

Memorandum of Understanding

*for***NRC****National Land Use Land Cover Analysis – Second Cycle***between*

Deputy Director, RS & GIS AA
National Remote Sensing Centre
ISRO, Dept. of Space, Govt. of India,
Balanagar, Hyderabad-500 037.

and

Registrar
Birsa Institute of Technology (BIT)
Mesra, Ranchi - 835215, Jharkhand

(Name of the authorized signatory and address)

Signed on this day 17th of January Month, Year 2012

1. PREAMBLE

National Remote Sensing Centre, Indian Space Research Organisation (ISRO), Department of Space, Government of India in collaboration with different State, Central Government Departments and Institutions has completed three mapping exercises of land use land cover (LULC 50K) for the country using remotely sensed satellite data on 1 : 50,000 scale.

Natural resources' mapping using satellite remote sensing has been an ongoing activity under the NNRMS framework for the past two decades. The project on Natural Resources Census was launched by the Department of Space during the 11th Five Year Plan. The first cycle of land use land cover mapping on 1 : 50000 scale has been successfully completed. Land use land cover is dynamic in nature and requires regular monitoring to understand areas of rapid change and to assess the reasons for the change. This will enable planners and administrators to initiate appropriate measures for developmental activities.

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 (Name of the PI)
 Represented by Dr. C. JESANATHAN with its office located
 at
Birla Institute of Technology (BIT)
Mesra, Ranchi - 835 215
Jharkhand

3. AUTHORISED SIGNATORIES

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

Dr. G. Behera, Deputy Director, RS & GIS AA, NRSC, ISRO, DOS Govt. of India, Balanagar, Hyderabad – 500 037, Andhra Pradesh.

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

Dr. D. Sasamal, Registrar, BIT, Mesra, Ranchi - 835215
Jharkhand

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

4.1 NRSC:

Sl. No	Name	Contact Address	Phone	Email
1	Shri. G Behera	Deputy Director, RS & GIS AA NRSC/ISRO, Dept of Space, Govt. of India, Balanagar, Hyderabad – 500 037	040-23884221	ddrsgis@nrsc.gov.in, behera_g@nrsc.gov.in
2	Dr.T. Ravisankar	Group Head LRUMG RS&GIS-AA NRSC/ISRO, Dept of Space, Govt. of India, Balanagar, Hyderabad – 500 037	040-23884213	ravisankar_t@nrsc.gov.in
3	Dr G. Ravi Shankar	Head, Land Use & Cover Monitoring Division, LRUMG RS&GIS-AA NRSC/ISRO, Dept of Space, Govt. of India, Balanagar, Hyderabad – 500 037	040-23884238	ravishankar_g@nrsc.gov.in



4.2 Partner Institution

→ Pl. See attached sheet for clarity.

Sl. No	Name	Contact Address*	Phone	Email
1.	Dr. C. JEGANATHAN	DEPT. OF REMOTE SENSING, BIT MESRA, RANCHI	08987630041	jeganathan.c@bitmesra.ac.in
2.	Dr. L.K. Sharma	SENSING, BIT MESRA, RANCHI	09430700932	LKsharma@bitmesra.ac.in
3.	Mr. N.K. Sinha	MESRA, RANCHI	09470368588	nitish@bitmesra.ac.in

PI
Co-PI
Co-PI

* Contact address is same for PI and Co-PIs.

5. EFFECTIVE DATE

5.1 Commencement : This MOU will come into effect from the date of receiving the funds / Satellite data.

5.2 Date of Signing : This MoU is signed on this day 17th of January (Month), 2012.

5.3 Duration : This MOU is valid for a duration of 18 months from the date of receipt of 1st installment of project funds / receipt of satellite data.

5.4

6. SCOPE OF WORK

The Scope of the work for the LULC 50K Second Cycle includes procurement of ortho-rectified three season satellite data of 2011 – 12; updating the LULC vector layer of 2005-06 using Resourcesat-2 LISS III satellite data of 2011 – 12; Identification and depiction of areas with major changes between 2005 – 06 and 2011 -12; and preparation of report and atlas containing LULC category-wise change statistics; spatial distribution of change and other ancillary information like ground truth point file along with ground photos etc

7. METHODOLOGY

The LULC vector layer generated from satellite data of 2005-06 will be overlaid on to the ortho-rectified three-season 2011-12 imagery. The LULC polygons will be updated by redrawing the boundary of changed areas through on screen visual interpretation techniques. 20% random sample ground checks need to be undertaken to assess change areas and to improve the accuracy of the maps.

8. DELIVERABLES AND GUIDELINES ON DATA / MAP SECURITY

8.1 Deliverables

- LULC layer of 2011-12 seamless thorough out the state in geodatabase format
- LULC layer 2011-12 in District mosaic in geodatabase format along with statistics.
- LULC Change Map between 2005-06 and 2011-12 and statistics
- Point layer in GIS to indicate location of Ground truth collection and linked with digital ground photos.

Birla Institute of Technology (BIT), Mesra (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. SPECIFICATIONS

As per NNRMS Standards – Parameter and Values for thematic / GIS Database and output for 1:50,000 Scale

A]	Thematic / Cartographic mapping standards	
	Image Registration accuracy (RMS) in meter	12
	Map Projection	LCC/TM
	Datum	WGS84
	Position (Planimetric) Accuracy in meter	50
	Minimum Mappable Unit (MMU) in sq. mts.	22500
	Thematic Accuracy of Classification / Mapping	90/90
B]	GIS Database Standards	
	Spatial Framework	Seamless
	Coordinate units for precision	Meters

Projection	LCC / TM
Datum	WGS 84
Minimum frame size for NRR	15` x 15`
GIS DB Tic Registration Accuracy (RMS) in meter	12.5
Position (Planimetric) Accuracy in meter	50

10. APPLICABLE DOCUMENTS

- Project Execution Plan
- Product Realization Plan (Technical Manual).

11. RESPONSIBILITIES OF EACH PARTY

11.1 Responsibilities of NRSC

1. NRSC shall provide the satellite data for the area, LULC geodatabase vector layer of 2005-06 and technical manual to be followed for preparation of the outputs.
2. NRSC shall provide the cost for satellite data interpretation, ground data collection, final geodatabase generation including IQC/EQC.
3. The funds for execution of the project will be released in three installments based on the progress of the work.
 - The first installment amounting to 40 % of project cost would be released upon receiving the signed MoU for project execution;
 - The second installment amounting to 40 % of the project cost will be released on completion of interpretation and ground truth for 100% of the allocated area and on receipt of the Utilization Certificate for the first installment.
 - The last installment of 20 % would be released upon receipt of deliverables along with the Utilization Certificate for the second installment at the end of the project.

4. A Utilization Certificate for 3rd installment and also a consolidated Utilization Certificate for the total fund received has to be sent to NRSC.

11.2 Responsibilities of the Partner Institution

1. The partner institution (PI) will identify Project Manager for this project; who will be the focal point for this project for interaction with NRSC. It should identify a team for executing the project and the project manager and team member should have qualified theme specialist related to land use.
2. The work should be executed strictly following the technical manual maintaining high standard of quality, 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.
3. Any inaccuracies noticed during quality inspection will have to be corrected to the satisfaction of the Project Director / Project Quality Assurance Team without any additional cost.
4. NRSC at his discretion will conduct inspection of the work at working place of the Dept. /Organization / University and also carry out field inspection if required. Such inspection will be done by Project Director or his authorized representative(s) at such intervals as deemed necessary for which the Dept./Organization/University should provide the transport and necessary facilities.
5. All the deliverables as specified in Clause 8.1 need to be submitted to NRSC, in the prescribed format.



6. The satellite data handed over to the Dept./Organization/University should be used carefully and exclusively for the execution of the job awarded.
7. 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 *take permission and duly acknowledge NRSC /DOS while publishing.*
8. The monthly progress report in the prescribed proforma has to be submitted to Project Director, in the first week of the following month.
9. The Project Manager is wholly responsible for smooth implementation of the project and 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

Project will be of 18 months duration for creation of the LULC change database. The detailed schedule is given in Annexure -1

13. SCHEDULE OF PRICES

The total cost for carrying out the project is Rs. 30,27,732/- The sub component wise fund breakup is provided under Annexure - II

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 delivery period for final data shall be by 18 months (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 be funded by NRSC, Hyderabad.

16.2 *Terms and conditions of payment :*

40% advance payment after signing of the MoU, 40% after completion of 100% of the allocated work, and 20% after submission of the deliverables.

17. TRAINING

Not applicable

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

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



20. CONFIDENTIALITY

20.1 During the tenure of the agreement 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 for any purposes other than in accordance with this agreement.

21. INTELLECTUAL PROPERTY RIGHTS

21.1 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 aid 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 over than the specific objectivities of the project, NRSC, ISRO and BIT, Mesra, Ranchi (name of the Partner Institution) shall retain absolute rights on such results.

22. CHANGE IN SCOPE OF WORK

22.1 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. MODIFICATIONS

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



24. FORCE MAJEURE

24.1 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.

25. INDEMNITY BOND

25.1 Birla Institute of Technology (BIT), Mesra, Ranchi
(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.

26. ARBITRATION

26.1 The parties shall endeavor to resolve any dispute or difference arising from this agreement or any transaction or performance or non-performance under this agreement, by mutual discussion. Any such dispute of difference which can't be so resolved within a reasonable time shall be referred to the sole arbitration of a person nominated by Director, NRSC as such arbitrator in accordance with the arbitration and Conciliation Act, 1996. The award of arbitrator shall be final and binding on the parties. The Arbitrator may from time to time with the consent of the parties enlarge the scope and time for making and publishing the award. The venue of arbitration shall be at NRSC, Hyderabad. Appropriate Court in Hyderabad alone shall have jurisdiction on any matter arising from this 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 17/1/12 IN THE PRESENCE OF WITNESS INDICATED.

Parties	For and on behalf of PARTY
For and on behalf of Partner Institute	For and on behalf of NRSC,ISRO,
Signature <u><i>D. D. Sasmal</i></u>	Signature <u><i>G. Behera</i></u>
Name <u>Dr. D. SASMAL, REGISTRAR, BIT</u>	Name <u>Shri. G. BEHERA</u>
Seal Registrar Birla Institute of Technology Mesra; Ranchi	Seal जी. बेहरा/G. BEHERA. उप-निदेशक (सु.सं. एवं भौ.सू.प्र.-अ.क्ष.) Deputy Director (RS & GIS-AA) राष्ट्रीय सुदूर संवेदन केन्द्र National Remote Sensing Centre इसरो / ISRO अन्तरिक्ष विभाग / Dept. of Sp. 22 भारत सरकार / Govt. of India बालानगर, हैदराबाद/Balanagar, Hyderabad 501 315
Witnesses: (Name & Address)	Witnesses (Name & Address)
1. <u><i>Dr. C. JELANATHAN</i></u> Professor Dept. of Remote Sensing BIT, MESRA, RANCHI -835215	1. <u><i>G. Padma Rani</i></u> G. RANI JAINAR HEAD, LU & CMD, ORSC, HYD
2. <u><i>M. Jaiswal</i></u> Mrs. Nidhi Jaiswal Asstt. Registrar (Legal) BIT Mesra.	2. <u><i>G. Padma Rani</i></u> (Dr. G. PADMA RANI) SC/ENR SP, LU & CMD. RS+GIS, NRSC, Hyderabad.
Date: <u>17.01.2012.</u>	Date: <u>17/1/12</u>

LULC 50 K Second Cycle – Time Schedule

S.No.	Activity	Month
01	Satellite data dissemination (In phases for Kharif, Rabi, Zaid)	Jan. – May 2012
02	Signing of MoUs – Release of First installment of project fund	Jan. – Feb. 2012
03	Regional Workshop	Feb. – Mar. 2012
04	LULC database creation & Internal Quality Checking (IQC)	Feb – Sept. 2012
05	Ground data Collection	Sept – Nov. 2012
06	Post field interpretation, IQC & External Quality Checking	Nov. 2012 & Jan . 2013
07	Ground data collection and IQC	Jan. – Feb 2012
08	Edge matching across districts	Mar. 2013
09	Geodatabase finalization	April 2013
10	Edge Matching across states	May 2013
11	Statistics and report generation and submission of data	June 2013

Name of the State: Bihar

Sl. No.	Amount (in Rs.)
1. Analysis cost (Manpower salary etc.)	1645975
2. GT Collection (Transport, DA etc.)	187669
3. Digital database creation (System cost etc.)	739108
4. Internal QAS (Manpower + System)	317625
5. Project Management	137355
6. GRAND TOTAL	3027732



4 FUNCTIONARIES AND CONTACT INFORMATION

4.2 Partner Institute:

Sl. No.	Name	Contact Address	Phone No	Email ID
1	Dr. C. Jeganathan Principal Investigator	Professor, Department of Remote sensing	8987630041	jeganathanc@bitmesra.ac.in
2	Dr. L. K. Sharma Co PI	Assistant Professor, Department of Remote Sensing	9430700932	lksharma@bitmesra.ac.in
3	Mr. Nitish Kumar Sinha Co PI	System Analyst, Department of Remote Sensing	9470368588	nitish@bitmesra.ac.in

