

Memorandum of Understanding

for

Land Degradation (Second Cycle) - 2015-16

between

Deputy Director, RSAA
National Remote Sensing Centre
ISRO, Dept. of Space, Govt. of India,
Balanagar, Hyderabad-500 037.

and

Department of Remote Sensing,
Birla Institute of Technology (BIT),
Mesra, RANCHI - 835 215,
JHARKHAND

Signed on this day 17th of June Month, Year 2016

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 the National Land Degradation Mapping using 2005-06 temporal LISS-III 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 theme Land degradation is dynamic in nature and requires regular monitoring to understand areas of rapid change and to assess the reasons for the change. It was felt appropriate to monitor this theme every ten years. In order to bring out the spatial changes in the land degradation status in the country there was a need to monitor the same at 1:50,000 scale. This project primarily focuses on change monitoring and is being executed using a common satellite data base along with LULC-3rd cycle mapping.

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:

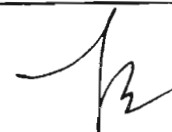
Department of Remote Sensing, Birla Institute of Technology (BIT), Represented by Dr. A.P. Krishna, with its office located at Mesra, RANCHI – 835 215, JHARKHAND.

3. AUTHORISED SIGNATORIES

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

Dr. P.G. Diwakar

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



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

Dr. A. P. Krishna

Department of Remote Sensing,
Birla Institute of Technology (BIT),
Mesra, RANCHI – 835 215,
JHARKHAND

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

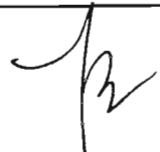
4.1 NRSC:

Sl. No	Name	Contact Address	Phone	Email
1	Dr.T. Ravisankar	Group Director LRUMG, RSA A NRSC/ISRO, Dept. of Space, Govt. of India, Balanagar, Hyderabad – 500 037	040- 23884214	ravisankar_t@nrsc.gov.in
2	Dr. K. Sreenivas	Head, Soil and Land Resources Assessment Division, RSA A, NRSC/ISRO, Dept. of Space, Govt. of India, Balanagar, Hyderabad – 500 037	040- 23884217	sreenivas_k@nrsc.gov.in

4.2 Partner Institution

Project : Land Degradation (Second Cycle)

Sl. No	Name	Contact Address	Phone	Email
1	Prof. A.P. Krishna	Department of Remote Sensing, Birla Institute of Technology (BIT), Mesra, RANCHI – 835 215,		apkrishna@bitmesra.ac.in



		JHARKHAND		
2	Dr. V.S. Rathore	Department of Remote Sensing, Birla Institute of Technology (BIT), Mesra, RANCHI – 835 215, JHARKHAND		vsrathore@bitmesra.ac.in
3	Prof. C. Jeganathan	Department of Remote Sensing, Birla Institute of Technology (BIT), Mesra, RANCHI – 835 215, JHARKHAND		jeganathanc@bitmesra.ac.in
4.	Mr. Nitish Kumar Sinha	Department of Remote Sensing, Birla Institute of Technology (BIT), Mesra, RANCHI – 835 215, JHARKHAND		nitish@bitmesra.ac.in

5. EFFECTIVE DATE AND DURATION

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

5.2 Date of Signing : This MoU is signed on this day 17th of June (Month), 2016.

5.3 Duration : This MOU will be valid from date of signing for a duration of 12 months .

6. SCOPE OF WORK

The scope of the work for all the three projects include generating thematic layers using output created previously onland degradation by using orthorectifiedthree season ResourcesatLISS III data of 2015 – 16 using Bhuvan Web Geo-portal. In this project, activities will include Identification and depiction of areas with major changesin land degradation with reference to the vectors between2005–06 and 2015-16 for land degradation (2nd cycle) project and preparation of report containingcategory-wise change statistics;

spatial distribution of change and other ancillary information like ground truthpoint file along with ground photos, soil chemical analysis (as required), etc.

7. METHODOLOGY

The vector layer generated from satellite data of the reference period i.e., 2005-06 for land degradation will be overlaid on to the ortho-rectified three-season 2015-16 imagery. The respective thematic vector layers will be updated by redrawing the boundary of changed areas using the vector tools provided on the Bhuvan Web Geoportal. The thematic layer in form of vector polygons and orthorectified satellite imagery for 2015-16 along with required legacy information will be available. 20% random sample ground checks need to be undertaken to assess change areas and to improve the accuracy of the maps. Soil samples are to be collected from change area in salt-affected lands and acidic lands and are to be analyzed in the laboratory as per procedures provided in project manual.

8. DELIVERABLES AND GUIDELINES ON DATA / MAP SECURITY

8.1 *Deliverables*

- Seamless land degradation layer of 2015-16 for the State and each of the district in geodatabase format along with statistics; change map between 2005-06 and 2015-16 along with change statistics and cross-matrix table; map compositions; point layer in GIS along with geotagged photographs; soil analytical data with georeferenced sample locations as shape file; status report for the State.

Department of Remote Sensing, Birla Institute of Technology (BIT), 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 1:50,000 Scale

A]	Thematic / Cartographic mapping standards	
	Image Registration accuracy (RMS) in meter	12
	Map Projection	Albers Equal Area
	Datum	WGS84
	Position (Planimetric) Accuracy in meter	50
	Minimum Mappable Unit (MMU) in sq. mts.	22,500

	Thematic Accuracy of Classification / Mapping	90/90
B]	GIS Database Standards	
	Spatial Framework	Seamless
	Coordinate units for precision	Meters
	Projection	Albers Equal Area
	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

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

11. RESPONSIBILITIES OF EACH PARTY

11.1 *Responsibilities of NRSC*

1. NRSC will make available the orthorectified satellite data of 2015-16, along with Land degradation vector layer of 2005-06.
2. Technical manual of procedure to be followed for preparation of the outputs for will be provided by NRSC. NRSC will provide the cost for satellite data interpretation, ground data collection, IQC/EQC and final geodatabase generation (Annexure-II).
3. Supervise the implementation, conduct monitoring, and evaluation of the project from time to time.
4. Obtain progress reports, monitoring and evaluation reports etc. and give suitable directions to the PIs of the project.
5. 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;
- Thesecond installment amounting to 40 % of the project cost will be released on completion of interpretation and ground truth for the allocated area and upon the receipt of 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.

11.2 Responsibilities of the Partner Institution

1. The partner institution (PI) will nominate a Project Manager for the project who will be the focal point for interaction with NRSC for the whole period of the project. The project manager will be changed only with the consent of NRSC.
2. It should identify aseparate team for executingthisproject along with a project manager. The team members should have specialization related to the theme of the project.
3. The work should be executed strictly following the technical manual 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 and Utilization Certificate before the release of the installments. For final release of the amount Utilization certificate for 3rd installment and also a consolidated Utilization Certificate for the total fund received has to be sent to NRSC.
6. 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 authorized representative(s) from NRSC at such intervals as deemed necessary for which the Dept./Organization/University should provide the transport and necessary facilities.
7. All the deliverables as specified in Clause 8.1 need to be submitted to NRSC, in the prescribed format.
8. 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.

9. The monthly progress report in the prescribed proforma has to be submitted to the respective functionaries at NRSC, in the first week of the following month.
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 the project is given in Annexure -1

13. SCHEDULE OF PRICES

The total cost for carrying out the project is given in Annexure 2 in which fund breakup is provided for each of the activity.

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 for the theme 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:

1. The entire project cost will 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

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

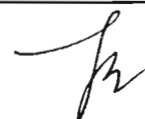
19.1 Partner Institution will establish a mechanism to monitor the progress under the project and will report to NRSC / ISRO on monthly basis. NRSC/ISRO will carry out periodic review of the progress of work.

20. CONFIDENTIALITY

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 Department of Remote Sensing, Birla Institute of Technology (BIT), 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.

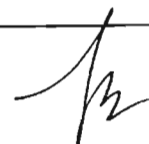
23. MODIFICATIONS

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



25.1 Department of Remote Sensing, Birla Institute of Technology (BIT), 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. 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

27 Jurisdiction

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

28. 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.

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

28.2 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.

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

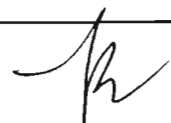
28.4 Obligations upon Termination



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

A handwritten signature in black ink, appearing to be the initials 'R' or 'R' with a flourish, located at the bottom right of the page.


SEAL OF PARTIES

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

THE PARTIES HAVE EXECUTED THIS MEMORANDUM OF UNDERSTANDING IN
DUPLICATE ON THIS DAY OF 17th June 2016 IN THE PRESENCE OF WITNESS INDICA

Parties

For and on behalf of Partner Institute

Signature 
17/6/16

Name Dr. A. P. Krishna

Seal Registrar
Birla Institute of Technology
Mesra, Ranchi

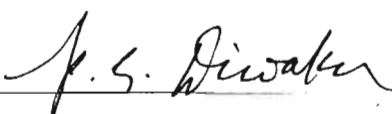
Witnesses: (Name & Address)

1. 
(C Sefmahan)
2. Nitish Kumar Singh
17/6/16

Date: 17/6/16

For and on behalf of PARTY


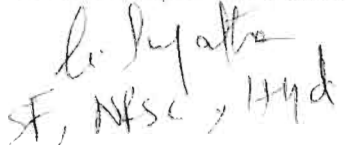
For and on behalf of NRSC,ISRO

Signature 

Name डॉ. पी.जी. दिवाकर / Dr. P.G. Diwakar
उप निदेशक, आरएसएन/Dy. Director, RSAA
राष्ट्रीय दूरदर्शन केंद्र
National Remote Sensing Centre
इसरो/ISRO अन्तरिक्ष विभाग/Dept. of Space
भारत सरकार/Govt. of India
बालासनगर, हैदराबाद/Balanagar, Hyderabad-500 037.

Seal

Witnesses (Name & Address)

1. 
Dr. K. SREENIVAS
Head, Soils & Land Resources
Assessment Division
LRUMG, RS & GIS-AA, NRSC
2. 
Dr. Sufatra
SF, NRSC, Hyd

Date: _____

Land Degradation – Time Schedule

S.No.	Activity	Month
01	Signing of MoUs – Release of First installment of project fund	May, 2016
02	Regional Workshop	June, 2016
03	Land Degradation database creation & IQC	June – October
04	Ground data Collection	Sept – November
05	Soil sample analysis	October – Dec
06	Post field interpretation, IQC & External Quality Checking	Dec, 2016 – Jan
07	Ground data collection and IQC	January, 2017
08	Edge matching across districts	February, 2017
09	Geodatabase finalization	February, 2017
10	Edge Matching across states	March, 2017
11	Statistics and report generation and submission of data	March, 2017

Budget breakup details for Partner Institutions

Name of the State: Uttar Pradesh (Eastern UP state: 98,078 Sq.km ; 140 sheets covering Balrampur, Balrampur, Siddharth Nagar, Bara Banki, Sant Kabir Nagar, Basti, Sultanpur, Rae Bareli, Azamgarh, Allahabad, Mau, Ballia, Jaunpur, Pratapgarh, Ghazipur, Kushinagar, Chitrakoot, Mirzapur, Sant Ravi Das Nagar, Varanasi, Sonbhadra, Shrawasti, Bahraich, Maharajganj, Gorakhpur, Kaushambi, Chandauli, Deoria, Faizabad, Ambedkarnagar districts)

Sl. No.	Amount (in Rs.)
1. Analysis cost (Manpower salary etc.)	Rs. 7,98,000
2. GT Collection (Transport, DA etc.)	Rs 3,29,000
3. Digital database creation (System cost etc.)	Rs. 3,86,400
4. Institutional Charges	Rs. 1,52,600
5. GRAND TOTAL	Rs. 16,66,000
First Installment (40%)	Rs. 6,66,400

