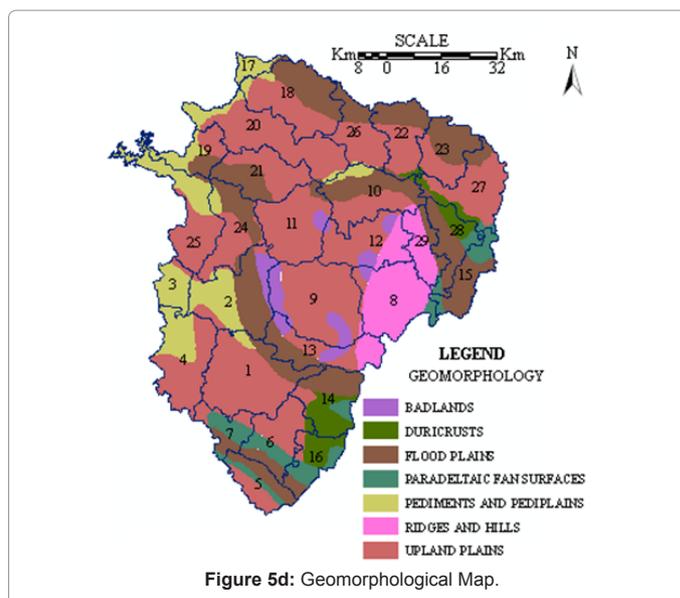


Figure 5d: Geomorphological Map.

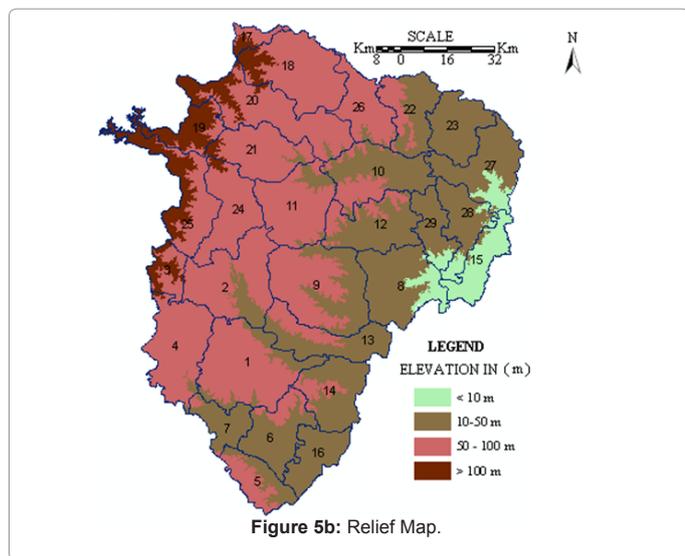


Figure 5b: Relief Map.

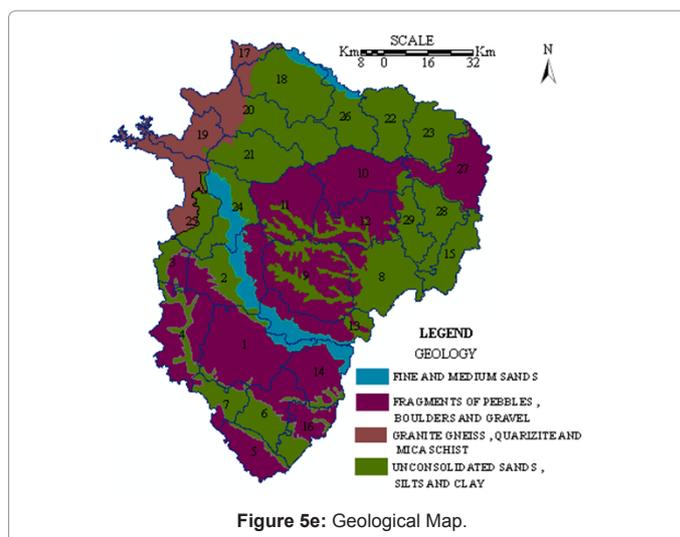


Figure 5e: Geological Map.

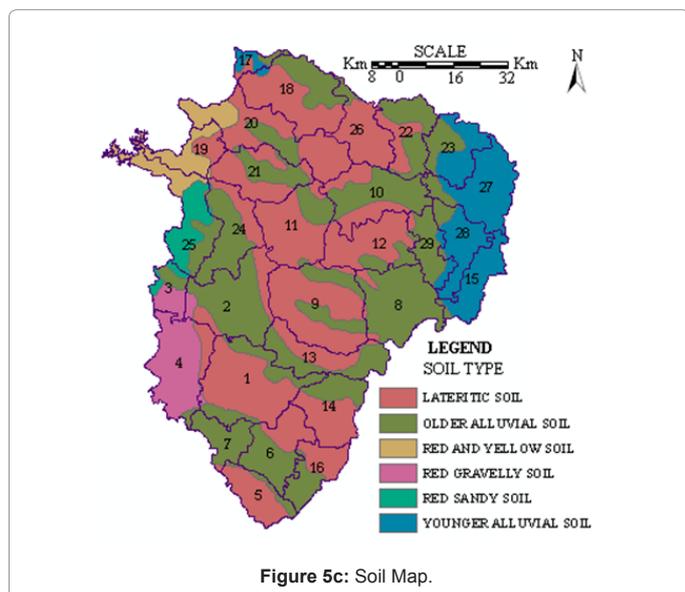


Figure 5c: Soil Map.

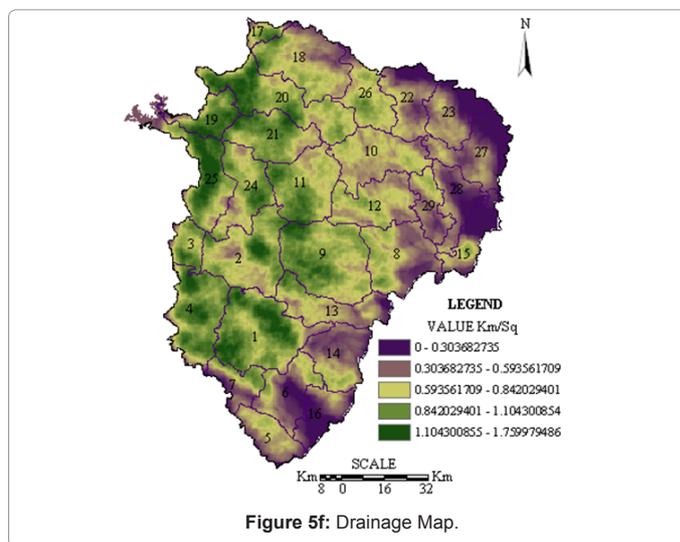


Figure 5f: Drainage Map.

forest and wetlands. Northern and Western part is attributed as the diversified land use pattern. In terms of Ground Water hydrology the area of Dry crop, Scrub forest, Mixed forest, and wet land are related with good and excellent ground water prospect on the other hand, Barren land, Dense forest, are closely associated with the to poor ground water Potentiality.

Accuracy Result

The basic idea is to compare the predicted classification of each pixel with the actual classification and the basic goal of the accuracy study is to quantitatively determine how effectively pixels were grouped

into the correct land cover classes. In the accuracy analysis, dense forest and crop land, mixed forest and medium dense forest, open forest and degraded forest and bared surface were considered as excellent, good, moderate and poor ground water potentiality respectively. The random points are compared with the classification map. When the random points and classification match, then the classification of that pixel is considered accurate. Classification accuracy in a broad sense refers to the correspondence between classification of remotely sensed data and actual observations on the field. The classification accuracy of the present work is 86.66% (Table 8).

Area in (%)	Block under Badland	Block under duricrusts	Block under flood plain	Block under Para deltaic fan surface	Block under pediment	Block under upland plains
5	Garbeta II	-	Garbeta II	-	Jhargram & Kotalpur	-
10	-	-	-	Kharaghpur II	Onda	Binpur II
15	Binpur I & Keshpur	-	-	-	-	Keshpur
20	Salboni & Garbeta III	Goghat	Goghat, Sankrail & Jhargram.	Nayagram	Taldangra	Binpur I
25	Midnapore	-	Midnapore	Ghatal	-	Midnapore
30	-	Chandrakona I	Binpur , & Nayagram,	Sank rail	Khatra	Gopiballavpur,& Khatra
35	-	Kharaghpur II & Keshiary	Sarenga	-	-	Sarenga & Raipur
40	-	-	Kharaghpur II, Khatra & Bishnupur.	Gopiballavpur	Raipur	Garbeta I
50	-	-	Garbeta I	Keshiary	-	Garbeta III
60	-	-	-	-	-	Simlapal & Joypur
75	-	-	Ghatal	-	-	Jhargram
80	-	-	-	-	Bankura	Salboni
90	-	-	-	-	Binpur II	Garbeta II

Table 6: Block wise distribution of different Geomorphic units.

SL. No.	Land use Classes	Area (ha)	Area (%)
1	Dry crop	29531.1	3.42
2	Scrub Forest	63961.1	7.41
3	Dense Forest	202689	23.44
4	Open Forest	63930.5	7.41
5	Medium Dense Forest	72120.9	8.34
6	Mixed Forest	164031	18.97
7	Barren Land	90874	10.51
8	Wet Land	133178	15.41
9	Gulley	26299.3	3.04
10	River	14725.9	1.71
11	Sand bank	3218.84	0.37
	Total	864559.64	100

Table 7: Land Use/ land cover map of Kangshabati Command Area.

Class name	Classified total	Number correct	Producers Correct	Users Accuracy	Accuracy Total.
Barren Land	2	3	1	50%	33.33%
Wet Land	5	4	3	60%	75%
Dry Crops	6	7	5	83.33%	71.43%
Dense Forest	9	8	8	88.88%	100%
Open Forest	8	8	6	75%	75%
Total	30	30	26		
Overall classification Accuracy = 86.66%					

Table 8: Accuracy Study.

Conclusion

The calculated prioritized factor rating value of land use, geomorphology, geology, drainage, slope, soil, relief and NDVI are 0.378, 0.205, 0.146, 0.103, 0.069, 0.048, 0.031 and 0.024 respectively that indicate geomorphology, land use, geology and drainage have dominant impact on ground water distribution in the study area. Large part of the study area suffers from severe drought condition and the ground water zonation map of the Command Area will contribute a lot of help and knowledge about the hydrology to the concerned authorities engaged in Land use planning. Basically, western part of the Command Area consisting the blocks of Salbani, Sarenga, Binpur, Raipur, Nayagram, Kotalpur, Khatra, Onda, Jaipur, and some parts of Garbeta-I, Garbeta-II, Garbeta-III with moderate to low ground water potential condition should be immediately paid much attention by Water Resource Planners for ensuring diversified agricultural practice based on ground water prospect. Besides, water resource preservation policies/technique should also be applied to get rid of the problems of water during deficient rainfall year evaluating the ground water potential zones map of the KICA. Overall study concludes that the floodplains and paradeltaic fan surfaces contribute much ground water prospect part of the Command Area. As the Kangshabati Irrigation Command area is an undulating terrain, the low lying area may provide suitable sites for the construction of reservoir which can supply water to water deficient area through proper irrigation system during summer/dry season for agricultural practice. Besides, the drainage network analysis indicates that the area is fit for the construction of check dams at the confluence point of several streams.

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