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**Village Spatial Information in India:
A Case from Palakurichi Village in Tamil Nadu**

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Abstract

Spatial information is required for local self-governance. This paper uses a case study from Palakurichi village of Nagapattinam district in Tamil Nadu to examine the village-level spatial information available in contemporary India. It is possible for us to purchase the cadastral databases and the official remote sensing images for each village in Tamil Nadu. However, the local government of this State does not have easy access to them.

Introduction

Spatial information is indispensable to the institutions of local self-government. Okabe & Bakshi (2016) examined a statistical domain of the village *panchayat* (*Gram Panchayat*), which has emerged in rural India as a consequence of the 73rd Amendment to the Constitution. However, Okabe & Bakshi does not discuss statistical databases as they relate to spatial information inside each village¹. ‘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.’² The access to spatial information is actually an unresolved issue for the people who are working on local self-governance. Therefore, we need to examine the village-level spatial information that is accessible to the local government, such as maps and remote sensing images. The purpose of this paper is to discuss a case study from Palakurichi village in Kivelur taluk of Nagapattinam district in Tamil Nadu.³

1. Village Cadastral Map

The village located in traditionally *raiayatwari* area has a cadastral map⁴ maintained at its revenue office (*patwari* office). The village cadastral map is prepared by the Survey Department at the State land revenue administration⁵ through ground surveying. The map shows the village

¹ ‘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)

² Okabe & Bakshi (2016), p. 26. ‘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)...’ (*Ibid.*, p. 243) As provided by the Constitution of India (Article 243), ‘“Gram Sabha” means a body consisting of persons registered in the electoral rolls relating to a village comprised within the area of Panchayat at the village level,’ and ‘“Panchayat area” means the territorial area of a Panchayat.’

³ This research result is based on a joint research project with the Foundation for Agrarian Studies (FAS). See, <http://fas.org.in/village-level-spatial-information-using-gis-technique/>

⁴ Since the 1920s, the Board of Economic Inquiry of Punjab started village-level economic surveys using the village cadastral map. See the Board of Economic Inquiry, Punjab (1928).

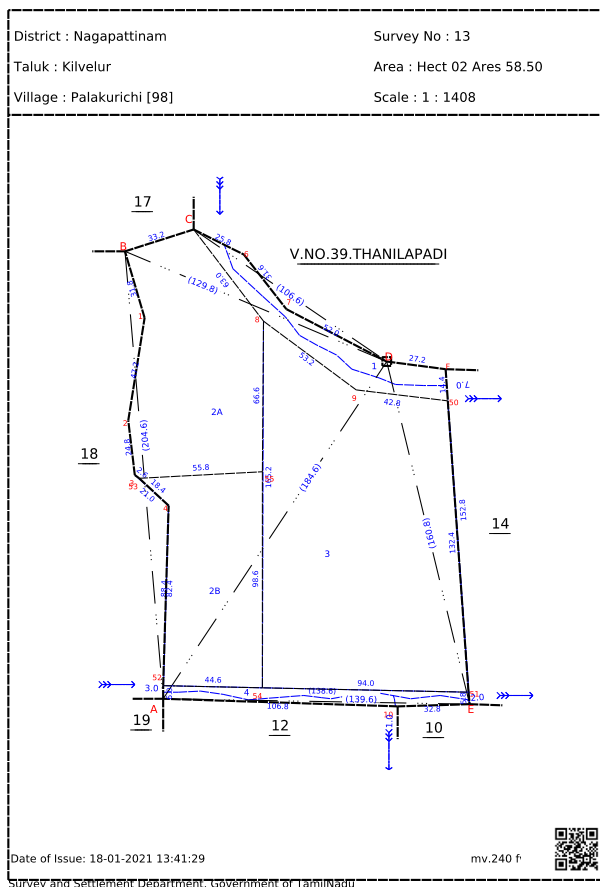
⁵ Some states that are located in a former *zamindari* area do not have the same primary reporting agency as the *patwari* office. In West Bengal, for example, the Block Land and Land Reform Office, administratively situated under the Land and Land Reforms Department of the State government, maintains the cadastral map and related land record for villages within that Block. In West Bengal, the basic unit of survey for cadastral mapping and land record is the ‘*mouza* (i.e. revenue village).’

boundary and its spread as well as some of the physical features (e.g., road, rivers and streams, and some structures). Among other details, this map shows every plot of land already documented in the land record. Figure 1 illustrates the cadastral map for Palakurichi village in the Nagapattinam district, Tamil Nadu. This map was drawn during the re-survey in 1920, and it was then updated in 1979 during the supplemental survey.

Every plot of land on this cadastral map has a plot number (‘survey number’) that corresponds to the land record maintained at the village revenue office. We can link every plot of land to that land record using this survey number. Table 1 illustrates the entry columns in the land record.⁶ This cadastral information is a large dataset that is comprised of a cadastral map and related land records. We can thus call it a “cadastral database.”⁷

Further still, the village cadastral map in Tamil Nadu is supplemented by FMB (Field

Figure 2 FMB map



Source: Survey and Settlement Department, Government of Tamil Nadu.

Measured Boundary) maps. Even if a plot of land on the cadastral map is denoted by a single survey number, that plot usually has its own subdivisions. The map of subdivisions for each plot is available on FMB. Figure 2 shows a FMB map for the plot denoted by Survey Number 13 in the cadastral map that is illustrated in Figure 1. This FMB map shows four subdivisions of the plot with the subdivision numbers 1, 2A, 2B, 3, and 4. The FMB is a book with these maps for the entire village. Each map in the FMB is linked to the corresponding survey number for a plot in the cadastral map. Every land record is not only tied to a FMB map, but also tied to a subdivision on the FMB map. All the subdivisions of each plot are tied to a FMB map by their subdivision number, and that FMB map is then tied to the same plot in the cadastral map by the

⁶ On details of the village land record, see Okabe & Bakshi (2016), pp. 183-189.

⁷ Sengupta, A. et al. (2016), p. 259.

Table 1 Entry columns in the land records of Tamil Nadu

Column name	Explanation
Survey_No	The survey number of the plot according to the existing resettlement record
Subdivision_No	The subdivision number of the plot according to the existing resettlement record
Old_survey_FMB_no	The old survey number corresponding to the new survey number of the plot
Old subdivision no	The old subdivision number corresponding to the new survey and subdivision number of the plot
Part	Unclear field. to be investigated
GOVT/Ryotwari	Indicates whether the plot of land belongs to the government (written as G) or individual ryots (written as R)
Land type	Indicates whether the plot of land is wet (W), dry (D), Potamboke/waste lands (P), government assessed lands (ASSESSED) or Natham (NATHAM). Natham lands are understood as sites for current or future housing.
Source of irrigation	Gives the source of irrigation in case of wetlands. They are marked as 'A' if fed by Kudhitaivevuganar canal or 'B' if fed by Therkodiyar canal
Event of two crops	1' is marked against the plots that have two crops
Soil type (primary)	Unclear field. to be investigated
Soil type (secondary)	Unclear field. to be investigated
Soil class	Unclear field. to be investigated
Rs/Hect	Gives the rupees of tax assessed per standard acre
P/Hect	Gives the paise of tax assessed per standard acre
Hect	Gives the extent of the plot in Hectares
Acre	Gives the extent of the plot in Acres.
Total Area Hect	Gives the total extent of the given piece of land in terms of hectares (Hect' + (Acre*100))
Rs	Gives the rupees of tax assessed for the given plot
P	Gives the paise of tax assessed for the given plot
Total Assessment Rs	Gives the total amount of tax assessed for the given plot in terms of rupees (the sum of the 'Rs' column and ('P' column*100))
Patta no	Gives the number of the patta which owns the plot of land. '0' is given to government lands, and '0.5' is given to Natham lands under Ryotwari
Patta name	Gives the name of the patta holder who owns the plot of land
Remarks	Remarks as contained in the A-register. In case the plot is a government potamboke land, it indicates what type of land it is
Remarks (Chitta)	Remarks as contained in the Chitta. It indicates if there are any channels, roads, pathways, etc. contained in the plot of private (ryotwari) land
Single Joint patta	
Owner 1 name	
Owner 1 Sex	
Owner 2 name	
Owner 2 Sex	
.....	

Source: Survey and Settlement Department, Government of Tamil Nadu. The Foundation for Agrarian Studies (FAS) translated Tamil into English.

survey number. The subdivision of each plot of land in the cadastral map is recorded and updated in the FMB by the Survey and Settlement Department of Tamil Nadu land revenue administration, and these updates are not reflected in the cadastral map.

Official permission will be required to gain access to the cadastral maps. In Tamil Nadu, we can purchase the hard copy of cadastral maps for a fee from the Survey and Settlement Department of the State land revenue administration. Each village *panchayat* can also gain access to their cadastral maps at the Village Administrative Officer (VAO) and the Survey and Settlement Department of the State land revenue administration. However, the VAO and the Survey and Settlement Department of the State land revenue administration are usually located far from the village.

Permission is also required to access the land records of an entire village. In Tamil Nadu, we can purchase the hard copy of land records and the FMB of an entire village from the Survey and Settlement Department of the State land revenue administration. The village *panchayat* can access them from the village revenue office (*patwari* office). The village *panchayat* can gain access to its FMBs at the VAO. But it is usually located far from the village. In some states, such as Punjab, part of the cadastral database is available online.

Okabe & Bakshi (2016, p. 248) have already learned that the cadastral database can be a matter of concern for the *panchayat* or members of the village council.⁸

As we will see in §3, all States in India can use the remote sensing image of the villages provided by the National Remote Sensing Centre, Hyderabad. However, the primary tool used to construct these cadastral maps is obviously the ground surveying conducted by the Survey Department of the State land revenue administration. This administration has held an effective monopoly on the village-level spatial information.⁹

All States in India are now digitalising their cadastral databases. Since the 1980's, many States have undertaken ground surveying to reinvestigate the cadastral maps tied to the land records. However, that progress has been uneven. Digitisation is a further challenge for these efforts. The use of the digital cadastral database is now a subject of discussion and debate. As far as we can see in the Palakurichi village in Tamil Nadu, the FMB maps and land records are digitised and updated, but the cadastral map itself has not been updated since 1979.

For a more rigorous exercise, there needs to be correspondence with land records, but that circumstance is where a problem arises. Land records are often outdated and inaccurate. Further still, the cadastral map is not always in accord with the digital spatial images generated using remote sensing technology.

⁸ '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 & Bakshi, 2016, p. 248)

⁹ '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 & Bakshi, 2016, p. 239)

2. Village Map Without Cadastral Information

We also find a village map in the *District Census Handbook* (DCHB) of the Census of India. Figure 3 shows a map of Palakurichi village (location code number 750) in the DCHB (Part XII-A) of the 2011 Census for the Nagapattinam District, Tamil Nadu. The Office of the Registrar General & Census Commissioner, India, has a digital database of geo-referenced (revenue) village maps. Their map division made a specific mention of the matching task between the existing village map obtained from the State land revenue administration and its corresponding map obtained from the 2011 Census for updating the base maps for use in the 2021 Census¹⁰. Thus, village maps in the DCHB are derived from the maps already maintained by the revenue offices, under the purview of the State land revenue administration. However, all information on the plots of land in the cadastral maps are absent from the village maps available in the DCHB.

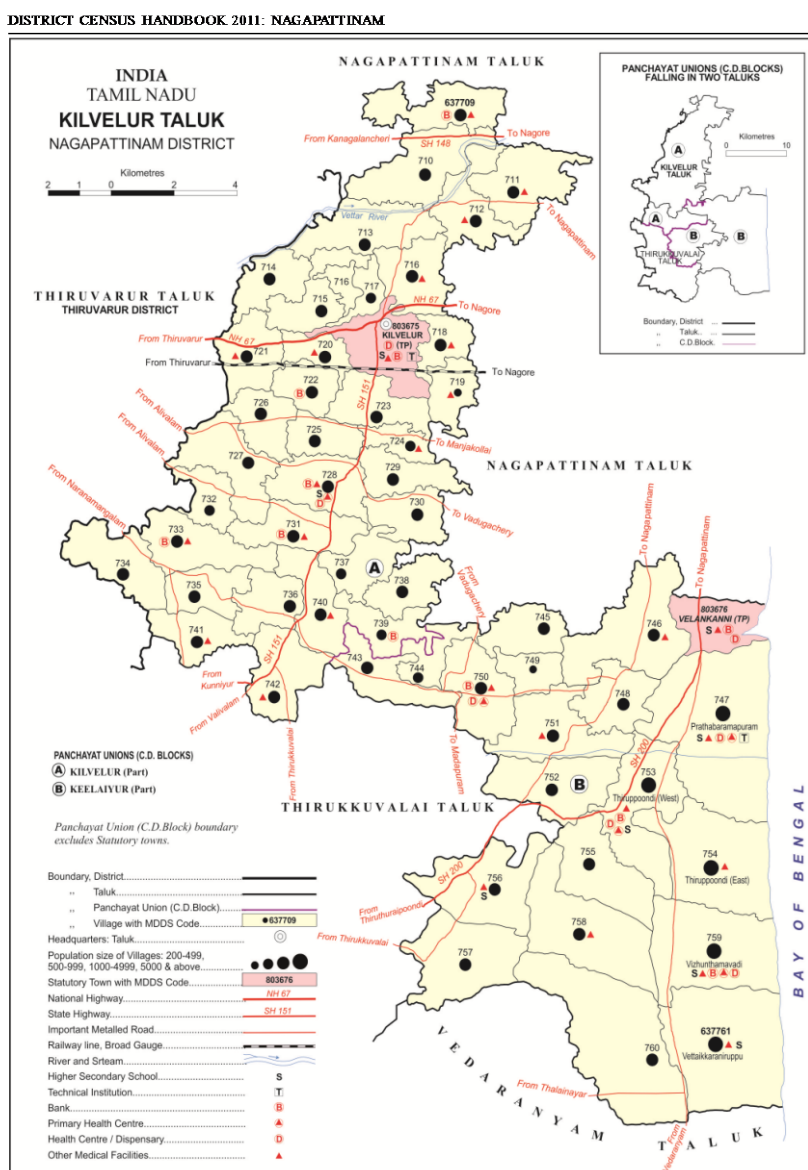
In addition, this village map is based on the (revenue) village, but not on the village *panchayat*. Sometimes the village *panchayats* can obtain a larger scale of the same village map from the revenue offices. However, the village *panchayat* does not necessarily compile and maintain its own official map independently of the revenue office. The details of the *panchayat* boundaries can be obtained from the concerned Block Development Officer (BDO).¹¹ In Tamil Nadu, these village maps that do not have cadastral information are available online.

Apart from the official village map generated by the State land revenue administration, unofficial maps are often produced in the village for operational uses for various activities. According to the *Instruction Manual for the Houselisting and Housing Census*, enumerators are required to

¹⁰ '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)

¹¹ Office of the Registrar General, India (2019), p. 3.

Figure 3



Source: Directorate of Census Operations, Tamil Nadu (2014), p. 96.

produce a 'layout map' of their Houselisting Block (HLB) as shown in Figure 4.¹² However, this layout map is a freehand drawing, not drawn to scale.¹³ Another example is the property tax

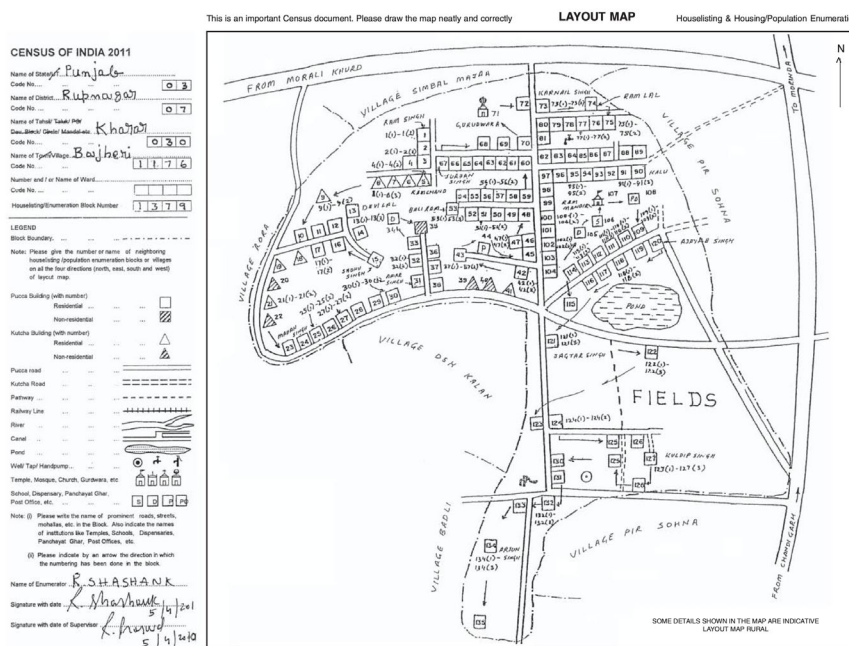
¹² 'While allotting numbers to buildings and Census houses in your Houselisting Block, you are likely to come across three situations:

- i) where buildings or Census houses are numbered systematically by the municipal or local authorities;
- ii) where numbers to open sites are given on property basis but there are number of sites where the buildings have not so far been constructed or where building numbers are existing but incomplete and not systematic, and
- iii) no numbering to buildings or Census houses exists.'

¹³ Office of the Registrar General & Census Commissioner, India 2011, p. 15.

register (house tax register). It contains information on each house in the village-panchayat's jurisdiction and its corresponding house number. The State Election Commission also produces the electoral roll for each polling booth boundary. In this electoral roll, house numbers are given to voters to indicate which voters are living in the same house¹⁴. Nevertheless, the information on structures and buildings on the village cadastral map are inaccurate and outdated (see, Fig. 1). This is a matter of course because the original purpose of the village cadastral map is land revenue administration.

Figure 4



Source: Office of the Registrar General & Census Commissioner, India (2011), p. 19.

At present, the official map and spatial information showing more information than the village map in the DCHB is the village cadastral map (and FMB) and digital images generated from remote sensing technology as provided by the National Remote Sensing Centre, Hyderabad.

3. Village-level Digital Images Generated from the Remote Sensing Technology

All States in India can compare their cadastral maps to the digital images generated by the remote sensing technology provided by the National Remote Sensing Centre, Hyderabad. As shown in

¹⁴ Okabe & Bakshi (2016), p. 256. Therefore, we can assume an unofficial village maps that cover structures and buildings falling within the area.

Figure 5 Digital images provided by the National Remote Sensing Centre



Source: National Remote Sensing Centre (2021)

Figure 6 Digital images provided by the Google Earth



Source: Google Earth viewed on March 18, 2021.

Figure 5, its high-resolution image even gives the boundaries of some plots of land. Thus, we can overlay the plots of land in the cadastral map on this remote sensing image. This digital image is an objective criterion derived from outside of the State land revenue administrations. The National Remote Sensing Centre offers this digital image independently of the State land revenue administrations. This digital image is sometimes used by the village *panchayat* for planning activities that implement many of the government schemes, such as the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA).

We can match the plots of land in the cadastral map (Fig. 1) with those appeared in this remote sensing image (Fig. 5) with some accuracy. However, they do not quite tally with each other. Mapping the plots of land for the cadastral map on the GPS-tagged digital image¹⁵ is now a challenge for every State.

The remote sensing image has played only a supplementary role in the construction of the cadastral map. At present, the village boundaries determined by the State land revenue administration are often overlaid on the remote sensing image provided by the National Remote Sensing Centre.

Apart from the National Remote Sensing Centre, Hyderabad, the village-level remote sensing image is provided online by Google Earth (See Fig. 6). It is handy and very useful. It is also available free of

¹⁵ 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).

charge. Usually, the National Remote Sensing Centre provides information, but only for a high price.

Conclusion

We have examined the village-level spatial information that is accessible by the local government. In Tamil Nadu, we had access to the entire cadastral database of a village, which includes the cadastral map and the FMB maps. We can also access village maps without cadastral information, which are based on the State land revenue administration. Further still, we can access the remote sensing images provided by the National Remote Sensing Centre, Hyderabad and obtain similar images from certain Internet services, such as Google Earth. If this village-level spatial information can be digitised onscreen in a Geographical Information System (GIS) and it would be linked to digital land records, another new statistical domain will come into being for the village.

However, we cannot ignore the fact that information on structures and buildings and other physical features on the village cadastral map is often inaccurate and outdated. Accurate official information on the structures and buildings located in the village is also not available.

At this time we did not find it easy for local self-government to access the village cadastral database. Official permission is required to access this spatial information. The village *panchayat* can easily gain access to just the village map, which we can find even in the DCHB. However, that does not have any of the cadastral information. The village *panchayat* can observe the remote sensing image of its jurisdiction, for example, just on a Smartphone. Thus, easy-to-access spatial information is substantially limited now for the village panchayat.

The eleventh schedule of the Constitution (Seventy-Third Amendment) Act of 1992 identifies 29 subjects as a functional domain to be devolved to the *Panchayati Raj Institutions* (PRIs). For example, 'land improvement, implementation of land reforms, land consolidation, and soil conservation' is of these subjects. However, devolution of functions to the PRIs occurs at the discretion of the Legislature of each State. Therefore, the actual functioning of the PRIs in each State differs in many respects. Given these circumstances, it is worthy of attention that the digitalised cadastral database becomes a topic of discussion and debate in all the States in India.

The research question of this paper addressed accessibility of the village-level spatial information. However, its main concern was not the accuracy of such information. Particularly, accuracy of the cadastral database needs to be explored further.

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