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No. EPSA/GHCAG/GSD/2017/DLD-let/08

Dated: July 07, 2017

To:

Prof. Ranendu Ghosh,
Dheerubhai Ambani Institute of Information Technology &
Communication Technology (DAIICT),
Gandhinagar-382 007
Gujarat

Sub: Signed copy of Work Plan of SAC- DAIICT collaboration for joint project

Dear Prof. Ranendu Ghosh

PI find enclosed duly signed copy of Work Plan for the SAC-DAIICT joint project entitled "Desertification and Land Degradation: Monitoring, Vulnerability Assessment and Combating Plans".

The funds for FY 2017-18 as projected in the Work Plan have been transferred to identified bank account of DAIICT for initiating the project work.

This is for your kind perusal and needful.

With regards,

Your sincerely,

(A.K. Sharma)

Encl: As above

Copy for information to
Director, DAIICT, Gandhinagar
Dy Director, EPSA, SAC
Group Director, GHCAG, EPSA, SAC

Desertification and Land Degradation: Monitoring, Vulnerability Assessment and Combating Plans

(Department of Space funded project)

(2017-2021)

WORK PLAN

Participating Agencies

Space Applications Centre, ISRO, Ahmedabad

and

Dhirubhai Ambani Institute of Information & Communication Technology (DAIICT), Gandhi Nagar

Space Applications Centre
Indian Space Research Organisation
Department of Space, Government of Space
Ahmedabad - 380015

May 2017

Contents

1. Introduction

Desertification and land degradation constitutes one of the most alarming geo-environmental global problem affecting two third countries of the world on which one billion people live (one sixth of world's population). Land degradation is reduction or loss of productive land due to natural processes, climate change and human activities. Desertification is land degradation in arid, semi-arid and dry sub-humid areas (also known as Drylands). The processes of desertification and land degradation are observed to have accelerated during recent years globally. There is a need to stop and reverse the process of desertification and land degradation. There are global efforts to combat desertification and land degradation through United Nations Convention for Combating Desertification (UNCCD). India is signatory to the UNCCD and committed to achieve desertification neutral status by 2030.

Space Applications Centre (SAC), Indian Space Research Organisation (ISRO), Ahmedabad has been working with Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India on monitoring of desertification and land degradation using remote sensing and Geographical Information System (GIS) techniques. SAC has published "Desertification and Land Degradation Atlas of India (Based on IRS AWiFS data of 2011-13 and 2003-05)". The digital database created in GIS environment on 1:500K has been uploaded on SAC Web Portal "Visualization of Earth Data and Archival System (VEDAS)". The outcome of the project is first of its kind, where changes in desertification and land degradation status (along with land cover and severity level) of entire country is available in digital form. This work has been appreciated by the MoEF&CC as well UNCCD. Further, work on bringing out changes in the desertification and land degradation status at 1:50 K for selected vulnerable areas (78 districts) using LISS-III data of 2011-13 and 2003-05 is under progress.

There is a requirement to monitor desertification and land degradation of the country at regular intervals using satellite data. The work done so far has been carried out using on-screen visual interpretation of satellite data. It is observed that although on-screen visual interpretation is based on interpretation keys defined for each of the class to be interpreted, it is subjective in nature and depends on the skill and experience of the person interpreting the data. It also takes lot of time in manually mapping different classes. Therefore, there is a need to go for digital semi-automated or automated mode for preparing digital desertification and land degradation maps. It is proposed to apply different digital classification approaches, evaluate the results and generate digital desertification and land degradation maps along with accuracy standards. Data from new sensors shall be explored for detection of land degradation units/indicators for further improving the desertification and land degradation maps.

In order to give early warning for desertification and land degradation, methodology for vulnerability assessment at 1:50,000 scale requires to be

developed and demonstrated for different agro-climatic zones of the country. Also, there is a requirement of large scale thematic mapping of micro-watersheds at 1:10,000 scale for deriving land and water resources development plans for combating desertification and land degradation. Hence, it is proposed to develop and demonstrate GIS based integrated geospatial techniques for desertification vulnerability modelling and preparation of action plans for combating desertification and land degradation.

2. Participating Agencies

1. Dhirubhai Ambani Institute of Information & Communication Technology (DAIICT), Gandhi Nagar.

and

2. Space Applications Centre, Indian Space Research Organisation, Ahmedabad.

3. Objective

There are three major work components under this work plan, viz. Research & Development (R&D), Semi-Operational and Operational. Objectives of each of the above mentioned components are given below:

3.1. Research & Development

- To develop digital classification techniques for mapping land degradation in Gujarat State.
- To utilize new sensors (microwave and hyperspectral) for detection of land degradation units/indicators.

3.2. Semi-Operational

- To develop methodology/ tools for Desertification and Land Degradation Vulnerability assessment at 1:50K scale and demonstration of the same for Panchmahal district in Gujarat.
- To develop methodology/ tools for preparation of Action plans for Combating Desertification and Land Degradation at 1:10K scale by demonstrating for one micro-watersheds in district selected for vulnerability assessment.

3.3. Operational

- To carryout desertification and land degradation status mapping for Gujarat State for timeframe 2017-18 on 1:500K scale and carry out change analysis wrt timeframe 2011-13 maps.

- To carryout desertification and land degradation status mapping for Bhavnagar, Panch Mahals, Sabar Kantha and Surendranagar districts in Gujarat for timeframe 2017-18 on 1:50K scale and carry out change analysis wrt timeframe 2011-13 maps.

4. Project Duration

The duration of the project is four years, from F.Y. 2017-18 to F.Y. 2020-21.

5. Broad Approach

5.1. Digital classification techniques for mapping land degradation

It has been observed that although on-screen visual interpretation is based on interpretation keys defined for each of the class to be interpreted, it is subjective in nature and depends on the skill and experience of the person interpreting the data. It also takes lot of time in manually mapping different classes.

Therefore, there is a need to go for digital semi-automated or automated mode for preparing digital desertification and land degradation maps. Efforts shall be made to apply different digital classification approaches, evaluate the results and improve further. Data from new sensors such as AVIRIS-NG, RISAT SAR and many other international missions shall be explored for detecting areas undergoing various processes of desertification/land degradation.

5.2. Desertification Vulnerability Assessment

Assessment of vulnerability towards desertification is an essential step towards its mitigation. Various parameters like climate condition, land use / land cover, soil type, representative vegetation of the area and anthropogenic factors play significant roles in the process of desertification.

It is proposed to carryout desertification vulnerability modeling using multi-parametric approach, viz. climate data, physical data, socio-economic data, etc.

5.3. Combating Plan

Preparation of action plans for combating desertification and land degradation on a large scale i.e., 1:10, 000 scale or at cadastral level involves integrated analysis in GIS environment along with in-situ data for proper assessment of land capability and defining strategies to improve not only land suitability to different land use practices, but also include employment generation for improving the socio-economic conditions by various means such as agro-industrial development, education and related infrastructure development, animal husbandry development, skill development and overall rural development through land and water resources development plans. The priority areas shall differ from one micro-watershed to the other based on dominant desertification/land degradation processes, agro-climatic zones, socio-economic set-up etc. Action

plans shall be formulated for each micro-watershed by considering all the factors mentioned above.

It is proposed to develop methodology for preparation of desertification combating plan in a one micro-watershed in each district selected for desertification vulnerability assessment.

5.4. Desertification and land degradation status mapping

Desertification and Land Degradation Status Mapping on 1:500K as well 1:50K using IRS AWiFS and LISS-III data of 2017-18 time frame shall be carried out following the methodology and classification system standardized during the previous studies/projects at SAC, ISRO. IRS AWiFS and LISS-3 Geo-coded digital satellite data will be analysed using onscreen visual interpretation techniques along with ancillary information to interpret Desertification and Land Degradation classes. Ground truth data and field checks will be carried out to finalize the maps. GIS databases of these maps will be used for change analysis for 2017-18 and 2011-12 time frame.

6. Man Power Requirement

One Scientist/ Professor of DAIICT and 2 Research Fellow (full time) will be involved for this project.

7. Roles and Responsibility

Activity	Responsibility
Development of automated techniques for digital Desertification and Land Degradation Mapping	
Procurement of satellite data	SAC
Pre-processing of satellite data	DAIICT
Collection of ancillary data and ground truth data	DAIICT + SAC
Technique development	DAIICT + SAC
Field validation/ accuracy assessment	DAIICT + SAC
Digital maps	DAIICT + SAC
Exploring new sensors for Desertification and Land Degradation studies	
Evaluation and development of techniques	DAIICT + SAC
Collection of ancillary data and ground truth data	DAIICT + SAC
Improved digital maps	DAIICT + SAC
Desertification and Land degradation vulnerability assessment (1:50K)	
Collection of ancillary data and ground truth data	DAIICT + SAC

Geospatial database creation	DAIICT
Geospatial modelling	DAIICT + SAC
Vulnerability assessment maps	DAIICT + SAC
Uploading of database on VEDAS	SAC
Action plan for combating Desertification and Land Degradation (1:10K)	
Procurement of satellite data	SAC
Pre-processing of satellite data	DAIICT
Collection of ancillary data and ground truth data	DAIICT + SAC
Geospatial database creation	DAIICT
Ground truth data collection	DAIICT + SAC
Geospatial technique development	DAIICT + SAC
Action plan Maps	DAIICT + SAC
Atlas of Action Plan Maps	DAIICT + SAC
Uploading of database on VEDAS	SAC
Desertification and Land Degradation Status Mapping and change detection for timeframe 2017-18 and 2011-12 (1:500K)	
Procurement of satellite data	SAC
Pre-processing of satellite data	DAIICT
Preliminary DSM Maps	DAIICT
Ground truth/ validation	DAIICT + SAC
Quality Checking	SAC
Final DSM Maps	DAIICT
Change detection Maps and analysis	DAIICT + SAC
Atlas of DSM Maps	SAC
Uploading of database on VEDAS	SAC
Desertification and Land Degradation Status Mapping and change detection for timeframe 2017-18 and 2011-12 (1:50K)	
Procurement of satellite data	SAC
Pre-processing of satellite data	DAIICT
Preliminary DSM Maps	DAIICT
Ground truth/ validation	DAIICT + SAC
Quality Checking	SAC
Final DSM Maps	DAIICT
Change detection Maps and analysis	DAIICT + SAC
Atlas of DSM Maps	SAC
Uploading of database on VEDAS	SAC
Final Technical Report	DAIICT

8. Milestones/Schedule:

The project is proposed for a duration of four years (48 months).

Activity	Timeline (T0 – Signing of agreement)								
	T0 + 3	T0 + 6	T0 + 12	T0 + 18	T0 + 24	T0 + 30	T0 + 36	T0 + 42	T0 + 48
Development of automated techniques for digital Desertification and Land Degradation Mapping									
Procurement of satellite data									
Pre-processing of satellite data									
Collection of ancillary data and ground truth data									
Technique development									
Field validation/ accuracy assessment									
Digital maps									
Exploring new sensors for Desertification and Land Degradation studies									
Evaluation and development of techniques									
Collection of ancillary data and ground truth data									
Improved digital maps									
Desertification and Land degradation vulnerability assessment (1:50K)									
Collection of ancillary data and ground truth data									
Geospatial database creation									
Geospatial modelling									
Vulnerability assessment maps									
Uploading of database on VEDAS									
Action plan for combating Desertification and Land Degradation (1:10K)									
Procurement of satellite data									
Pre-processing of satellite data									
Collection of ancillary data and ground truth data									
Geospatial database creation									
Ground truth data collection									

Activity	Timeline (T0 – Signing of agreement)								
	T0 + 3	T0 + 6	T0 + 12	T0 + 18	T0 + 24	T0 + 30	T0 + 36	T0 + 42	T0 + 48
Geospatial technique development									
Action plan Maps									
Atlas of Action Plan Maps									
Uploading of database on VEDAS									
Desertification and Land Degradation Status Mapping and change detection for timeframe 2017-18 and 2011-12 (1:500K)									
Procurement of satellite data									
Pre-processing of satellite data									
Preliminary DSM Maps									
Ground truth/ validation									
Quality Checking									
Final DSM Maps									
Change detection Maps and analysis									
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Ground truth/ validation									
Quality Checking									
Final DSM Maps									
Change detection Maps and analysis									
Atlas of DSM Maps									
Uploading of database on VEDAS									
Final Technical Report									

9. Deliverables

The following deliverables will be submitted to SAC by DAIICT:

1. All software and tools developed under this project.
2. All maps along with Geospatial database.
3. Final technical report

10. Budget (in INR)

S. No.	Head	2017-18	2018-19	2019-20	2020-21	Total
1	Services(salary)	720000	720000	806400	806400	3052800
2	Travel	100000	100000	100000	100000	400000
3	Contingency	10000	10000	10000	10000	40000
4	Institutional charges (20%)	166000	166000	183280	183280	698560
Total		996000	996000	1099680	1099680	4191360 say 4200000

1. Satellite data to be purchased by SAC.
2. Any publication resulting out of this work will be brought jointly by SAC and DAIICT.

Signatures

Project Director, SAC

for
ए.के. शर्मा / A.K. Sharma
प्रधान, भू-विज्ञान प्रभाग / Head, Geo-Science Division
भू-विज्ञान, जल विज्ञान, हिममंडल विज्ञान एवं उपयोग समूह/ईपीएसए
Geo-Sciences, Hydrology, Cryosphere Sciences & Application Group/EPSA
अंतरिक्ष उपयोग केन्द्र (इसरो) / Space Applications Centre (ISRO)
भारत सरकार / Government of India
अहमदाबाद / Ahmedabad - 380 015

Principal Investigator, DAIICT

Co-Principal Investigator, DAIICT

Director, DAIICT

Dr. Nagaraj R.
Director
DA-IICT, Gandhinagar.

DA-IICT GANDHINAGAR

Place: Gandhinagar

Date: May 26 2017