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**Availability of Maps for the Village in India**

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## Availability of Maps for the Village in India

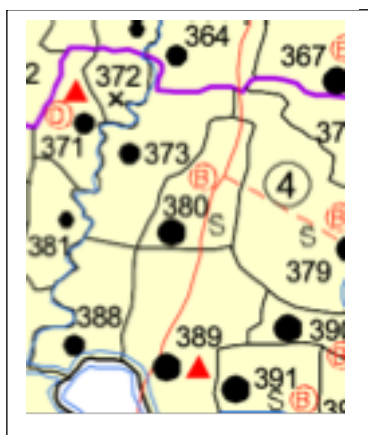
### Introduction

Okabe and Bakshi (2016) examined a statistical domain of the village panchayat (*Gram Panchayat*), which has emerged in rural India as a consequence of the 73<sup>rd</sup> Amendment to the Constitution. Its focus was the data needs of village panchayats which are the first stage of the collection and recording of data. However, it has left an unresolved issue, which pertains to a panchayat's spatial information:

This book also did not discuss village panchayat-level databases in relation to the geographical information systems, which have been making remarkable progress. (Okabe and Bakshi, 2016, p. 344)

Indeed, spatial information is indispensable to local governments. 'The object domain of the panchayat's governance is defined by its geographical area and its functional domain. Since the object of local governance is a region within the nation, the panchayat's object domain, first, is its geographically defined jurisdiction. No government can be ignorant of its jurisdiction. A jurisdiction delineates regional boundaries of local society in relation to its inhabitants.' (Okabe and Bakshi, 2016, p. 26)<sup>1</sup> Nevertheless, the village panchayat office under investigation in Okabe and Bakshi (2016) did not necessarily maintain even an official map for its whole territory, not to mention geographical information systems (GIS) data. The only map found in the village was a map for the revenue villages; this map was maintained by the revenue office. Therefore, we will examine the availability of any maps for a village or a panchayat before discussing GIS corresponding to village panchayat-level statistical database. Map information is one of the primary sources of data for the GIS.

Figure 1



### 1. Village map without information of cadastral map

We find a basic village map in the District Census Handbook (DCHB) of the 2011 Census. Figure 1 shows the map of Warwat Khanderao village (location code number 380) in the DCHB (Part XII-A) of Buldana, which shows location codes of the (revenue) village with boundary and its spread along with other physical features (e.g., road, railway lines, rivers and streams, reserved forest). The Office of the Registrar General & Census Commissioner, India, has a digital database of geo-referenced

<sup>1</sup> 'Self-governance by panchayat requires data on its territory (i.e., its jurisdiction in spatial terms). This data presupposes spatial information including information from maps and the geographical information systems (GIS).....' (Okabe and Bakshi, 2016, p. 243)

(revenue) village maps. Their map division mentions matching tasks of village maps obtained from the State Revenue Department and those obtained from 2011 Census for updating the base maps for the 2021 Census<sup>2</sup>. The revenue office, under the purview of the State Land Revenue Administration<sup>3</sup>, maintains a village map together with information of the cadastral map. The village map in the DCHB is derived from this map. However, information from the cadastral map is almost absent from the map in the DCHB.

This type of village map has the following limitations:

- (1) It is based on the (revenue) village but not on the village panchayat.
- (2) This map does not have land use and land ownership information maintained in the cadastral map.
- (3) Physical features shown in the map are too simple to use.

Sometimes we and a panchayat can obtain a larger-scale of the same village map from the land revenue offices or the block offices. In principle, we can compile a panchayat-level map from (revenue) village maps. While territory of the Warwat Khanderao village panchayat in Buldana district in Maharashtra is identical to a (revenue) village, the Raina village panchayat in Bardhaman district in West Bengal consists of 13 villages (*mouzas*). However, village panchayat does not necessarily compile and maintain its own map independently of the revenue office.

Strictly speaking, a village map with or without cadastral map information is provided by a department commonly known as Survey Department. This department is one of the separate departments in the State Land Revenue Administration. The Survey Department conducts ground surveying not only to measure land and fix boundaries of holdings, but also to determine boundaries of the villages.

We or a panchayat may use this type of map, for instance, for social/resource mapping. We may also capture it for use in the GIS.

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<sup>2</sup> 'The complete list of villages should be obtained from the State Revenue Department and compared with the list of villages of the 2011 Census. ...To speed-up the process of obtaining the complete list of villages along with hamlets, a copy of the 2011 list of villages as per Master Directory may be sent to each Tahsildar or concerned sub-district level authority along with the available sub-district level maps of Census 2011 with the request to mark all type of changes in the list like creation of new or deletion of village(s), changes in the names, if any, etc.' (Office of the Registrar General, India 2017, p. 2) 'On the basis the Village list collected for 2021 Census and the Sub-district map obtained from the Survey/Revenue Department/Tehsil headquarters etc., the existing 2011 Census digital database are to be corrected/updated and concurrence of the changes should be matched with that of Master Directory. Fresh working map with Village/Town boundaries with names need to be prepared, so that the Village/Town boundaries are precisely identified' (Office of the Registrar General, India 2019, p. 2)

<sup>3</sup> Although West Bengal has no primary reporting agency like the *patwari* at the village level in Maharashtra, the Block Land and Land Reform Office administratively under the Land and Land Reforms Department of the State Government maintains the cadastral map and related land records for villages within the Block. In West Bengal, the unit of survey for cadastral mapping and land records is a mouza (i.e. revenue village). See, Sengupta, A., et al. (2016), pp. 259-260.

## 2. Village map with information of cadastral map

We can take a glance at the cadastral map maintained at the village revenue office (*patwari* office), like the one in Warwat Khanderao. The revenue office should have a comprehensive map for the whole village together with information of cadastral map. This village map is prepared by the Survey Department through ground surveying and the map is maintained by the revenue office.

In the 1930s the Board of Economic Inquiry of Punjab gave us a map of each villages, along with all plots of land in the cadastral map (fig. 2). We can take it as an example of the complete village map at the revenue office. If every plot of land in the cadastral map has a plot number corresponding to land records, we can link every plot of land to the village's land records. In this way we can construct a dataset comprised of a cadastral map and related land records. We can call it the Cadastral Database. Table 1 shows that a wide range of items for each plot number, including land ownership, basic land use and area, is contained in the land record.

All States in India are now digitalising their Cadastral Databases. Since the 1980's, many States have undertaken ground surveying to reinvestigated cadastral maps tied to land records. However, the progress has been uneven. Digitisation is a further challenge to these efforts. For a more rigorous exercise, there needs to be some correspondence with land records, but that is where the problem arises.

The Cadastral Database has a particular kind of problem:

- (1) Land records tied to each plot of land in the cadastral map are often outdated and inaccurate<sup>4</sup>.
- (2) The cadastral map described in this village map does not always accord with digital spatial image of remote sensing.

Official permission will be required to obtain access to these maps. Permission would also be required to access the land records of an entire village. Access to some land records in Warwat Khanderao is available for a fee. In some states, some parts of the Cadastral Database might be available online. The use of the digital geo-referenced Cadastral Database is a subject of discussion and debate. Okabe and Bakshi (2016, p. 248) have already found that 'Statutorily, the village land records can be a matter of concern to the panchayat or village council members'.<sup>5</sup>

The States in India are now geo-referencing all plot-wise village maps using digital images generated

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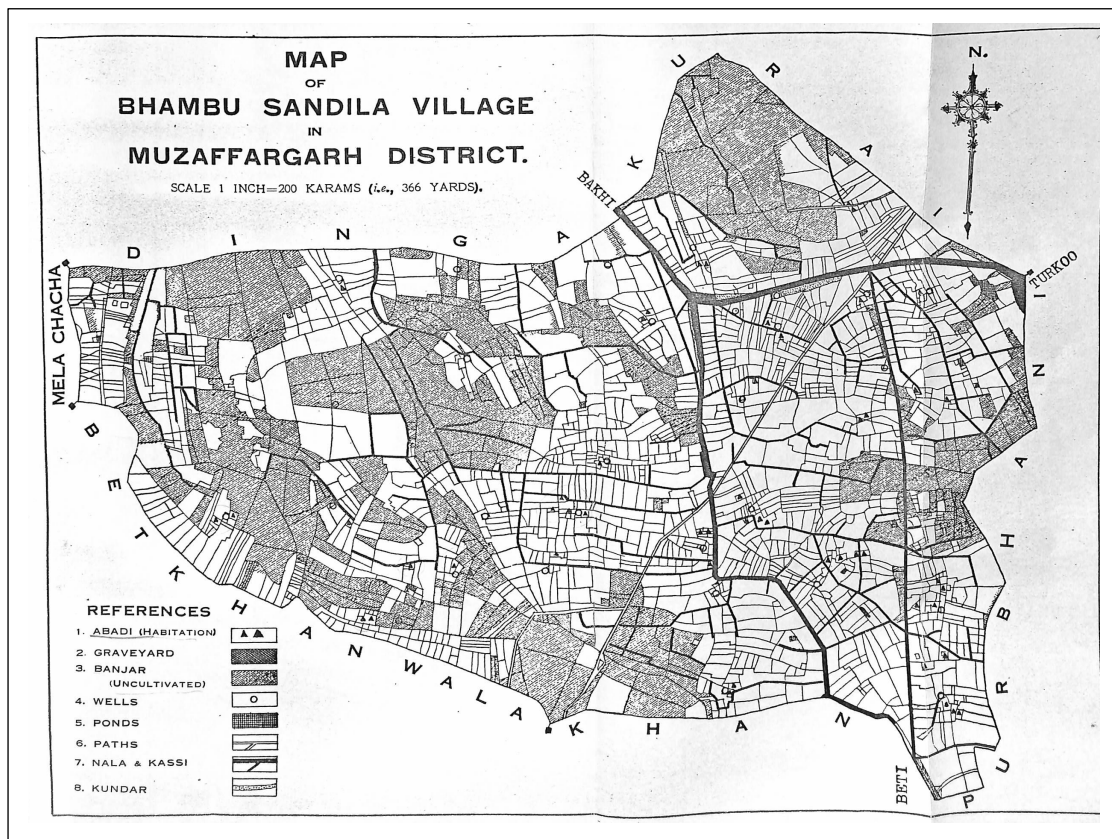
<sup>4</sup> There is a large discrepancy between land holding data from the Land and Livestock Holding Survey of NSS and from land records (such as the Agricultural Census).

<sup>5</sup> 'Since the Bombay Village Panchayats Act, 1958, has the function of "maintenance of village records relating to land revenue," the fifty-eighth subject in the list of activities to be devolved to the village panchayats, the village panchayats in Maharashtra have the potential to revise information on tenants. Statutorily, the village land records can be a matter of concern to the panchayat or village council members.' (Okabe and Bakshi, 2016, p. 248)

from remote sensing technology provided by the National Remote Sensing Centre, Hyderabad. However, the digital map generated from remote sensing has played just a supplementary role in the construction of the cadastral map. The primary tool was obviously the ground surveying conducted by the Survey Department of the State Land Revenue Administration. Thus, the State Land Revenue Administration had an effective monopoly on the village-level spatial information.<sup>6</sup> The data source of the two types of village maps mentioned above — village maps with and without cadastral map information — is the State Land Revenue Administration.

The digital Cadastral Database itself is a sort of GIS data. Every polygon for the plots of land in the digital cadastral map is directly linked to digital land records as an attribute information of the GIS.

**Figure 2**



Source: Board of Economic Inquiry, Punjab (1935), p. xxi. [obtained from Usami, Y. and Sugimoto, D.]

<sup>6</sup> 'According to our interview with the Block Development Officer of Sangrampur, Buldhana District, Maharashtra, the *Tehsildar* in Maharashtra wielded greater administrative powers as he was the Programme Officer for all programmes under the Ministry of Rural Development. Thus, the power of the Block Development Officer is limited.' (Okabe and Bakshi, 2016, p. 239)

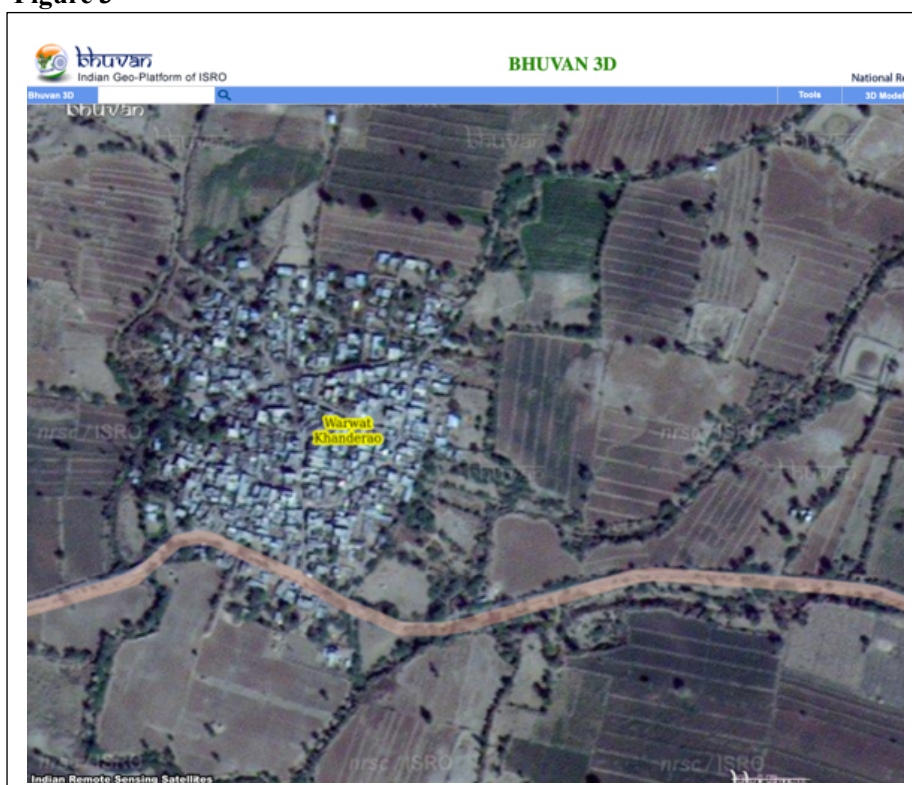
### 3. Village-level spatial information generated from remote sensing

Mapping the plot-level land records to digitised GPS tagged maps is now a challenge for every State. The National Remote Sensing Centre, Hyderabad provides the necessary data and technology.

Its high-resolution of digital spatial images show more detailed physical features of the village than those of map in the DCHB. Therefore, this village-level spatial information is sometimes used by village panchayats for planning activities to implement the government schemes, such as the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA).

Furthermore, as shown in figure 3, this high-resolution of digital image can show the details of agricultural land. We can match its images with the plots of land in the cadastral map with some accuracy.<sup>7</sup>

**Figure 3**



<sup>7</sup> The Continuously Operating Reference Stations (CORS) GNSS network also provides centimetre-level accuracy geodetic services for positioning. See, Geodetic & Research Branch, Survey of India Dehradun (2019).

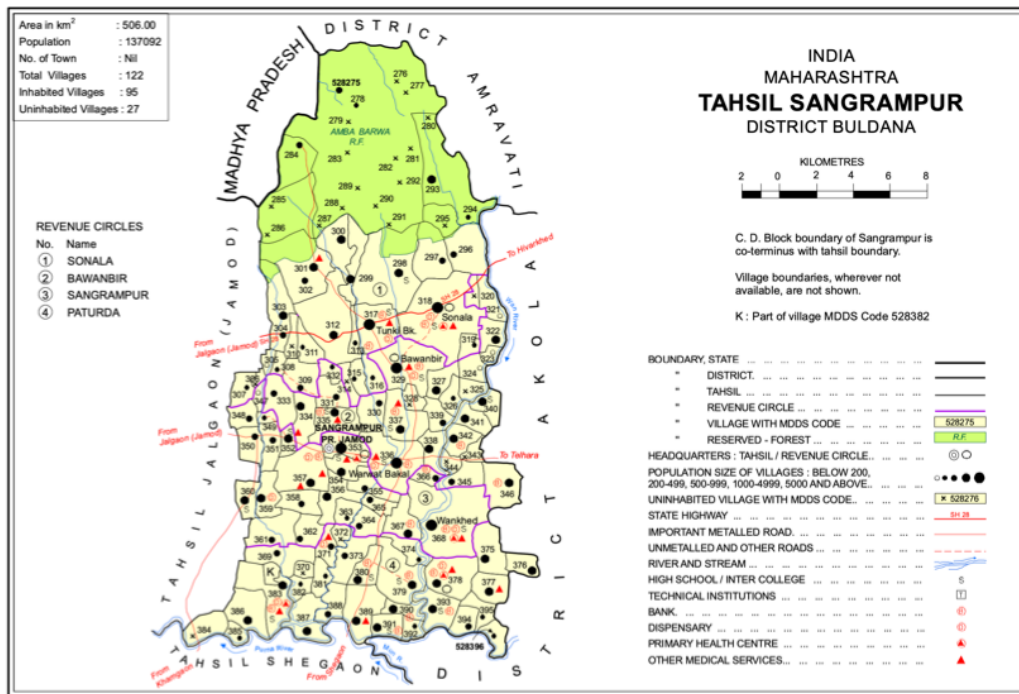
Therefore, the relative strengths and weaknesses between the cadastral map measured on the ground and the digital image generated from remote sensing are controversial. However, these types of spatial information are linked. For instance, village boundaries determined by the State Land Revenue Administration are often overlaid on the digital image provided by the National Remote Sensing Centre.

We can see the village-level spatial information at the website of the National Remote Sensing Centre. However, we cannot download this information. We have to purchase it at a high price.

### Conclusion

In principle, we can easily compile a village panchayat-level map without the cadastral map information, using the (revenue) village maps. However, the digital or non-digital Cadastral Database is not easily available. Relative strengths and weaknesses between the cadastral map measured on the ground and the digital image generated from remote sensing are now controversial.

Note: Figure 1 is extracted from a part of the following map in the DCHB of the 2011 Census.



**Table 1 Land Record in Maharashtra**

Village Form 7/12 (Record of Rights) [Rules 3, 5, 6 and 7 of the Maharashtra Land Revenue Record of Rights (Preparation and Maintenance) Rules, 1971]

Village \_\_\_\_\_ Taluka \_\_\_\_\_

Survey No/Gat No.	Division of Survey No./ Gat Number.	Tenure		Name of the occupant			Account Number	
							Name of the Tenant	Rent
Local land Name							Rs.	P.
Cultivable Area		Ha. ३	R				Other rights	
_____								
_____							Boundary and land survey symbol	
_____								
Total								
Uncultivable Land								
Class A								
Class B								
Total								
Assessment		Rs.	P.					
Judi or special assessment								

**Village Form 7/12 (Crop Record)**

Year	Seasons	Details of Area under Crop									Non-cultivating Available Land		Irrigated Equipment	Name of occupant	Remark
		Details of Area under Mixed Crop			Details of Area under Unmixed Crop			Crop name	Irrigated	Non-irrigated	Nature	Area			
		Mixed Code No.	Irrigated	Non-irrigated	Areas under Decline Crop										
					Crop name	Irrigated	Non-irrigated	Crop name	Irrigated	Non-irrigated					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
			H. R	H. R		H. R	H. R		H. R	H. R		H. R			



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