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Mapping Of Gram Panchayat / Village Committee Boundary Of Tripura Using Geo-Spatial Technology In 1:4000 Scale

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Abstract: In the state of Tripura, rural resource planning is heading towards web-based geospatial enablement. But, data-gap exists in case of clearly defined boundaries the Gram Panchayat (GP)/ Village Committee (VC) which are the basic planning units. Currently, GP/VC database are available in 1:50000 scale. For large scale mapping GP/VC boundaries were abstracted by the ground staff of Rural Development Department through surveying using Android Mobile Application and later fine-tuned with 30 cm spatial resolution ortho-rectified satellite imagery. Further, GP/VC boundaries were validated in the field by concerned Block Development Officers. The results show that the methodology is well suited for the precise demarcation of the territorial extents in a time-effective manner.

Keywords: Satellite data, GIS, Administrative Boundaries, TSAC, GP/VC, MGNREGA, Developmental, Planning.

1. Introduction:-

Administrative Boundary is a fundamental requirement for administration. Knowing the Boundary of any area in physically and digitally, gives administration to plan as per requirement and execute the plan effectively to the very ground level like Gram Panchayat/ Village Committee level, which empowers administrative authority to monitor the progress and development of any project remotely by using Geo-Spatial technology. The proficiency of an administrative area hugely depends on how well they are planned and how efficiently they are managed. Once the final data layer is ready, hopefully it is very useful for analysis of asset development within a particular administrative area. In this way the other administrative boundaries, like Block Boundary, Sub-Divisional Boundary & District Boundary can be readily available following the basic boundary like Gram Panchayat/Village Council.

GIS technology applies geographical science with tools for understanding and collaboration. It is a system for managing, analyzing, and displaying geographic information and data. Geographic information system (GIS) can be used as a valuable tool for preparation of Geo-Spatial data that incorporates geographical features. With GIS, it is possible to map, model, query and analyze large quantities of data. Whereas, in addressing the precise and meaningful administrative boundary, GIS technology proven to be an integral tool.

2. Requirement of GIS based Administrative Boundary:-

Administrative Boundary means the boundary, as defined in a certificate of approval, for the administration. Every user of geospatial data has experienced the challenge of obtaining, organizing, storing, sharing, and visualizing their data. Acquiring geographic data is an important factor in any geographic information system (GIS) effort. It has been estimated that data acquisition typically 70 to 80 percent of the time and money spent on any given project. Therefore, care must be taken to ensure that GIS projects remain mindful of their stated goals so the collection of Spatial Data precedes an efficient and effective manner as possible.

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is a social security measure that aims to guarantee the right to work. Geospatial layers, including the administrative boundary data for Gram Panchayat or Village Committee (GP/VC), are crucial for implementing and monitoring MGNREGA projects. Here are some general requirements for geospatial layers related to GP/VC boundaries for MGNREGA projects:

1. **Accuracy and Precision:**

The geospatial layer should accurately represent the administrative boundaries of GP/VCs. Precision is essential for planning and implementing MGNREGA projects effectively.

2. **Standardization:**

We need to follow standard geospatial data formats and protocols to ensure interoperability with other systems and datasets. Common formats include Shape files, Geo-JSON, or other open standards

3. **Attribute Information:**

Relevant attribute information such as GP/VC names, unique identifiers, administrative levels, and any other details needed for MGNREGA project management to be included.

4. **Topological Consistency:**

Topological consistency is to prevent errors in data representation. Borders of adjacent GP/VCs should coincide without overlaps or gaps should be ensured.

5. **Temporal Information:**

If administrative boundaries change over time, the geospatial layer should differentiate this temporal information. This is crucial for understanding the historical context and changes in administrative divisions.

6. **Projection and Coordinate System:**

To use an appropriate map projection and coordinate system needs to ensure accurate spatial representation. Consistency in projection is essential for integrating geospatial data from different sources.

7. **Metadata:**

Include metadata that provides information about the source, data creation date, accuracy, and any other relevant details. This metadata is essential for data quality assessment and management.

8. **Scale Considerations:**

The geospatial layer is suitable for the intended scale of analysis. Different scales may be required for various MGNREGA project activities, so the data should be versatile to be ensured.

9. **Accessibility:**

The geospatial layer is easily accessible to relevant stakeholders involved in MGNREGA projects. This may involve setting up appropriate data-sharing mechanisms or platforms to be ensured.

10. **Interoperability:**

The geospatial layer can be easily integrated into existing MGNREGA project management systems and other relevant platforms to be ensured.

11. **Security and Privacy:**

Implementation of appropriate security measures to protect sensitive geospatial data. Ensure that privacy concerns are addressed, especially when dealing with data related to individuals or communities.

12. **Integration with Other Datasets:**

Integration of the GP/VC boundary layer with other relevant geospatial datasets, such as land use, population, and infrastructure layers used to enhance the analysis and planning capabilities for MGNREGA projects.

Adhering to this requirement will contribute to the effective use of geospatial data for MGNREGA projects and improve overall project planning, monitoring, and evaluation processes.

The Pradhan Mantri Awas Yojana (PMAY) is an initiative of the Government of India, which aims for providing affordable housing to the people. Although the scheme was first launched on 25th June 2015, it has been observed that, houses allotted through Pradhan Mantri Awas Yojana (PMAY) are not matching into those concerns Gram Panchayat. That's why updating of GP/VC boundaries is very much essential. In this connection TSAC have been awarded a project namely "Finalization of GP/VC Boundary uses Geo-spatial Technology under MGNREGA" by the Rural Development Department, Government of Tripura. In PM-Gatishakti project, association of administrative boundaries along with line department database makes planner a readymade platform for their effective planning.

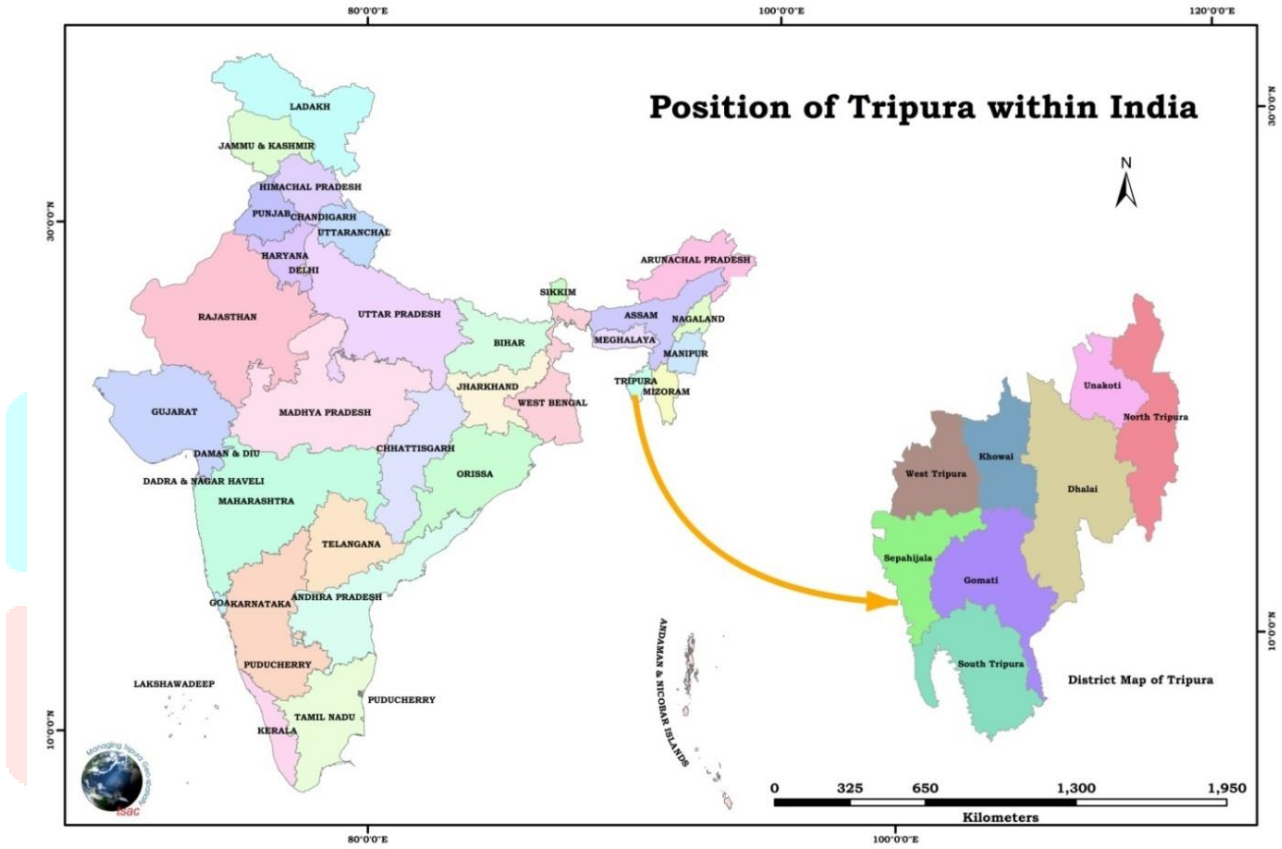


Figure 1. Map Showing Position of Tripura within Indian Boundary.

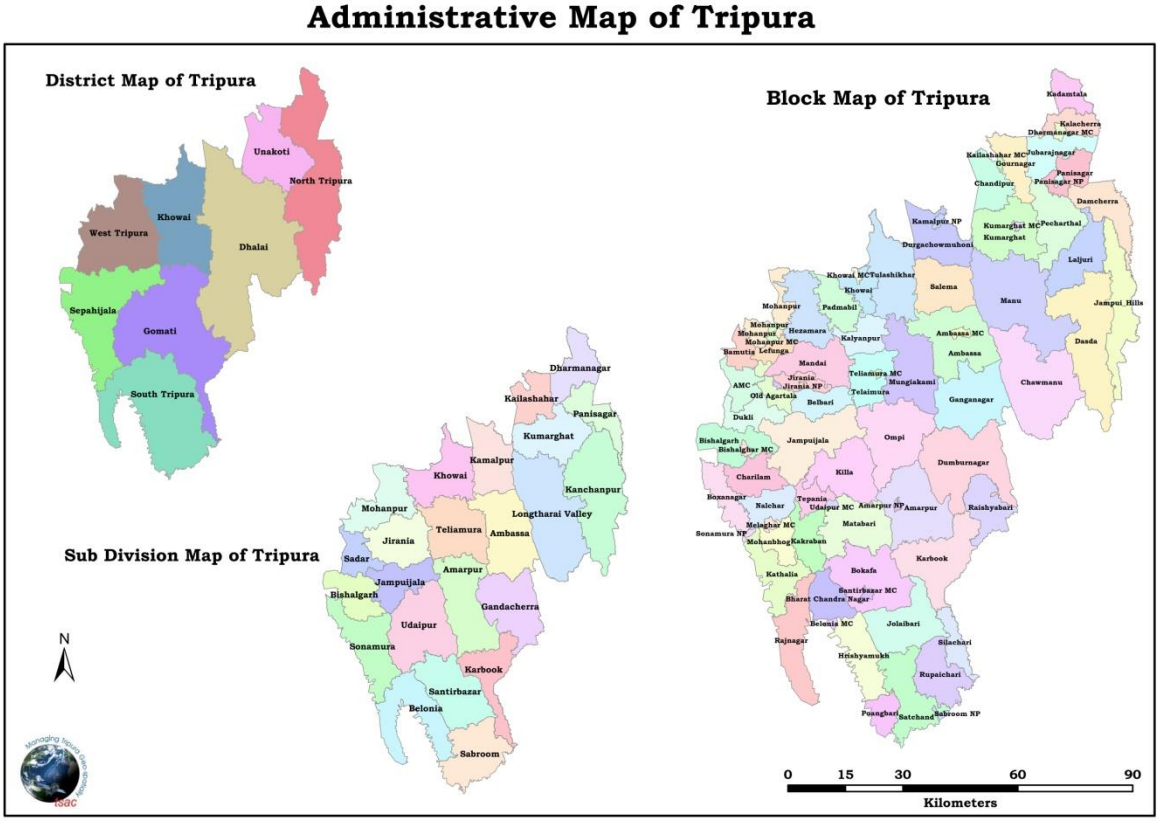


Figure 2. Map Showing Administrative detail of the Tripura.

2. Data Used & Methodology:-

The spatial data layer modification has been initiated with the old dataset, available at TSAC in 1:50,000 scale. Later on, the actual boundary has been rectified following the geo-tagged survey data captured by Rural Development Department, Government of Tripura. However, two (2) sets of data were used in the present study viz. ortho rectified High Resolution Satellite imagery (30 cm), Geo-tagged Vector Layer (.kml format) depicting panchayat boundary of the state Tripura.

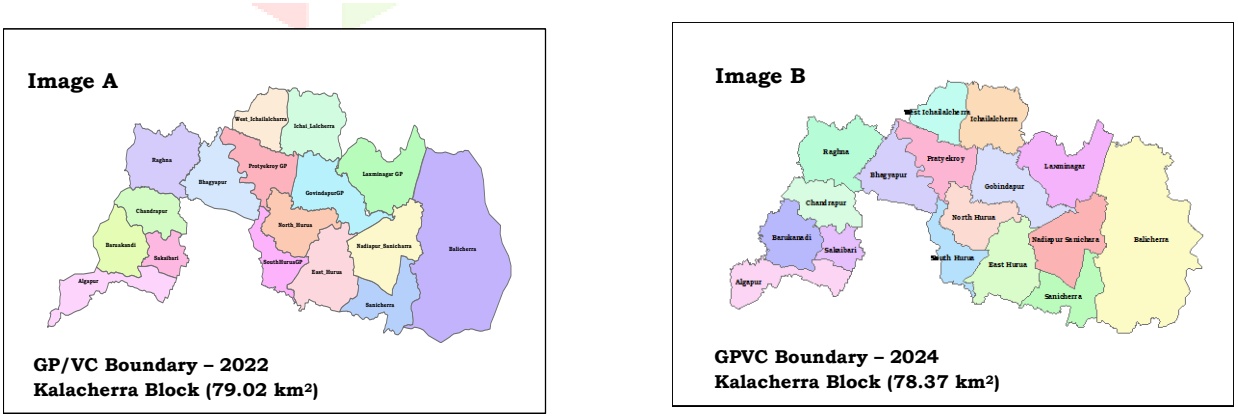


Figure 3. Image A, shows the geo-tagged survey data prepared by the RD Department, Tripura & Image B, shows the rectified final dataset of the GP/VC Boundary of Tripura by TSAC.

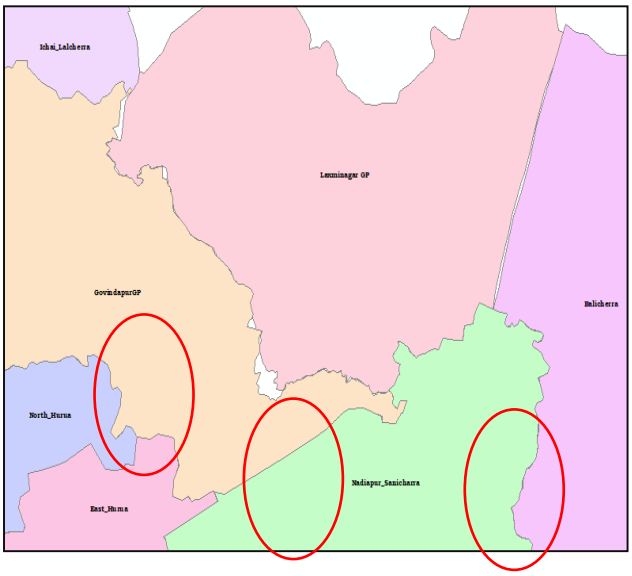


Figure 4(a). Survey Data by RD Department

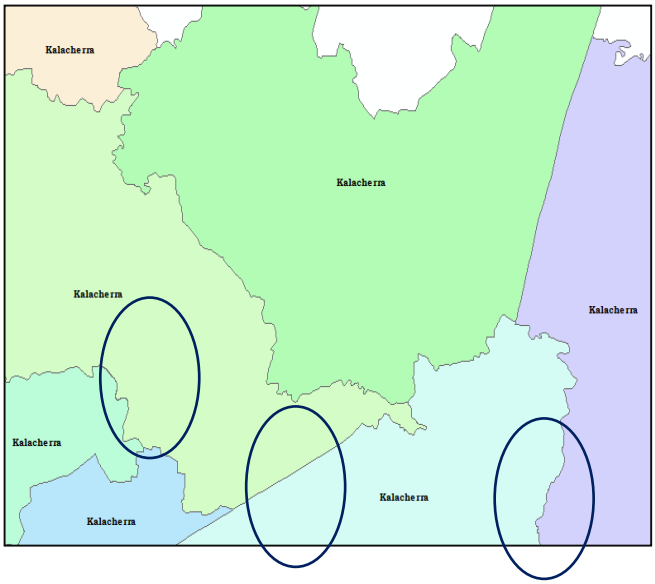


Figure 4(b). Final Rectified Data by TSAC

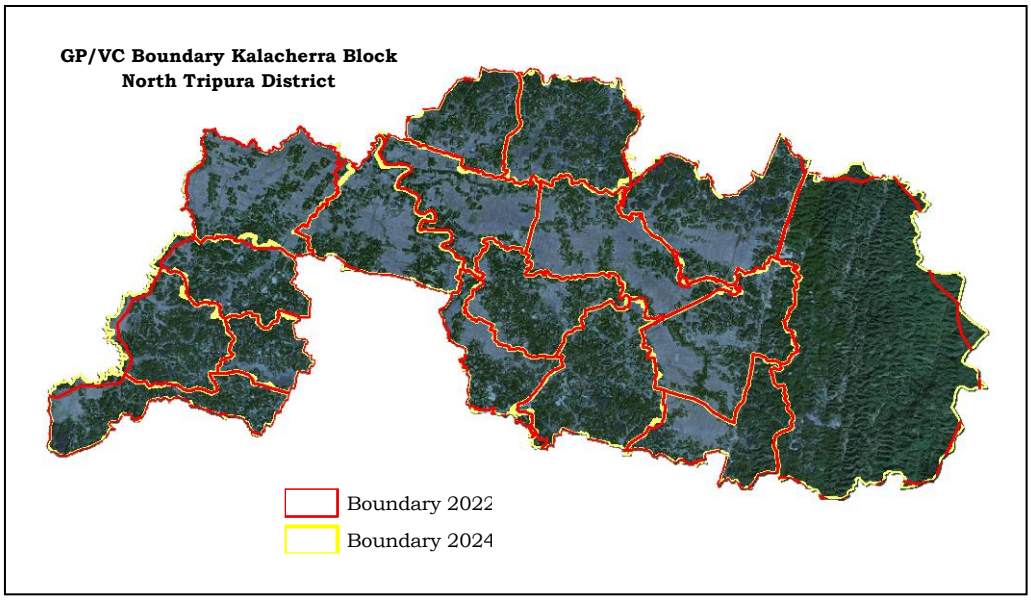


Figure 5. Rectified GP/VC Boundary overlaid on HRSI.

The boundary (2022) in a .kml file format received from the Rural Development Department; Government of Tripura has some distortions **(as shown in Figure 4[a])** like overlapping, gapping etc. with respect to ground surface that caused the total geographical area. Therefore, the vector layer has been overlaid on high resolution satellite image (30cm) to rectify **(as shown in Figure 4[b])** the presence of any shifts with respect to geo-tagged field

verifications which has been carried out by the block level field officials.

For the development of geospatial database for the state of Tripura, professional GIS software has been used. TSAC is the state nodal centre for Geo-spatial technology and uses professional software such as Arc-GIS. The Arc-GIS software provides all up-to date facility. A base map can be prepared with the help of spatial data like high resolution satellite images, GPS locations as well as non-spatial data under the GIS environment. Similarly, Tripura Space Applications Centre uses the same concept for finalization of Gram Panchayat/Village Council database. However a brief methodology is demonstrated step-by-step;

i. Tripura Space Applications Centre provided training to the field officials of Rural Development Department, Government of Tripura for collection of field data.

ii. Field level officials visited the field with their representative from a Panchayat, including another representative from a neighboring Panchayat.

iii. Field officials from R.D Department have collected co-ordinates through GP/VC Boundary wise. They are free to write their comments on remarks column, if they wish to enter landmarks regarding a particular point. There is no duplication of data in case of a joint survey.

iv. Rural Development Department allowed to share field data in an excel sheet as well as in KML file format, prepared using Google Earth.

v. Field data is recorded in an Excel sheet as per the format provided by the TSAC. Otherwise, officials may use suitable application prescribed by the TSAC to collect field data and download same and send it to TSAC.

vi. TSAC has created Geo-spatial data layers following the field data received, for each GP/VC.

vii. Geo-spatial data layers have been finalized once survey for all GP/VC of a Block is completed. If there is a gap/overlap of boundary, TSAC has informed to the R.D Department for further survey. A representative from TSAC visited the field when & where required.

viii. A joint visit with R.D. Department to all the Block Head Quarters (HQ) for training to B.D.O and their technical team with methodology to overlap prepared GP/VC Boundary using Google image. So that, the technical team may verify their work and authenticate the boundary.

ix. Technical team from block office further verified the GP/VC boundary of their concern block, following the notification file, shared with the Block Development Officer (BDO).

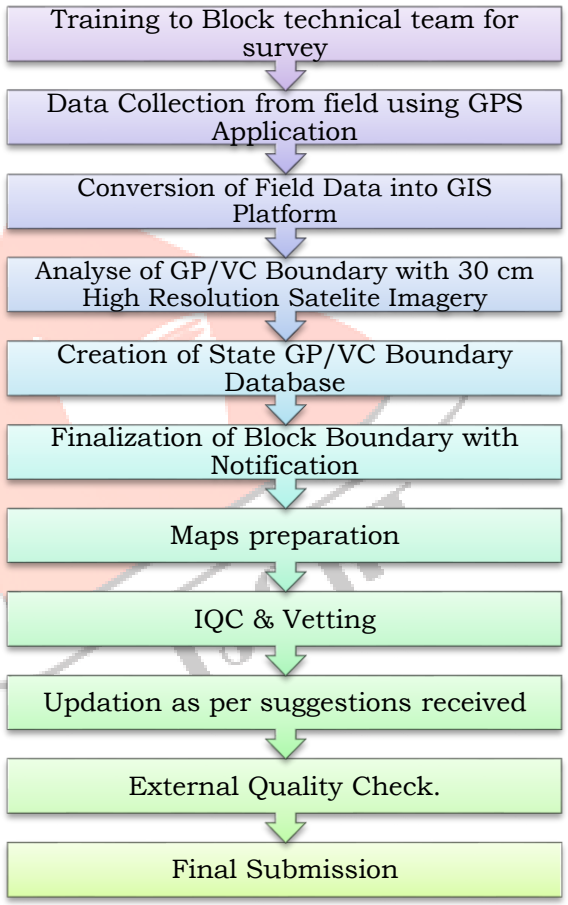


Figure 6. Methodology for generation of Panchayat & Village Layer.

x. Based on the report received from the Block Development Officer (BDO), TSAC has modified GP/VC Boundary layer. And the quality of the prepared Geo-spatial database for every block has been checked by the Internal Quality Checker Team (IQC) of TSAC.

xi. Further, a draft copy of Block Notification report along with IQC (Internal Quality

Check) report, Block Boundary Map, and Block Geo-statistics Report has been shared to R.D. Department for vetting.

xii. Upon vetting, Tripura Space Applications Centre built topology for the GP/VC spatial layer after completion of the rectification based on the modified reports from concern Block officers.

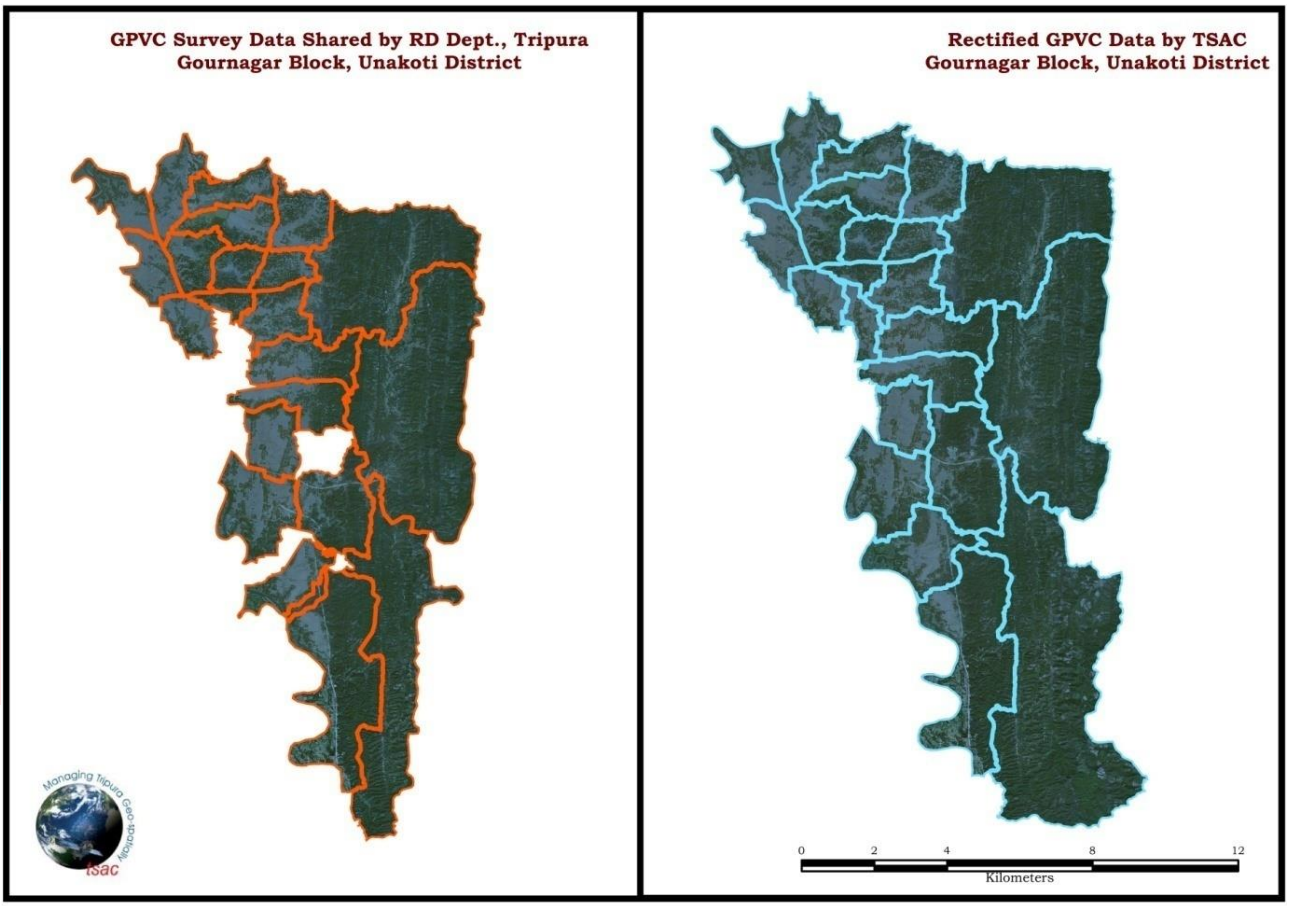
xiii. External Quality Checking (EQC) of spatial data was done by National Institute of Technology, Agartala.

xiv. Boundaries of GP/VC have been edited as per the External Quality Checker's (EQC) recommendation.

xv. Upon finalization the GP/VC Boundary, a final map has been created and sent to the authority of R.D Department for their views/opinion.

xvi. Final GP/VC Boundary has been handed over to the R.D Department in shape file & KML file formats.

xvii. After finalization of the Gram Panchayat & Village Council boundaries, TSAC finalized all administration boundaries of Tripura.



(a) (b)

Figure 7. a. Survey Data Layer received from RD Department.
b. Updated Data Layer by TSAC.

3. External Quality Checking (EQC):-

External Quality Checking was completed by the National Institute of Technology, Agartala. Dr. Partha Pratim Sarkar, Associate Professor, Civil Engineering Department and Dr. Mrinmoy Majumder, Assistant Professor, Civil Engineering Department was associated in the EQC process and the report submitted by them.

4. Final Outcome:-

The work deals with Geo-spatial database Development of Administrative Boundary like Gram Panchayat (GP)/ Village Council (VC) for the state of Tripura. After this project is completed, various benefits can be obtained from this project:

i. It will become an asset for the state of Tripura.

ii. All Departments of State Government may use the same for their planning and implementation of project/ scheme.

iii. Other Administrative Boundaries like Block, Sub-Divisions, and District Boundary may prepare using GP/VC Boundary following government notifications.

5. Future Prospect:-

i. **Administrative Clarity**: Clearly defined boundaries help in establishing administrative jurisdictions. This clarity is essential for government officials to know the areas they are responsible for, enabling better and more efficient delivery of services.

ii. **Planning and Development:** With finalized boundaries, local governments can create more effective development plans tailored to the needs of specific areas. This promotes sustainable development and enhances the overall quality of life for residents.

iii. **Administrative Efficiency:** Well-defined boundaries make the administration more efficient. Local government officials can better manage and coordinate activities within their jurisdiction when they have a clear understanding of the area they are responsible for.

iv. **Local Governance:** Local self-governance bodies, such as Gram Panchayats, rely on defined boundaries to carry out their functions. It ensures that they have a specific constituency to serve, allowing for focused and targeted development initiatives.

v. **Dispute Resolution:** Clearly demarcated boundaries can help prevent and resolve disputes related to land use, resources, and jurisdiction. This, in turn, contributes to maintaining peace and order within the community.

vi. **Resource Allocation:** Once boundaries are finalized, it becomes easier to allocate resources effectively. This includes distribution of funds, infrastructure development, and provision of essential services based on the specific needs and demographics of each area.

vii. **Service Delivery:** Well-defined boundaries enable local authorities to provide public services more effectively. It ensures that the services reach the intended beneficiaries without ambiguity or overlap.

In summary, boundary finalization is not just a bureaucratic process; it's a foundational step that enables efficient and effective governance at the grassroots level. It forms the basis for all subsequent planning, resource allocation, and service delivery.

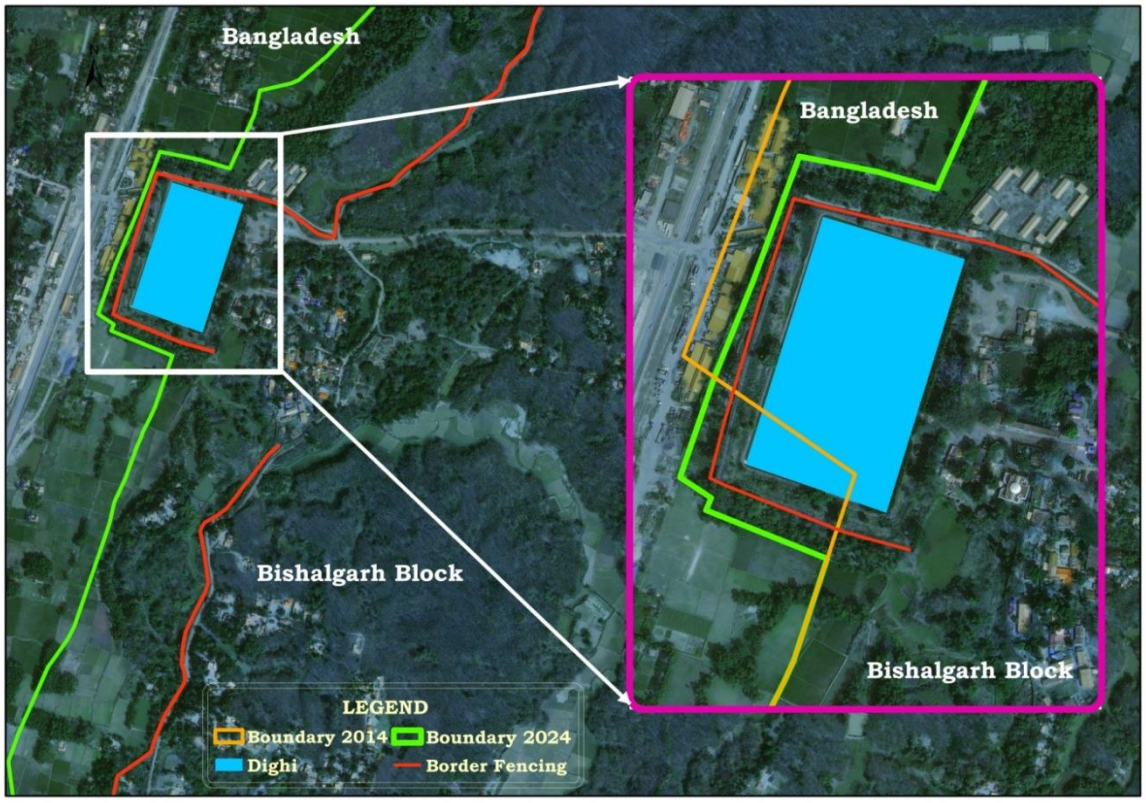


Figure 7. Green color line Shows Rectified Boundary (2024) according to physical feature using High Resolution Satellite Imagery & Orange color line shows old boundary (2014) which was demarcated earlier that crosses the natural feature (Dighi/Pond) in between. Red Color line Shows Border fencing line of Government of India, in its territory.

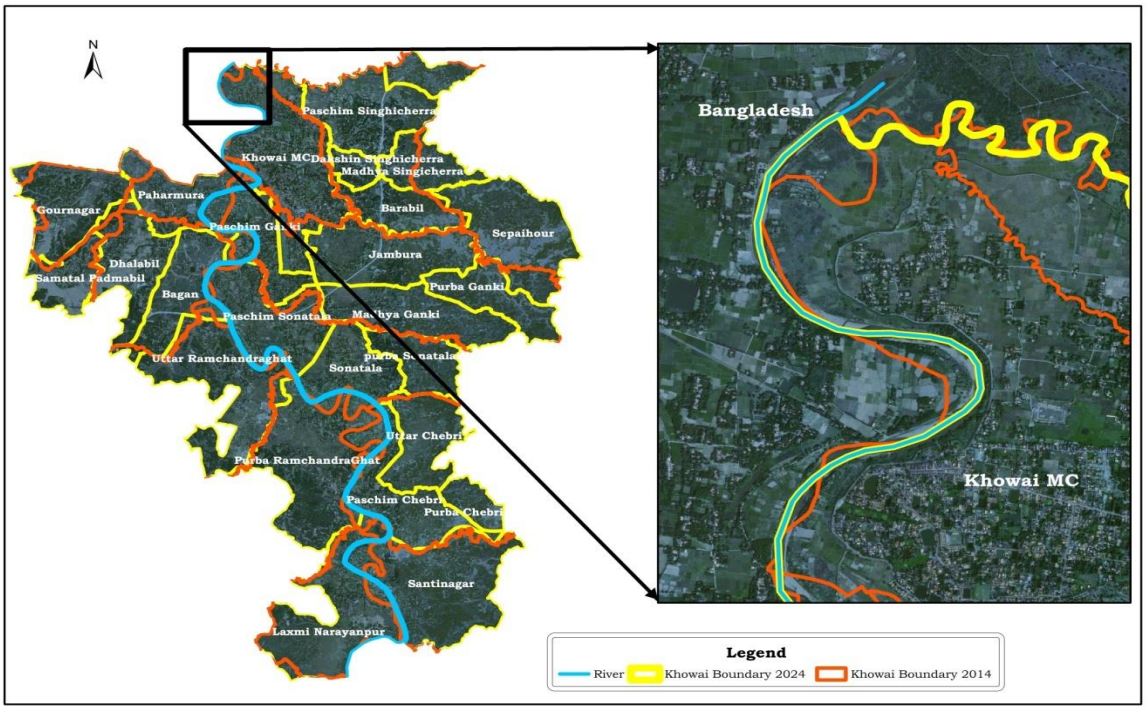


Figure 8. Yellow color line shows rectified Boundary (2024) according to physical feature that has been enhanced by TSAC using High Resolution Satellite Imagery whereas Orange color line (2014) shows old boundary which was demarcated earlier under Khowai Block.

6. References:-

a) Ministry of Rural Development, Government of India. (2021). "MGNREGA Operational Guidelines." Retrieved from [https://rural.nic.in/en/sanctionorders/department-rural-development/nrega]

b) Baiocchi, V., and Lelo, K., 2005. Georeferencing the Historical Maps of Rome between the Seventeenth and Eighteenth Centuries. CIPA 2005 XX International Symposium. Torino, Italy.

c) Bitelli, G., and Gatta, G., 2011. Experiences on georeferencing of maps from the XIX century Gregorian Cadastre of Bologna (Italy). e-Perimetron, 6 (4), 270-275.

d) Boutoura, C., and Livieratos, E., 2006. Some fundamentals for the study of the geometry of early maps by comparative methods. e-Perimetron, 1 (1), 60-70.

e) Brovelli, M. A., and Minghini, M., 2012. Georeferencing old maps: a polynomial-based approach for Como historical cadastres. e-Perimeter on, 7 (3), 97-110.

f) Krishna Murthy, Y.V.N., 2010. A Statewide Land Information System for Natural Resource Management and Disaster Mitigation: Scope for Land Administration. In K. Deininger, C. Augustinus, S. Enemark, & P. Munro-Faure (Eds.), Innovations in Land Rights Recognition, Administration, and Governance, The World Bank, pp. 83-95.

g) Ministry of Rural Development, Government of India. (2021). "MGNREGA GPVC Survey data." Retrieved from

http://mnregaweb4.nic.in/netnrega/GISEnablePanchayat_report.aspx?page=S&lflag=eng&state_name=TRIPURA&state_code=30&fin_year=2019-2020&source=national&Digest=LWQs/vDLsS/Rk2VMCo4Bmg

h) Panchayet Dept. Government of Tripura."Tripura GPVC LGD Code & GPVC Master Table" https://panchayat.tripura.gov.in/gram-panchayats

i) Directorate of Information Technology, Government of Tripura" Tripura LGD code hardcopy"

j) Ministry of Rural Development, Government of India "Tripura Habitation Data".

7. Acknowledgements:-

a) Survey of India, Government of India.

b) Rural Development Department, Government of Tripura.

c) Directorate of Information Technology, Government of Tripura.

d) Panchayat Department, Government of Tripura.

e) Tribal Welfare Department, Government of Tripura.

f) Department of Science, Technology and Environment, Government of Tripura.