

Identification of *diara* villages in West Champaran district of Bihar

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Abstract

Diara regions are unique geographical features formed in the middle of the river as a result of deposition of sands over time- a common feature in the rivers flowing in the states of Bihar, West Bengal and Uttar Pradesh. Villages located in these diaras are the most inaccessible and excluded as they face the brunt of flood and drought every year. This paper is an attempt to demarcate Gandak diara region of West Champaran district of Bihar and locate such villages. Field visits were carried out to map the physiography of this diara region. Spatially referenced village map was superimposed on satellite imagery in Google Earth and the diara villages were identified with the help of satellite images.

Keywords: *Gandak Diara, Diara village, diara delineation, diara characterization*

Introduction

Human civilization from time immemorial has grown along the rivers. A unique adjustment of human beings to rivers is seen in settlements and/or economies that have thrived not along, but within the river itself known as the diaras representing unique geographical features created in the middle of the river as a result of deposition of sands over the decades. Because of its vulnerable location, people residing in diara region face the brunt of the flood and drought every year. Rivers flowing in northern Indian plains are highly dynamic. After Assam, Bihar experiences acute flood every year. The problem in recent years is getting further accentuated on account of climate change that has serious repercussion on the *Diara* lands which are most vulnerable to floods and droughts. Rivers originating from Himalayas flowing into northern Bihar carry huge sediment load and are notorious for frequent changes to their course (Sinha,

2008). The twin dangers of river course change and increased intensity of floods have made the inhabitants of the *Diaras* far more exposed to risks in the present times compared to the past.

Diaras are somewhat similar to river islands. These are by and large spatially excluded and the inhabitants belong to the most marginalized section of the population leading a traditional life bereft of many modern amenities available to people in the nearby villages away from the banks. It is imperative to document their life and livelihoods. A beginning is made in this research by delineating diara villages using geospatial techniques and undertaking a primary field survey.

Objective

The main objective of this paper is to delineate Gandak *Diara* and its villages in the

West Champaran district of Bihar state which have rarely attracted the attention from the academia or policy makers alike.

Data base and methodology

Diara villages continue to remain largely unexplored and un-mapped. The present study makes an attempt to fill this gap by demarcating Gandak *Diara* region of West Champaran district of Bihar and mapping the villages included within it. The aim of this paper is to present diara as a geographical entity manifesting itself as a place, space and region. In order to achieve the twin objectives of this research, intensive field visits were carried out in the months of March and May, 2019 to map the local physiography of the region. Satellite imagery available from the Google Earth and the Census of India maps with village boundary were profitably used for the study. The width of diara region was measured with the help of the GPS. It may be mentioned here that the river embankments are highly irregular- not easily observable on satellite imagery due largely to the work of erosion. Field observation as well as interpretation of satellite imagery therefore was considered important in delineating the boundaries of diara.

Before delineation, some diara villages were personally visited to determine their actual locations between the river embankments. Field observation was a crucial to describe micro units such as the diaras and identification of diara villages.

Community Development Blocks (CD Blocks) are administrative sub-units of the district, known by various names in different regions: Taluk, Tehsil, Mandal, Revenue Circle, Police Station etc. (Census of India, 2011). Villages are administrative units of

the lowest order in the rural areas. It is also called as revenue village (District Census Handbook, West Champaran, 2011). A total of nine CD Blocks of West Champaran district of Bihar located in the Gandak river channel were considered for identification of diara villages. Census maps showing village boundary were geo-referenced. Village boundary falling in Gandak river channels was digitized. These digitized villages were superimposed on Google Earth. Only those villages situated within the river channels or near the river channel were selected for the study. *Diara* villages were identified by a careful examination of the properties of features available in the images. The criteria adopted for the identification of diara villages have been illustrated in the flow chart as in figure 1.

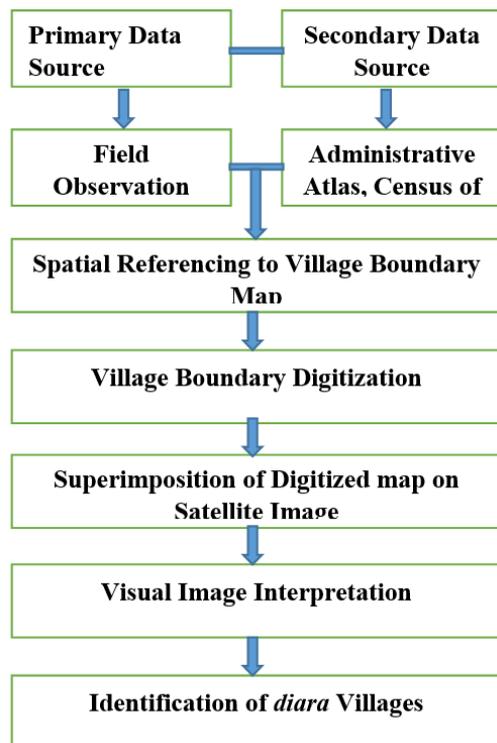


Fig. 1: Data sources and methodology

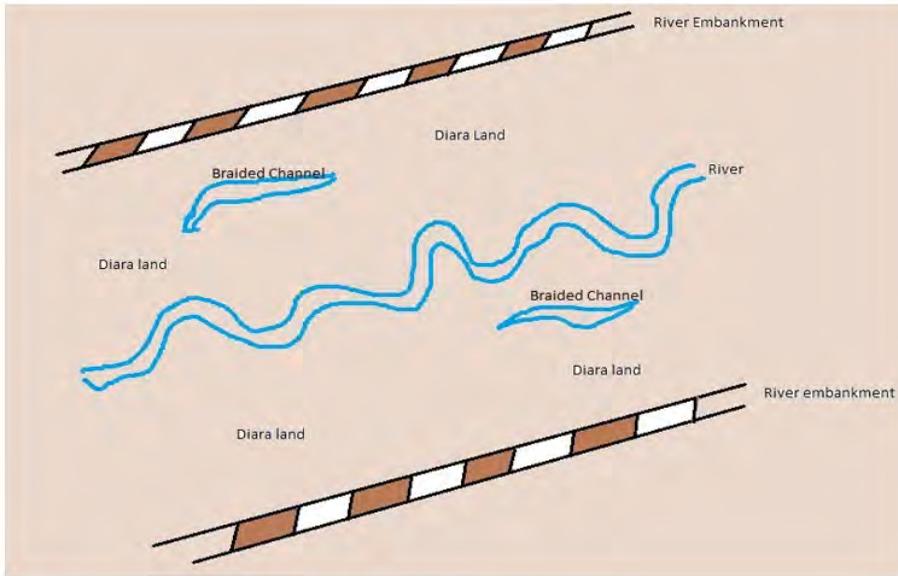


Fig. 2: Location of diara land between the river embankments
Source: Sketch by the authors



Fig. 3: Gandak Diara region captured from embankment.
Source: Photograph by the first author during field visit

Diara

Diara is a place located between river embankments and is known by varied names in different regions (Kumari et al., 2018). *Diara* or ‘a fluctuating river tract’ is that land which a river leaves in its wake, or it inundates yearly, as well as the land bordering the new beds that it may form in the course of its movement (Hill, 1987). A sketch has been drawn in fig. 2 to depict the location of diara land. These are common in the states of Bihar, Uttar Pradesh and West Bengal and are found in all the river channels of Northern flood plains of Ganga, Gandak, Kosi rivers, etc.

The word diara has been derived from local word ‘diya’ which means earthen oil lamp. It is said that diara is the place where earthen oil lamp is never lit (Udas et al., 2018). Sometimes the word ‘*Reta*’ is also interchangeably used for diara in Bihar (Kumari et al., 2018). ‘*Reta*’ denotes sand. Due to dynamic nature of the rivers; erosion and deposition take place every year, leading to rivers depositing sands over large part of the river bed which is why these are also known as ‘*Reta*’. *Diaras* have several other local names such as *Khadar*, *Kachhar*, *Doab*, *Dariyari*, *Kochsr*, *Nad*, *Tali* and *Nadiari*. The typical earthen oil lamp shape of the diaras is due to its relief as a depression. It is a saucer shape flood plain of the rivers (Government of India, 2008). *Diara* land is essentially a fluctuating river track, inundated every year as the frequently fluctuating river course erodes and forms this type of land feature and all this happen within the confines of the embankments (Hill, 1987). Within the river bed, there are multiple river channels. Sometimes diara land gets surrounded by river channels in all directions. This type of

unique land is formed and also get destroyed every year and is subject to frequent alteration due to meandering, braiding and change in the river course (Kumar et al., 2008). Topography of diara land is largely undulating, uneven and is intersected with multiple abandoned and disconnected channels (Kumar et al., 2013). The frequent erosion and deposition of the river make these lands very fertile and hence attractive for cultivation of a variety of crops and vegetables (Bhargava, 2007). It has been reported that 40 million hectares of land comes under flood prone region in India, out of which 2.64 million hectares (6.6%) is diara land.

In Bihar state alone, it is estimated that 400,000 hectares is diara land spread in the flood plains of river Ganga and Ghaghra (Government of India, 2008). Vast stretch of backwaters known locally as *Tal* lands is found south of the natural levee of the river Ganga. The flood plains of Ganga which get reworked and get eroded and deposited at regular intervals are lighter than *Tal* lands and are known locally as diara lands (Singh, 1971). The *Tal*, *Diara* and *Chaur* (remnants of river channel) lands are inundated by water for varying periods, and are difficult to manage (TERI, 2013). *Chaur* is a local term widely used in Bihar for low lands extremely fertile for cultivation, but frequently inundated during rainy season and are essentially deserted or dead channels, dead arm or remnants of the river channels (Singh, 1971).

Diara land is often considered as an ecosystem and is seen to have great potential from agricultural point of view (Department of Agriculture, Government of Bihar, 2016). These are a favourite habitat for many exotic wild animals and birds. Scrubs and grasslands

are very common to diara (Verma, 1997). The width of diara land between embankments varies greatly; from being as narrow as 5 km to as wide as 15 km (Singh, 1971) (Fig. 3). *Diara* region is perceived as a unique place in terms of its physiography, biogeography and socio-economic system. However, it is also an area which is generally backward because of its traditional mores and lacking in basic modern amenities and facilities. *Diara* is also perceived as havens for crime and hideouts for criminals and people from the mainland rarely venture into these places for this very reason. Lack of road and transport connectivity too makes it hard to visit such places. People living in the diara are however are poor, greatly deprived of health, education and other such facilities and constitute an excluded social group suffering from extreme poverty and uncertainty. The uncertainty of flood and drought make their life vulnerable to poverty and associated social pathologies (Udas, 2018).

The Study Area

The diara villages of River Gandak in the district of West Champaran of Bihar constitute the focus of this study. As per the Flood Hazard Atlas for Bihar (National Remote Sensing Centre and Bihar State Disaster Management Authority, 2013), the West Champaran district is one of the 15 most flood-affected districts and is located in the northwest corner of the state of Bihar. Gandak is the main river flowing in the district. The river's origin is at Sapt-Gandaki in the central mountain basin in Nepal- a place where seven streams come together. After flowing for 50 kilometers in Nepal, the river enters India. This river flows over several districts of Bihar and Uttar Pradesh and forms the state boundary with Uttar Pradesh in Northwest part of Bihar. The

length of the river is 640 km of which 260 km is in Tibet and Nepal and 380 kms flows in India. The total catchment area of the river is 46300 km² of which 7620 km² (16.7%) lies in India and the remaining in Nepal and Tibet (Ministry of Water Resource, 2004). Figure 4 shows the spatial location of the study area.

Delineating *diara* villages

The most difficult aspect of *Diara* land delineation is the identification of its boundary. There are only a handful of studies delineating diara villages but the methodology of delineation is still a challenge. Kumar et al. (2008) made an attempt to delineate diara region of river Ganga in Bhagalpur district of Bihar using satellite imagery and identified its land-use land-cover change. This study took railway track and National Highway as the basis for determining the boundary. National Highways and railway tracks are relatively more stable which restrict the dynamic nature of the river. District administrative boundaries too were also considered in demarcating the diara region. GPS was handy in marking the limits of diara. Satellite images- Pan Data of IRS-1D and LISS III were merged to delineate diara land through visual image interpretation techniques. Kumar et al. (2013) also prepared digital map of diaras of Bhagalpur district with the help of visual image interpretation of satellite images and for analysis of physiography of the land. Almost similar method, as used by Kumar et. al. (2008), was adopted in the present study. The former used the false colour composite of IRS LISS III satellite image verified by ground truthing with the help of toposheets and GPS. By analyzing tone, texture, pattern and morphological expression of the relief feature from the satellite images; diara lands were identified

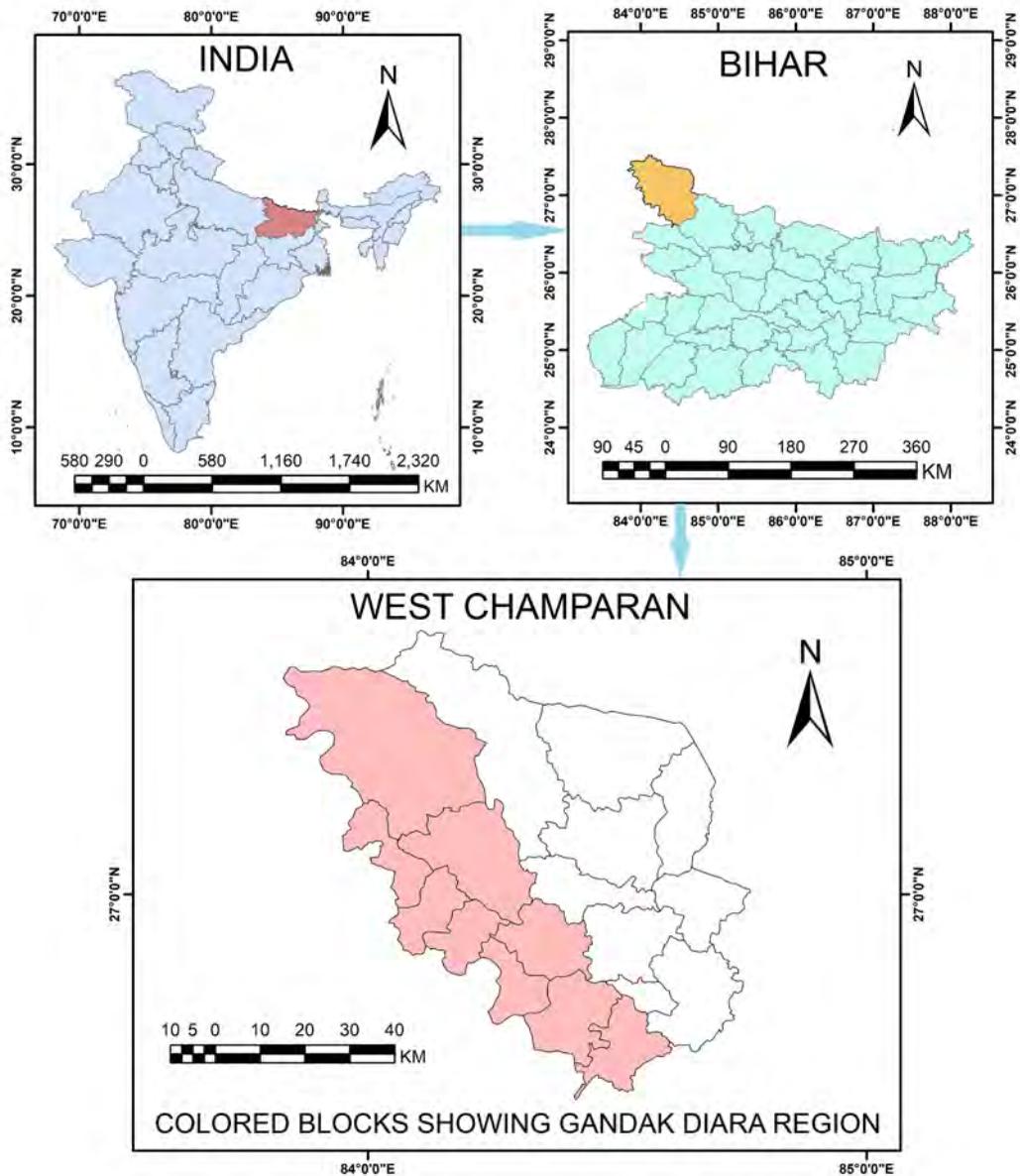


Fig. 4: Location of the study area

and delineated. Kumari et al. (2018) defined the river bed as diara land and also termed it as bank area or the area between two or more streams of a river. Available researches on diara region are relatively scarce despite its unique geography that renders identification of diara region a highly challenging task. Different methodologies followed in the delineation of diara as discussed above are specific to the respective regions and hence are not uniformly applicable to all diara regions due to varying human-made features like rail lines or highways. Despite being common demarcation lines, identification of the embankments is sometimes difficult from the satellite data as these embankments are irregular and sometimes there are no embankments on rivers banks due to erosion.

Kumar et al. (2013) identified two kinds of diara lands- the old diara and the new diara land on the basis of physio-chemical properties of soil such as the tone, texture, pattern and morphological expression of relief features located in diara belt of Bhagalpur district of Bihar. The study is extremely helpful in understanding the soil properties

and agricultural prospects in diara. Based on satellite imagery, the authors classified cultivated land in diara into three groups- upland, medium land and lowland. Jain et al. (2005) attempted to delineate flood prone area of Koa river basin, which is a tributary of Ganga River. The study used remote sensing technique to delineate flood prone area.

Field visits to these regions are therefore important for ground verification and area demarcation. The present study made a modest attempt to identify diara regions with the help of geospatial data and intensive field survey.

Delineation of Gandak *diara*

Based on the methodology discussed in the paper, the delineation of the diara region and the diara villages have been attempted in the following section. The West Champaran District with blocks and villages falling within the embankments were identified by field verification. It was observed that river embankments from both sides of the river Gandak are the stable features controlling the dynamic nature of Gandak River, and

Table 1: Share of *diara* area (in ha) to total area

C.D. Blocks	Area	Diara Area	Percentage
Sidhaw	57096.4	18197.4	32
Bagha	34923.7	2971	9
Piprasi	16021.7	16021.7	100
Madhubani	14052.7	7043.7	50
Thakhranha	14398.2	14398.2	100
Bhitaha	14088.15	14088.15	100
Jogapatti	21896.4	4382.4	20
Bairiya	23049.02	13994	61
Nautan	18848.07	3004	16
Total	214374.3	94100.55	44

Source: Calculated from Census of India, 2011

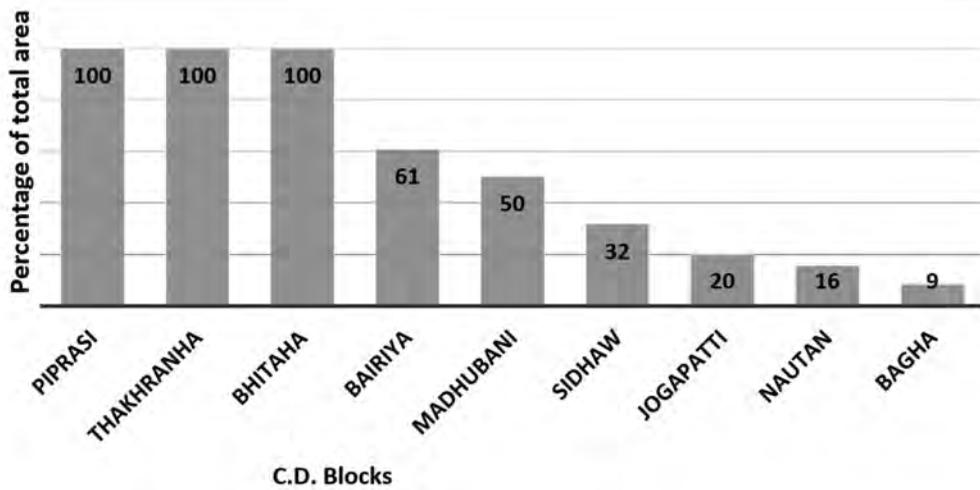


Fig. 5: Share of Diara regions in C.D. Blocks in Gandak
Source: Calculated by the authors

Table 2: Villages under Gandak *diara*

C.D. Blocks	Villages	Number of Diara Villages		
		Inhabited	Uninhabited	Total
Bairiya	55	23	4	27
Bhitaha	23	21	2	23
Madhubani	30	11	8	19
Sidhaw	175	16	1	17
Thakranha	13	10	3	13
Jogapati	105	10	0	10
Nautan	45	5	3	8
Bagha	136	5	0	5
Piprasi	3	3	0	3
Total	585	104	21	125

Source: Calculated from Census of India, 2011 and results of Image Analysis.

therefore, the embankments were considered as the boundaries of diara. From the western side of the river, it is the state boundaries of Uttar Pradesh and Bihar which form the district boundary of West Champaran district and also act as demarcation line for Gandak diara. On the southern side, it is the

district boundary, and on the eastern side, it is embankment, texture of the soil and physical distance from the river were taken as identification criteria. The national boundary of Nepal and India is the district boundary of West Champaran in the north.

The width of Gandak diara is approximately 10 kms long. There are eighteen Community Development Blocks in the West Champaran district. The diara land is found in varying proportion in these nine blocks of Sidhaw, Bagha, Piprasi, Madhubani, Bhitaha, Jogapatti, Thakranha, Bairiya and Nautan ((Table 1; Fig. 5 and 6). The total area of this diara in these nine blocks is measured as 94100.55 hectares accounting for 44 percent of the total area of these nine blocks. Piprasi, Thakranha and Bhitaha C. D. Blocks

are fully covered under diara region. On the other hand, much of Bairiya block (61%) and Madhubani (50%) too were included under diara while 32 percent of Sidhaw, 20 percent of Jogapatti, 16 percent of Nautan and 9 percent of Bagha C. D. Block are part of Gandak *Diara* (Table 1).

As Gandak river moves southward, the width of the river bed/diara increases accommodating more villages under diara region. The majority of diara villages (27) are found in Bairiya block followed by Bitaha,

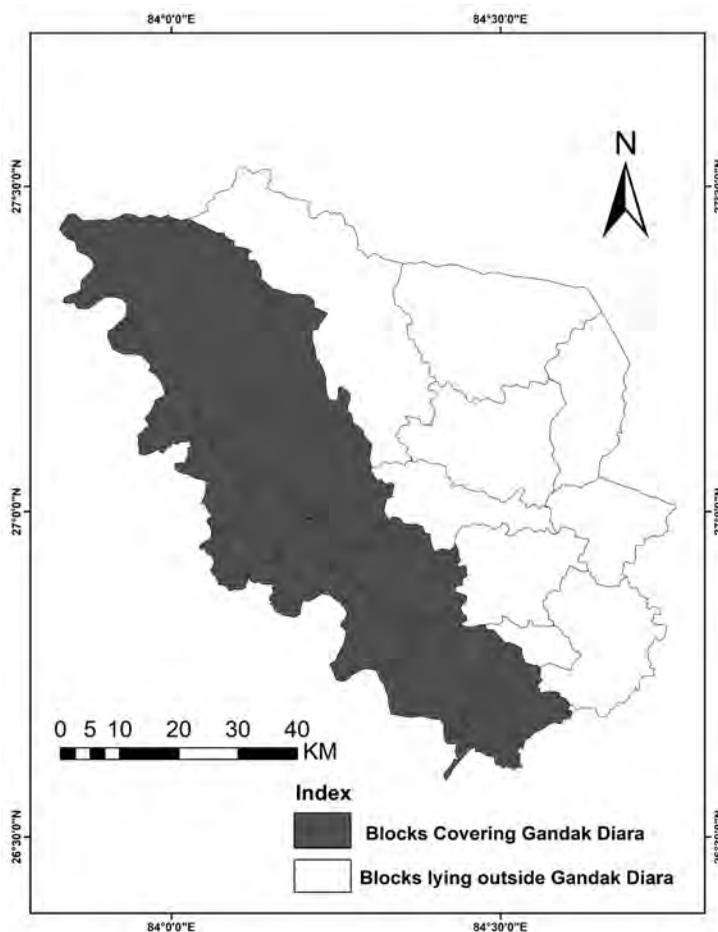


Fig. 6: C. D. Blocks covering Gandak Diara of West Champaran

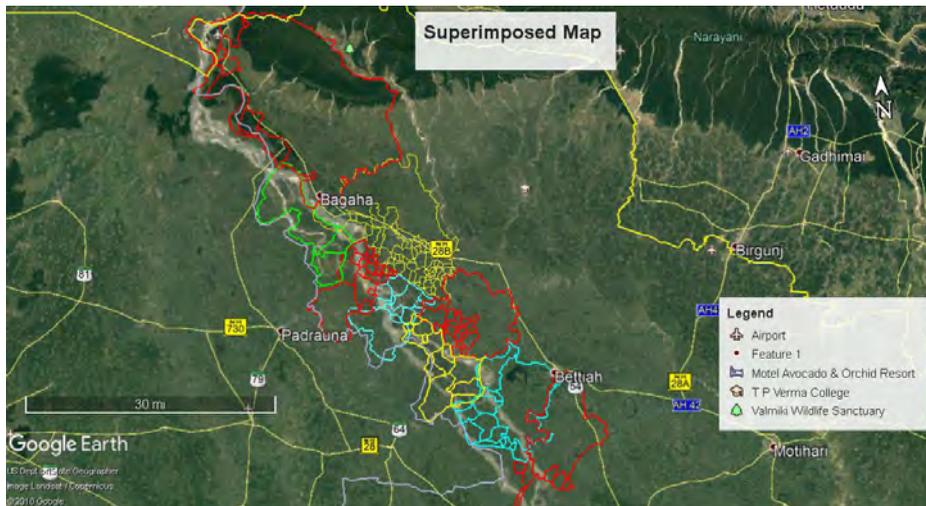


Fig. 7: Superimposition of village boundaries on the satellite imagery

Source: Prepared by the authors

Note: The geocoded village boundary shapefile was superimposed on satellite image of Google Earth. Villages falling outside Diara region were left out as figure 7 shows.



Fig. 8: Identified Gandak Diara Villages of West Champaran district

Note: There are a total of 125 villages identified as Diara villages in Gandak River of the West Champaran district of Bihar. Out of 125 Diara villages, 121 Diara villages are inhabited and 21 uninhabited. In Sidhaw C.D. Block, there are 17 villages identified as Diara villages. Similarly, 5 villages of Bagaha, 8 villages of Nautan, 10 villages of Jogapatti and 19 villages of Madhubani and 27 villages of Bairiya C.D. Blocks are identified as Diara villages (Table 2). All villages of Piprasi, Bhitha and Thakraha C. D. Block are identified as Diara villages.

Madhubani, Sidhav, Thakranha and Jogapati blocks with 23, 19, 17, 13 and 10 diara villages respectively. Nautan, Bagha Piprasi has 8, 5 and 3 villages respectively included in diara region (Table 2). River Gandak gets bifurcated into two major channels in Bairiya block covering relatively large number of villages under diara. These two river channels join at Rampur Tengrahi of Gopalganj District. Gandak River is widest over Bhitaha and Bairiya Blocks. This is the area where the river is divided into several sub-streams with several braided channels and meanders (Fig. 7 and 8). This has helped Gandak river bed sprouting the greatest number of diara villages.

Conclusion

The study finds 44 per cent of the total area of all the blocks coinciding with diara region fully or partially falls under diara region. Out of the 585 villages in this area, 125 villages are identified as diara. Three blocks are fully covered under diara region. Studies (Manjushree et al., 2015) have confirmed that the Gandak River is moving westward very rapidly converting non-diara into diara land. This fact itself is of enormous significance for the development of this region. As an area diara lands are vulnerable to flood and drought. Most of these lands are considered wasteland and barren. However, the huge diara land has great potential from agricultural point of view that can be harnessed for the benefit of the people inhabiting these areas. Hence, there is a requirement of diligent planning to effectively and sustainably utilize the available resources for its development. This explorative study is expected to provide a base for further research on diara region.

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