

Memorandum of Understanding

FOR

Use of Geo Informatics in Rural Road Projects under PMGSY

between

National Remote Sensing Centre
Indian Space Research Organisation
Dept. of Space, Govt. of India,
Hyderabad – 500 037.

and

Registrar
Birla Institute of Technology
Mesra, Ranchi - 835215
(Name of the authorized signatory and address)

Signed on this day 31st of July Month, Year 2019


Deputy Director

National Remote Sensing Centre



Registrar

Birla Institute of Technology, Mesra

1. PREAMBLE

In the entire spectrum of human settlements, Village is an important habitat. An insight of the rural development scenario reveals that, although we are in an era of urbanization, 2/3rd of country's population is still living in rural areas. Rural road connectivity is a vital component of rural development since it promotes access to economic and social services to rural areas thereby expands market for rural products (e.g. agricultural produce, cottage industry etc.), communication, access to health and education services as well as employment, and as whole rural growth opportunities. To tackle important issue of Rural Road connectivity, Government of India launched the **Pradhan Mantri Gram Sadak Yojana (PMGSY)** on 25th December, 2000a fully funded Centrally Sponsored Scheme under the Ministry of Rural Development (MoRD) to provide **all weather road connectivity in rural areas of the country**. In this programme all 'eligible' unconnected habitations that have a) A population of 500 people and above in plain areas; b) A population of 250 people and above in special category states, Schedule V Tribal Areas, Desert areas (as identified under Desert Development Programme) and in selected Tribal and Backward Districts (as identified by the Ministry of Home Affairs) will be connected.

Under PMGSY, till date more than 4.90 lakh Kilometer (Km) rural roads are constructed / upgraded. It is estimated that approximately 2.50 lakh Km length roads would be added in the next 2-3 years under the programme. It is a great challenge to manage such a gigantic activity using traditional methods, which is not only tedious and time consuming but also difficult to ensure timely retrieval of the desired information. To overcome these difficulties, it was felt that the use of Geo Informatics would help in effective planning, decision making and monitoring of PMGSY scheme.



An attempt was made to create spatial database on rural roads in the year 1999 on a pilot basis for Ichoda Mandal in Adilabad district, Telangana State. Subsequently, the study was extended to the districts of Jhalawar, Baran and Dhaulpur in Rajasthan on operational for MoRD, Gol in the year 2001.

MoRD was planning to use geospatial technologies in rural road projects under PMGSY for entire country based on the success of the pilot studies. Towards this a tripartite agreement was entered on 07th March, 2017 among i) National Rural Development Agency (NRRDA), MoRD, New Delhi ii) National Remote Sensing Centre (NRSC), Indian Space Research Organization (ISRO), Dept. of Space, Hyderabad iii) Centre for Geo-Informatics Application in Rural Development (CGARD), National Institute of Rural Development & Panchayati Raj (NIRD&PR), Hyderabad.

2. PARTIES

2.1 Indenting party:

National Remote Sensing Centre, Indian Space Research Organization (ISRO) under Dept. of Space, Govt. of India, Balanagar, Hyderabad hereinafter called as NRSC.

2.2 Executing party:

Department of Remote Sensing, BIT, Mesra, Ranchi (Name of the Partner Institution - PI) Represented by Dr. A. P. Krishna with its office located at: Birla Institute of Technology,
Area / Locality: Mesra
City: Ranchi; State: JHARKHAND; Pincode : 835215



3. AUTHORISED SIGNATORIES

3.1 For and on behalf of Indenting party (NRSC):

Deputy Director, RSA,
NRSC, ISRO, Department of Space, Govt. of India,
Balanagar, Hyderabad - 500 037, Telangana.

3.2 For and on behalf of Executing Party(PI):

Designation and Address: Registrar
Birla Institute of Technology
Mesra, Ranchi - 835215, JHARKHAND

4. FUNCTIONARIES AND CONTACT ADDRESS, PHONE, EMAIL, ETC

4.1 NRSC:

| Sl. No | Name | Contact Address | Phone | Email |
|--------|----------------------|--|-----------------------|---------------------------------|
| 1. | Dr. Manoj Raj Saxena | Scientist - SG Land Use & Cover Monitoring Division, RSA NRSC/ISRO, Dept. of Space, Govt. of India, Balanagar, Hyderabad - 500 037 | +91 40- 2388- 4239 | manojraj_saxena@n rsc.gov.in |
| 2. | Shri. Rajiv Kumar | Scientist - SG Land Use & Cover Monitoring Division, RSA NRSC/ISRO, Dept. of Space, Govt. of India, Balanagar, Hyderabad - 500 037 | +91 402388 4532 | rajiv_kumar@nrsc.g ov. in |



| Sl.No | Name | Contact Address | Phone | Email |
|-------|-----------------------------|---|-----------------------|--------------------------------|
| 3. | Shri. J.Chandra Mohan | Scientist - SE Land Use & Cover Monitoring Division, RSA NRSC/ISRO, Dept. of Space, Govt. of India, Balanagar, Hyderabad - 500 037 | +91 40- 2388- 4603 | chandramohan_j@nrs c.gov.in |
| 4. | Shri. Arulraj | Scientist - SF Head, Bhuvan Web Services Development Division, NRSC/ISRO, Dept. of Space, Govt. of India, Balanagar, Hyderabad - 500 037 | +91 08542- 225454 | arulraj_m@nrsc.gov.i n |

4.2 Partner Institution

| Sl. No | Name | Contact Address | Phone | Email |
|--------|---|---|--------------------------|--------------------------------|
| 1. | Dr. A. P. Krishna Professor | Department of Remote Sensing, Birla Institute of Technology Mesra, Ranchi | 9431100447 | apkrishna@bitmesra. ac.in |
| 2. | Dr. C. Jeganathan Professor | Department of Remote Sensing, Birla Institute of Technology Mesra, Ranchi | 8979630041 7763859236 | jeganathanc@bitmes ra.ac.in |
| 3. | Dr. V. S. Rathore Assistant Professor | Department of Remote Sensing, Birla Institute of Technology Mesra, Ranchi | 9431382641 | vsrathore@bitmesra. ac.in |
| 4. | Mr. Nitish Kumar Sinha System Analyst | Department of Remote Sensing, Birla Institute of Technology Mesra, Ranchi | 9470368588 9955002266 | nitish@bitmesra.ac.i n |




5. EFFECTIVE DATE AND DURATION

5.1 Commencement: This MOU will come into effect from the date of transferring the funds.

5.2 Date of Signing: This MoU is signed on this day 31st of July
(Month), 2019.

5.3 Duration: This MOU will be valid from the details mentioned in section 5.1 with the ending date on **March 31, 2020**, subject to the extension of tripartite agreement entered among NRRDA, NRSC and NIRD&PR.

6. SCOPE OF WORK

The scope of work under this project include determining rural road connectivity status in terms of length as per the inputs provided by National Rural Road Development Agency (NRRDA), MoRD, generating spatial database on road connectivity with respect to habitations connected as on date, facilitating monitoring for ongoing roads under PMGSY etc.

7. METHODOLOGY

The Online Management, Monitoring and Accounting System (OMMAS) Non spatial data will form the input data. Keeping Core Network ID from OMMAS as reference, road network will be delineated using high resolution ortho-rectified Satellite data. Start & end point names of the road segments will be entered in attribute data of this shape file. The road length thus arrived will be compared with the corresponding length in OMMAS data. Corrections will be carried out with random sample ground checks (about 40%) to improve accuracy of mapped road segments.



8. DELIVERABLES AND GUIDELINES ON DATA / MAP SECURITY

8.1 Deliverables

- Road layer delineated as shape file using OMMAS and satellite data.
- Road length statistics as per the format specified.
- District and state level report.
- Geo-tagged ground truth photographs.

Birla Institute of Technology (name of the partner Institution) will take action to provide overall security as per applicable law or as may be required to all parts of the Project during the operation phase. The data shall be utilized for the bonafide official purposes only.

9. PROJECT SPECIFICATIONS

Parameter and Values for thematic / GIS Database and output for 1:10,000 Scale

| A] | Thematic / Cartographic mapping standards | |
|----|---|-------------------|
| | Map Projection | Albers Equal Area |
| | Datum | WGS84 |
| | Position (Planimetric) Accuracy in meter | 15 |
| | Accuracy of Length measurement | 5-10% |
| | | |
| B] | GIS Database Standards | |
| | Spatial Framework | Seamless |
| | Coordinate units for precision | Meters |
| | Projection | Albers Equal Area |
| | Datum | WGS 84 |
| | Position (Planimetric) Accuracy in meter | 15 |



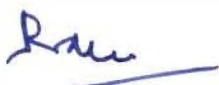
10. APPLICABLE DOCUMENTS

Product Realization Plan (Technical Manual) will be prepared by NRSC to enable guidance to the participating scientists in the projects.

11. RESPONSIBILITIES OF EACH PARTY

11.1 Responsibilities of NRSC

1. Will make available the high resolution ortho-rectified satellite data in phased manner to cover the entire study area.
2. Provide project realization plan (technical manual) and orientation training for project staff.
3. Provide the cost for satellite data interpretation, ground data collection, IQC/EQC and final geo-database generation, supervise the implementation, project review and evaluation from time to time.
4. Obtain progress reports, monitoring and evaluation reports etc. and give suitable directions for project implementation.
5. The funds for execution of the project will be released in THREE installments based on the progress of the work, subject to as and when MoRD releases funds to NRSC.
 - a) The first installment amounting to 40 % of project cost would be released upon receiving the signed MoU for project execution;
 - b) The second installment (40 %) of the project cost will be released on receipt of Utilization Certificate for the amount released as first installment and on satisfactory progress of the project work.



- c) The third installment will be released after submission of project deliverables and utilization certificate for the amount released during second installment.

11.2 Responsibilities of the Partner Institution

1. The partner institution (PI) will nominate a Project Manager who will be the focal point for interaction with NRSC during the course of the project. The project manager will be changed only with the consent of NRSC.
2. Identify a separate team for executing the project along with a project manager. The team members should have specialization related to the project theme.
3. The work should be executed strictly following the technical manual and maintaining high quality standards, which will be checked and certified by the internal quality team exclusively identified by the PI for quality assurance. Prior to final submission of outputs to NRSC, approval of external quality assurance team as identified by NRSC is to be obtained. The QC reports given by internal as well as external teams have to be submitted to NRSC along with the final outputs.
4. Any inaccuracies noticed during quality inspection will have to be corrected to the satisfaction of the functionaries from NRSC (as mentioned at 4.1) / Project Quality Assurance Team without any additional cost.
5. Provide monthly progress report in the prescribed format has to be submitted to the respective functionaries at NRSC, in the first week of the following month.
6. Utilization Certificate before the release of the installments. A consolidated Utilization Certificate for the total fund received has to be sent to NRSC.



7. NRSC at his discretion will conduct review of the project activities at NRSC / working place of the Dept. /Organization / University and also carry out field inspection if required. Review will be done by authorized representative(s) from NRSC at such intervals as deemed necessary for which the Dept./Organization/University should provide the transport and necessary facilities.
8. All the deliverables as specified in Clause 8.1 need to be submitted to NRSC, in the prescribed format.
9. The outputs produced by the Dept./Organization/University will be the property of NRSC (ISRO) /DOS and the property / intellectual right vests with ISRO / DOS. The partner institution shall *necessarily take prior permission before sharing the data to any agency and also duly acknowledge NRSC /DOS while publishing.*
10. The Project Manager is wholly responsible for smooth implementation of the project. In the event if Project Manager is not able to complete the project for what so ever reason, the institution should nominate another person as project manager and arrange for proper handing over and carrying out the unaccomplished project work for smooth functioning of the project.

12. PROJECT SCHEDULE

The detailed schedule for each of the project is given in Annexure -1

13. SCHEDULE OF PRICES

The total cost for carrying out the project will be communicated separately.

14. SCHEDULE OF INSTALLATION, SUPPLY AND ACCEPTANCE TEST

- 14.1 The deliverables are to be supplied upon completion of all process steps as mentioned under Clause-7 (Methodology).



14.2 The schedule delivery period for final data need to be strictly adhered to (as per clause 5.3)

14.3 The responsibility of data accuracy checks and acceptance of the deliverables lies with NRSC.

15. CONSIDERATION

15.1 As per mutually agreed terms and conditions

16. FUNDING & TERMS AND CONDITIONS OF PAYMENT

16.1 *Funding:*

The entire project cost will funded by NRSC, Hyderabad.

16.2 *Terms and conditions of payment :*

As mentioned in Sl.No.5 of section 11.1

17. TRAINING

Orientation training program will be provided by NRSC, schedules of which will be communicated to the participating PIs.

18. WARRANTY

18.1 The contents or the information provided by the PI's to be true and realistic along with supporting ground information.

18.2 PI to guarantee the accuracy and specifications as mentioned under Clause-9 (specifications).



18.3 If any errors are brought out by the Quality team of NRSC within the project duration, the same shall be rectified by PI, if the errors are beyond the specifications.

19. PROJECT MONITORING

Partner Institution will establish a mechanism to monitor the progress under the project and will report to NRSC / ISRO on monthly basis. NRSC/ISRO will carry out periodic review of the progress of work.

20. CONFIDENTIALITY

During the tenure of the MOU and thereafter both Partners undertake on their behalf and on behalf of their employees / representatives / associates to maintain strict confidentiality and prevent disclosure thereof, of all the information and data exchanged/ generated pertaining to work under this agreement. The Parties will not use the information for any purpose other than in accordance with this agreement without the prior written consent of the other party.

However, following additional clauses regarding confidentiality of information needs to be taken into consideration:

“All Confidential Information shall remain the exclusive property of the disclosing Party. The Parties agree that this MoU and the disclosure of the Confidentiality Information do not grant or imply any license, interest or right to the recipient in respect to any intellectual property right of the other Party.

Unpublished information, whatever oral, in writing or otherwise, discovered or conceived by the scientists or technicians and exchanged under the provisions of this MoU will not be transmitted to a third party.



21. INTELLECTUAL PROPERTY RIGHTS

Partner Institution shall have to consult NRSC to commercially exploit / use the intellectual property generated in the Projects. In such an event, the fee and royalty and other terms and conditions for the commercial exploitation / use of the said intellectual property created in the project shall be decided by NRSC, ISRO for which a separate agreement shall be entered into.

During the work envisaged under the agreement in the event of NRSC, ISRO Scientists exploring, inventing or discovering results other than the specific objectives of the project, NRSC, ISRO and Birla Institute of Technology (name of the Partner Institution) shall retain absolute rights on such results.

Following clauses needs to be followed regarding protection and ownership of IP:

“Each Party will ensure appropriate protection of Intellectual Property Rights generated from cooperation pursuant to MoU, consistent with laws, rules and regulations of India (as both Parties are Indian).

In case of research obtained through joint activities, the grant of intellectual property rights will be sought by both the Parties jointly and once granted these rights will jointly owned by the Parties.”

22. CHANGE IN SCOPE OF WORK

No amendment or modification of this agreement shall be valid unless the same is made in writing by both parties and their otherwise representatives and specifically stating the same to be amendment of this



agreement. The modification/changes shall be effective from the date on which they are made / executed, unless otherwise agreed to.

23. PUBLICATION & COMMERCIALIZATION

“Any publication, document and/or paper arising out of work conducted by the Parties pursuant to this MoU will be jointly owned. The use of the name, logo and/or official emblem of the Parties on any publication, document and /or paper will require prior permission of both the Parties. It may however be ensured the official to emblem and logo is not misused.

In case of research results obtained through joint activities under this MoU both Parties will apply as co-applicants for the protection of Intellectual property rights subject to the exclusive rights of both the Parties to commercialize the technology in India. Commercialization in any other country shall be done jointly through a separate agreement.”

24. MODIFICATIONS TO MOU

Any further modifications to this MoU, if required, would be through amendments with mutual consent.

Furthermore, Provisions of transaction of business rules needs to be followed. Also, in case of additional agreements on IPR related issues DIPP should be consulted.

25. FORCE MAJEURE

Neither party shall be held responsible for non-fulfillment of their respective obligation under the agreement due to the exigency of one or more of the unforeseen events such as but not limited to Acts of God, war, flood, earthquake, strike, lockouts, epidemics, riots, civil commotion etc. provided on the occurrence and cessation of any such events, the party affected thereby shall give a notice in writing to other party within



one month of such occurrence or cessation. If the force-majeure conditions continue beyond six months, the parties shall then mutually decide about the future course of action.

26. INDEMNITY

Birla Institute of Technology (name of the Partner Institution) shall exercise reasonable skill, care and diligence in the performance of the contract and indemnify and keep indemnified NRSC/ISRO in respect of any loss, damage or claim howsoever arising out of or related to breach of contract, statutory duty or negligence by employees, agents or sub-contractors in relation to the performance or otherwise of the services to be provided under this contract.

27. DISPUTE RESOLUTION

26.1 In the event of any dispute or difference between the parties hereto, such disputes or differences shall be resolved amicably by mutual consultation. If such resolution is not possible, then unresolved disputes or differences will be resolved as per latest rules of Government of India on the subject.

26.2 Pending the submission of and/or decision on a dispute, the Parties shall continue to perform all of their obligations under this MOU without prejudice to final decision in regard to dispute.

28. Pending the submission of and / or decision on a dispute, difference or claim or until the arbitral award is published; the parties shall continue to perform all of their obligations under this Contract without prejudice to a final adjustment in accordance with such award.

29. Jurisdiction

Any dispute arising out of the MOU or the terms shall be subject to the exclusive jurisdiction of **Hyderabad** only.



30. Termination: (for Cause, Convenience, and Force Majeure)

During the tenure of the agreement, either Party may terminate and nullify this Agreement/MOU by providing prior written notice of 30days to the other party for any of the reasons - Cause/convenience/Force Majeure.

29.1 Termination for Convenience: For convenience without assigning any reason.

29.2 Termination for Cause: For the breach of any obligations/responsibilities/conditions of this agreement by the other party, with an opportunity to cure/rectify such a situation within thirty (30) days to the defaulting party and no remedial action is taken to the satisfaction of the aggrieved party.

29.3 Termination for Force Majeure: in the event of "Force Majeure" as defined in clause #25.0

29.4 Obligations upon Termination

Following termination or expiration of this Agreement, in addition to any other obligations existing hereunder or otherwise at law or in equity:

- a) The rights and obligations of the parties thereto shall be settled by mutual discussion; the financial settlement if any shall take into consideration not only the expenditure incurred but also the expenditure committed by the parties hereto.
- b) The agreement arrived at between the parties hereto for the utilization of the intellectual property (defined in clause #22.0) shall survive the termination of the agreement



SEAL OF PARTIES

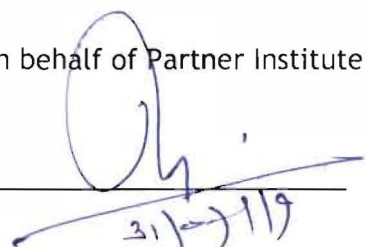
In witness whereof the parties hereto have signed this agreement on the day, month and year mentioned hereinbefore.

THE PARTIES HAVE EXECUTED THIS MEMORANDUM OF UNDERSTANDING (MOU) IN DUPLICATE ON THIS DAY OF 31 July 2019 IN THE PRESENCE OF WITNESS INDICATED.

Parties

For and on behalf of Partner Institute

Signature



Name

Dr. A. P. Krishna,
**Birla Institute of Technology
Mesra, Ranchi**

Seal



Witnesses: (Name & Address)

1. Dr. C. Jeyaraman
Dept. of Rem. Sensing
BIT, Mesra
(31/7/19)
2. Mrs. Nitish Kumar Sinha
Dept. of Remote Sensing
B.I.T. Mesra
Ranchi
(31/7/19)

Date: 31st July 2019

For and on behalf of PARTY

For and on behalf of NRSC, ISRO,

Signature



Name

RAO
Deputy Director, Remote Sensing Area
राष्ट्रीय सुदूर संवेदन केंद्र (National Remote Sensing Centre),
इसरो, अंतरिक्ष विभाग, भारत सरकार
ISRO, Dept. of Space, Govt. of India
बालानगर, हैदराबाद, तेलंगाना
Balanagar, Hyderabad-500 127 T.S.

Seal

Witnesses (Name & Address)

1. [Signature]
2. [Signature]
(RAJIV KUMAR)
Sci 'SG'
LUCMO, RSA, NRSC
Hyderabad

Date: _____

Use of Geo Informatics in Rural Road Projects Under PMGSY - Time Schedule

| S.No. | Activity | Month |
|-------|--|-----------------------|
| 01 | Signing of MoUs – Release of First installment of project fund | Jul, 2019 |
| 02 | Hands on training | Jul, 2019 |
| 03 | Delineation of Road information & IQC | Aug, 2019 – Feb, 2020 |
| 04 | Ground Truth | Aug – Dec 2019 |
| 05 | Post field interpretation, IQC & External Quality Checking | Jan – Feb , 2020 |
| 09 | Statistics and report generation and submission of data | Apr, 2020 |

The following are the project execution related and budget details:

1. Study / Project Area: Bihar State
2. Total Road Length: 48,602 Kms
3. Amount for every 10 Kms: ₹.1,118/- (Total Budget = Rs. 54,33,704)
4. No. of Districts: All the districts with PMGSY road (Road segments with id and other details will be provided)