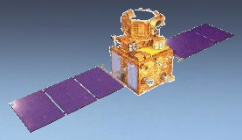
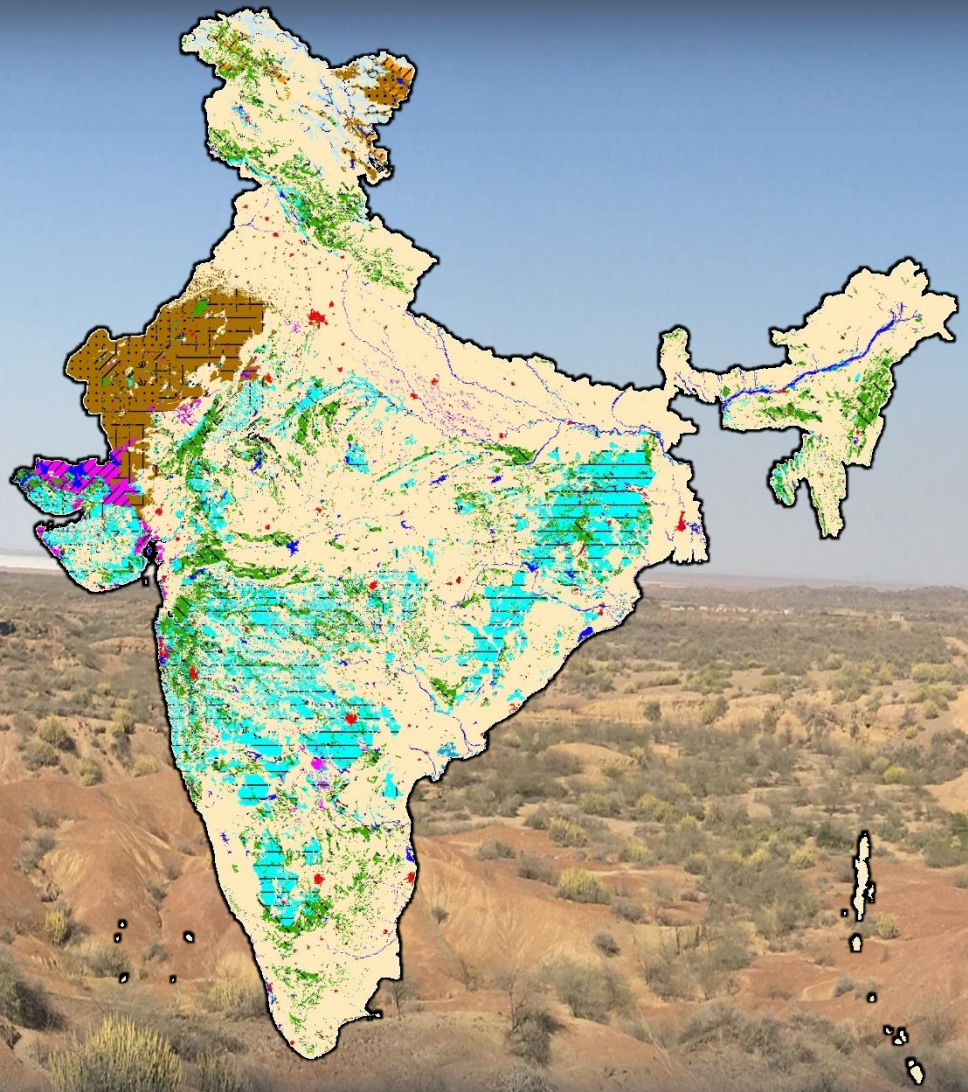
DESERTIFICATION AND LAND DEGRADATION ATLAS OF INDIA

Assessment and analysis of changes over 15 years based on remote sensing





Space Applications Centre
Indian Space Research Organisation
Government of India, Ahmedabad - India

Desertification and Land Degradation

Atlas of India

(Assessment and analysis of changes over 15 years based on remote sensing)

Space Applications Centre
Indian Space Research Organisation
Department of Space, Government of India
Ahmedabad – 380 015, India

June 2021

Published by: Space Applications Centre, ISRO, Ahmedabad, India
www.sac.gov.in

Citation: SAC. (2021). Desertification and Land Degradation Atlas of India (Assessment and analysis of changes over 15 years based on remote sensing). Space Applications Centre, ISRO. Ahmedabad, India. 282 pages.

ISBN: ISBN: 978 - 93 - 82760 - 39 - 9

Available from: Space Applications Centre, ISRO, Ahmedabad - 380015, India

Cover page: Front - Land degradation status map of India for timeframe 2018-19 and a filed photo showing landscape in parts of Kachchh district, Gujarat

Back - Agriculture practices on sand dunes, in parts of Bikaner district, Rajasthan

मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन,
सूचना एवं प्रसारण और
भारी उद्योग एवं लोक उद्यम
भारत सरकार

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ENVIRONMENT, FOREST & CLIMATE CHANGE,
INFORMATION & BROADCASTING AND
HEAVY INDUSTRIES & PUBLIC ENTERPRISES
GOVERNMENT OF INDIA

प्रकाश जावडेकर
Prakash Javadekar

MESSAGE

Land is the fundamental resource that is integral to all air-water-nutrition and energy cycles. It is both a source and a sink of Green House Gases (GHGs) and is intrinsically related to climate change adaptation and mitigation and biodiversity conservation.

India has been at the forefront of bringing the issue of land degradation to the core of relevant international alliances for protection and conservation of environment. India hosted the 14th session of Conference of Parties (COP 14) to the United Nations Convention to Combat Desertification (UNCCD), in September 2019, where Hon'ble Prime Minister announced India's aspirational goals to achieve Land Degradation Neutrality (LDN) and restore 26 M ha of degraded land by 2030.

India is striving towards achieving these national commitments by utilizing benefits of land restoration efforts under various schemes/programmes of concerned Central Ministries/Departments. For this purpose baseline measurement of degraded lands has been calculated from the Desertification and Land Degradation Atlas of India, 2011-13, prepared by Space Applications Centre, Indian Space Research Organisation (SAC-ISRO), Ahmedabad.

I am happy to note that Space Applications Centre, ISRO has prepared the latest Desertification/ Land Degradation Atlas of India which provides State-wise Desertification/ Land Degradation status of the country for 2018-19 timeframe. It also provides a quantitative assessment and analysis of changes over 15 years, from 2003-05 to 2018-19, based on Indian multi-spectral satellite images at 1:500,000 scale.

I congratulate project team of Space Applications Centre, ISRO, Ahmedabad and all other partner centers for their efforts in bringing out the atlas - "Desertification and Land Degradation Atlas of India (Assessment and analysis of changes over 15 years based on remote sensing)". I am certain that salient findings will be useful in assessing country's progress towards fulfilling the land restoration related commitments and to all other related fields.

With best wishes.

June 14, 2021

(Prakash Javadekar)

।। प्लास्टिक नहीं, कपड़ा सही ।।
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पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
भारत सरकार

MESSAGE

Land is a vital resource providing the basis for human livelihoods and well-being including the supply of food, freshwater and multiple other ecosystem services, as well as biodiversity.

Land degradation has negative impact on ecology, soil and food security but also in the social and economic well-being of the human beings including forced migration. The Global issue of Desertification - Land degradation - drought and its implications on people in all walks of society, environment and economy.

India being an agrarian economy has huge dependence on land resources. India ranks first in the world with highest net crop area. Around 51% of India's geographical area is under cultivation as compared to 11% of the world average. India has a population of around 1.37 billion with around 536 million of livestock population. All these clearly indicates the huge pressure on land and the immediate requirement of prevention, halting and reversing land degradation.

India hosted the 14th session of Conference of Parties (COP 14) of United Nations Convention to Combat Desertification (UNCCD), in September 2019. During this Global meet, India took the targets of achieving Land Degradation Neutrality and restoring 26 million hectares of degraded land by 2030. To achieve these national commitments Govt. of India adopted, collective approach in order to strengthen various schemes/programmes with land-restoration in degraded lands.

Remote sensing and Geoinformatics technology plays key role in measuring Country's progress towards achieving the Land restoration related targets, by facilitating precise monitoring and quantitative analysis of degraded lands. Present Alias is an inventory of State wise areas of degraded land along with their process of degradation, severity and associated land use land cover categories of 2018-19. The Atlas also provides changes in terms of area undergoing degradation from 2003-05 to 2018-19.

I congratulate the project team for their dedicated efforts to bring out this Atlas. I am sure that the salient features of this Atlas would be useful not only as a ready reference but also as a tool for identifying problem areas, analysing the gaps and planning for required intervention

(Babul Supriyo)

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GOVERNMENT OF INDIA

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व
सचिव, अन्तरिक्ष विभाग
Chairman, Space Commission
&
Secretary, Department of Space

MESSAGE

Harnessing space technology for national development has always been the major focus of Indian Space Programme. The role of space technology in inventory, monitoring and management of national natural resources is well established and it is operationally utilized by Ministries/ Departments for regional and national level projects in close association with Indian Space Research Organisation.

Desertification and land degradation is one of the major environmental concerns affecting earth ecosystem economy and lives. Accurate assessment of land degradation and understanding of its dynamics is very crucial for combating and prioritizing areas for restoration. Space Applications Centre (SAC) had been involved in various land degradation related studies including monitoring, vulnerability assessment and change analysis.

This atlas is one of the outcomes of the national project titled "Desertification and Land Degradation: Monitoring, Vulnerability Assessment and Combating Plans" carried out by SAC. It depicts Desertification/ Land Degradation status of the country for 2018-19 timeframe, generated using Indian Remote Sensing Satellites data, including the changes with reference to the earlier inventories of 2003-05 and 2011-13 timeframes.

I am sure that the geospatial database and the atlas will be of immense help to the Ministry of Environment, Forest & Climate Change (MoEF&CC) for India's reporting to United Nations Convention to Combat Desertification (UNCCD) and also to achieve country's commitment of land degradation neutrality and land restoration program.

I applaud the efforts of the project team and appreciate their remarkable contribution in bringing out this national atlas as a ready reference for policy makers, planners and researchers.

June 01, 2021

(कै शिवन / *K Sivan*)

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आर पी गुप्ता
R P Gupta

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FOREWORD

Desertification, along with climate change and loss of biodiversity are the major challenges of our times and ever increasing demands of finite resources is triggering the imbalance in ecosystem. Sustainable development, futuristic management and efficient utilisation of the natural resources are the way forward to overcome these challenges.

India is a signatory to the United Nations Convention on Combating Desertification (UNCCD) and is committed to combat desertification/land degradation and achieve land degradation neutral status by 2030. The Ministry of Environment, Forest and Climate Change (MoEF&CC) is the nodal Ministry for India's periodic reporting on status of desertification/land degradation to UNCCD. In order to combat land degradation, Government of India has also committed to restore 26 million hectare land and has launched various national and regional level programmes/ schemes.

There has always been the requirement of regular monitoring of desertification/land degradation status of the country for effective planning and prioritising of the areas to combat desertification/ land degradation. Use of Indian Remote Sensing satellite data and geospatial techniques are important and reliable tools towards this endeavour. The previous publication by Space Applications Centre "Desertification and Land Degradation Atlas of India (based on IRS AWiFS data of 2011-13 and 2003-05)" was utilised for India's reporting to UNCCD and was also used as baseline data for country's land restoration program.

The current atlas "Desertification and Land Degradation Atlas of India (Assessment and analysis of changes over 15 years based on remote sensing)" provides Desertification/ Land Degradation status of the country for 2018-19 timeframe. In addition to this, the atlas also provides change analysis over 15 years, from 2003-05 to 2018-19. The salient findings of the atlas would be useful not only as a ready reference but it will also facilitate identifying gap areas and planning for restoration efforts.

I congratulate and appreciate the national project team for their efforts and I am sure that this atlas would be useful as a ready reference for concerned policy makers, researchers and all others concerned with national land restoration program.

(R P Gupta)

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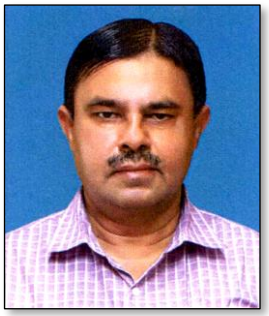
PREFACE



Desertification and Land Degradation (DLD) in a region poses a great threat to the long term balance of the ecosystem at local as well as global scales. The Increase in the extent of area affected with DLD eventually results in the reduction in fertile land and livelihood of people, over-exploitation of natural resources, migration of living organisms, conflicts in nature and so on. India, with 2.4 % of global land area is homeland to around 18% of global human population, 30.4% livestock population and supports more than 8% of world's agriculture. Moreover, around 69% of the country's area falls under drylands. Considering all these facts, the monitoring of land degradation is very crucial for our country.

The role of earth observation satellites data and geospatial technology is well recognized in various natural resource management applications, including land degradation. Space Applications Centre (SAC), ISRO, Ahmedabad, has been working on the land degradation related studies for more than 2 decades. I am happy to share with the readers that the outcome of a previously completed project was used as baseline data for India's land restoration program by Ministry of Environment, Forest and Climate Change (MoEF&CC) and was also reported to the United Nations Convention to Combat Desertification (UNCCD).

The present atlas showcases Desertification and Land Degradation Status of India, prepared using IRS AWiFS data of 2018-19 timeframe and also provides the details of changes with respect to the earlier inventories prepared for 2011-13 and 2003-05 time frames. The outcome will be extremely useful for identifying the areas vulnerable for desertification and for prioritizing areas for restoration. The geospatial database has also been hosted on SAC's Web Portal "Visualisation of Earth Observation Data and Archival Systems, VEDAS".

The analysis reveals that 97.85 Mha (29.77%) area of the country is affected with various processes of Land degradation by 2018-19 timeframe. It also indicates the cumulative decrease in the rate of land degradation in the country. State wise statistics and map compositions are also available for use as ready references by various central/ state government/ departments.

I appreciate the efforts made by the national project team members and congratulate them for their valuable contributions. I am sure that the project team will further work towards the utilization of newer and advanced technologies viz. machine learning and artificial intelligence in their near future studies.

Place: Ahmedabad
Date: 10 June 2021

(एन एम देसाई) / *(N M Desai)*
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ACKNOWLEDGEMENT

Space Applications Centre (SAC) in collaboration with thirteen other organisations/institutions has carried out Desertification and Land Degradation status mapping of India using IRS AWiFS satellite data at 1:500K scale for 2018-19 timeframe. The outcome is being published in the form of this atlas. The atlas also brings out changes with reference to 2003-05 and 2011-13 timeframes.

Mapping of this magnitude has been possible with the motivation and encouragement provided by Dr. K. Sivan, Chairman, ISRO and Shri Nilesh Desai, Director, SAC. The entire project team expresses deep gratitude for their full support and guidance.

We are grateful to all officials of Ministry of Environment, Forest & Climate Change (MoEF&CC) for showing keen interest in this project. Smt. B. V. Uma Devi, Additional Secretary, MoEF&CC and Shri Jigmet Takpa, Joint Secretary, Desertification Cell, MoEF&CC deserves special mention here.

We express our sincere thanks to Dr. Raj Kumar, former Deputy Director, Earth, Ocean, Atmosphere, Planetary Sciences and Applications Area (EPSA), SAC for providing technical guidance, suggestions and necessary support. We are thankful to Dr. Shantanu Bhatawdekar, Director, Earth Observation Application and Disaster Management Support Service Program Office (EDPO), ISRO HQ for overall support.

We express our sincere thanks to respective heads of the organisations for collaborating in this project and its execution.

We are thankful to the SAC Committee on, 'Applications Projects - Monitoring and review, Inter-Centre Agency Technical Document Review and RS-Applications Outsourcing Committee', for their comments and suggestions. Shri Shashikant A. Sharma, Group Director, VEDAS Research Group, SAC is acknowledged for facilitating hosting of geospatial database and Atlas on SAC Web Portal VEDAS for wider dissemination and usage.

Efforts of Dr. A. S. Rajawat, former Group Director, GHCAG, SAC and Dr. D. Ram Rajak, Head, GSD, SAC are thankfully acknowledged for their contribution in timely completion of the work.

I specially express my full appreciation for the contribution made by Shri Manish Parmar, Scientist, SAC in the analysis of the results and preparation of this atlas. I congratulate the entire team behind the mapping and making of this atlas.

(I M Bahuguna)

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EXECUTIVE SUMMARY

Land degradation is decline in productivity of land in terms of bio-diversity and economy, resulting from various causes including climate and human induced factors, leading to loss of ecosystem. Desertification is referred as land degradation occurring in arid, semi-arid and dry sub-humid regions. The United Nations Convention to Combat Desertification (UNCCD) had identified desertification as one of the most challenging environmental concerns of present and future.

Desertification/ Land Degradation is an issue of global concern and threatens productivity of land, water, biodiversity, ecology, economy, and people. There is an urgent need to stop and reverse the process of land degradation, and efforts at national and international levels are emerging to combat desertification and land degradation. Sustainable management of soil, water and human society are required for protecting the land from further degradation.

One of the key requirement is inventory and monitoring desertification and land degradation of the country using satellite data in Geographical Information System (GIS) environment for providing baseline data to be used for prioritizing and monitoring areas, carrying out desertification vulnerability and risk assessment and also preparing action plans for combating desertification and land degradation.

India is signatory to the UNCCD and is committed to achieve the Land Degradation Neutral status by 2030. Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India, New Delhi represents India in UNCCD and has established a multi-institutional mechanism for India's reporting to UNCCD related to implementation of Indian programs for combating land degradation and restoration. India is also the host country for Conference of Parties (COP)-14th session. In the direction of achieving land degradation neutrality, Government of India has envisaged plans for restoration of 26 Mha area under degradation.

Space Applications Centre (SAC), Indian Space Research Organisation (ISRO), Ahmedabad carries more than two decades of experience in monitoring and assessment of land degradation in the country and have carried multiple national projects on this theme. The last national project executed by SAC, titled "Desertification Status Mapping of India", was a MoEF&CC funded project and the outcome of this project has been considered as the base line for measuring the progress towards achieving the national commitment related to land restoration.

The present national atlas titled "Desertification and Land Degradation Atlas of India (Assessment and analysis of changes over 15 years based on remote sensing)", is one of the outcomes of an ongoing Department of Space (DOS) funded national project entitled, "Desertification and Land Degradation: Monitoring, Vulnerability Assessment and Combating Plans", being executed by the SAC, ISRO, Ahmedabad along with 15 concerned Central/State government departments and academic institutes. Country level Desertification/Land Degradation (DLD) mapping has been carried out for timeframe 2018-19. The analysis of changes on the status of DLD has also been carried out with previously available inventories of DLD of timeframes 2011-13 and 2003-05.

On-screen visual interpretation of Indian Remote Sensing Satellite (IRS), Advanced Wide Field Sensor (AWiFS) data (three season i.e. kharif, rabi and summer) in GIS environment on 1:500,000 scale has been carried out. Geo-database was created using ArcGIS software package based on National Spatial Frame work on 1:250K with LCC projection and WGS 84 datum. Base layers of administrative boundaries, settlements, water bodies, road and rail networks were used as

reference from ancillary datasets. Forest boundaries were taken from Forest Survey of India (FSI) and used as reference layer to delineate polygons particularly within forest areas. Ground truth data and field checks were carried out to finalize the maps. Quality Checking (QC) was carried out considering accuracy of georeferencing (Image co-registration < 2 pixels error), uniformity in projection and datum, correctness of interpreted land use, process & severity, correctness of GIS database design and standards (MMU > 225 ha, topology checking, seamless mosaic, codification, cartographic elements) etc.

The analysis reveals that 97.85 million ha area of the country is undergoing land degradation i.e. 29.77% of the Total Geographic Area (TGA) of the country during 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed as 96.40 million ha (29.32% of the TGA) and 94.53 million ha (28.76% of the TGA) respectively. A cumulative increase of 1.45 million ha area (0.44% of the TGA) undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, a cumulative increase of 1.87 million ha area (0.57% of the TGA) is observed.

The most significant process of desertification/ land degradation in the country is Water Erosion (11.01% in 2018-19, 10.98% in 2011-13 and 10.83% in 2003-05), followed by Vegetation Degradation (9.15% in 2018-19, 8.91% in 2011-13 and 8.60% in 2003-05) and Wind Erosion (5.46% in 2018-19, 5.55 % in 2011-13 and 5.58 % in 2003-05).

Land degradation within dryland regions (arid, semi-arid and dry sub-humid regions) is termed as Desertification, 83.69 million ha area is observed as undergoing desertification for 2018-19 timeframe. Whereas, area undergoing desertification during 2011-13 and 2003-05 is 82.64 million ha and 81.48 million ha respectively. There is a cumulative increase of 1.05 million ha area under desertification from timeframe 2011-13 to 2018-19. The increase in area under desertification from 2003-05 to 2011-13 is 1.16 million ha. The most significant processes of desertification in arid region is wind erosion. Whereas, water erosion and vegetation degradation processes are prominent in semi-arid and dry sub-humid regions.

Analysis shows that around 23.79% (2018-19), 23.63% (2011-13) and 23.34% (2003-05) of the area undergoing desertification/land degradation with respect to TGA of the country is contributed by Rajasthan, Maharashtra, Gujarat, Karnataka, Ladakh UT, Jharkhand, Odisha, Madhya Pradesh and Telangana (in descending order). All other remaining states are contributing less than 1% (individually) wrt country TGA. However, the analysis with respect to TGA of the individual states show that Jharkhand, Rajasthan, Delhi, Gujarat and Goa are showing more than 50% area under desertification/land degradation, whereas states with less than 10% area under desertification/land degradation are Kerala, Assam, Mizoram, Haryana, Bihar, Uttar Pradesh, Punjab and Arunachal Pradesh.

The maps and salient findings compiled in the form of Atlas are meant for a ready reference to be used by concerned policy makers, regional planners and researchers. The status of India's desertification and land degradation along with the changes can be used for India's reporting to UNCCD. The geospatial database along with satellite data can be easily used for regional planning and to the ongoing targets of land degradation neutrality and land restoration programs.

TABLE OF CONTENTS

INTRODUCTION

Land degradation is decline in productivity of land in terms of bio-diversity and economy, resulting from various causes including climate and human dominance, leading to loss of ecosystem. The term desertification is subset of land degradation, and referred as land degradation occurring in dryland regions (UNEP 1992). The United Nations Convention to Combat Desertification (UNCCD) identifies desertification as one of the most challenging environmental concerns (UNCCD 1994; UNCCD 2002). Degradation may affect variety of land usage including cropland (rain-fed and irrigated), rangeland, pastureland, forest and woodlands. The degradation of land may result from factors including climatic variations or the chain of processes arising from human activities. Land degradation/desertification is an issue of increasing global concern and threatens productivity of land, water quality, biodiversity, ecology, economy, and living status of the people (UNCCD 2017).

There is an urgent need to stop and reverse the process of land degradation, and efforts at national and international levels are emerging to combat desertification and land degradation. Sustainable management of soil, water and human society are required for protecting the land from further degradation, which is an inherent and most important part of the ecology. There are global efforts to combat desertification/land degradation. One of the key requirement is inventory and monitoring desertification and land degradation of the country using satellite data in Geographical Information System (GIS) environment for providing baseline data to be used for prioritizing and monitoring areas, carrying out desertification vulnerability and risk assessment and also preparing action plans for combating desertification and land degradation.

India is signatory to the UNCCD and is committed to achieve the Land Degradation Neutral (LDN) status by 2030 (MoEF&CC, 2020a). Desertification Cell at Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India, New Delhi represents India in UNCCD and has established a multi-institutional mechanism for India's reporting to UNCCD related to implementation of Indian programs for combating desertification and land degradation. India is also the host country for Conference of Parties (COP) – 14th session. In the direction of achieving land degradation neutrality, Government of India has envisaged a plans for restoration of 26 Mha area (MoEF&CC, 2020b).

Space Applications Centre (SAC), ISRO, Ahmedabad carries more than two decades of experience in monitoring and assessment of land degradation in the country and have carried out multiple national projects on this theme. The last national project executed by SAC, titled "Desertification Status Mapping of India", was a MoEF&CC funded project. The outcome of this project was utilised for India's reporting to UNCCD and also has been considered as the base line data for measuring the progress towards achieving the national commitment related to land restoration (SAC, 2016; SAC, 2018a; SAC, 2018b).

The current Atlas presents State-wise Desertification and Land Degradation (DLD) Status Maps prepared using on-screen visual interpretation of Indian Remote Sensing Satellite (IRS), Advanced Wide Field Sensor (AWiFS) data of 2018-19 timeframe in GIS environment. The analysis of changes on the status of DLD has also been carried out with reference to previously available DLD inventories DLD of timeframes 2011-13 and 2003-05 (SAC, 2016). Area under desertification/land degradation for all three time frames and changes are reported state-wise as well for the entire country.

OBJECTIVE

1. Desertification and Land Degradation Status Mapping using IRS AWiFS data on 1:500,000 scale for 2018-19 timeframe for the entire country.
2. Analysis of changes in Desertification and Land Degradation Status for the entire country.

DATA USED

Multi-temporal digital IRS AWiFS data, ancillary information, collateral data and forest layer of Forest Survey of India (FSI) were used for carrying out the mapping of desertification/ land degradation. IRS AWiFS is 10 bits data with 56 meters spatial resolution, 5 day repeativity, combined swath of 740 km in four spectral channels, i.e. 520-590 nm (Green), 620-680 nm (Red), 770-860 nm (NIR) and 1550-1700 nm (SWIR). False Color Composite (FCC) prepared using first three channels/bands was used for on-screen digitization. Desertification and Land Degradation Status Maps of timeframes 2011-13 and 2003-05 (SAC, 2016) were also used for change analysis. Base layers of administrative boundaries were taken from Natural Resources Data Base (NRDB) and road and railway network were taken from SAC National Wetland Inventory & Assessment (NWIA) project. Limited field data was also utilised to support image interpretation.

Satellite Data (2018-19)	
Season	**Timeframe**
Kharif	September – November
Rabi	December – March
Summer	April – June

Ancillary Data	
Layer	**Source**
Desertification status maps of 2011-13 and 2003-05	Desertification Status Mapping project, SAC
Forest Boundary	Forest Survey of India
Administrative boundary	Natural Resources Data Base
Water body, Rivers, Road and railway network	SAC National Wetland Inventory & Assessment

CLASSIFICATION SYSTEM

The classification system and the broad methodology for the desertification/land degradation mapping standardized during the previous studies/projects at SAC, ISRO (SAC 2007a, SAC, 2007b, Ajai et al., 2009 and SAC, 2016) has been followed in the present work. It comprises of three elements, viz. Land Use, Process of Degradation and Severity Level. A three level Alpha-numeric code is used for codification of the DLD maps in the current project. The details of classification system are depicted below:

Level-1: Land Use		**Level-2: Process of Desertification**		**Level-3: Severity**	
Agriculture irrigated	I	**vegetation degradation**	**v**	**Low**	**1**
Agriculture unirrigated	D	water erosion	w	High	2
Forest / Plantation	**F/P**	wind erosion	e		
Grassland / Grazing land	G	salinity / alkalinity	s/a		
Land with scrub	S	water logging	l		
Barren	B	mass movement	g		
Rocky area	R	frost heaving	h		
Dune / Sandy area	E	frost shattering	f		
Glacial	C	man made	m		
Periglacial	L				
Others	T				

Forest, vegetation degradation, Low → Fv1

PROCESSES OF DESERTIFICATION/ LAND DEGRADATION

Vegetation degradation:

Vegetation degradation is referred as reduction in the biomass and/or decline in the vegetative ground cover, as a result of deforestation and/ or overgrazing. Such degradation is a major contributory factor to soil degradation particularly with regard to soil erosion and loss of soil organic matter. Vegetation is an important factor in the protection of soil and soil fertility. Destruction of vegetation accelerates soil degradation leading to its degradation. When a soil loses vegetation cover, it becomes more susceptible to wind and water erosion. Removal of top soil by water or wind erosion results in loss of organic material leading to decrease in soil aggregation and stability, and hence soil fertility. The water-holding capacity and the nutrient content of the soil are reduced when organic material is lost, which is an additional strain on vegetation survival. Agriculture observed within forest lands has also been classified under vegetation degradation. Figure-1 shows vegetation degradation as seen in AWiFS image and corresponding field photograph.

Figure-1: Vegetation degradation inside forest as visible in AWiFS image covering parts of Mizoram with corresponding field photograph

Water erosion:

Water Erosion is referred as loss of soil cover mainly due to rainfall and/ or surface runoff water. Water erosion can be categorised in three types, based on severity level, viz. sheet / rill erosion, gully erosion and ravine erosion. The sheet erosion (mostly within agricultural lands) and rills are categorised in slight category, the narrow and shallow gullies are categorized as moderate erosion, while the deep / wide gullies and ravines are classified as severe erosion. Particularly in the context of desertification or land degradation as a whole, water erosion does not refer to the river erosion. Figure-2 shows water erosion in AWiFS image and corresponding field photograph

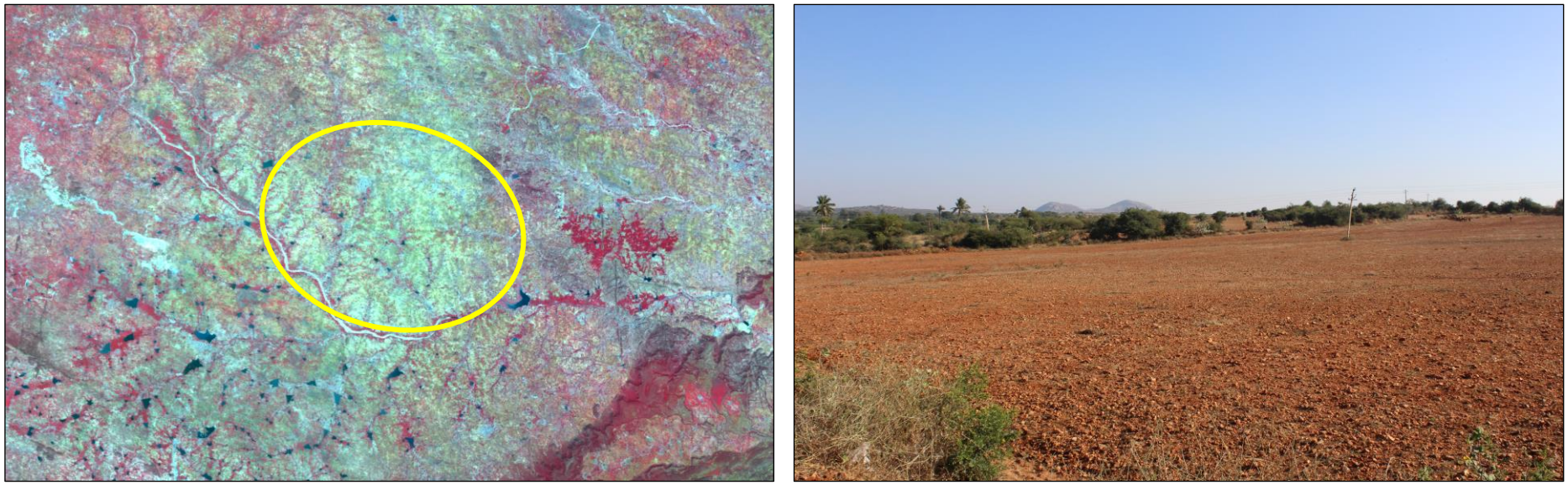


Figure-2: Water (Sheet) erosion as visible in AWiFS image covering parts of Telangana with corresponding field photograph

Wind erosion:

Wind erosion pertains to the Aeolian activities. It denotes the spread of sand by various processes, even up to lofty altitudes of Himalayas. Soil is more vulnerable to wind erosion in conditions such as very sparse or no vegetative cover, increasing wind speed, loose, dry, fine or very light soil, smooth soil surface, large exposed area etc. Wind erosion removes the topsoil, which is rich in all plant nutrients and bacterial activities. Removal of topsoil reduces the capacity of the soil to function and restricts its ability to sustain future uses. Moreover, windblown dust or sand is deposited in cultivated land and buries the lands, thus reducing the production. Various kind of sand cover and their severity are classified based on the depth and spread of sand sheet/dunes and barchans. Figure-3 shows the AWiFS satellite image and field photograph of wind erosion.

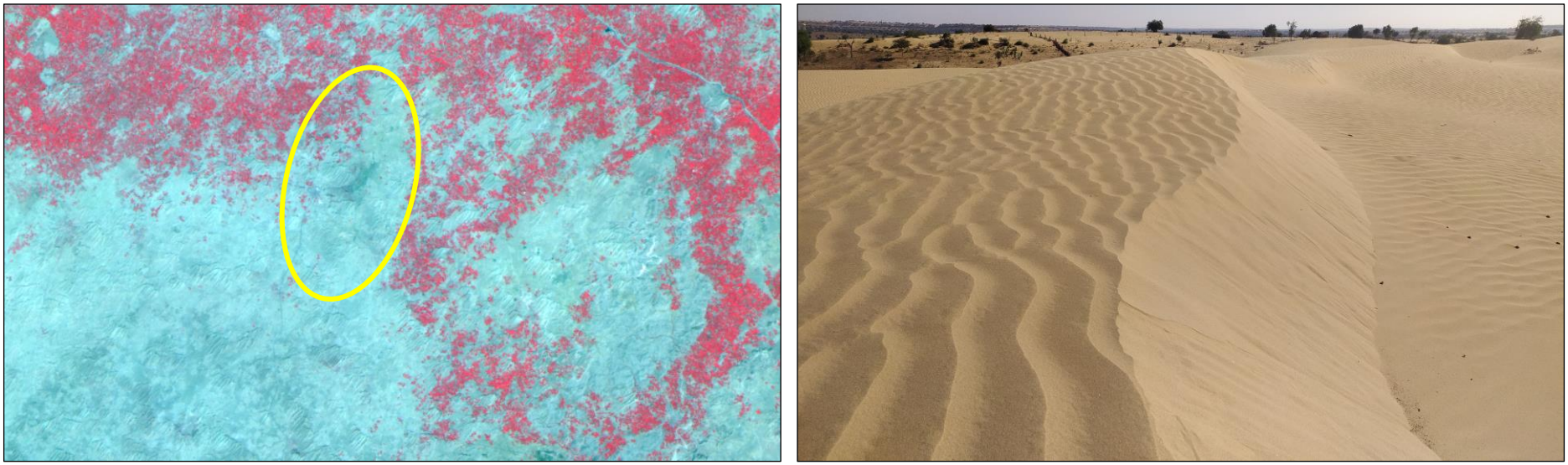


Figure-3: Wind erosion/deposition as visible in AWiFS image covering parts of Jodhpur, Rajasthan with corresponding field photograph

Water logging:

Water logging refers to the saturation of soil with water. The undrained land parcels tend to accumulate standing water for longer durations of time on the surface, this condition is called water logging. Soil may be regarded as waterlogged when it is nearly saturated with water much of the time such that its air phase is restricted. This results in reduction of productivity as in agriculture, various crops need air to a greater or lesser depth in the soil. The severity of water logging is determined based on the period of time the water remains stagnant. Several situations can be responsible for the rise in water table like flood, salt-rich hard pans, excess irrigation, wrong drainage planning etc. Water logging may also lead to salinization. Figure-4 shows water logging in AWiFS image and in corresponding field photograph.

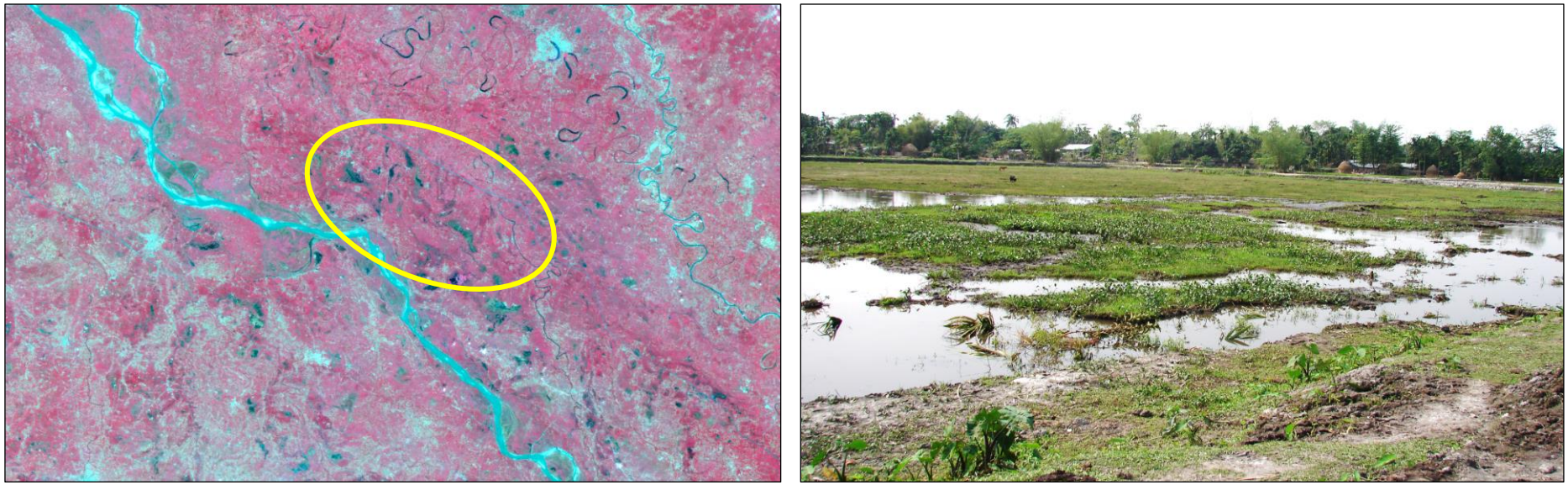


Figure-4: Water logging as visible in AWiFS image covering parts of Bihar with representative field photograph

Salinity / Alkalinity:

Salinity or Alkalinity is fundamentally the chemical property of the soils. It occurs mostly in cultivated lands, especially in the irrigated areas. At places salinity is clearly observed on satellite images, while the alkalinization is not seen and is mostly inferred based on ground truth and soil sample analysis as well as information/ published maps. Soil salinity refers to the water dissolvable salt present in soil. Salinity can develop naturally, or by human-induced factors. The main causes of salinity are excess evapotranspiration, drought, excess irrigation, increase in toxicity, and rise in ground water table. The salts from the groundwater are raised by capillary action to the surface of the soil and over time, water evaporates, and the salt remains on the surface. Salinity in irrigated land can occur due to over irrigation and excess use of fertilizers and other chemicals. Figure-5 shows AWiFS image and field photograph of salinity.

Figure-5: Salinity in agricultural field as visible in AWiFS image covering parts of Uttar Pradesh with corresponding field photograph

Mass Movement:

The spontaneous downward movement of soil and rock under the influence of gravity (but without the dynamic action of moving fluids) is included under the general term Mass Movement (mass wasting). The mass movement processes include all forms of down slope movement of soils, overburden, or bedrock under the direct influence of gravity. Mass movement represents the spontaneous yielding of earth materials when gravitational force exceeds the internal strength of the material. It involves sliding, rolling and flowage of masses of soil, overburden and bedrock. Figure-6 shows the AWiFS image of mass movement as visible in satellite image and corresponding field photograph.

Figure-6: Mass movement as visible in AWiFS image covering parts of Jammu & Kashmir with representative field photograph

Frost Heaving:

Frost heaving is the process of ice lens formation beneath the soil surface during freezing conditions in the atmosphere. The ice grows in the direction of heat loss (vertically toward the surface), starting at the freezing front or boundary in the soil. It requires a water supply to keep feeding the ice crystal growth. The growing ice is restrained by overlying soil, which applies a load that limits its vertical growth and promotes the formation of a lens-shaped area of ice within the soil. The force of one or more growing ice lenses is sufficient to lift a layer of soil, as much as 30 cm or more. Due to coarse spatial resolution this process could not be identified in AWiFS images. However, the LISS3 satellite images and corresponding field photographs of frost heaving is shown in figure-7.

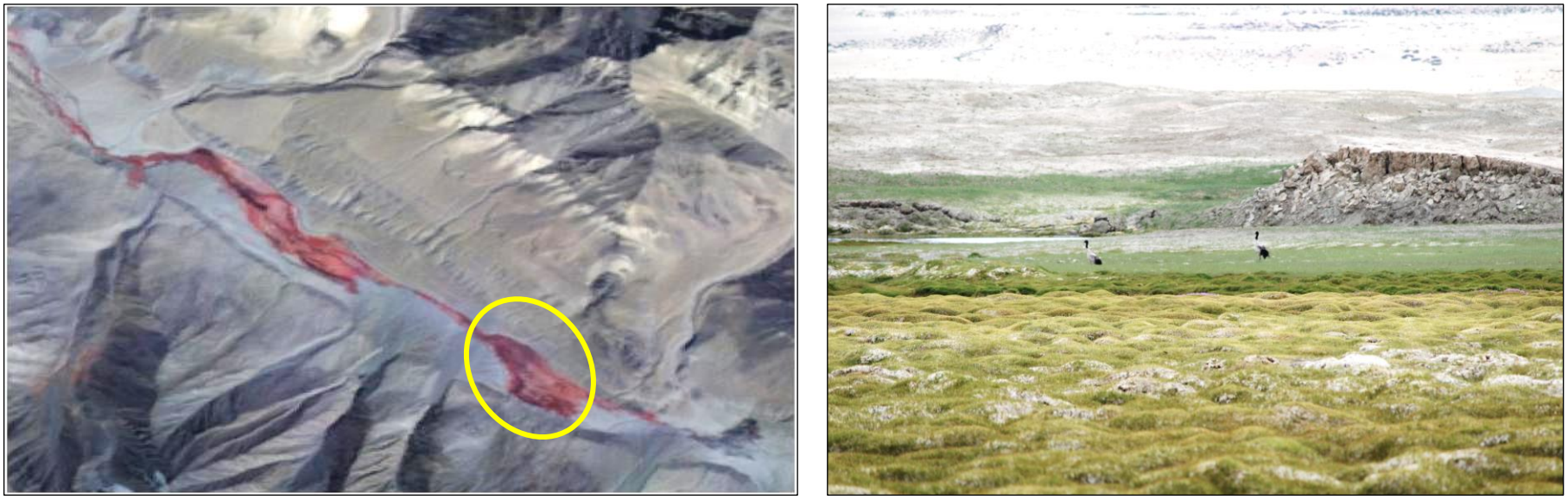


Figure-7: Frost heaving as visible in LISS3 image covering parts of Ladakh with representative field photograph

Frost shattering:

Frost shattering is the essentially a process of mechanical weathering or breakdown of rocks due to regular fluctuation in temperature, around 0^{o}C, in joints or cracks in rocks. At times water enters into the cracks of rock and it freezes to ice and results in increases in its volume. This creates tremendous pressure on the surrounding rock and generates cracks. This process continues over time, widens the joints/cracks, and causes pieces of rock to shatter from the main rock. The broken pieces of rocks fall down and spread over creating a stony surface called Talus or Scree. This is a regular process in a periglacial environment. The alternating process of frost shattering slowly widens the joints/cracks, and in time, causes pieces of rock to shatter from the main rock. Figure-8 shows AWiFS image and field photograph of frost shattering process.

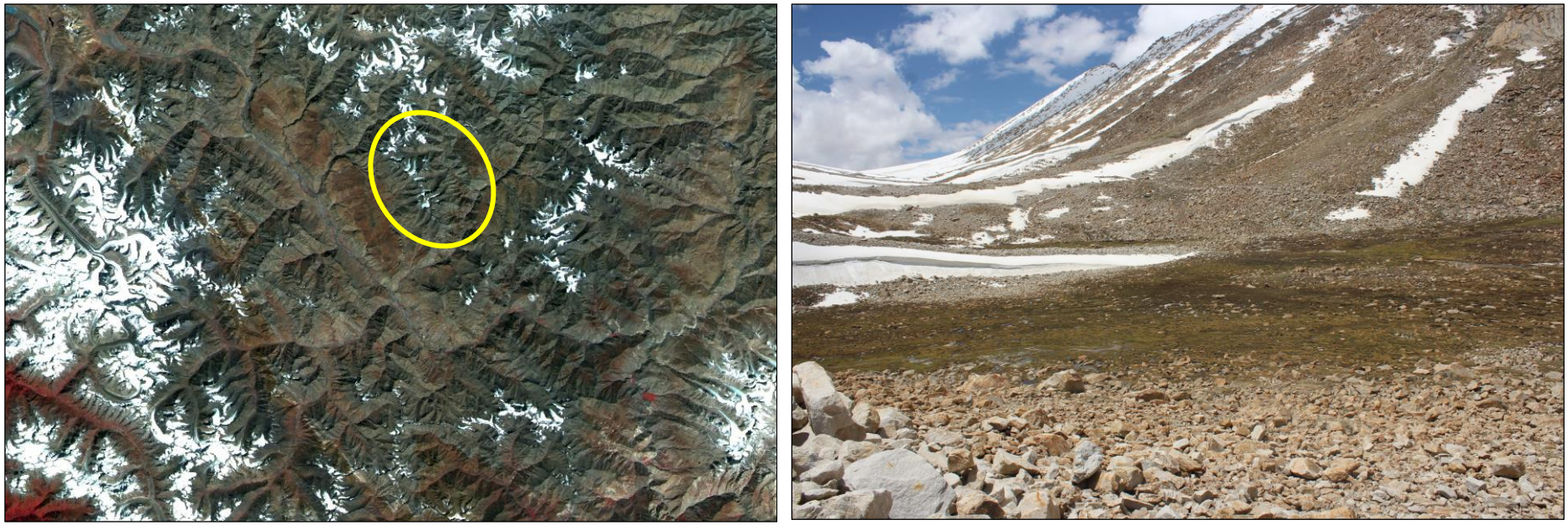


Figure-8: Frost shattering as visible in AWiFS image covering parts of Himachal Pradesh with representative field photograph

Man Made:

All those land degradation processes which are induced directly or indirectly by human intervention and are not natural, are categorised as Man Made desertification processes. It includes, Mining/Quarrying, Brick Kiln, Industrial Effluents, City Waste, Urban Agglomeration etc. This occurs across various land use/ land cover classes. Figure-9 shows mining area in AWiFS image and corresponding field photograph.

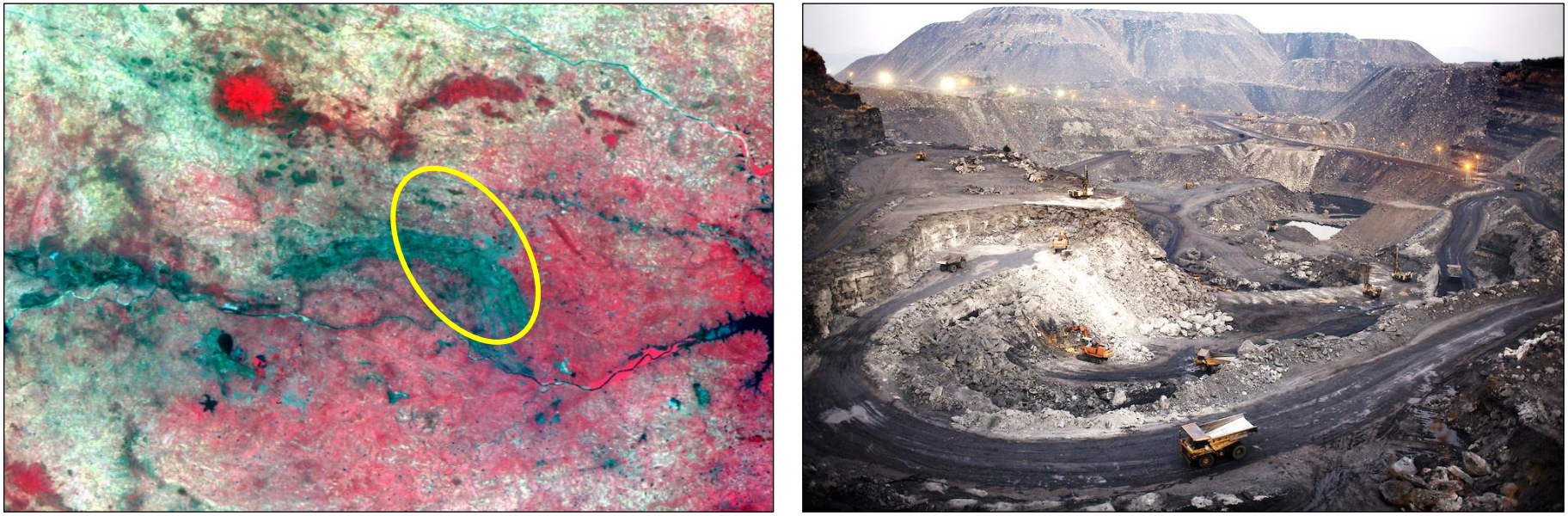


Figure-9: Open cast mining as visible in AWiFS image covering parts of Jharkhand with corresponding field photograph

Barren / Rocky area:

Barren / rocky areas are kind of wastelands which do not have productive capacity. These areas are mostly without or negligible soil cover either due to weathering and erosion of exogenetic processes or due to specific regolith made of hard rock. Figure-10 shows AWiFS image and field photograph of rocky area.

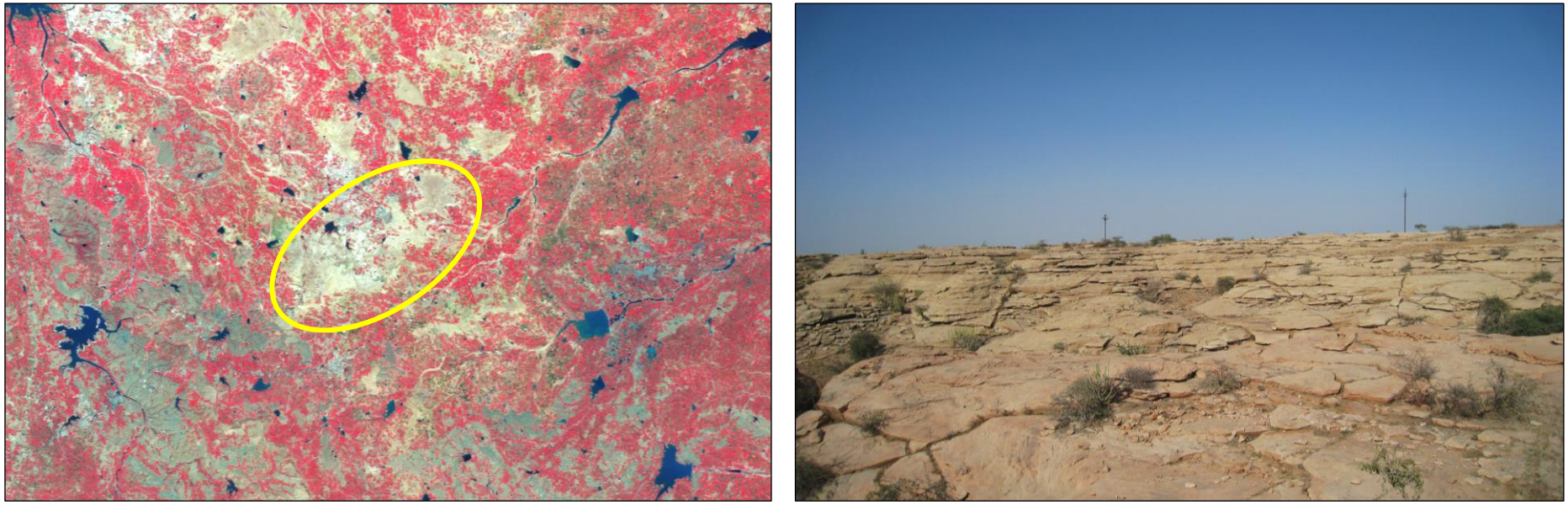


Figure-10: Rock outcrop as visible in AWiFS image covering parts of Gujarat with corresponding field photograph

PARTICIPATING ORGANISATIONS

S No	Name of Participating Organisations	Mapping State / Work Responsibility
1	Central Arid Zone Research Institution, Jodhpur	Rajasthan
2	Dhirubhai Ambani Institute of Information & Communication Technology, Gandhinagar	Gujarat
3	Jawaharlal Nehru University, Delhi	Haryana, Himachal Pradesh, Punjab and Uttarakhand
4	Jharkhand Space Applications Centre, Ranchi	Jharkhand
5	Maharashtra Remote Sensing Applications Centre, Nagpur	Maharashtra and Goa
6	MP Council of Science and Technology, Bhopal	Madhya Pradesh and Chhattisgarh
7	National Bureau of Soil Survey and Land Use Planning, Bangalore	Andhra Pradesh, Karnataka and Telangana
8	National Centre for Earth Science Studies, Thiruvananthapuram	Kerala and Tamil Nadu
9	North East Space Applications Centre, Meghalaya	Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim, Tripura and West Bengal
10	North Eastern Hill University, Shillong	Assam and Meghalaya
11	Orissa Remote Sensing Applications Centre, Bhubaneshwar	Odisha
12	Remote Sensing Applications Centre, Uttar Pradesh, Lucknow	Uttar Pradesh and Bihar
13	University of Kashmir, Srinagar	Jammu & Kashmir and Ladakh
14	Space Applications Centre (SAC), ISRO, Ahmedabad	Project conceptualisation, formulation, overall coordination, methodology development, geospatial database design and organization, training, quality checking, analysis of outcome and Atlas Preparation

METHODOLOGY

Geo-coded AWiFS digital data were analysed using onscreen visual interpretation techniques, along with ancillary information to interpret Desertification and land degradation classes. State wise maps on 1:500,000 scale were prepared in Geographical Information System (GIS) environment. Geo-database was created in GIS using ArcGIS software package based on National Spatial Frame work on 1:250K with LCC projection and WGS 84 datum. Base layer of administrative boundaries was used as reference from NRDB datasets and road and rail networks were used as reference from SAC NWIA project. Forest boundaries were taken from Forest Survey of India (FSI) and used as reference layer to delineate polygons particularly within forest areas. Ground truth data and field checks were carried out to finalize the maps. DLD maps of 2011-13 and 2003-05 timeframes (SAC 2016) were used for changes analysis.

Quality Checking (QC) was carried out considering accuracy of georeferencing (Image co-registration < 2 pixels error), Uniformity in Projection and Datum (WGS 1984 Lambert Conformal Conical), process & severity identification and GIS database design and standards (MMU > 225 ha, topology checking, seamless mosaic, codification, cartographic elements, etc.). Necessary corrections were incorporated.

State wise statistics were generated for different processes for 2018-19 time frames. Changes in desertification and land degradation classes were brought out between timeframes 2018-19, 2011-13 and 2003-05. Insignificant land degradation observed in Union Territories (UT) viz. Andaman and Nicobar, Chandigarh, Dadra Nagar Haveli, Daman and Diu, Lakshadweep, and Puducherry; hence the area of these UTs is included in No Apparent Degradation (NAD) class.

Mapping of area under Frost Shattering process was carried out from the images showing maximum ablation zone.

The area mapped/categorised as undergoing degradation are productive areas and these are observed to be effected with various processes of land degradation and severity levels.

Schematic representation of the methodology is shown in Figure 11.

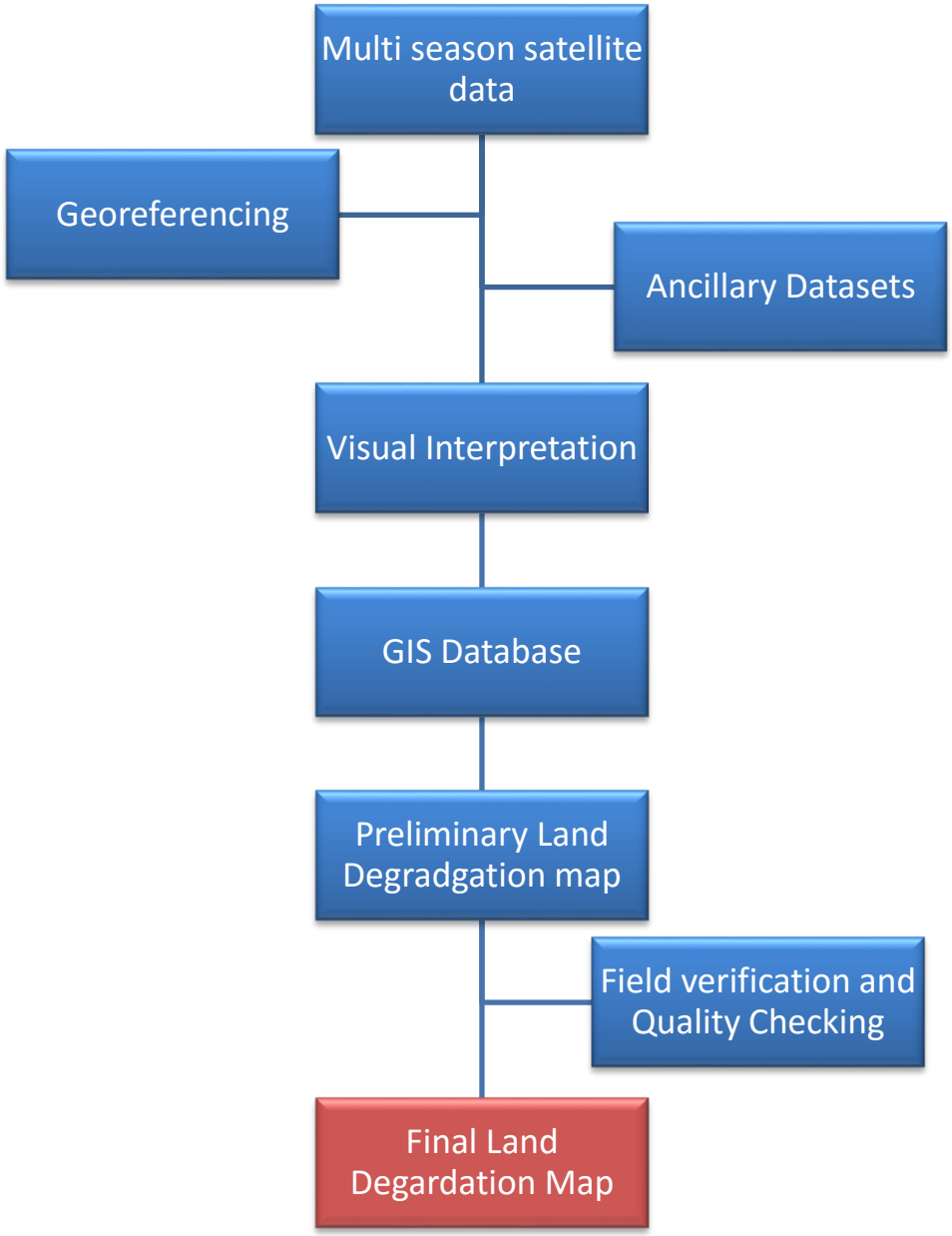
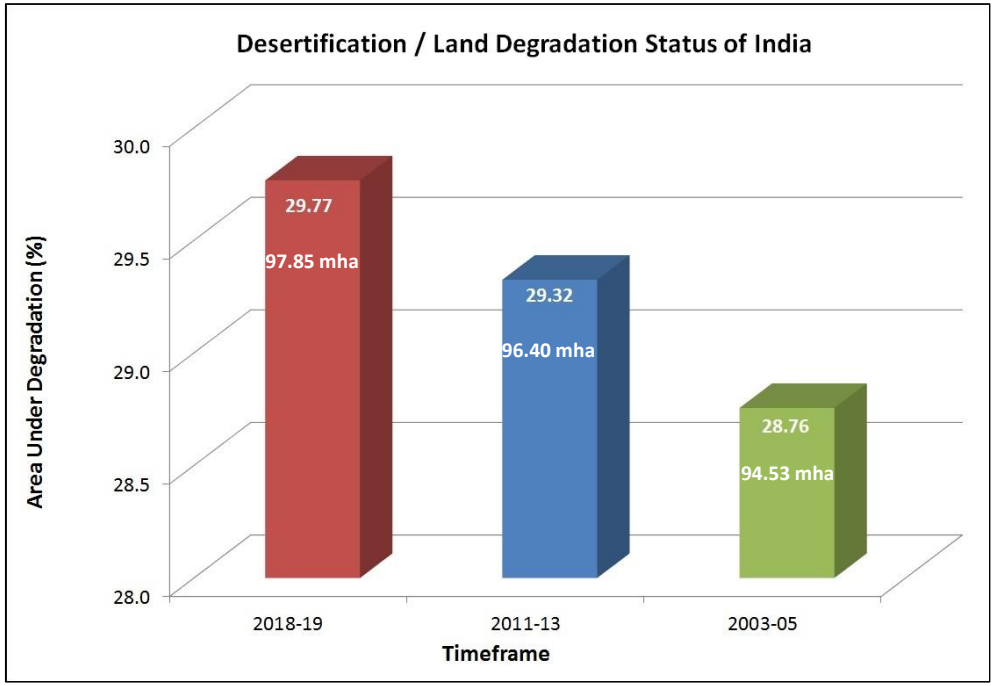


Figure-11: Schematic representation of Methodology

DESERTIFICATION/ LAND DEGRADATION STATUS OF THE COUNTRY

India is the second most populated country in the world with 1.21 billion population and area wise is the seventh largest covering 328.72 million ha (Census of India, 2011). The country is also at first place with 512 million livestock population (Census Livestock, 2012). India is covered with variety of land use and land covers; from evergreen forest to barren areas, cold/hot deserts to highly productive agriculture lands, glaciers to sand dunes, etc. Climate wise, there are areas witnessing very intense rainfall as well as areas with scarcity of rainfall, temperature in some of the area touches 50°C in summer season and at some places the temperature is observed as low as -30°C (IMD, 2019). Globally, India is the second largest producer of food and agricultural (FAO, 2019). India has the second-largest arable land area covering 1.53 billion hectare (World Bank, 2011). The blend of high population, high agriculture production and diverse agro-climatic conditions create a scenario of excessive pressure on land and raise the risk factor for degradation of land in India.

The country level Desertification and Land Degradation (DLD) map is prepared by integrating DLD maps of all the states. The statistical summary and analysis reveals that 97.85 million ha, 29.77% of the Total Geographic Area (TGA) of the country is undergoing land degradation during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed as 96.40 million ha (29.32% of the TGA) and 94.53 million ha (28.76% of the TGA) respectively. A cumulative increase of 1.45 million ha area (0.44% of the TGA) undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, a cumulative increase of 1.87 million ha area (0.57% of the TGA) is observed.



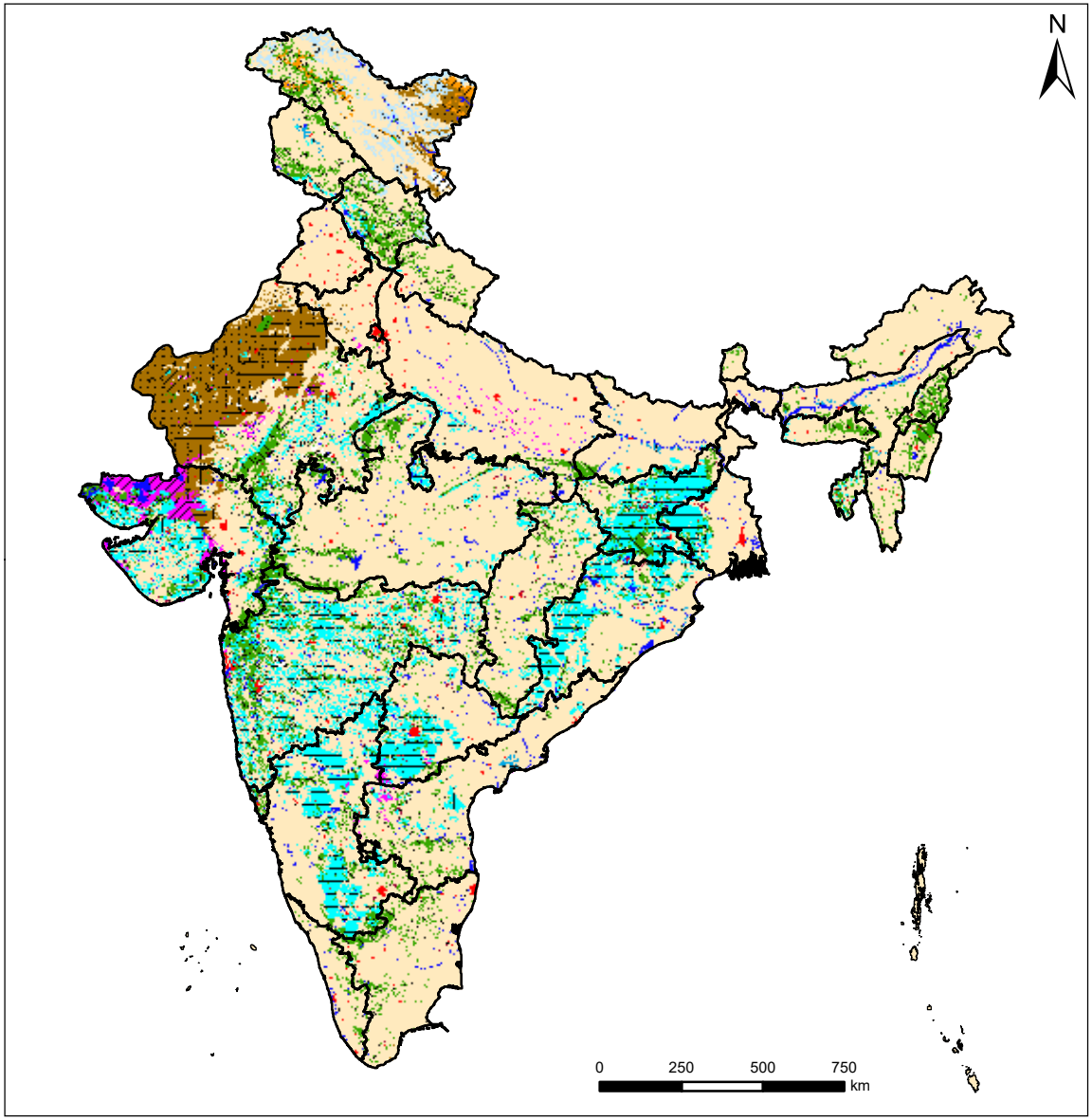
The most significant process of desertification/ land degradation in the country is Water Erosion (11.01% in 2018-19, 10.98% in 2011-13 and 10.83% in 2003-05), followed by Vegetation Degradation (9.15% in 2018-19, 8.91% in 2011-13 and 8.60% in 2003-05) and Wind Erosion (5.46% in 2018-19, 5.55 % in 2011-13 and 5.58 % in 2003-05).

Land degradation within dryland regions (arid, semi-arid and dry sub-humid regions) is termed as Desertification, 83.69 million ha area is observed as undergoing desertification for 2018-19 timeframe. Whereas, area undergoing desertification during 2011-13 and 2003-05 is 82.64 million ha and 81.48 million ha respectively. There is a cumulative increase of 1.05 million ha area under desertification from timeframe 2011-13 to 2018-19. The increase in area under desertification from 2003-05 to 2011-13 is 1.16 million ha. The most significant processes of desertification in arid region is wind erosion. Whereas, water erosion and vegetation degradation processes are prominent in semi-arid and dry sub-humid regions.

Analysis shows that around 23.79% (2018-19), 23.63% (2011-13) and 23.34% (2003-05) of the area undergoing desertification/land degradation with respect to TGA of the country is contributed by Rajasthan, Maharashtra, Gujarat, Karnataka, Ladakh UT, Jharkhand, Odisha, Madhya Pradesh and Telangana (in descending order). All other remaining states are contributing less than 1% (individually) wrt country TGA.

The analysis with respect to TGA of the individual states show that Jharkhand, Rajasthan, Delhi, Gujarat and Goa are showing more than 50% area under desertification/land degradation; whereas, states with less than 10% area under desertification/land degradation are Kerala, Assam, Mizoram, Haryana, Bihar, Uttar Pradesh, Punjab and Arunachal Pradesh.

DESERTIFICATION / LAND DEGRADATION STATUS MAP OF INDIA - 2018-19

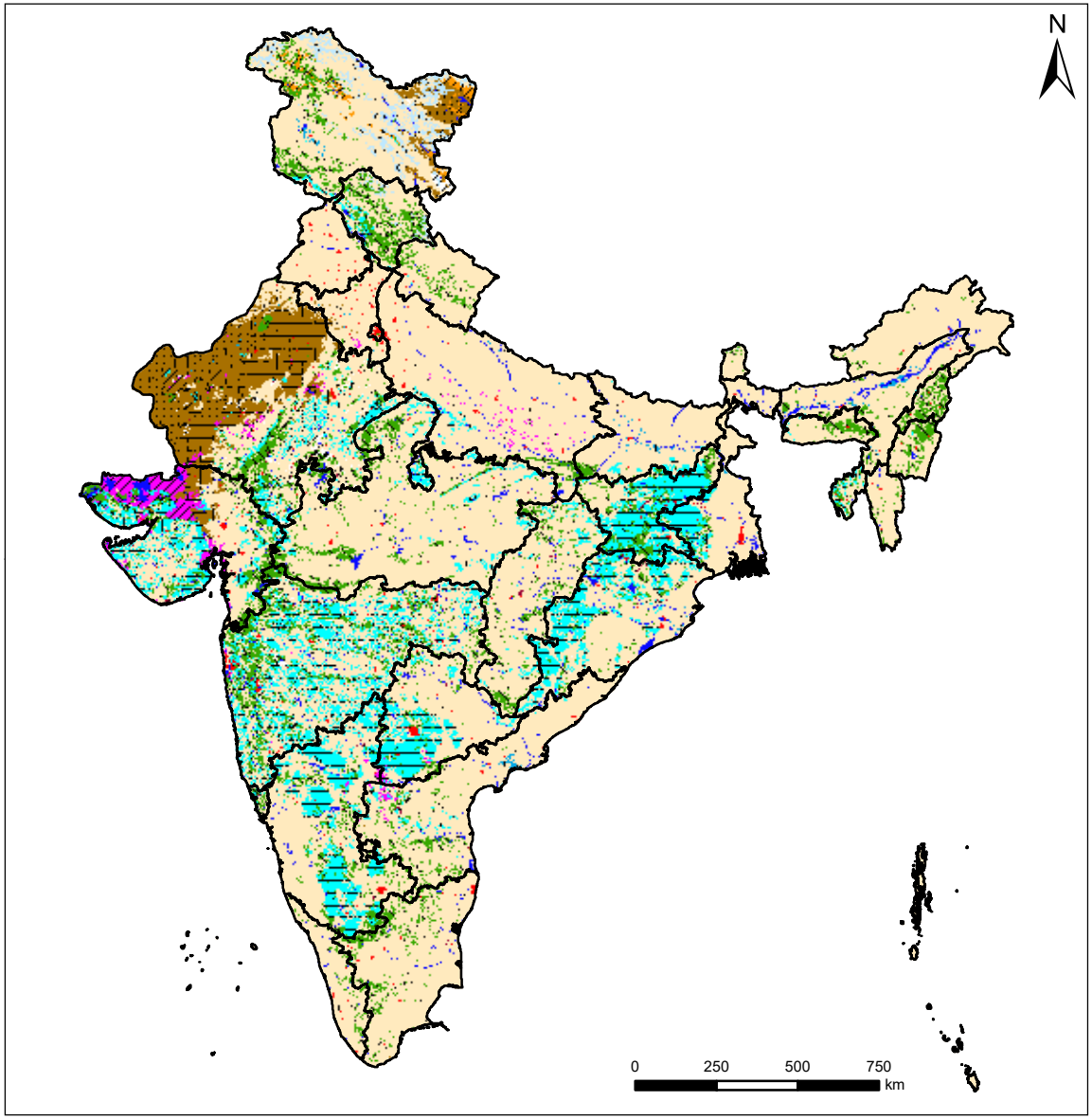


Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Gv1,2	Grassland / Grazing land, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ew1	Dune / Sandy area, water erosion
	Ie1,2	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Se1,2	Land with scrub, wind erosion
	Be1	Barren, wind erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Is1,2	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Gs1,2	Grassland / Grazing land, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Il1,2	Agriculture irrigated, water logging
	Dl1,2	Agriculture unirrigated, water logging
	Fl1	Forest, water logging
	Gl2	Grassland / Grazing land, water logging
	Sl1,2	Land with scrub, water logging
	El1,2	Dune / Sandy area, water logging
	Bg2	Barren, mass movement
	Rf1	Rocky, frost shattering
	Lf1,2	Periglacial, frost shattering
	Fm1,2	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source: IRS AWiFS (2018-19), Ancillary Information

Prepared by:
Space Applications Centre,ISRO, Ahmedabad

DESERTIFICATION / LAND DEGRADATION STATUS MAP OF INDIA - 2011-13



Legend		
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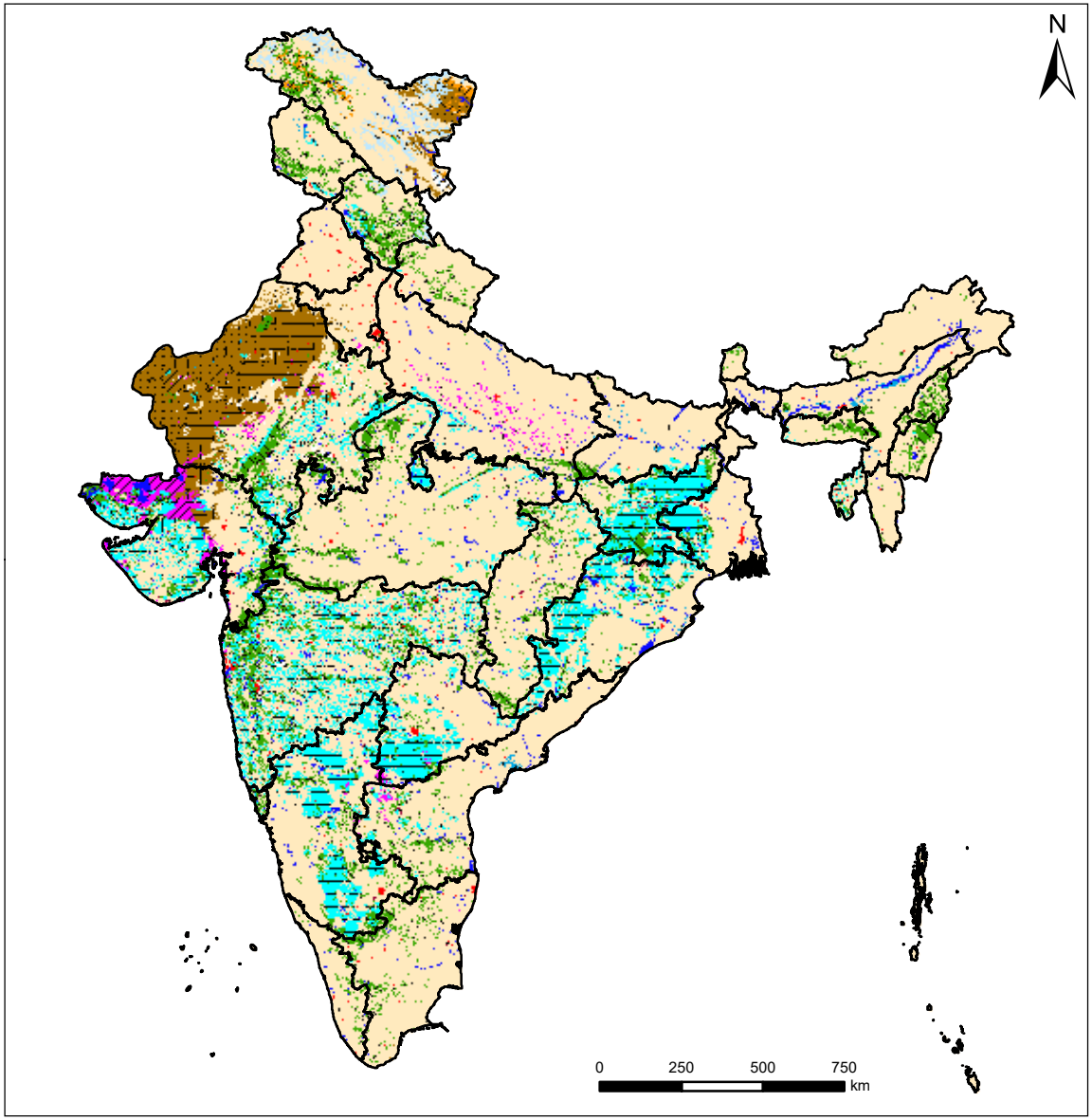
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Gs1,2	Grassland / Grazing land, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Il1,2	Agriculture irrigated, water logging
	Dl1,2	Agriculture unirrigated, water logging
	Fl1	Forest, water logging
	Gl2	Grassland / Grazing land, water logging
	Sl1,2	Land with scrub, water logging
	El1,2	Dune / Sandy area, water logging
	Bg2	Barren, mass movement
	Rf1	Rocky, frost shattering
	Lf1,2	Periglacial, frost shattering
	Fm1,2	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source: IRS AWiFS (2011-13), Ancillary Information

Prepared by:
Space Applications Centre,ISRO, Ahmedabad

DESERTIFICATION / LAND DEGRADATION STATUS MAP OF INDIA - 2003-05



Legend		
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	Bw1	Barren, water erosion
	Ew1	Dune / Sandy area, water erosion
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	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Il1,2	Agriculture irrigated, water logging
	Dl1,2	Agriculture unirrigated, water logging
	Fl1	Forest, water logging
	Gl2	Grassland / Grazing land, water logging
	Sl1,2	Land with scrub, water logging
	El1,2	Dune / Sandy area, water logging
	Bg2	Barren, mass movement
	Rf1	Rocky, frost shattering
	Lf1,2	Periglacial, frost shattering
	Fm1,2	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source: IRS AWiFS (2003-05), Ancillary Information

Prepared by:
Space Applications Centre,ISRO, Ahmedabad

State wise Status of Desertification and Land Degradation - 2018-19 and 2011-13 (area in ha)

State Name	Vegetation Degradation		Water Erosion		Wind Erosion		Salinity		Water Logging		Frost Shattering		Mass Movement	
	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13
Andhra Pradesh	1170184	1164257	801280	789433	3986	3986	119368	117952	166341	132334	-	-	-	-
Arunachal Pradesh	162560	120499	-	-	-	-	-	-	-	-	23726	20186	-	-
Assam	532652	471958	31827	31424	-	-	-	-	229584	186667	-	-	-	-
Bihar	265244	242525	327004	321175	-	-	-	-	125187	106628	-	-	-	-
Chhattisgarh	1356314	1348089	854393	783645	-	-	-	-	-	-	-	-	-	-
Delhi	9980	9980	-	-	-	-	-	-	347	347	-	-	-	-
Goa	139765	138172	30328	33889	-	-	-	-	9551	9005	-	-	-	-
Gujarat	2322802	2319826	3833330	3859497	1174936	1177105	2598828	2645405	3375	3375	-	-	-	-
Haryana	44226	41411	13568	13568	151224	151797	33640	27841	15293	12530	-	-	-	-
Himachal Pradesh	1796300	1790803	268824	268261	-	-	-	-	-	-	332423	332423	-	-
Jammu and Kashmir	868556	832760	151031	136918	-	-	-	-	78858	70159	9051	9051	-	-
Jharkhand	1419362	1379038	3915868	4036785	-	-	-	-	-	-	-	-	-	-
Karnataka	1697479	1712386	5012171	5043041	2159	2159	89122	86740	-	-	-	-	-	-
Kerala	359046	337613	-	-	-	-	-	-	11989	11989	-	-	-	-
Ladakh	1122940	1115514	9243	9243	1738937	1673347	-	-	-	-	3080041	2964674	941083	929710
Madhya Pradesh	2537442	2523801	1129718	1125418	-	-	6854	-	7788	7788	-	-	-	-
Maharashtra	5142353	4884005	8217047	8060753	-	-	28713	29089	-	-	-	-	-	-
Manipur	584394	575603	8070	8070	-	-	-	-	5026	5026	-	-	-	-
Meghalaya	466072	435527	71772	53149	-	-	-	-	9916	1548	-	-	-	-
Mizoram	253871	167050	8119	8119	-	-	-	-	-	-	-	-	-	-
Nagaland	819753	778421	-	-	-	-	-	-	-	-	-	-	-	-
Orissa	747574	745122	4439799	4409413	-	-	-	-	43992	36439	-	-	-	-
Punjab	37972	32561	15344	14116	-	-	-	-	-	-	-	-	-	-
Rajasthan	2614640	2606221	2124456	2116314	14843215	15197874	365834	363768	18425	18421	-	-	-	-
Sikkim	77794	74318	-	-	-	-	-	-	-	-	6116	3730	-	-
Tamil Nadu	1414888	1385478	6411	6411	30429	30429	10500	9878	-	-	-	-	-	-
Telangana	545477	541145	2826129	2854285	-	-	105955	86514	-	-	-	-	-	-
Tripura	245366	236374	185575	186900	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	419538	413476	584188	586961	-	-	282913	307571	34505	33620	-	-	-	-
Uttarakhand	630308	606616	11943	11943	-	-	-	-	-	-	13786	13786	-	-
West Bengal	269089	265277	1323275	1329539	-	-	-	-	47759	17627	-	-	-	-
Total	**30073939**	**29295826**	**36200711**	**36098271**	**17944887**	**18236697**	**3641727**	**3674759**	**807935**	**653504**	**3465142**	**3343850**	**941083**	**929710**

State wise Status of Desertification and Land Degradation - 2018-19 and 2011-13 (area in ha)

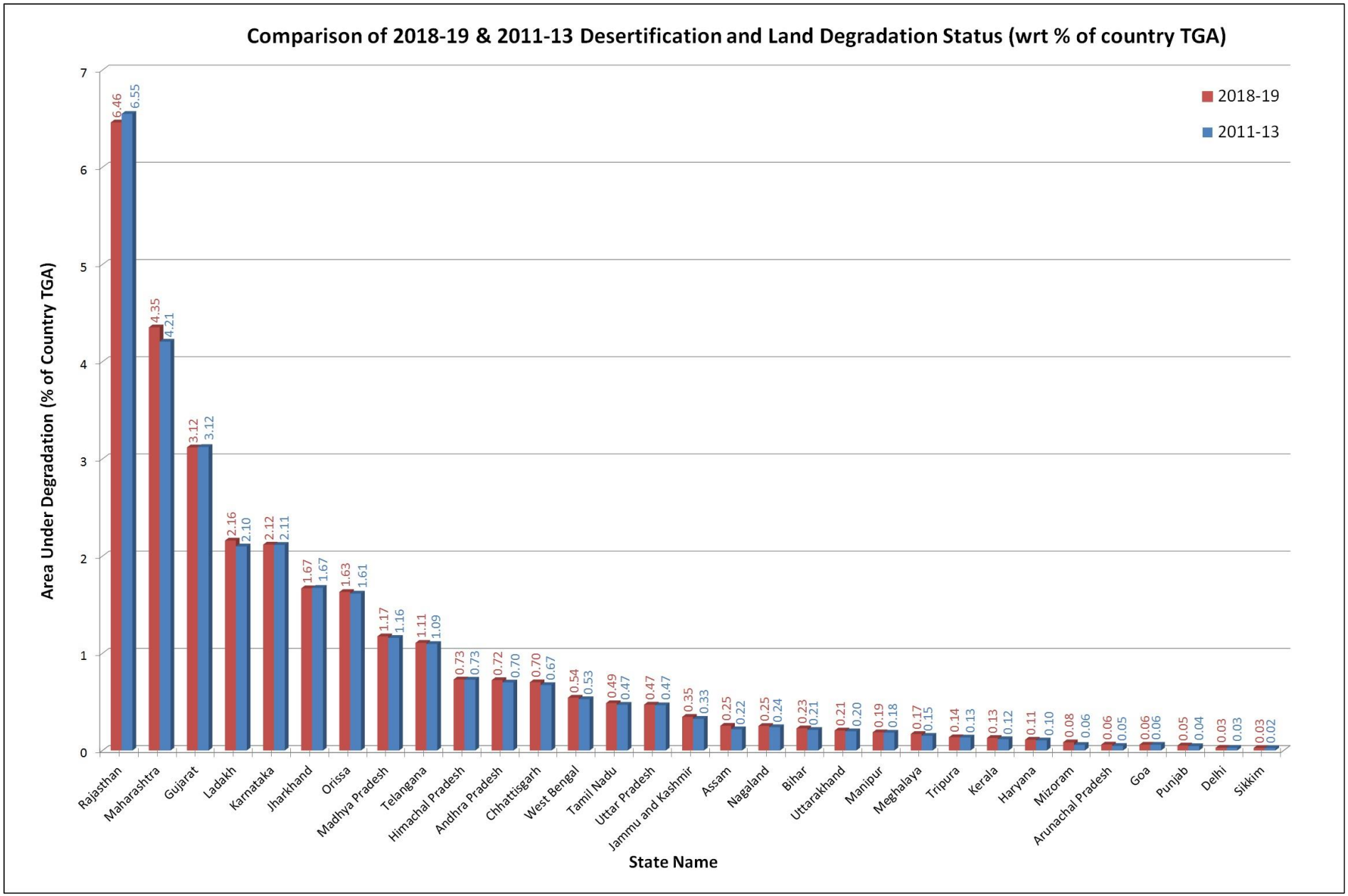
State Name	Manmade		Barren/Rocky		Settlement		Total Area under Desertification		Total Area under Desertification		No Apparent Degradation	
	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13	2018-19	2011-13
Andhra Pradesh	30203	20833	20521	20521	66158	49441	2378042	2298758	14.84	14.35	13346249	13447078
Arunachal Pradesh	-	-	-	-	14398	13247	200683	153933	2.40	1.84	8091702	8144850
Assam	427	-	-	-	40040	26548	834530	716596	10.64	9.14	6441437	6591013
Bihar	984	984	-	-	28168	23496	746586	694809	7.93	7.38	8414652	8511828
Chhattisgarh	52756	40541	7222	7222	35845	31656	2306531	2211153	17.06	16.36	11033053	11130592
Delhi	-	-	-	-	81216	79541	91543	89868	61.73	60.60	55633	57307
Goa	3374	3374	-	-	11860	8533	194877	192973	52.64	52.13	167388	168648
Gujarat	68649	51637	33484	39218	212653	165578	10248057	10261641	52.22	52.29	8545265	8533439
Haryana	5962	5962	-	-	100241	85855	364154	338964	8.24	7.67	4057046	4082236
Himachal Pradesh	656	656	-	-	2097	2097	2400300	2394240	43.11	43.01	3117564	3123624
Jammu and Kashmir	-	-	-	-	22008	15832	1129503	1064721	20.86	19.67	4241000	4305782
Jharkhand	95301	52734	-	-	51730	30169	5482260	5498726	68.77	68.98	2411930	2398866
Karnataka	38794	20876	3252	3389	116871	82409	6959847	6951000	36.29	36.24	11975482	11984329
Kerala	1759	-	-	-	49505	29984	422299	379587	10.87	9.77	3381160	3455238
Ladakh	-	-	219725	219085	-	-	7111968	6911573	42.31	41.12	9513355	9714757
Madhya Pradesh	42018	19454	30873	31495	105043	96359	3859735	3804315	12.52	12.34	26417669	26502030
Maharashtra	49022	19912	497661	506163	371234	326013	14306029	13825935	46.49	44.93	15931281	16415568
Manipur	-	-	-	-	15075	13260	612566	601959	27.44	26.96	1601584	1613978
Meghalaya	642	-	-	-	9175	4656	557576	494880	24.86	22.06	1683879	1746580
Mizoram	-	-	-	-	13837	12285	275827	187453	13.08	8.89	1812845	1903762
Nagaland	-	-	-	-	9190	8257	828943	786678	50.00	47.45	827297	869562
Orissa	72883	63851	5128	5128	49638	44161	5359014	5304114	34.42	34.06	9715492	9758929
Punjab	1641	1641	-	-	113032	96335	167989	144653	3.34	2.87	4824232	4849651
Rajasthan	81796	53058	1050236	1052374	139064	118482	21237665	21526512	62.06	62.90	12821672	12546925
Sikkim	-	-	-	-	700	700	84610	78749	11.92	11.10	624372	630234
Tamil Nadu	18036	13965	515	515	119203	97223	1599981	1543898	12.30	11.87	11287656	11344261
Telangana	41076	16982	1979	1979	117893	97951	3638508	3598856	31.68	31.34	7633243	7689491
Tripura	-	-	-	-	16437	13854	447378	437128	42.66	41.69	593730	608776
Uttar Pradesh	9836	5970	-	-	218628	181399	1549608	1528997	6.43	6.35	22092515	22115961
Uttarakhand	-	-	-	-	17858	15908	673894	648253	12.60	12.12	4642109	4667750
West Bengal	22206	15102	-	-	122016	106386	1784345	1733931	20.10	19.54	6827084	6884910
Total	638022	407531	1870594	1887088	2270811	1877617	97854851	96404853	29.77	29.32	224129575	225797954

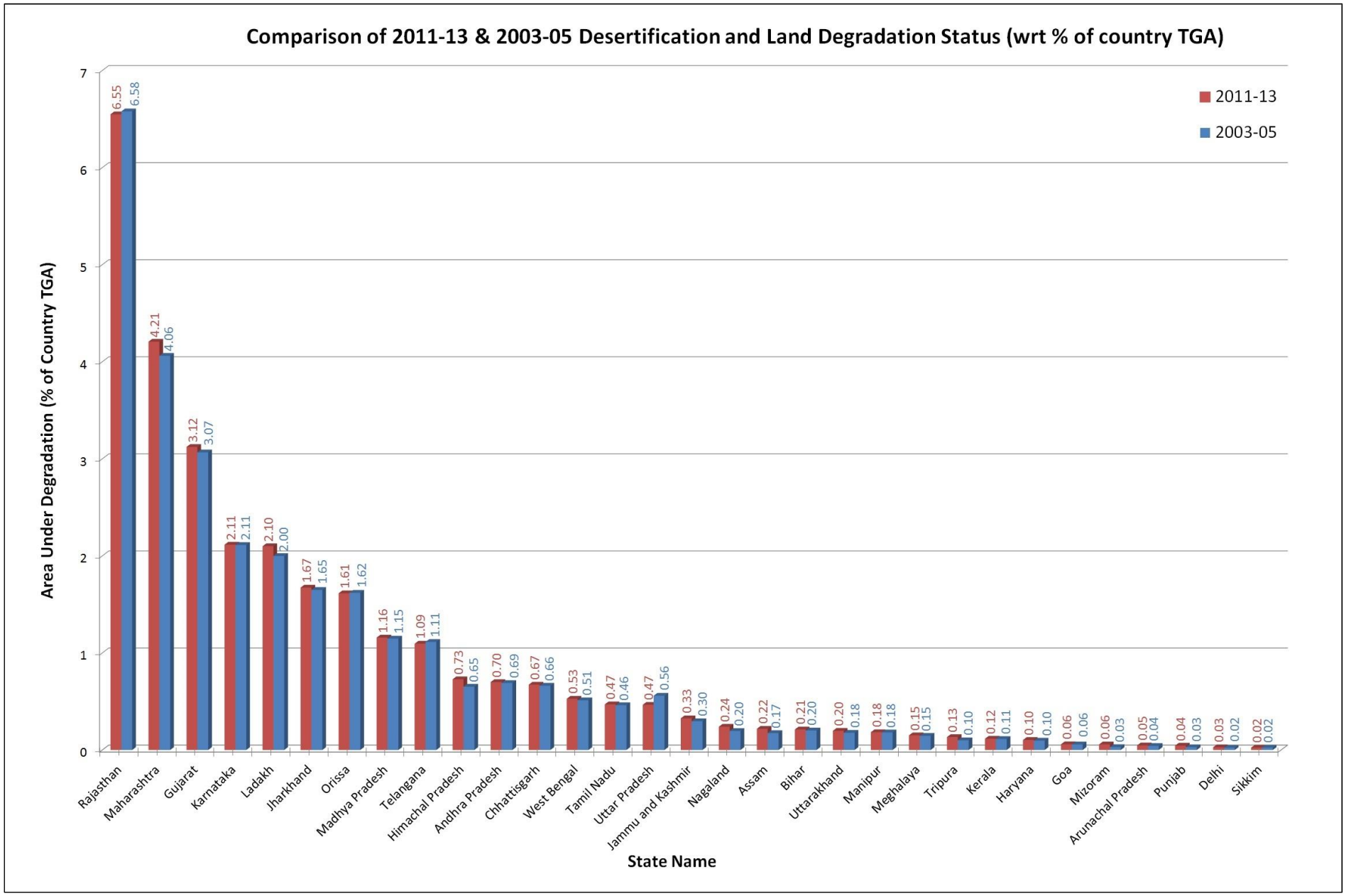
State wise Status of Desertification and Land Degradation - 2011-13 and 2003-05 (area in ha)

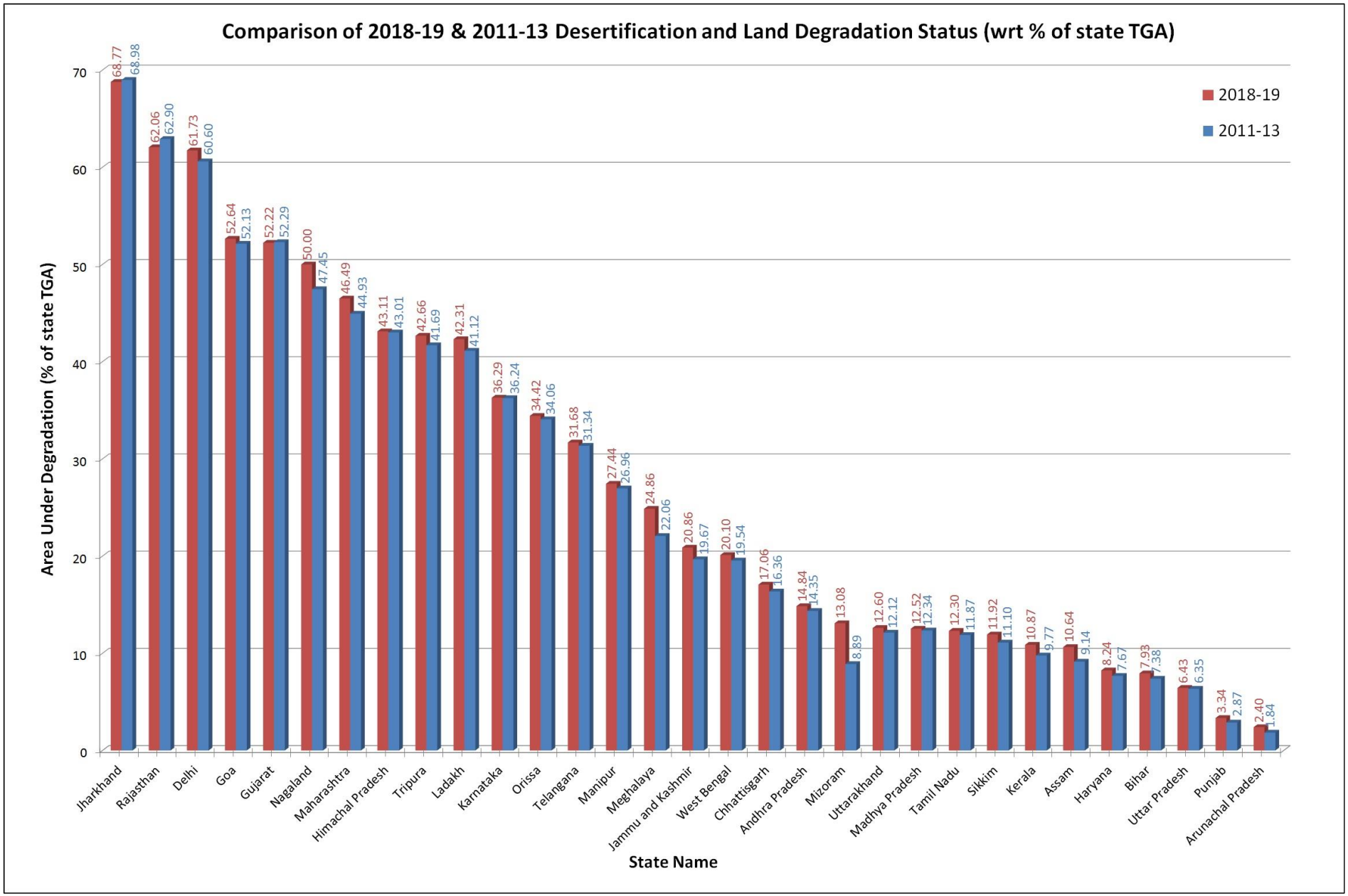
State Name	Vegetation Degradation		Water Erosion		Wind Erosion		Salinity		Water Logging		Frost Shattering		Mass Movement	
	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05
Andhra Pradesh	1164257	1168447	789433	783830	3986	4722	117952	117239	132334	125755	-	-	-	-
Arunachal Pradesh	120499	107845	-	-	-	-	-	-	-	-	20186	19072	-	-
Assam	471958	322540	31424	31424	-	-	-	-	186667	193669	-	-	-	-
Bihar	242525	255073	321175	304364	-	-	-	-	106628	78450	-	-	-	-
Chhattisgarh	1348089	1348122	783645	770387	-	-	-	-	-	-	-	-	-	-
Delhi	9980	9980	-	-	-	-	-	-	347	347	-	-	-	-
Goa	138172	132301	33889	33892	-	-	-	-	9005	9003	-	-	-	-
Gujarat	2319826	2255417	3859497	3788099	1177105	1179548	2645405	2643828	3375	3375	-	-	-	-
Haryana	41411	40514	13568	13568	151797	148151	27841	27841	12530	8822	-	-	-	-
Himachal Pradesh	1790803	1582938	268261	233990	-	-	-	-	-	-	332423	322417	-	-
Jammu and Kashmir	832760	805788	136918	100419	-	-	-	-	70159	46282	9051	2584	-	-
Jharkhand	1379038	1307162	4036785	4037261	-	-	-	-	-	-	-	-	-	-
Karnataka	1712386	1704569	5043041	5059629	2159	2159	86740	86582	-	-	-	-	-	-
Kerala	337613	328638	-	-	-	-	-	-	11989	12906	-	-	-	-
Ladakh	1115514	1098797	9243	9243	1673347	1653644	-	-	-	-	2964674	2752763	929710	845121
Madhya Pradesh	2523801	2514983	1125418	1120221	-	-	-	-	7788	7788	-	-	-	-
Maharashtra	4884005	4890778	8060753	7622800	-	-	29089	30054	-	-	-	-	-	-
Manipur	575603	574706	8070	8070	-	-	-	-	5026	5026	-	-	-	-
Meghalaya	435527	414659	53149	54046	-	-	-	-	1548	5881	-	-	-	-
Mizoram	167050	81854	8119	7444	-	-	-	-	-	-	-	-	-	-
Nagaland	778421	637957	-	-	-	-	-	-	-	-	-	-	-	-
Orissa	745122	752929	4409413	4442556	-	-	-	-	36439	36439	-	-	-	-
Punjab	32561	18705	14116	1897	-	-	-	-	-	-	-	-	-	-
Rajasthan	2606221	2596003	2116314	2116082	15197874	15332054	363768	365666	18421	18421	-	-	-	-
Sikkim	74318	74205	-	-	-	-	-	-	-	-	3730	3730	-	-
Tamil Nadu	1385478	1368330	6411	6411	30429	30429	9878	9878	-	-	-	-	-	-
Telangana	541145	538533	2854285	2951871	-	-	86514	81917	-	-	-	-	-	-
Tripura	236374	125058	186900	189533	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	413476	414176	586961	610989	-	-	307571	636202	33620	33907	-	-	-	-
Uttarakhand	606616	545610	11943	11943	-	-	-	-	-	-	13786	13786	-	-
West Bengal	265277	264325	1329539	1299542	-	-	-	-	17627	13261	-	-	-	-
Total	**29295826**	**28280942**	**36098271**	**35609508**	**18236697**	**18350706**	**3674759**	**3999206**	**653504**	**599331**	**3343850**	**3114352**	**929710**	**845121**

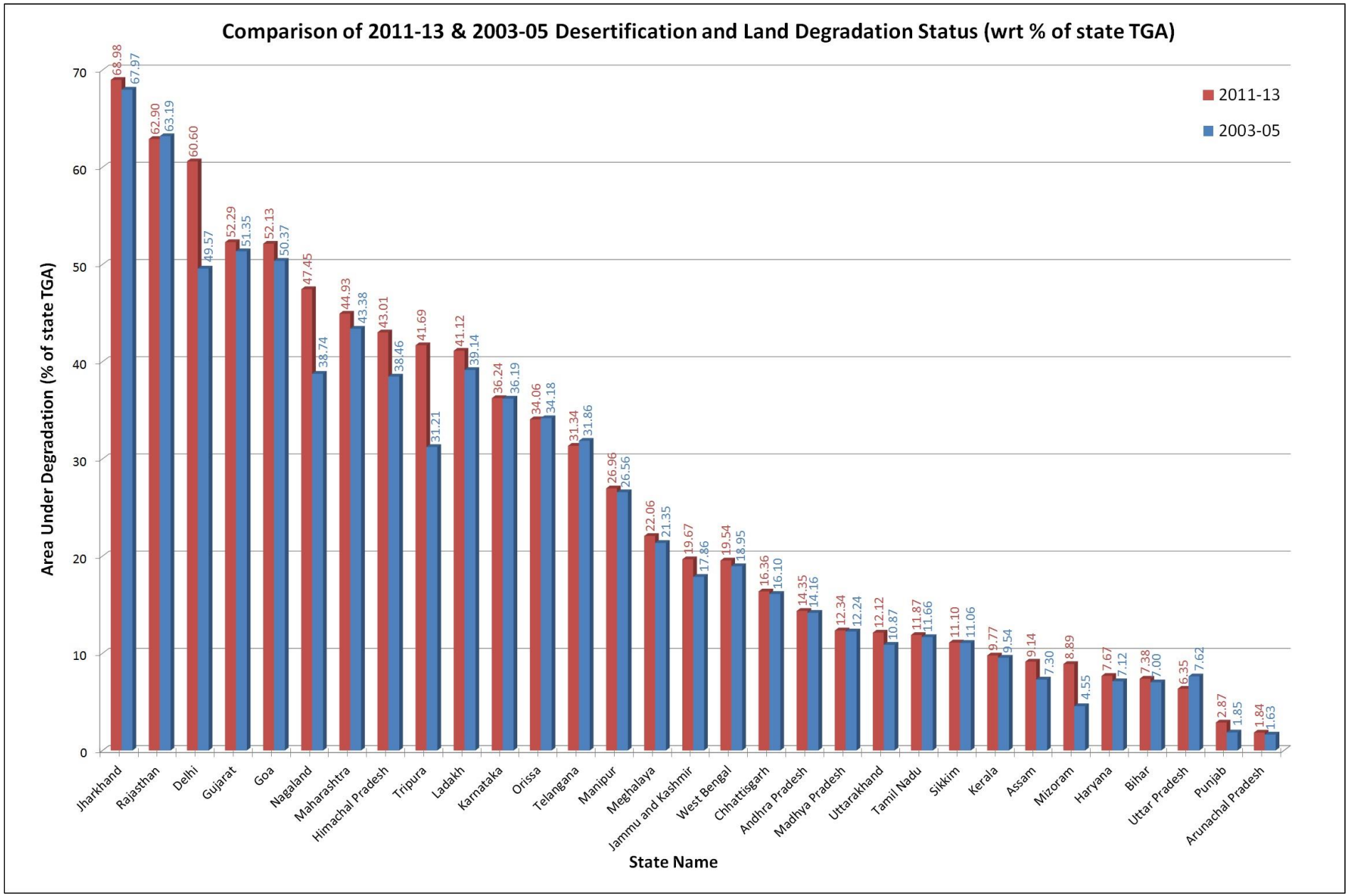
State wise Status of Desertification and Land Degradation - 2011-13 and 2003-05 (area in ha)

State Name	Manmade		Barren/Rocky		Settlement		Total Area under Desertification		Total Area under Desertification		No Apparent Degradation	
	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05	2011-13	2003-05
Andhra Pradesh	20833	20565	20521	20521	49441	26649	**2298758**	**2267728**	**14.35**	**14.16**	**13447078**	**13476591**
Arunachal Pradesh	-	-	-	-	13247	9769	**153933**	**136686**	**1.84**	**1.63**	**8144850**	**8162237**
Assam	-	-	-	-	26548	24583	**716596**	**572215**	**9.14**	**7.30**	**6591013**	**6735134**
Bihar	984	984	-	-	23496	20669	**694809**	**659539**	**7.38**	**7.00**	**8511828**	**8527091**
Chhattisgarh	40541	31972	7222	7222	31656	18685	**2211153**	**2176388**	**16.36**	**16.10**	**11130592**	**11166012**
Delhi	-	-	-	-	79541	63187	**89868**	**73514**	**60.60**	**49.57**	**57307**	**73661**
Goa	3374	3374	-	-	8533	7889	**192973**	**186458**	**52.13**	**50.37**	**168648**	**174991**
Gujarat	51637	50524	39218	39218	165578	117447	**10261641**	**10077455**	**52.29**	**51.35**	**8533439**	**8718876**
Haryana	5962	4894	-	-	85855	70792	**338964**	**314583**	**7.67**	**7.12**	**4082236**	**4106617**
Himachal Pradesh	656	656	-	-	2097	1365	**2394240**	**2141366**	**43.01**	**38.46**	**3123624**	**3376690**
Jammu and Kashmir	-	-	-	-	15832	11723	**1064721**	**966795**	**19.67**	**17.86**	**4305782**	**4403724**
Jharkhand	52734	49730	-	-	30169	24503	**5498726**	**5418657**	**68.98**	**67.97**	**2398866**	**2469577**
Karnataka	20876	18704	3389	2887	82409	66413	**6951000**	**6940943**	**36.24**	**36.19**	**11984329**	**11994157**
Kerala	-	-	-	-	29984	28968	**379587**	**370512**	**9.77**	**9.54**	**3455238**	**3464358**
Ladakh	-	-	219085	219085	-	-	**6911573**	**6578653**	**41.12**	**39.14**	**9714757**	**10044881**
Madhya Pradesh	19454	16024	31495	30457	96359	82379	**3804315**	**3771853**	**12.34**	**12.24**	**26502030**	**26648676**
Maharashtra	19912	19912	506163	509789	326013	275272	**13825935**	**13348604**	**44.93**	**43.38**	**16415568**	**16873660**
Manipur	-	-	-	-	13260	5290	**601959**	**593093**	**26.96**	**26.56**	**1613978**	**1622844**
Meghalaya	-	-	-	-	4656	4239	**494880**	**478825**	**22.06**	**21.35**	**1746580**	**1762634**
Mizoram	-	-	-	-	12285	6575	**187453**	**95873**	**8.89**	**4.55**	**1903762**	**1998679**
Nagaland	-	-	-	-	8257	4347	**786678**	**642304**	**47.45**	**38.74**	**869562**	**1013937**
Orissa	63851	51445	5128	5053	44161	33481	**5304114**	**5321903**	**34.06**	**34.18**	**9758929**	**9741425**
Punjab	1641	652	-	-	96335	71861	**144653**	**93115**	**2.87**	**1.85**	**4849651**	**4901242**
Rajasthan	53058	50865	1052374	1047818	118482	98696	**21526512**	**21625604**	**62.90**	**63.19**	**12546925**	**12448140**
Sikkim	-	-	-	-	700	546	**78749**	**78482**	**11.10**	**11.06**	**630234**	**630500**
Tamil Nadu	13965	13965	515	515	97223	87133	**1543898**	**1516660**	**11.87**	**11.66**	**11344261**	**11371500**
Telangana	16982	14592	1979	1979	97951	69591	**3598856**	**3658482**	**31.34**	**31.86**	**7689491**	**7631019**
Tripura	-	-	-	-	13854	12711	**437128**	**327302**	**41.69**	**31.21**	**608776**	**716717**
Uttar Pradesh	5970	4028	-	-	181399	135962	**1528997**	**1835263**	**6.35**	**7.62**	**22115961**	**21831845**
Uttarakhand	-	-	-	-	15908	9903	**648253**	**581241**	**12.12**	**10.87**	**4667750**	**4738936**
West Bengal	15102	14112	-	-	106386	90941	**1733931**	**1682181**	**19.54**	**18.95**	**6884910**	**6926022**
Total	**407531**	**366998**	**1887088**	**1884543**	**1877617**	**1481571**	**96404853**	**94532276**	**29.32**	**28.76**	**225797954**	**227752375**


Comparison of 2018-19 & 2011-13 Desertification and Land Degradation Status (wrt % of country TGA)
2018-19
2011-13
Area Under Degradation (% of Country TGA)
State Name
Rajasthan 6.46 6.55
Maharashtra 4.35 4.21
Gujarat 3.12 3.12
Ladakh 2.16 2.10
Karnataka 2.12 2.11
Jharkhand 1.67 1.67
Orissa 1.63 1.61
Madhya Pradesh 1.17 1.16
Telangana 1.11 1.09
Himachal Pradesh 0.73 0.73
Andhra Pradesh 0.72 0.70
Chhattisgarh 0.70 0.67
West Bengal 0.54 0.53
Tamil Nadu 0.49 0.47
Uttar Pradesh 0.47 0.47
Jammu and Kashmir 0.35 0.33
Assam 0.25 0.22
Nagaland 0.25 0.24
Bihar 0.23 0.21
Uttarakhand 0.21 0.20
Manipur 0.19 0.18
Meghalaya 0.17 0.15
Tripura 0.14 0.13
Kerala 0.13 0.12
Haryana 0.11 0.10
Mizoram 0.08 0.06
Arunachal Pradesh 0.06 0.05
Goa 0.06 0.06
Punjab 0.05 0.04
Delhi 0.03 0.03
Sikkim 0.03 0.02


Comparison of 2011-13 & 2003-05 Desertification and Land Degradation Status (wrt % of country TGA)
2011-13
2003-05
Area Under Degradation (% of Country TGA)
State Name
0
1
2
3
4
5
6
7
Rajasthan 6.55 6.58
Maharashtra 4.21 4.06
Gujarat 3.12 3.07
Karnataka 2.11 2.11
Ladakh 2.10 2.00
Jharkhand 1.67 1.65
Orissa 1.61 1.62
Madhya Pradesh 1.16 1.15
Telangana 1.09 1.11
Himachal Pradesh 0.73 0.65
Andhra Pradesh 0.70 0.69
Chhattisgarh 0.67 0.66
West Bengal 0.53 0.51
Tamil Nadu 0.47 0.46
Uttar Pradesh 0.47 0.56
Jammu and Kashmir 0.33 0.30
Nagaland 0.24 0.20
Assam 0.22 0.17
Bihar 0.21 0.20
Uttarakhand 0.20 0.18
Manipur 0.18 0.18
Meghalaya 0.15 0.15
Tripura 0.13 0.10
Kerala 0.12 0.11
Haryana 0.10 0.10
Goa 0.06 0.06
Mizoram 0.06 0.03
Arunachal Pradesh 0.05 0.04
Punjab 0.04 0.03
Delhi 0.03 0.02
Sikkim 0.02 0.02

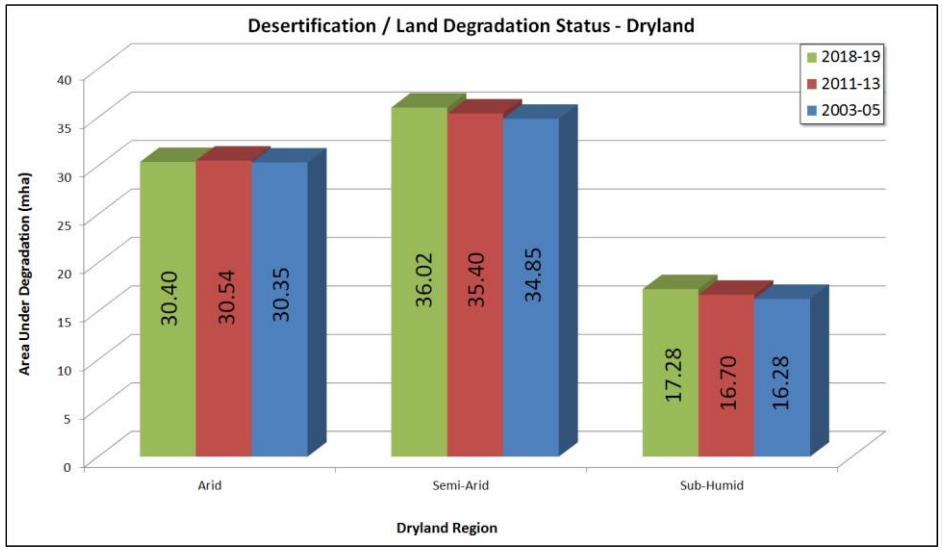

Comparison of 2018-19 & 2011-13 Desertification and Land Degradation Status (wrt % of state TGA)
Area Under Degradation (% of state TGA)
State Name
2018-19
2011-13
0
10
20
30
40
50
60
70
Jharkhand 68.77 68.98
Rajasthan 62.06 62.90
Delhi 61.73 60.60
Goa 52.64 52.13
Gujarat 52.22 52.29
Nagaland 50.00 47.45
Maharashtra 46.49 44.93
Himachal Pradesh 43.11 43.01
Tripura 42.66 41.69
Ladakh 42.31 41.12
Karnataka 36.29 36.24
Orissa 34.42 34.06
Telangana 31.68 31.34
Manipur 27.44 26.96
Meghalaya 24.86 22.06
Jammu and Kashmir 20.86 19.67
West Bengal 20.10 19.54
Chhattisgarh 17.06 16.36
Andhra Pradesh 14.84 14.35
Mizoram 13.08 8.89
Uttarakhand 12.60 12.12
Madhya Pradesh 12.52 12.34
Tamil Nadu 12.30 11.87
Sikkim 11.92 11.10
Kerala 10.87 9.77
Assam 10.64 9.14
Haryana 8.24 7.67
Bihar 7.93 7.38
Uttar Pradesh 6.43 6.35
Punjab 3.34 2.87
Arunachal Pradesh 2.40 1.84

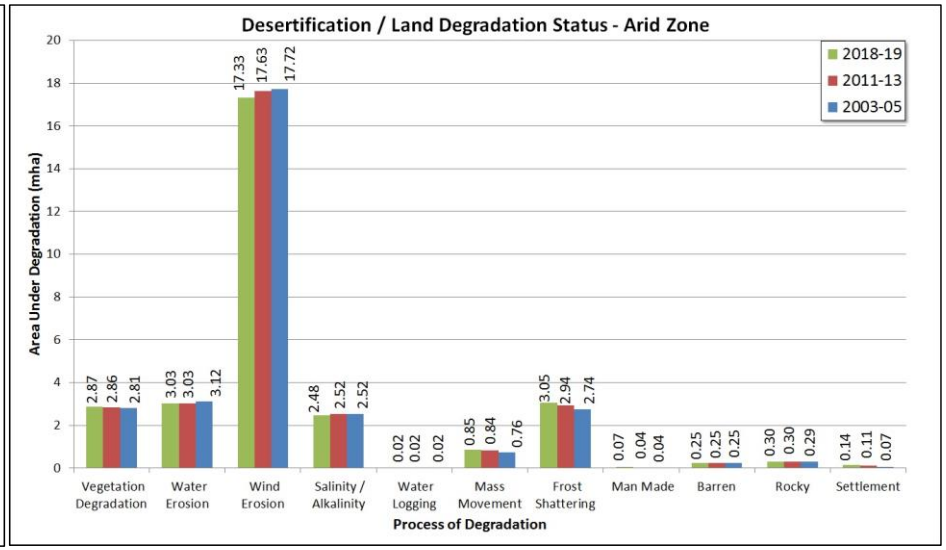

Comparison of 2011-13 & 2003-05 Desertification and Land Degradation Status (wrt % of state TGA)
Area Under Degradation (% of state TGA)
State Name
2011-13
2003-05
0
10
20
30
40
50
60
70
Jharkhand 68.98 67.97
Rajasthan 62.90 63.19
Delhi 60.60 49.57
Gujarat 52.29 51.35
Goa 52.13 50.37
Nagaland 47.45 38.74
Maharashtra 44.93 43.38
Himachal Pradesh 43.01 38.46
Tripura 41.69 31.21
Ladakh 41.12 39.14
Karnataka 36.24 36.19
Orissa 34.06 34.18
Telangana 31.34 31.86
Manipur 26.96 26.56
Meghalaya 22.06 21.35
Jammu and Kashmir 19.67 17.86
West Bengal 19.54 18.95
Chhattisgarh 16.36 16.10
Andhra Pradesh 14.35 14.16
Madhya Pradesh 12.34 12.24
Uttarakhand 12.12 10.87
Tamil Nadu 11.87 11.66
Sikkim 11.10 11.06
Kerala 9.77 9.54
Assam 9.14 7.30
Mizoram 8.89 4.55
Haryana 7.67 7.12
Bihar 7.38 7.00
Uttar Pradesh 6.35 7.62
Punjab 2.87 1.85
Arunachal Pradesh 1.84 1.63

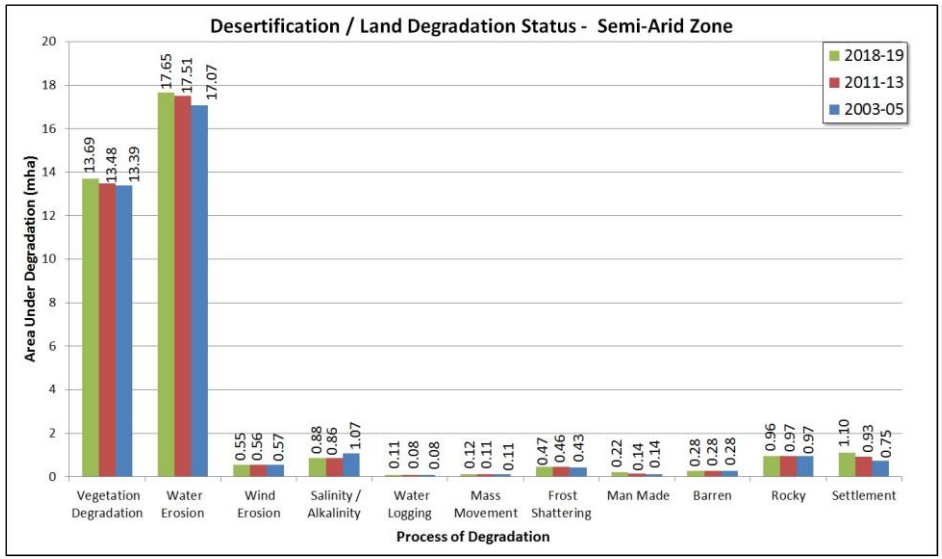
AREA UNDER DESERTIFICATION

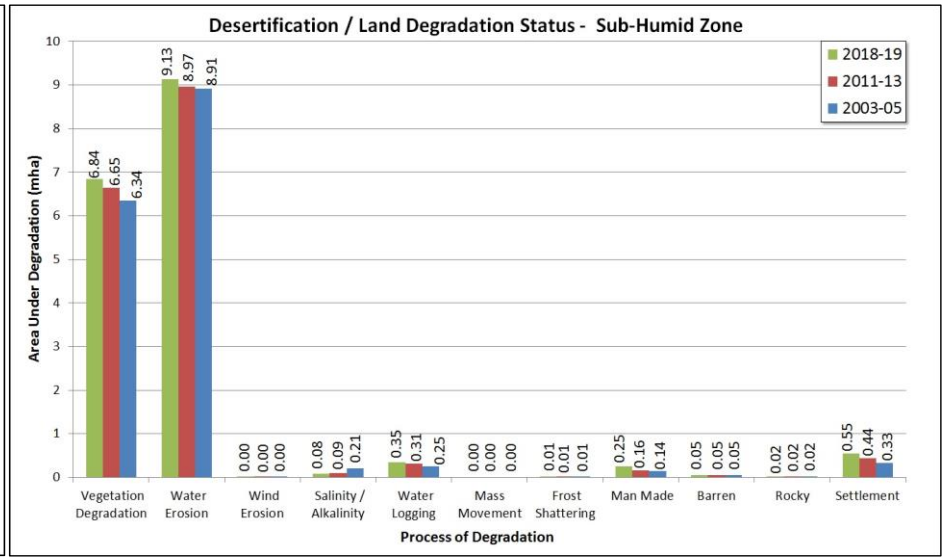
Land degradation observed within dryland regions (including Arid, Semi-Arid and Dry Sub-Humid regions) is called as Desertification. Statistics and charts of total area under desertification and process wise distribution of area undergoing desertification within different dryland regions (Arid, Semi-Arid and Dry Sub-Humid) for timeframes 2018-19, 2011-13 and 2003-05 are given below:

Process of Degradation	Area under Desertification (million ha)											
	2018-19				2011-13				2003-05			
	Arid	Semi-Arid	Sub-Humid	Total	Arid	Semi-Arid	Sub-Humid	Total	Arid	Semi-Arid	Sub-Humid	Total
Vegetation Degradation	2.87	13.69	6.84	23.39	2.86	13.48	6.65	22.99	2.81	13.39	6.34	22.55
Water Erosion	3.03	17.65	9.13	29.81	3.03	17.51	8.97	29.51	3.12	17.07	8.91	29.11
Wind Erosion	17.33	0.55	0.00	17.89	17.63	0.56	0.00	18.19	17.72	0.57	0.00	18.30
Salinity / Alkalinity	2.48	0.88	0.08	3.44	2.52	0.86	0.09	3.48	2.52	1.07	0.21	3.80
Water Logging	0.02	0.11	0.35	0.48	0.02	0.08	0.31	0.42	0.02	0.08	0.25	0.36
Mass Movement	0.85	0.12	-	0.97	0.84	0.11	-	0.96	0.76	0.11	-	0.87
Frost Shattering	3.05	0.47	0.01	3.53	2.94	0.46	0.01	3.41	2.74	0.43	0.01	3.18
Man Made	0.07	0.22	0.25	0.54	0.04	0.14	0.16	0.35	0.04	0.14	0.14	0.32
Barren	0.25	0.28	0.05	0.58	0.25	0.28	0.05	0.58	0.25	0.28	0.05	0.58
Rocky	0.30	0.96	0.02	1.27	0.30	0.97	0.02	1.29	0.29	0.97	0.02	1.28
Settlement	0.14	1.10	0.55	1.79	0.11	0.93	0.44	1.47	0.07	0.75	0.33	1.15
Grand Total	**30.40**	**36.02**	**17.28**	**83.69**	**30.54**	**35.40**	**16.70**	**82.64**	**30.35**	**34.85**	**16.28**	**81.48**


Desertification / Land Degradation Status - Dryland
2018-19
2011-13
2003-05
Area Under Degradation (mha)
30.40
30.54
30.35
36.02
35.40
34.85
17.28
16.70
16.28
Arid
Semi-Arid
Sub-Humid
Dryland Region

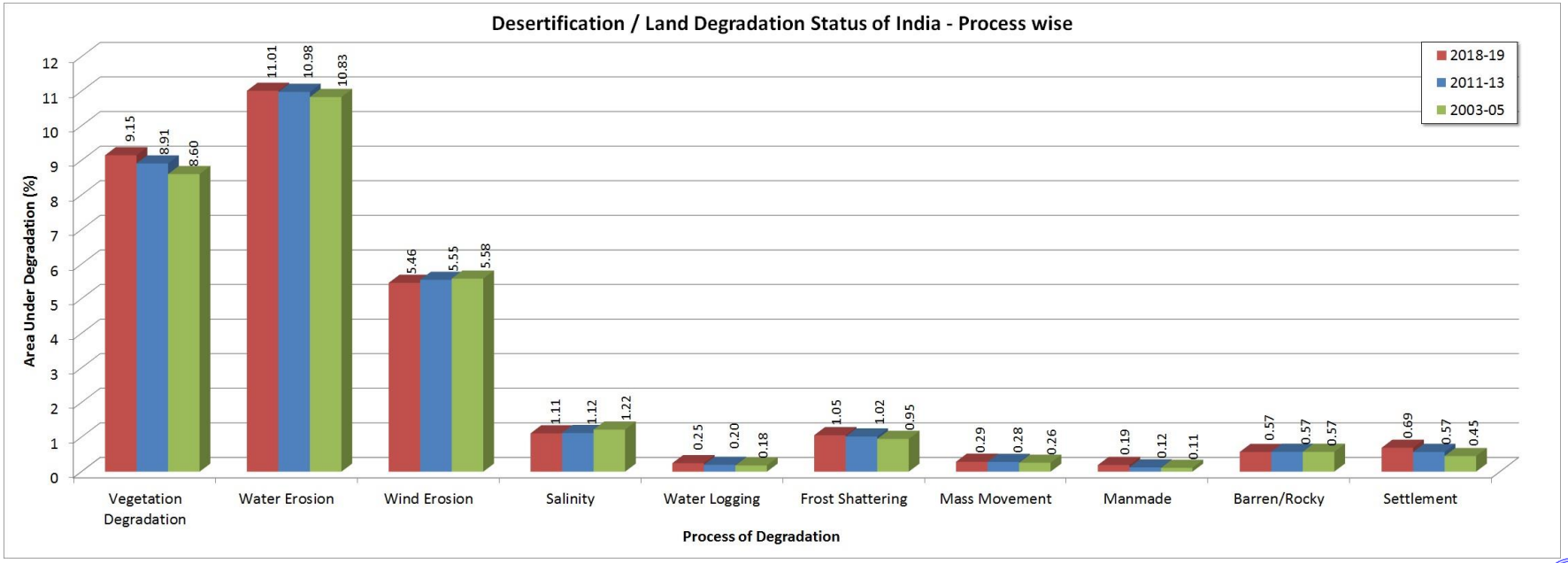

Desertification / Land Degradation Status - Arid Zone
2018-19
2011-13
2003-05
Area Under Degradation (mha)
2.87 2.86 2.81
3.03 3.03 3.12
17.33 17.63 17.72
2.48 2.52 2.52
0.02 0.02 0.02
0.85 0.84 0.76
3.05 2.94 2.74
0.07 0.04 0.04
0.25 0.25 0.25
0.30 0.30 0.29
0.14 0.11 0.07
Vegetation Degradation
Water Erosion
Wind Erosion
Salinity / Alkalinity
Water Logging
Mass Movement
Frost Shattering
Man Made
Barren
Rocky
Settlement
Process of Degradation


Desertification / Land Degradation Status - Semi-Arid Zone
2018-19
2011-13
2003-05
Area Under Degradation (mha)
13.69 13.48 13.39
17.65 17.51 17.07
0.55 0.56 0.57
0.88 0.86 1.07
0.11 0.08 0.08
0.12 0.11 0.11
0.47 0.46 0.43
0.22 0.14 0.14
0.28 0.28 0.28
0.96 0.97 0.97
1.10 0.93 0.75
Vegetation Degradation
Water Erosion
Wind Erosion
Salinity / Alkalinity
Water Logging
Mass Movement
Frost Shattering
Man Made
Barren
Rocky
Settlement
Process of Degradation


Desertification / Land Degradation Status - Sub-Humid Zone
2018-19
2011-13
2003-05
Area Under Degradation (mha)
6.84 6.65 6.34
9.13 8.97 8.91
0.00 0.00 0.00
0.08 0.09 0.21
0.35 0.31 0.25
0.00 0.00 0.00
0.01 0.01 0.01
0.25 0.16 0.14
0.05 0.05 0.05
0.02 0.02 0.02
0.55 0.44 0.33
Vegetation Degradation
Water Erosion
Wind Erosion
Salinity / Alkalinity
Water Logging
Mass Movement
Frost Shattering
Man Made
Barren
Rocky
Settlement
Process of Degradation

PROCESS WISE CHANGES IN DESERTIFICATION/ LAND DEGRADATION STATUS

Process of Desertification/ Land Degradation	2018-19		2011-13		2003-05		Change (mha)	
	Area (mha)	Area (%)	Area (mha)	Area (%)	Area (mha)	Area (%)	(2018-19)-(2011-13)	(2011-13)-(2003-05)
Vegetation Degradation	30.07	9.15	29.30	8.91	28.28	8.60	0.78	1.01
Water Erosion	36.20	11.01	36.10	10.98	35.61	10.83	0.10	0.49
Wind Erosion	17.94	5.46	18.23	5.55	18.35	5.58	-0.29	-0.11
Salinity	3.64	1.11	3.67	1.12	4.01	1.22	-0.03	-0.32
Water Logging	0.81	0.25	0.65	0.20	0.60	0.18	0.15	0.05
Frost Shattering	3.47	1.05	3.34	1.02	3.11	0.95	0.12	0.23
Mass Movement	0.94	0.29	0.93	0.28	0.84	0.26	0.01	0.08
Manmade	0.64	0.19	0.41	0.12	0.37	0.11	0.23	0.04
Barren/Rocky	1.87	0.57	1.89	0.57	1.88	0.57	-0.02	0.00
Settlement	2.27	0.69	1.88	0.57	1.48	0.45	0.39	0.40
Total Area under Desertification	**97.85**	**29.77**	**96.40**	**29.32**	**94.53**	**28.76**	**1.45**	**1.87**
No Apparent Degradation	**225.06**	**68.46**	**226.73**	**68.97**	**228.68**	**69.57**	**-1.67**	**-1.95**
Total Geographical Area (mha)	**328.72**							



STATE WISE MAPS AND STATISTICS

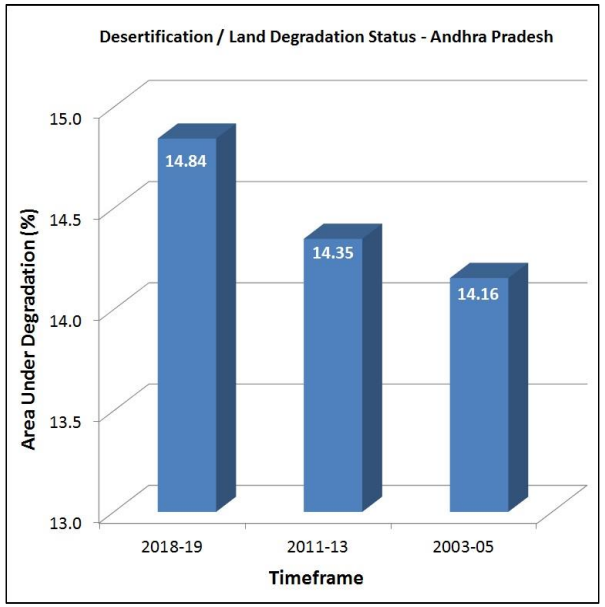
ANDHRA PRADESH

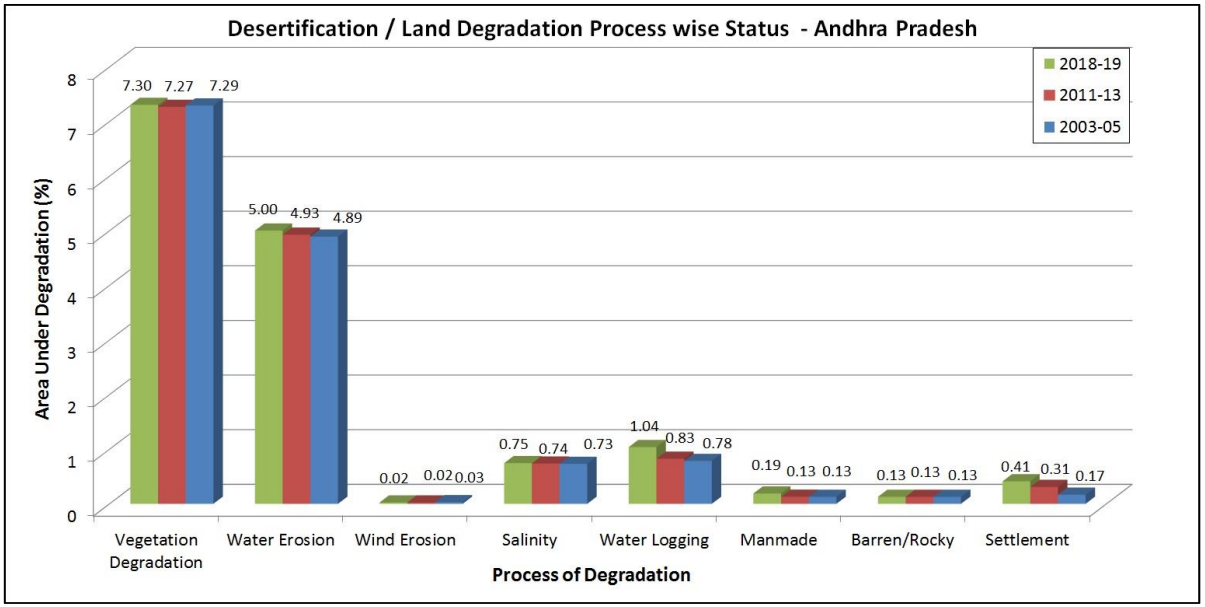
Andhra Pradesh state is located in south-eastern part of India covering 1,60,205 sq km area. The state has population of 4,93,86,799 with 308 population density, 993 sex ratio and 67.02% literacy (Census 2011). The state as three capitals viz. Visakhapatnam as executive capital, Amaravati as legislative capital and Kurnool as judicial capital. The state is dotted with hill ranges from the north to the south, running erratically down the middle of the country dividing it into western part or Rayalseema and eastern or coastal Andhra. Godavari, Krishna, Tungbhadra and Pennar are the major rivers of the state. Andhra Pradesh has second longest coastline along the Bay of Bengal in country after Gujarat with several noteworthy beaches. Coastal region experiences humid tropical climate with regular cyclones and storm surges whereas western part experiences relatively dry and cool climate. Average annual temperature ranges from 12^{o}C to 40^{o}C.

The statistical summary and analysis of the Land Degradation of Andhra Pradesh state reveal that 14.84% (2.37 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 14.35% (2.29 million ha) and 14.16% (2.26 million ha) respectively. An increase of 0.49% (79,283 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.19% (31,030 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (7.30% in 2018-19, 7.27% in 2011-13 and 7.29% in 2003-05) followed by Water Erosion (5.00% in 2018-19, 4.93% in 2011-13 and 4.89% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in agriculture area effected with water logging & water erosion and area affected with manmade activities is observed. The same trend is observed between timeframe 2003-05 & 2011-13.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

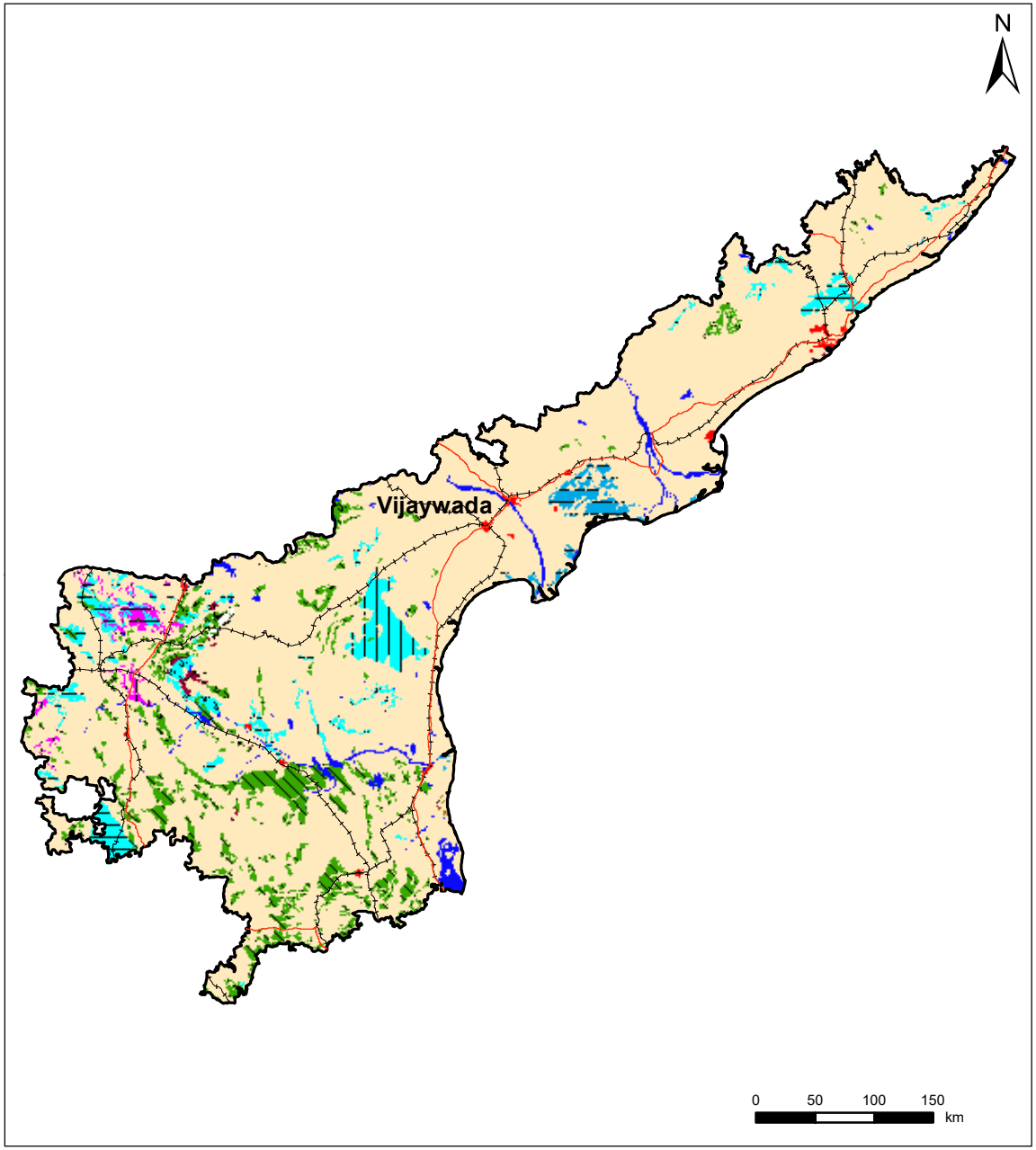




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	1170184	7.30	1164257	7.27	1168447	7.29	5927	-4190
Water Erosion	801280	5.00	789433	4.93	783830	4.89	11847	5603
Wind Erosion	3986	0.02	3986	0.02	4722	0.03	0	-736
Salinity	119368	0.75	117952	0.74	117239	0.73	1416	714
Water Logging	166341	1.04	132334	0.83	125755	0.78	34007	6579
Manmade	30203	0.19	20833	0.13	20565	0.13	9369	268
Barren/Rocky	20521	0.13	20521	0.13	20521	0.13	0	0
Settlement	66158	0.41	49441	0.31	26649	0.17	16717	22792
Total Area under Desertification	**2378042**	**14.84**	**2298758**	**14.35**	**2267728**	**14.16**	**79283**	**31030**
No Apparent Degradation	**13346249**	**83.31**	**13447078**	**83.94**	**13476591**	**84.12**	**-100830**	**-29513**
Total Geographical Area (ha)	**16020500**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	741275	4.63	742319	4.63	-1044
2	Fv2	Forest, vegetation degradation, High	202915	1.27	204439	1.28	-1525
3	Sv1	Land with scrub, vegetation degradation, Low	135573	0.85	134038	0.84	1534
4	Sv2	Land with scrub, vegetation degradation, High	90421	0.56	83460	0.52	6961
5	Iw1	Agriculture irrigated, water erosion, Low	253875	1.58	254346	1.59	-471
6	Dw1	Agriculture unirrigated, water erosion, Low	436703	2.73	423564	2.64	13140
7	Sw1	Land with scrub, water erosion, Low	85773	0.54	85773	0.54	0
8	Sw2	Land with scrub, water erosion, High	24929	0.16	25750	0.16	-822
9	Ee2	Dune / Sandy area, wind erosion, High	3986	0.02	3986	0.02	0
10	Is1	Agriculture irrigated, salinity / alkalinity, Low	39915	0.25	37910	0.24	2005
11	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	71136	0.44	80042	0.50	-8906
12	Ds2	Agriculture unirrigated, salinity / alkalinity, High	8317	0.05	0	0.00	8317
13	Dl1	Agriculture unirrigated, water logging, Low	166341	1.04	132334	0.83	34007
14	Fm1	Forest, man made, Low	367	0.00	0	0.00	367
15	Tm1	Others, man made, Low	9002	0.06	0	0.00	9002
16	Tm2	Others, man made, High	20833	0.13	20833	0.13	0
17	R	Rocky	20521	0.13	20521	0.13	0
18	S	Settlement	66158	0.41	49441	0.31	16717
Total Area Under Desertification/ Land Degradation			**2378042**	**14.84**	**2298758**	**14.35**	**79283**
19	W	Water body/ Drainage	296210	1.85	274664	1.71	21546
20	NAD	No Apparent Degradation	13346249	83.31	13447078	83.94	-100830
Total Geographical Area (ha)			**16020500**	**100**	**16020500**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	742319	4.63	745341	4.65	-3022
2	Fv2	Forest, vegetation degradation, High	204439	1.28	201159	1.26	3280
3	Sv1	Land with scrub, vegetation degradation, Low	134038	0.84	139306	0.87	-5268
4	Sv2	Land with scrub, vegetation degradation, High	83460	0.52	82640	0.52	820
5	Iw1	Agriculture irrigated, water erosion, Low	254346	1.59	181910	1.14	72436
6	Dw1	Agriculture unirrigated, water erosion, Low	423564	2.64	492047	3.07	-68484
7	Sw1	Land with scrub, water erosion, Low	85773	0.54	93707	0.58	-7934
8	Sw2	Land with scrub, water erosion, High	25750	0.16	16166	0.10	9585
9	Ee2	Dune / Sandy area, wind erosion, High	3986	0.02	4722	0.03	-736
10	Is1	Agriculture irrigated, salinity / alkalinity, Low	37910	0.24	45195	0.28	-7285
11	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	80042	0.50	72043	0.45	7999
12	Ds2	Agriculture unirrigated, salinity / alkalinity, High	0	0.00	0	0.00	0
13	Dl1	Agriculture unirrigated, water logging, Low	132334	0.83	125755	0.78	6579
14	Fm1	Forest, man made, Low	0	0.00	0	0.00	0
15	Tm1	Others, man made, Low	0	0.00	0	0.00	0
16	Tm2	Others, man made, High	20833	0.13	20565	0.13	268
17	R	Rocky	20521	0.13	20521	0.13	0
18	S	Settlement	49441	0.31	26649	0.17	22792
Total Area Under Desertification/ Land Degradation			**2298758**	**14.35**	**2267728**	**14.16**	**31030**
19	W	Water body/ Drainage	274664	1.71	276181	1.72	-1517
20	NAD	No Apparent Degradation	13447078	83.94	13476591	84.12	-29513
Total Geographical Area (ha)			**16020500**	**100**	**16020500**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP ANDHRA PRADESH (2018-19)

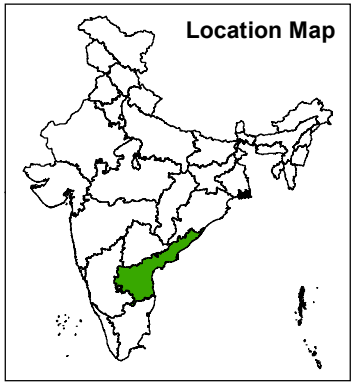
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ee2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1, Ds2	Agriculture unirrigated, salinity / alkalinity
	Dl1	Agriculture unirrigated, water logging
	Fm1	Forest, man made
	Tm2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

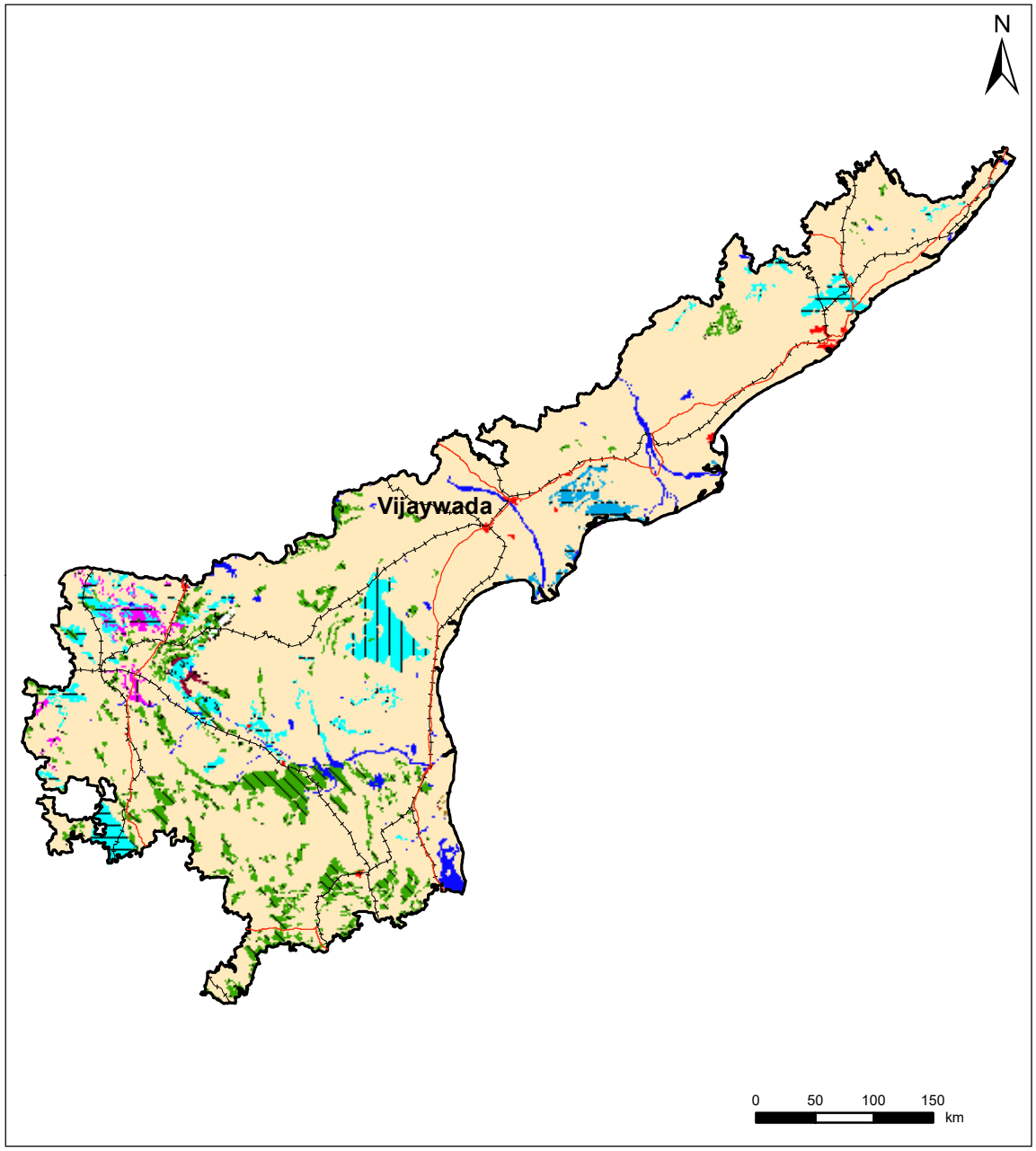
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
National Bureau of Soil Survey and Land Use Planning, Bengaluru
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP ANDHRA PRADESH (2011-13)

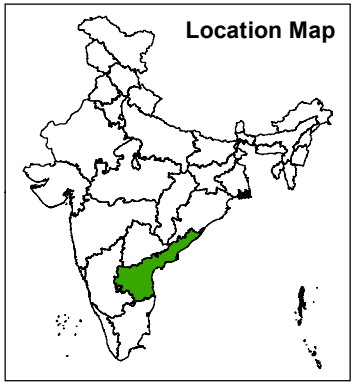
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ee2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Dl1	Agriculture unirrigated, water logging
	Tm2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
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&
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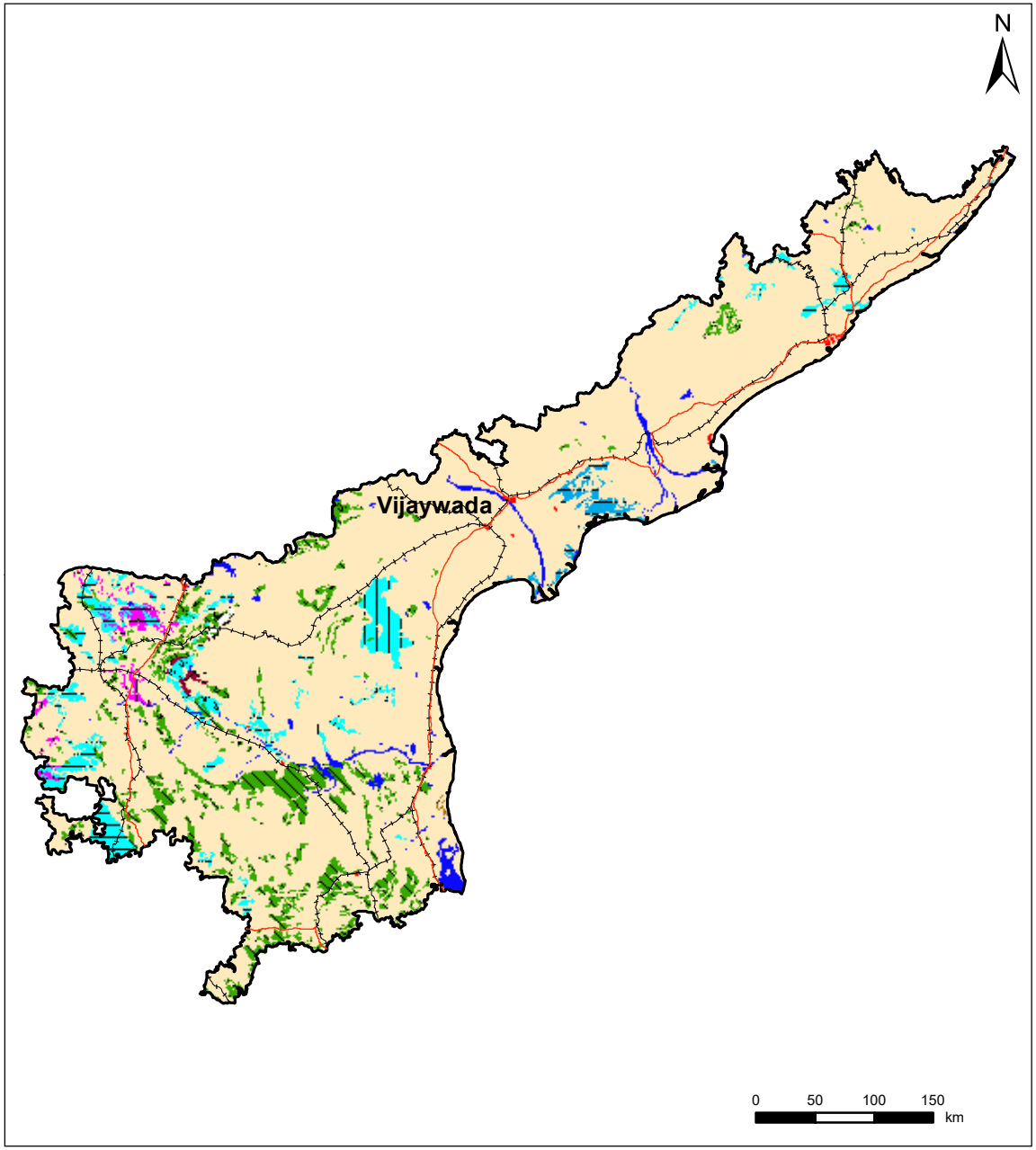


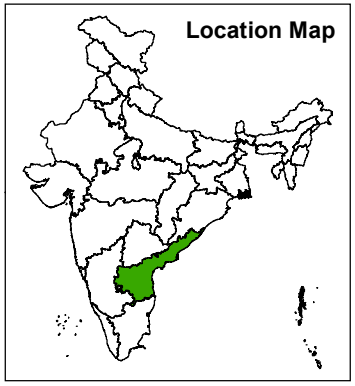
DESERTIFICATION / LAND DEGRADATION STATUS MAP ANDHRA PRADESH (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ee2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Dl1	Agriculture unirrigated, water logging
	Tm2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

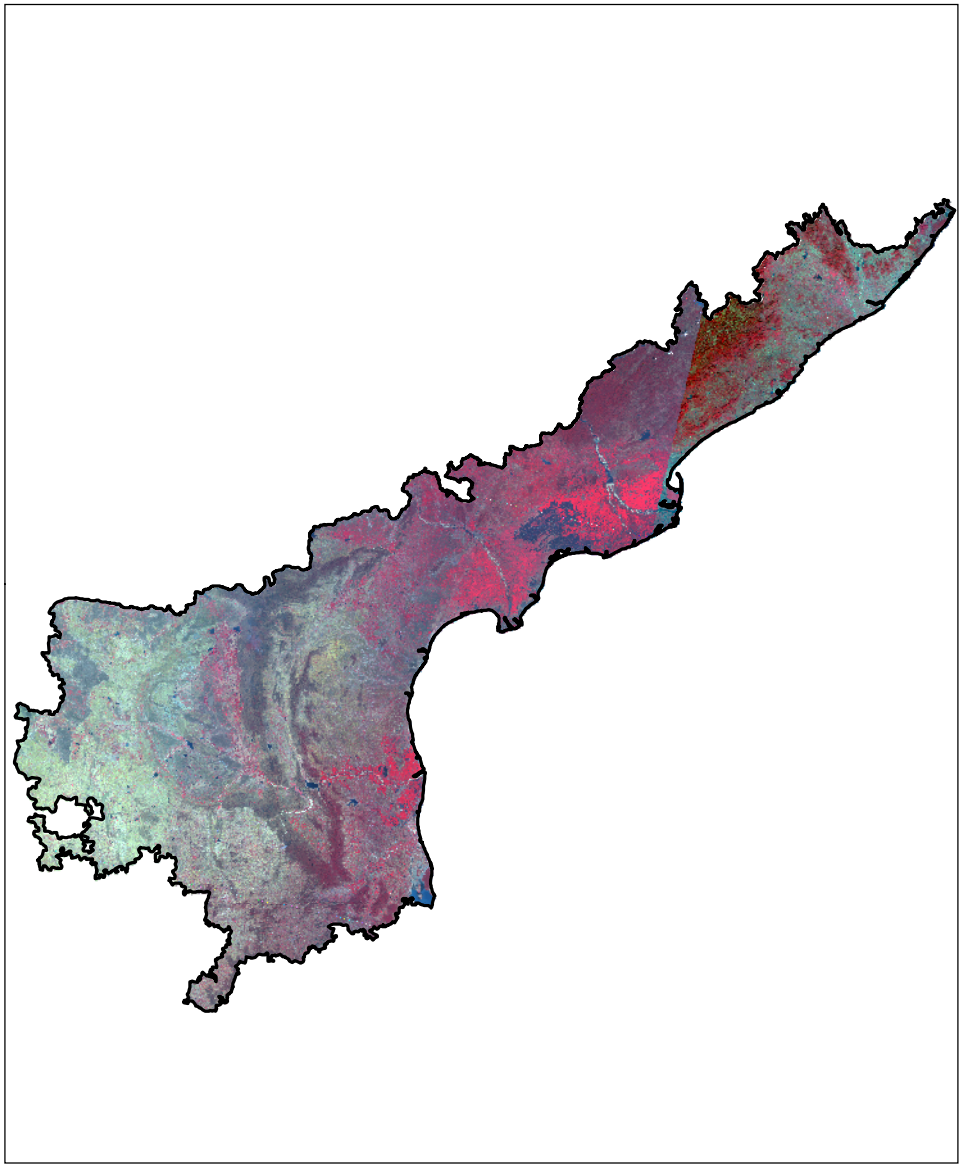
	International boundary
	State boundary
	Major roads
	Rail



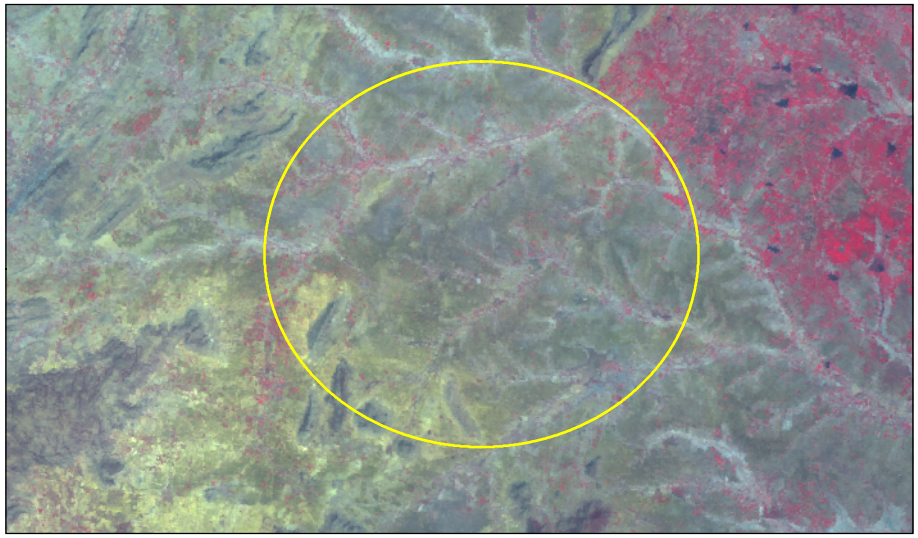
Prepared by:
National Bureau of Soil Survey and Land Use Planning, Bengaluru
&
Space Applications Centre, ISRO, Ahmedabad

Andhra Pradesh - Illustrative representation of Land Degradation process on IRS AWiFS data

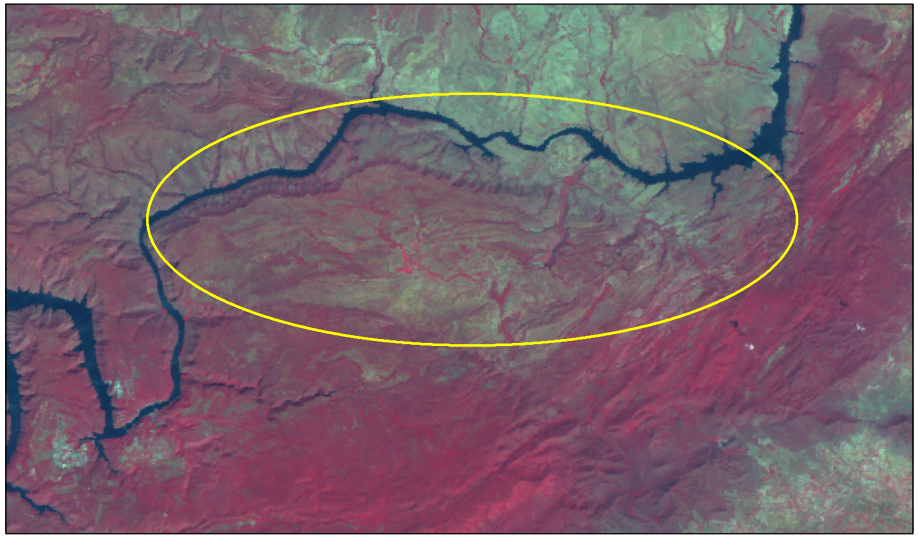
Andhra Pradesh as seen on IRS AWiFS (February 2019)



Agriculture area affected with water erosion (February 2019)



Forest area under vegetation degradation (October 2018)



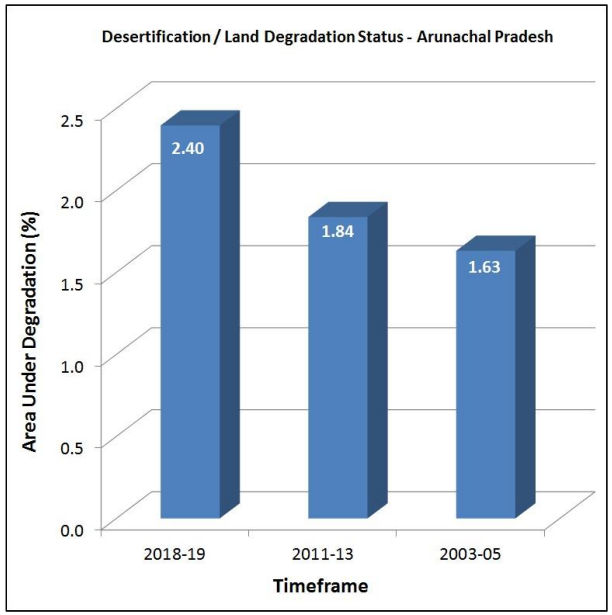
ARUNACHAL PRADESH

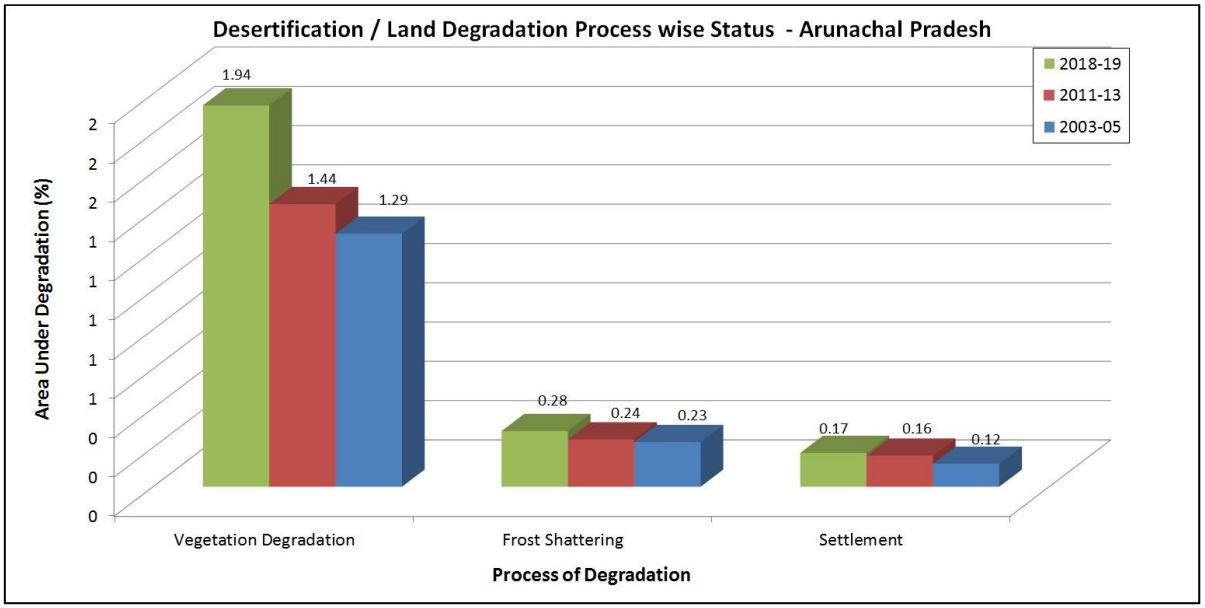
Arunachal Pradesh is located in north-east part of India with 83,743 sq km area. The state has population of 13,83,727; with 17 population density, 938 sex ratio and 65.38% literacy (Census 2011). Itanagar is the capital of Arunachal Pradesh. The land of Arunachal Pradesh is mostly mountainous with the Himalayan ranges. These divide the state into five river valleys: Kameng, Subansiri, Siang, Lohit and Tirap. All these valleys are fed by snow. The climate of Arunachal Pradesh varies with elevation; alpine or Tundra climate in very high elevation, temperate climate in Middle Himalayas and humid/sub-tropical climate with hot summers and mild winters in sub-Himalayan. Arunachal Pradesh receives heavy rainfall of 2,000-4,100 mm annually, most of it between May and September.

The statistical summary and analysis of the Land Degradation of Arunachal Pradesh state reveal that 2.40% (2,00,683 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 1.84% (1,53,933 ha) and 1.63% (1,36,686 ha) respectively. An increase of 0.56% (46,750 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.21% (17,247 ha). Arunachal Pradesh is the state with lowest desertification/ land degradation area in the country with respect to state TGA

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (1.94% in 2018-19, 1.44% in 2011-13 and 1.29% in 2003-05) followed by Frost Shattering (0.28% in 2018-19, 0.24% in 2011-13 and 0.23% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation is observed and the same trend is observed between timeframe 2003-05 & 2011-13.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

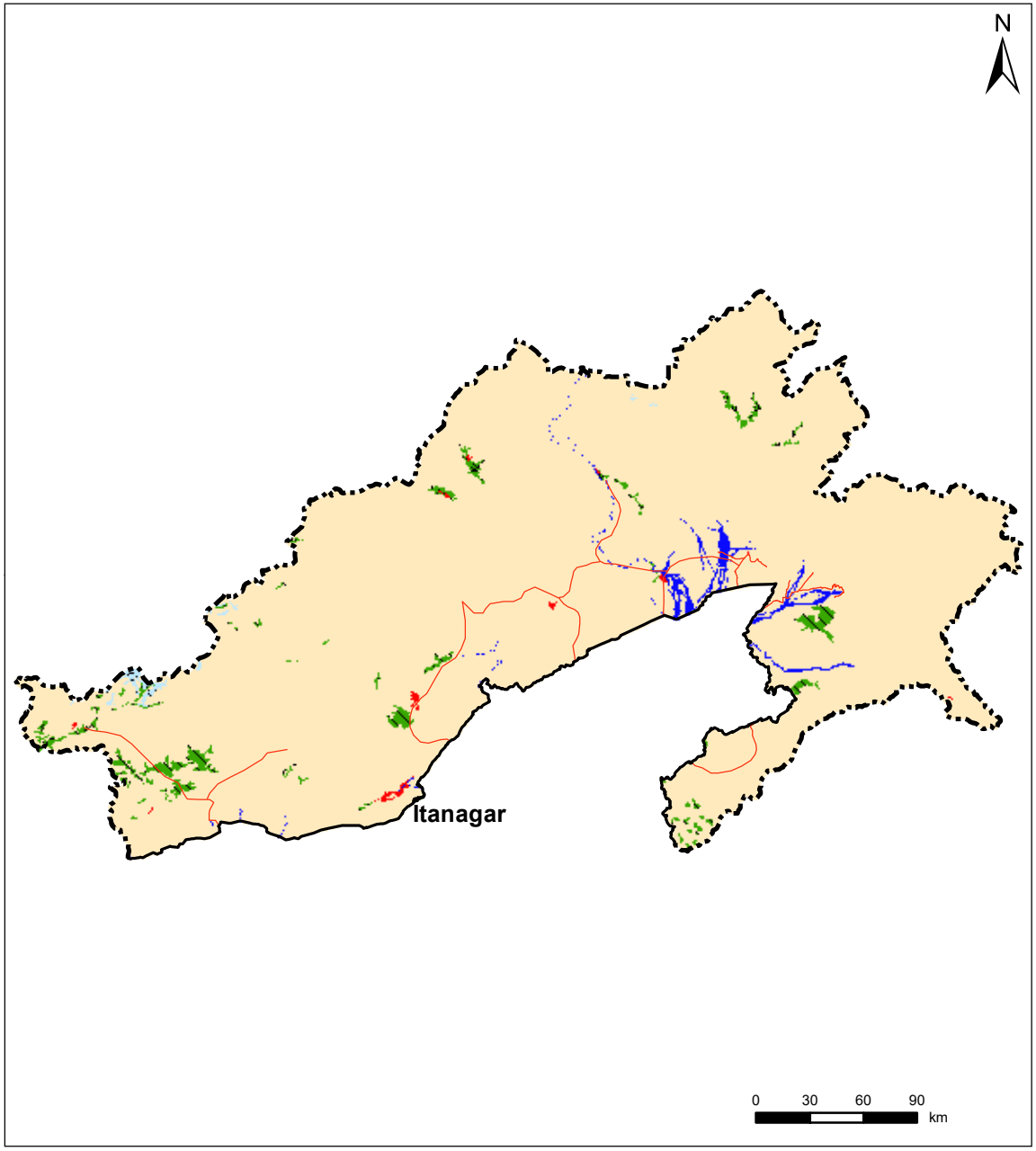




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	162560	1.94	120499	1.44	107845	1.29	42060	12655
Frost Shattering	23726	0.28	20186	0.24	19072	0.23	3539	1114
Settlement	14398	0.17	13247	0.16	9769	0.12	1151	3478
Total Area under Desertification	**200683**	**2.40**	**153933**	**1.84**	**136686**	**1.63**	**46750**	**17247**
No Apparent Degradation	**8091702**	**96.63**	**8144850**	**97.26**	**8162237**	**97.47**	**-53148**	**-17387**
Total Geographical Area (ha)	**8374300**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	84021	1.00	63026	0.75	20995
2	Fv2	Forest, vegetation degradation, High	29851	0.36	11849	0.14	18003
3	Sv1	Land with scrub, vegetation degradation, Low	39912	0.48	37699	0.45	2213
4	Sv2	Land with scrub, vegetation degradation, High	8775	0.10	7926	0.09	849
5	Lf1	Periglacial, frost shattering, Low	5647	0.07	3695	0.04	1952
6	Lf2	Periglacial, frost shattering, High	18079	0.22	16491	0.20	1588
7	S	Settlement	14398	0.17	13247	0.16	1151
Total Area Under Desertification/ Land Degradation			**200683**	**2.40**	**153933**	**1.84**	**46750**
8	W	Water body/ Drainage	81915	0.98	75517	0.90	6398
9	NAD	No Apparent Degradation	8091702	96.63	8144850	97.26	-53148
Total Geographical Area (ha)			**8374300**	**100**	**8374300**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	63026	0.75	55720	0.67	7306
2	Fv2	Forest, vegetation degradation, High	11849	0.14	7395	0.09	4453
3	Sv1	Land with scrub, vegetation degradation, Low	37699	0.45	36804	0.44	895
4	Sv2	Land with scrub, vegetation degradation, High	7926	0.09	7926	0.09	0
5	Lf1	Periglacial, frost shattering, Low	3695	0.04	2581	0.03	1114
6	Lf2	Periglacial, frost shattering, High	16491	0.20	16491	0.20	0
7	S	Settlement	13247	0.16	9769	0.12	3478
Total Area Under Desertification/ Land Degradation			**153933**	**1.84**	**136686**	**1.63**	**17247**
8	W	Water body/ Drainage	75517	0.90	75378	0.90	140
9	NAD	No Apparent Degradation	8144850	97.26	8162237	97.47	-17387
Total Geographical Area (ha)			**8374300**	**100**	**8374300**	**100**	



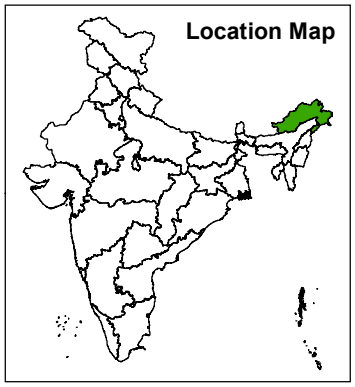
DESERTIFICATION / LAND DEGRADATION STATUS MAP ARUNACHAL PRADESH (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Lf1,2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

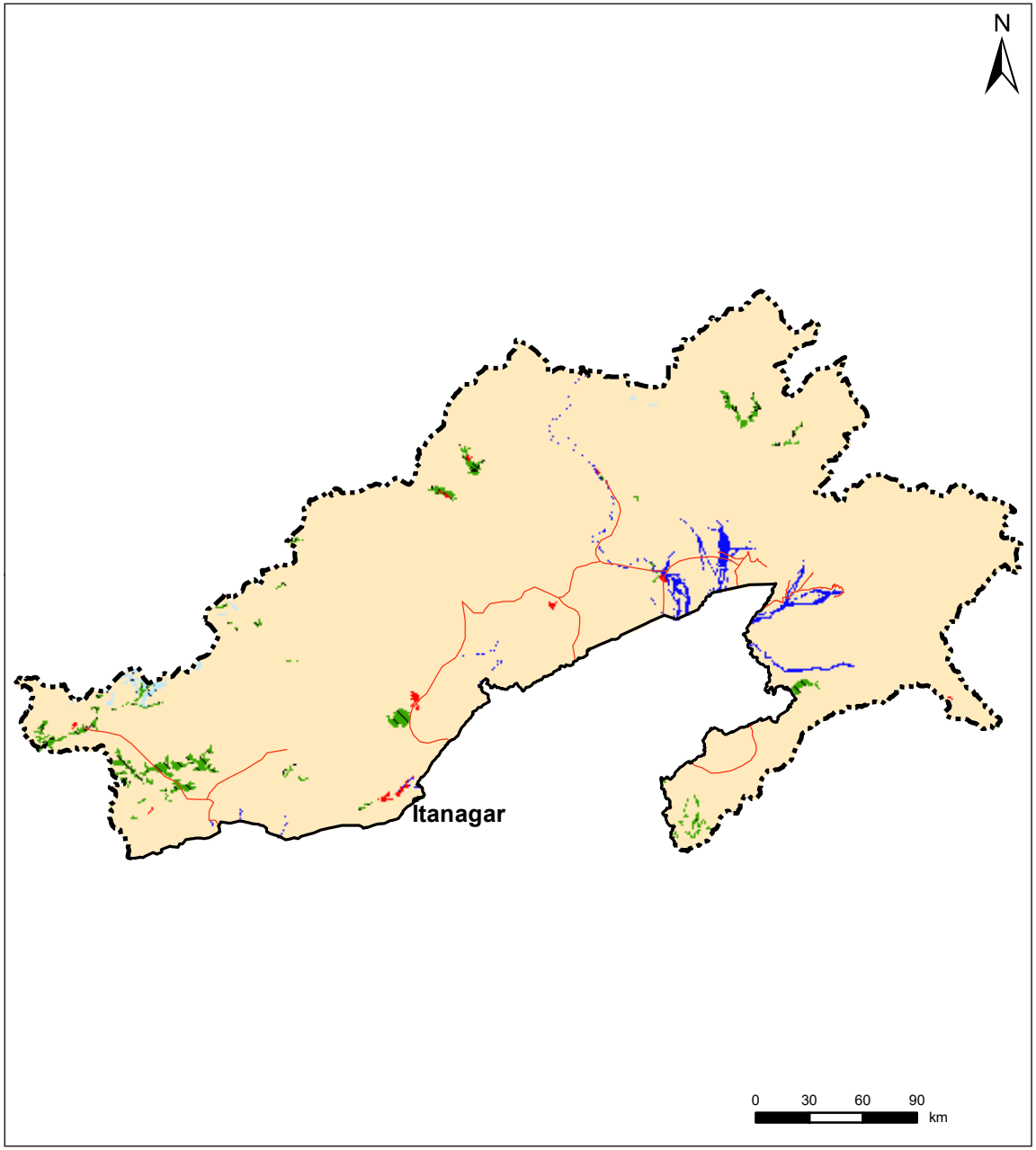
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
North Easrern Space Applications Centre, Meghalaya
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP ARUNACHAL PRADESH (2011-13)

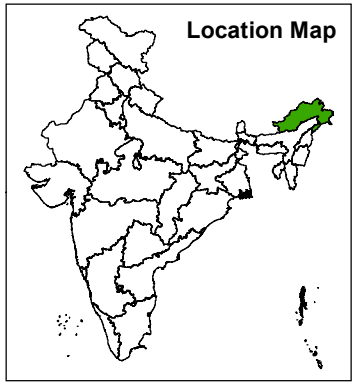
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Lf1,2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

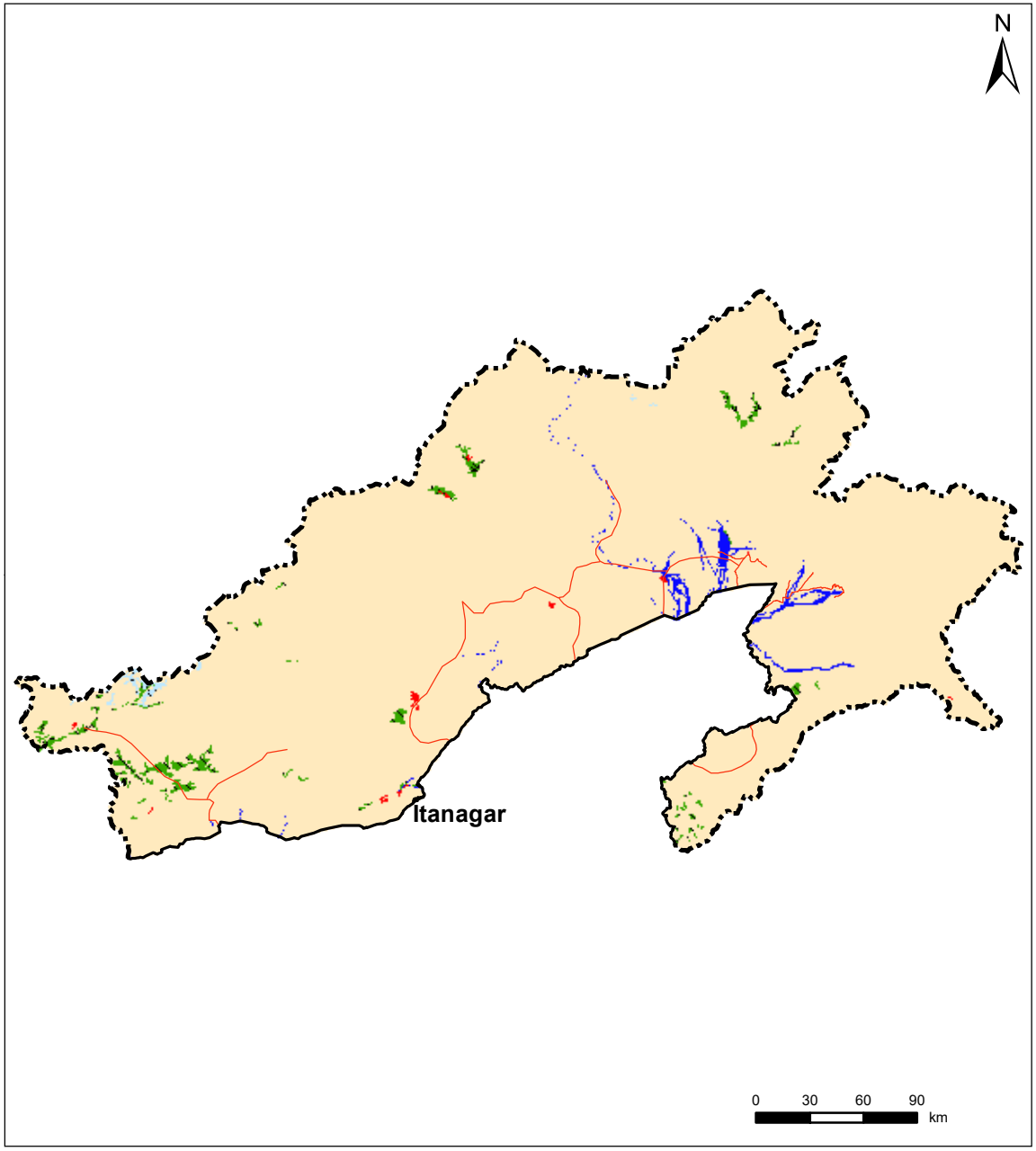
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
State Remote sensing Applications Centre, Itanagar
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP
ARUNACHAL PRADESH (2003-05)

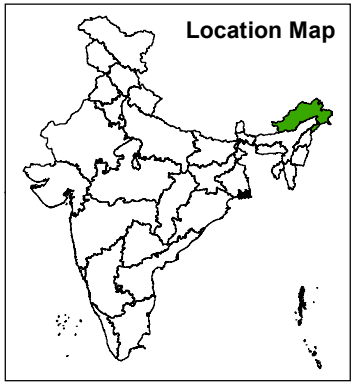
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Lf1,2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

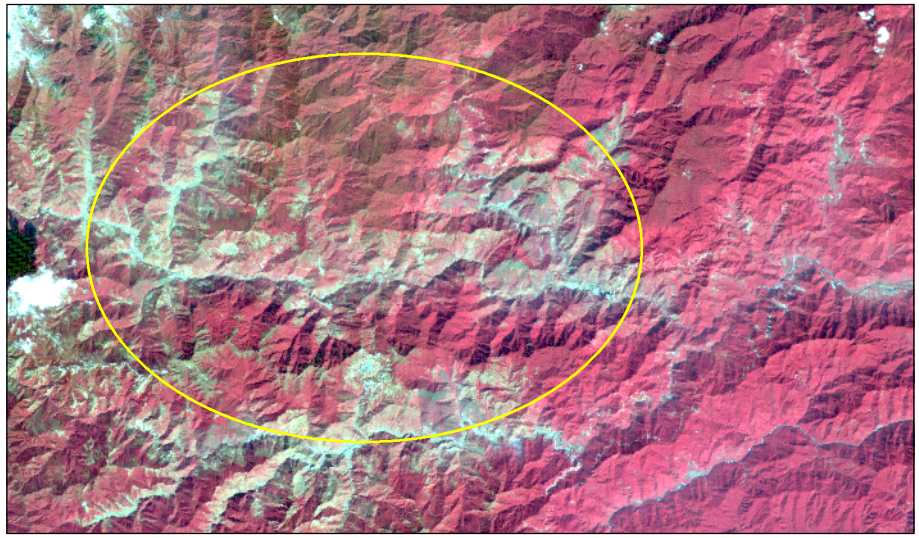
	International boundary
	State boundary
	Major roads
	Rail



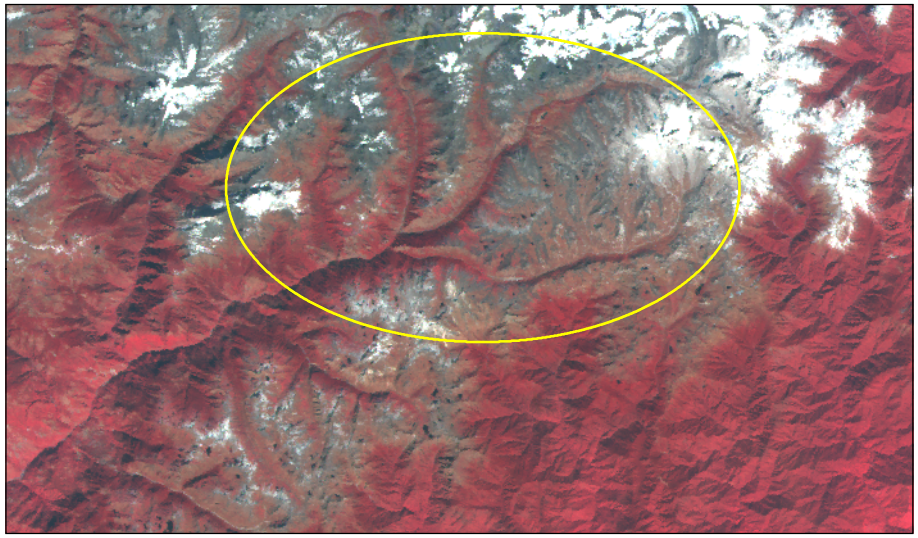
Prepared by:
State Remote sensing Applications Centre, Itanagar
&
Space Applications Centre, ISRO, Ahmedabad

Arunachal Pradesh - Illustrative representation of Land Degradation process / changes on IRS AWiFS data

Forest area under vegetation degradation (February 2019)



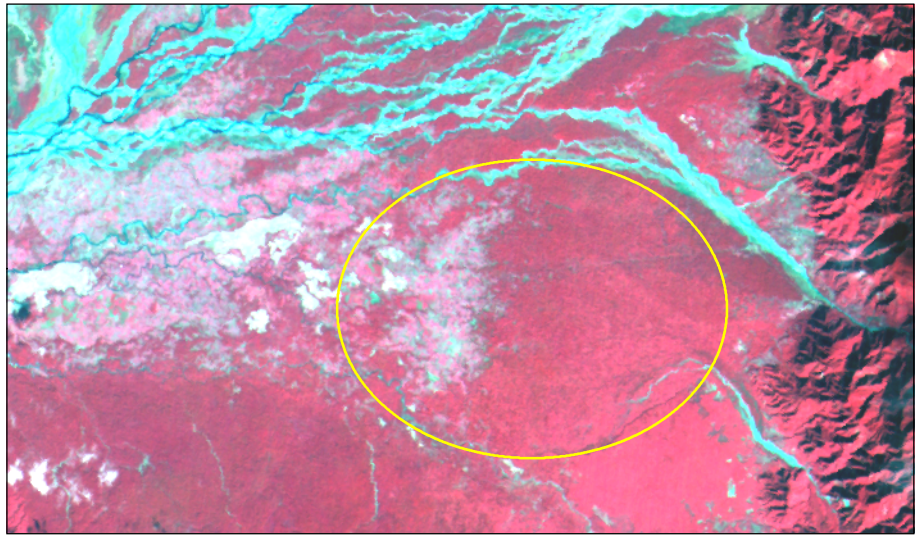
Area under frost shattering (November 2018)

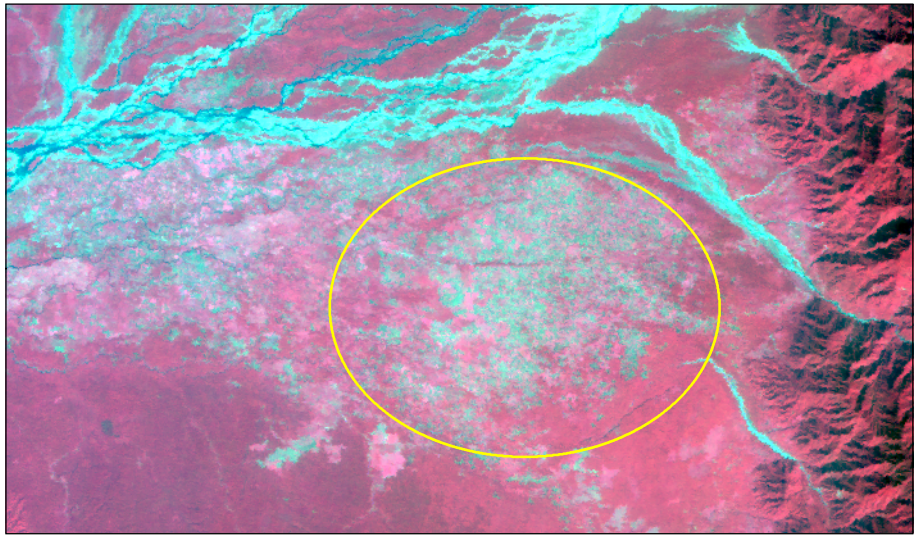


January 2004

Conversion of Forest area into agriculture/plantation

November 2018





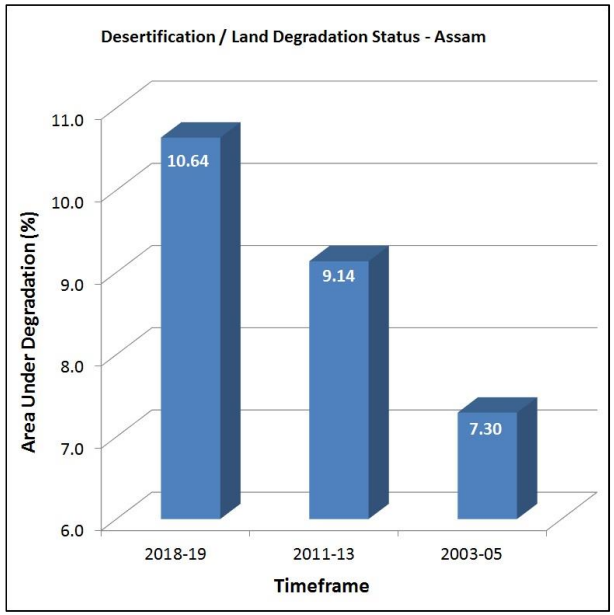
ASSAM

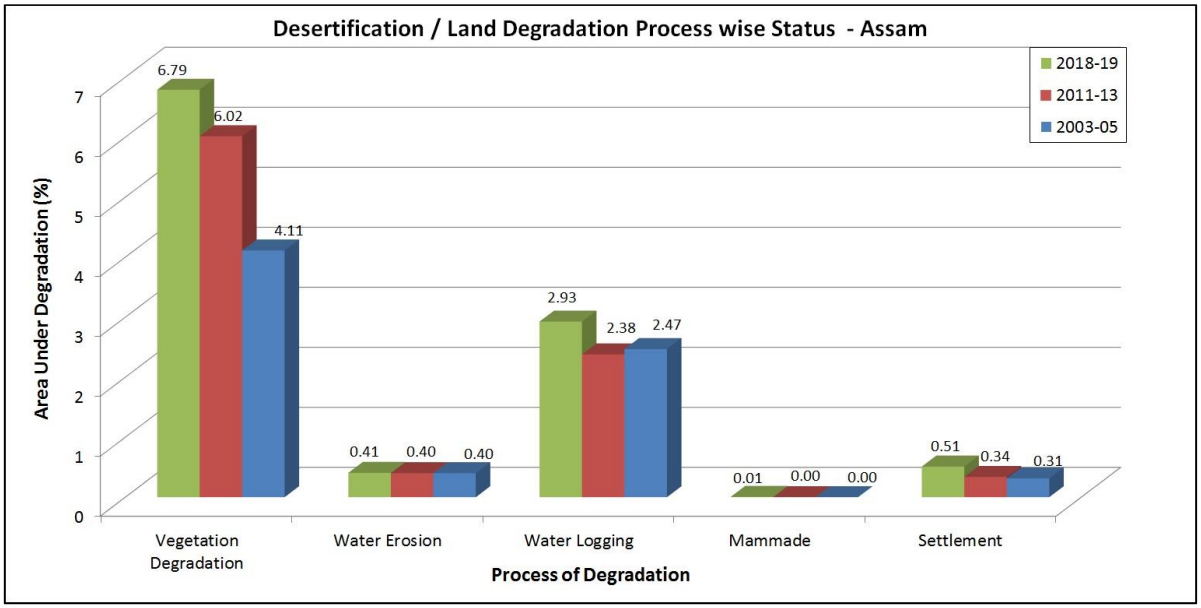
Assam is located in eastern part of India, coving 78,438 sq km area. The state has population of 3,12,05,576; with 398 population density, 958 sex ratio and 72.19% literacy (Census 2011). Guwahati is the capital of Assam. Assam contains three of six physiographic divisions of India - The Northern Himalayas (Eastern Hills), The Northern Plains (Brahmaputra plain) and Deccan Plateau (Karbi Anglong). Geomorphic studies conclude that the Brahmaputra, the life-line of Assam is an antecedent river, older than the Himalayas. Assam experiences sub-alpine climate in hilly regions and excessive humid weather in the plains with 6°C - 38°C temperature, very heavy rainfall and high humidity. All the lands of Assam are characterized by alluvial qualities.

The statistical summary and analysis of the Land Degradation of Assam state reveal that 10.64% (8,34,530 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 9.14% (7,16,596 ha) and 7.30% (5,72,215 ha) respectively. An increase of 1.5% (1,17,934 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.84% (1,44,381 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (6.79% in 2018-19, 6.02% in 2011-13 and 4.11% in 2003-05) followed by Water Logging (2.93% in 2018-19, 2.38% in 2011-13 and 2.47% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area & scrub land undergoing vegetation degradation and agriculture area affected with water logging is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area and land with scrub undergoing vegetation degradation and slight decrease in agriculture area affected with water logging is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

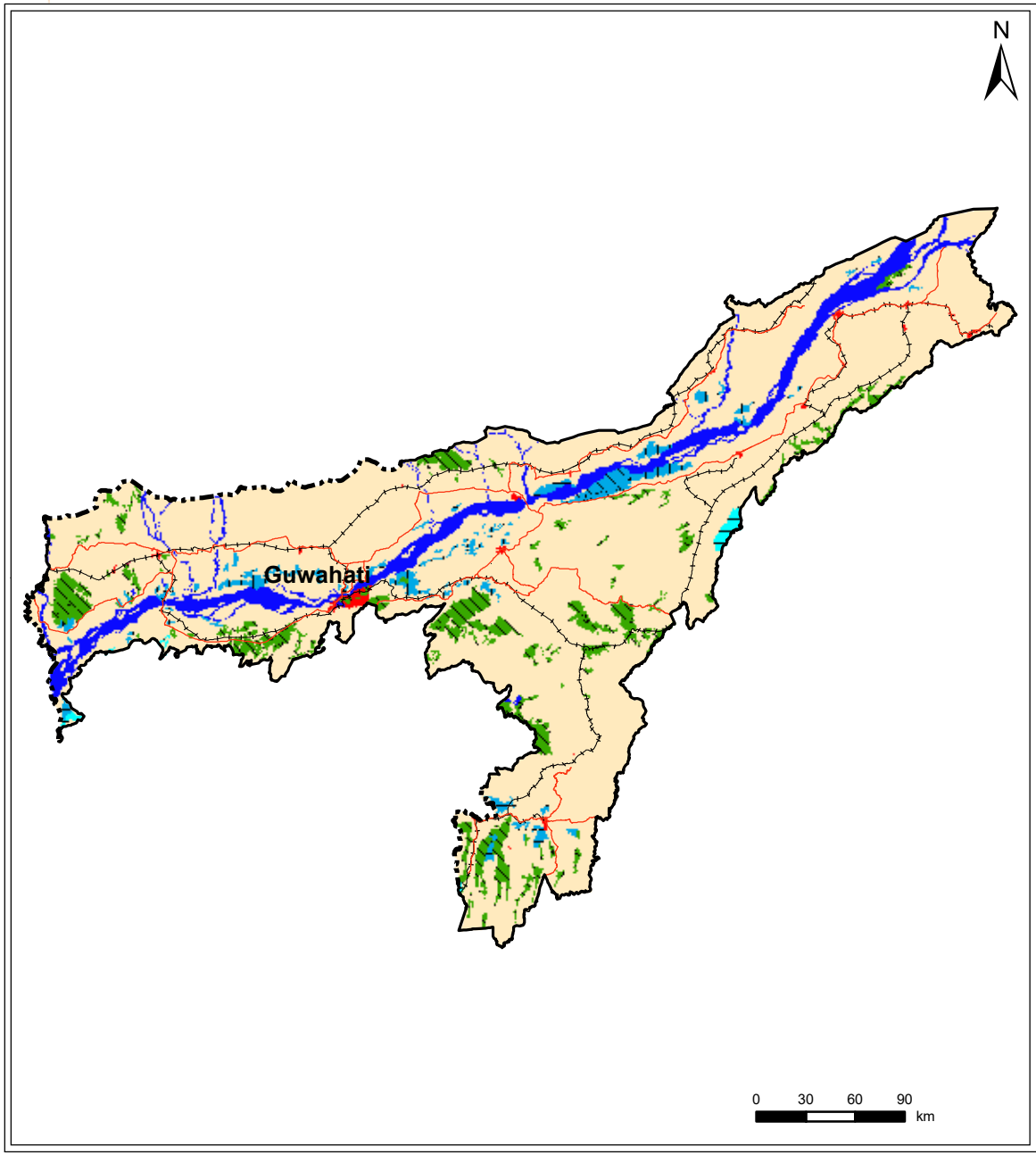




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	532652	6.79	471958	6.02	322540	4.11	60694	149418
Water Erosion	31827	0.41	31424	0.40	31424	0.40	403	0
Water Logging	229584	2.93	186667	2.38	193669	2.47	42917	-7001
Mammade	427	0.01	0	0.00	0	0.00	427	0
Settlement	40040	0.51	26548	0.34	24583	0.31	13492	1964
Total Area under Desertification	**834530**	**10.64**	**716596**	**9.14**	**572215**	**7.30**	**117934**	**144381**
No Apparent Degradation	**6441437**	**82.12**	**6591013**	**84.03**	**6735134**	**85.87**	**-149575**	**-144121**
Total Geographical Area (ha)	**7843800**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	408097	5.20	383751	4.89	24346
2	Fv2	Forest, vegetation degradation, High	29439	0.38	18365	0.23	11074
3	Sv1	Land with scrub, vegetation degradation, Low	82156	1.05	66045	0.84	16111
4	Sv2	Land with scrub, vegetation degradation, High	12960	0.17	3797	0.05	9163
5	Iw1	Agriculture irrigated, water erosion, Low	0	0.00	839	0.01	-839
6	Dw1	Agriculture unirrigated, water erosion, Low	31827	0.41	30585	0.39	1242
7	Il1	Agriculture irrigated, water logging, Low	114077	1.45	77285	0.99	36792
8	Il2	Agriculture irrigated, water logging, High	9979	0.13	2810	0.04	9979
9	Dl1	Agriculture unirrigated, water logging, Low	65195	0.83	62148	0.79	3047
10	Fl1	Forest, water logging, Low	24543	0.31	27022	0.34	-2479
11	Sl1	Land with scrub, water logging, Low	15790	0.20	17402	0.22	-1612
12	Tm1	Others, man made, Low	427	0.01	0	0.00	427
13	S	Settlement	40040	0.51	26548	0.34	13492
Total Area Under Desertification/ Land Degradation			**834530**	**10.64**	**716596**	**9.14**	**117934**
14	W	Water body/ Drainage	567832	7.24	536191	6.84	31641
15	NAD	No Apparent Degradation	6441437	82.12	6591013	84.03	-149575
Total Geographical Area (ha)			**7843800**	**100**	**7843800**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	383751	4.89	266709	3.40	117042
2	Fv2	Forest, vegetation degradation, High	18365	0.23	7782	0.10	10583
3	Sv1	Land with scrub, vegetation degradation, Low	66045	0.84	44252	0.56	21793
4	Sv2	Land with scrub, vegetation degradation, High	3797	0.05	3797	0.05	0
5	Iw1	Agriculture irrigated, water erosion, Low	839	0.01	839	0.01	0
6	Dw1	Agriculture unirrigated, water erosion, Low	30585	0.39	30585	0.39	0
7	Il1	Agriculture irrigated, water logging, Low	77285	0.99	102592	1.31	-25307
8	Il2	Agriculture irrigated, water logging, High	2810	0.04	-	-	2810
9	Dl1	Agriculture unirrigated, water logging, Low	62148	0.79	46652	0.59	15496
10	Fl1	Forest, water logging, Low	27022	0.34	27022	0.34	0
11	Sl1	Land with scrub, water logging, Low	17402	0.22	17402	0.22	0
12	Tm1	Others, man made, Low	0	0.00	0	0.00	0
13	S	Settlement	26548	0.34	24583	0.31	1964
Total Area Under Desertification/ Land Degradation			**716596**	**9.14**	**572215**	**7.30**	**144381**
14	W	Water body/ Drainage	536191	6.84	536451	6.84	-260
15	NAD	No Apparent Degradation	6591013	84.03	6735134	85.87	-144121
Total Geographical Area (ha)			**7843800**	**100**	**7843800**	**100**	



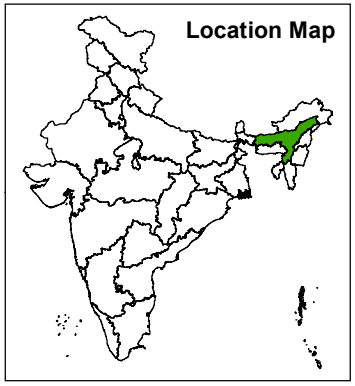
DESERTIFICATION / LAND DEGRADATION STATUS MAP ASSAM (2018-19)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Il1,2	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Fl1	Forest, water logging
	Sl1	Land with scrub, water logging
	Tm1	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

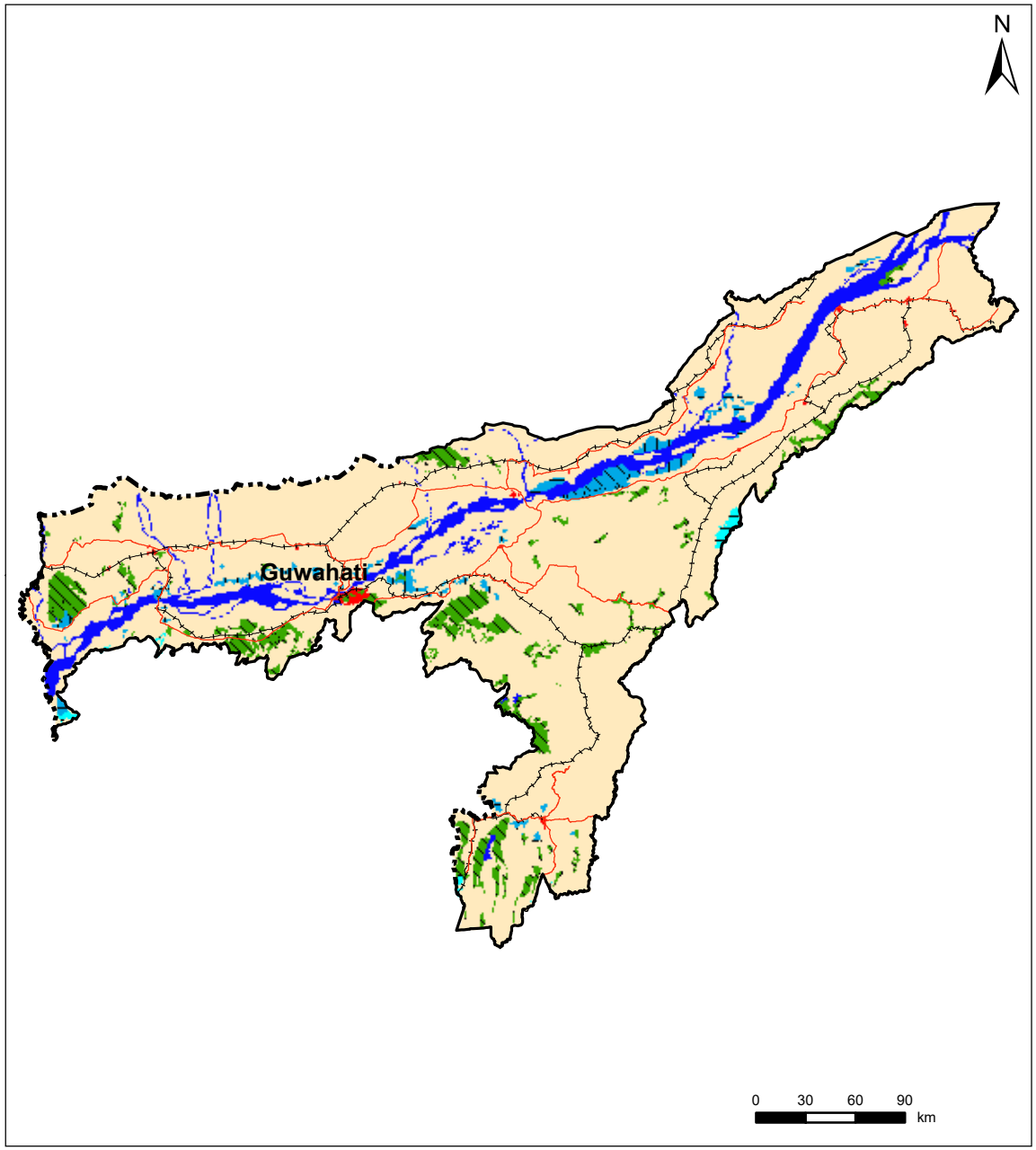
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
North Eastern Hill University, Shillong
&
Space Applications Centre, ISRO, Ahmedabad



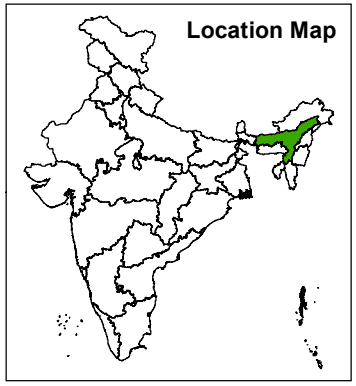
DESERTIFICATION / LAND DEGRADATION STATUS MAP ASSAM (2011-13)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Il1,2	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Fl1	Forest, water logging
	Sl1	Land with scrub, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

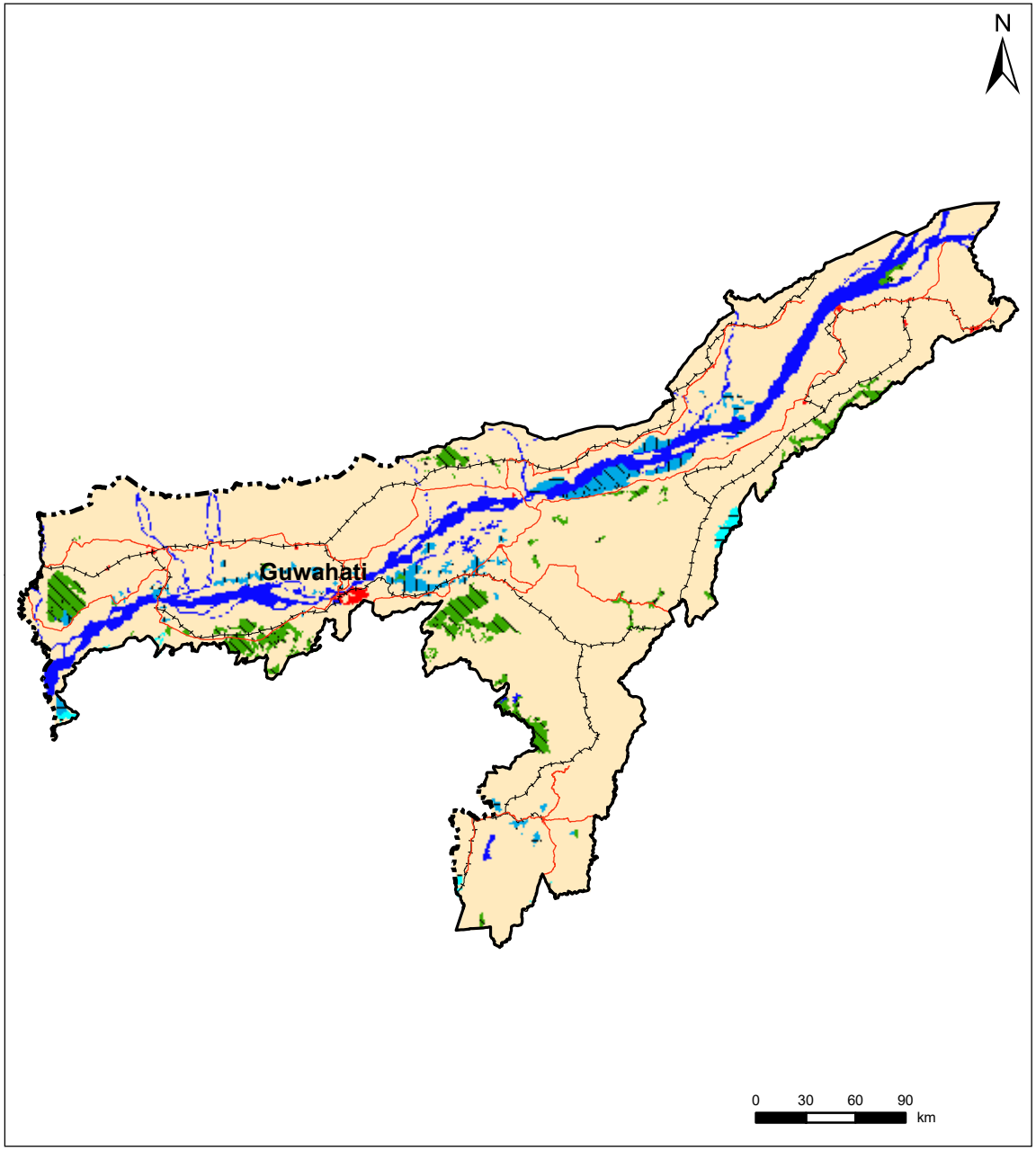
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
North Eastern Hill University, Shillong
&
Space Applications Centre, ISRO, Ahmedabad



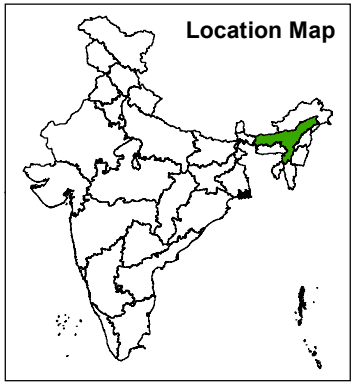
DESERTIFICATION / LAND DEGRADATION STATUS MAP ASSAM (2003-05)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Fl1	Forest, water logging
	Sl1	Land with scrub, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

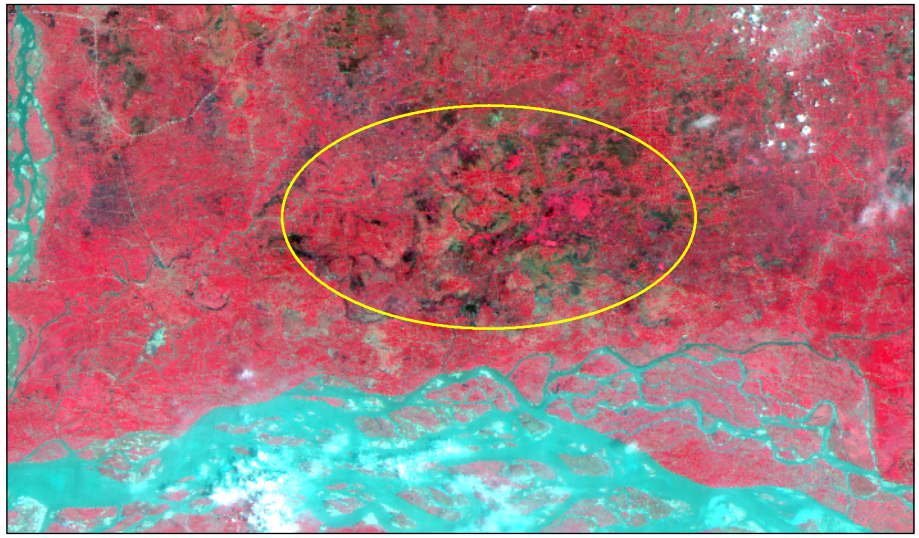
	International boundary
	State boundary
	Major roads
	Rail



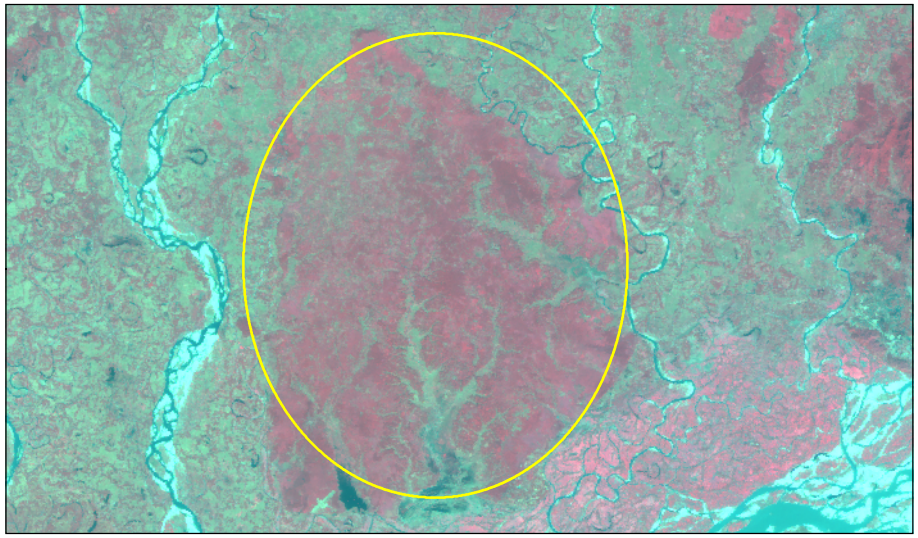
Prepared by:
North Eastern Hill University, Shillong
&
Space Applications Centre, ISRO, Ahmedabad

Assam - Illustrative representation of Land Degradation process / changes on IRS AWiFS data

Agriculture area affected with water logging (May 2019)



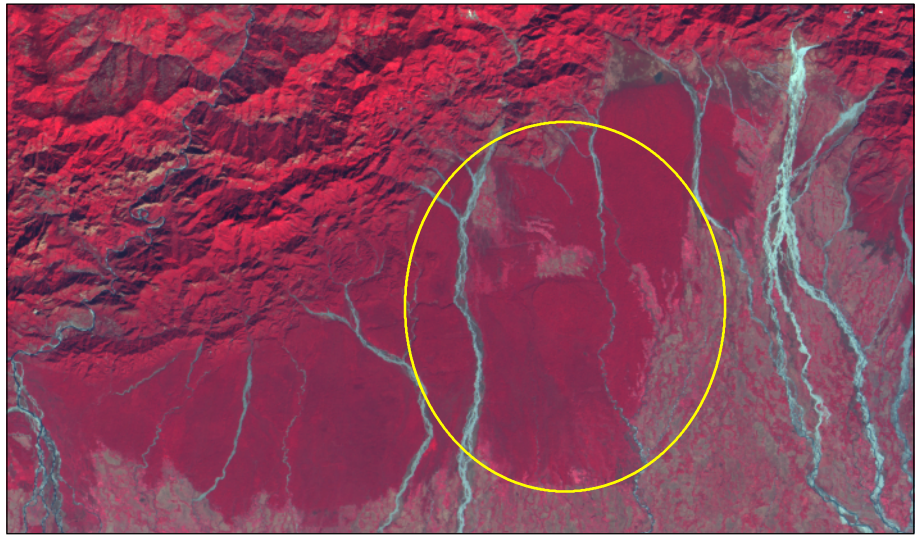
Forest area under vegetation degrdaation (November 2018)

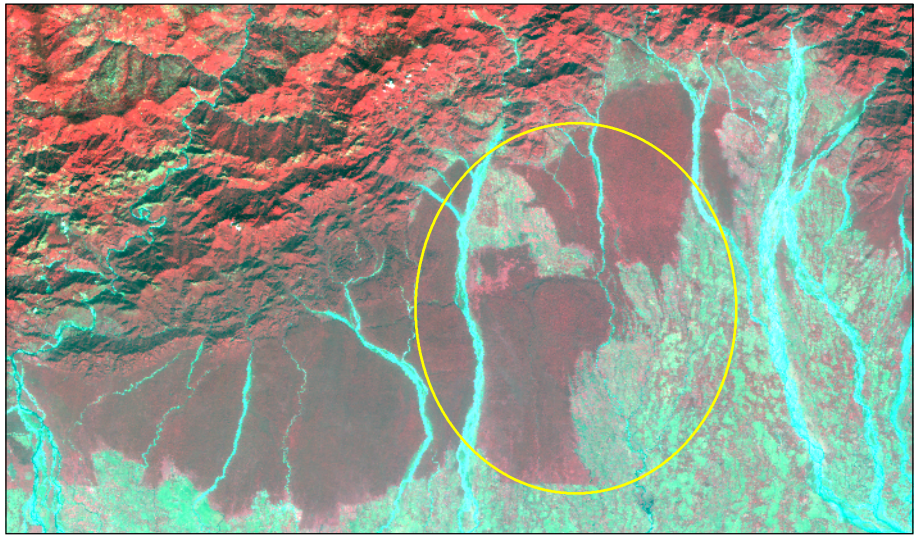


December 2004

Conversion of forest area into agriculture/plantation

November 2018





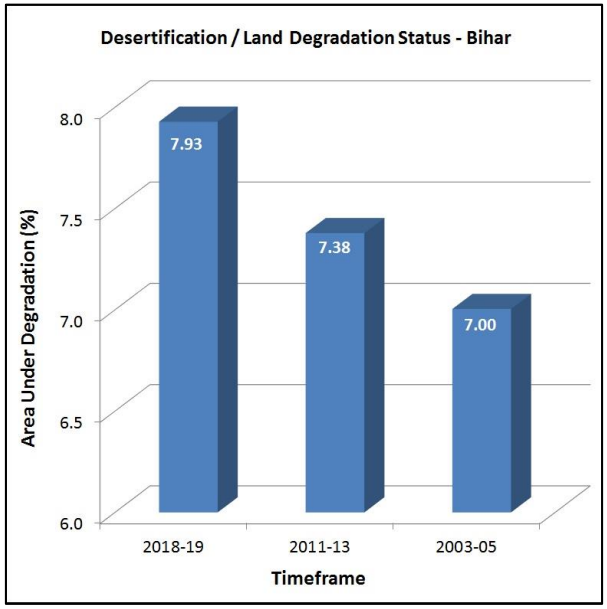
BIHAR

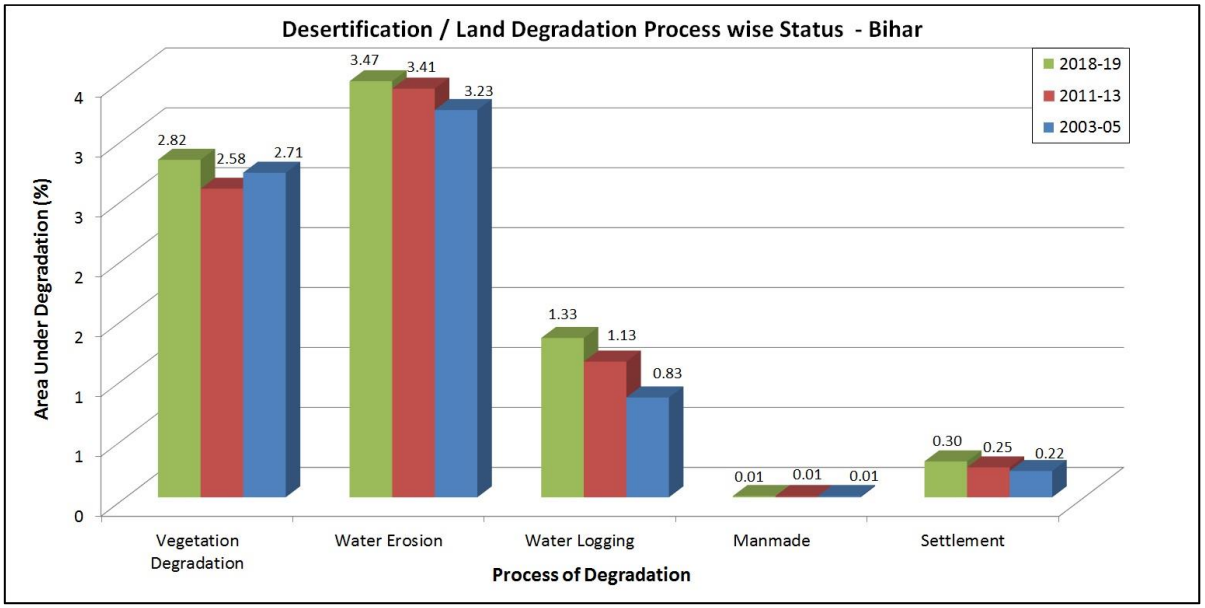
Bihar state is located in northern part of India, bordering with Nepal, and covers 94,163 sq km area. The state has population of 10,40,99,452; with 1106 population density, 918 sex ratio and 61.80% literacy (Census 2011). Patna is the capital of Bihar. The physiography of the state exhibits three distinct divisions, the northern mountains, the Indo-Gangetic alluvial plain and the undulating highlands of plateau. Major ranges of the state are Rajgir hills, Bateswar hills, Kaimur hills, Brahmayoni hills etc. Main rivers are Ganga, Kosi, Gandak and Son. Climate is characterised by cold winter (lowest temperatures being around 0-10°C in December-January), hot summer (35-40°C in April-June) and heavy rainfall in monsoon season. The Indo-Gangetic plain consist fertile alluvial soil, getting rejuvenated regularly supporting very good agriculture and horticulture.

The statistical summary and analysis of the Land Degradation of Bihar state reveal that 7.93% (7,46,586 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 7.38% (6,94,809 ha) and 7.00% (6,59,539 ha) respectively. An increase of 0.55% (51,777 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.38% (35,270 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (3.47% in 2018-19, 3.41% in 2011-13 and 3.23% in 2003-05) followed by Vegetation Degradation (2.82% in 2018-19, 2.58% in 2011-13 and 2.71% in 2003-05) and Water Logging (1.33% in 2018-19, 1.13% in 2011-13 and 0.83% in 2003-05) . Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation and agriculture area affected with water erosion and water logging is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in agriculture area affected with water erosion & water logging is observed and decrease in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

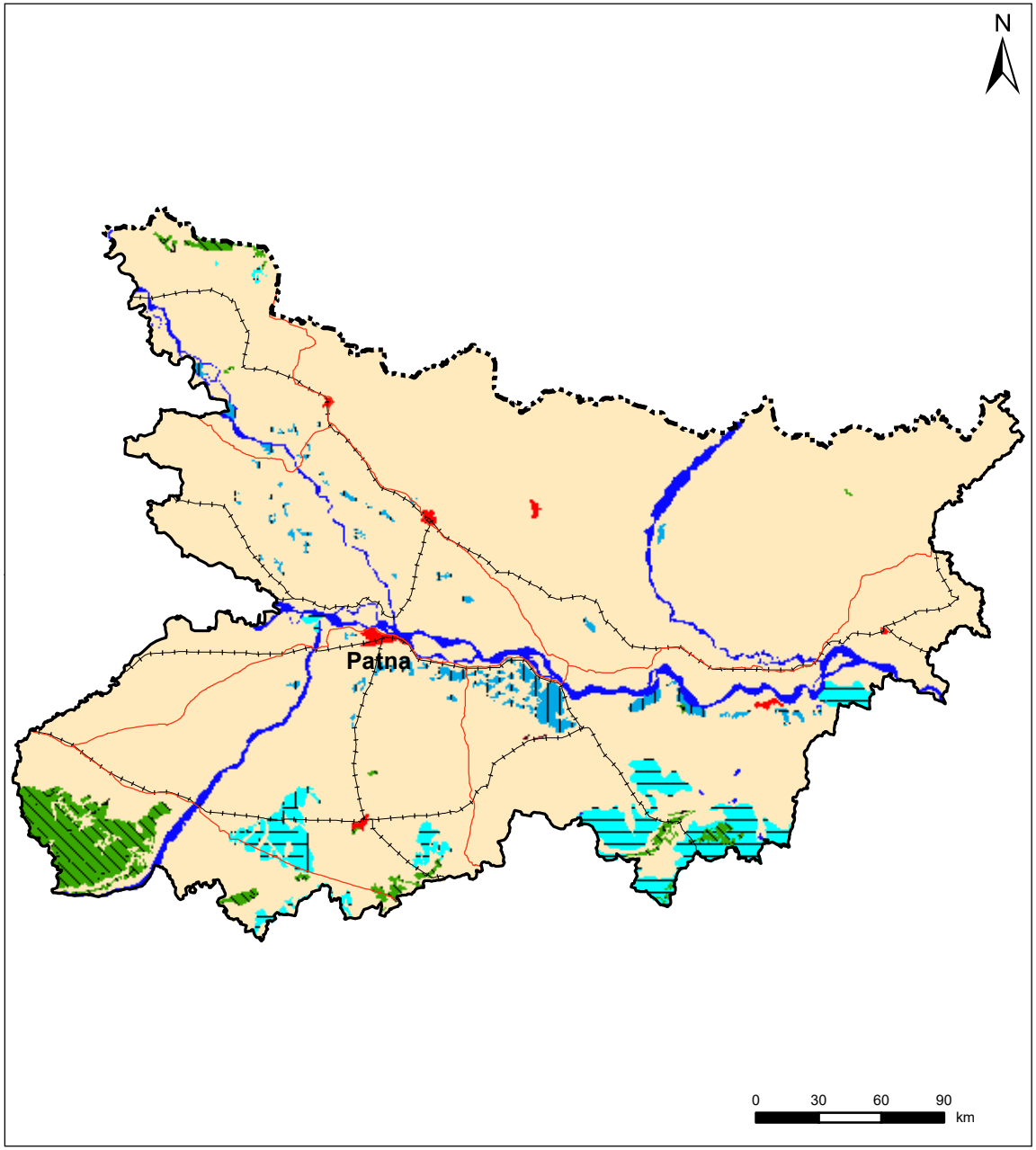




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	265244	2.82	242525	2.58	255073	2.71	22718	-12547
Water Erosion	327004	3.47	321175	3.41	304364	3.23	5828	16811
Water Logging	125187	1.33	106628	1.13	78450	0.83	18559	28178
Manmade	984	0.01	984	0.01	984	0.01	0	0
Settlement	28168	0.30	23496	0.25	20669	0.22	4671	2828
Total Area under Desertification	**746586**	**7.93**	**694809**	**7.38**	**659539**	**7.00**	**51777**	**35270**
No Apparent Degradation	**8414652**	**89.36**	**8511828**	**90.39**	**8527091**	**90.56**	**-97177**	**-15263**
Total Geographical Area (ha)	**9416300**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	235146	2.50	213346	2.27	21800
2	Fv2	Forest, vegetation degradation, High	-	-	-	-	0
3	Sv1	Land with scrub, vegetation degradation, Low	30097	0.32	29179	0.31	918
4	Iw1	Agriculture irrigated, water erosion, Low	28866	0.31	0	0.00	28866
5	Dw1	Agriculture unirrigated, water erosion, Low	298137	3.17	321175	3.41	-23038
6	Il1	Agriculture irrigated, water logging, Low	116967	1.24	101847	1.08	15120
7	Dl1	Agriculture unirrigated, water logging, Low	8220	0.09	4781	0.05	3439
8	Tm1	Others, man made, Low	984	0.01	984	0.01	0
9	S	Settlement	28168	0.30	23496	0.25	4671
Total Area Under Desertification/ Land Degradation			**746586**	**7.93**	**694809**	**7.38**	**51777**
10	W	Water body/ Drainage	255062	2.71	209663	2.23	45400
11	NAD	No Apparent Degradation	8414652	89.36	8511828	90.39	-97177
Total Geographical Area (ha)			**9416300**	**100**	**9416300**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	213346	2.27	220844	2.35	-7498
2	Fv2	Forest, vegetation degradation, High	-	-	6067	0.06	-6067
3	Sv1	Land with scrub, vegetation degradation, Low	29179	0.31	28161	0.30	1018
4	Iw1	Agriculture irrigated, water erosion, Low	0	0.00	0	0.00	0
5	Dw1	Agriculture unirrigated, water erosion, Low	321175	3.41	304364	3.23	16811
6	Il1	Agriculture irrigated, water logging, Low	101847	1.08	75384	0.80	26463
7	Dl1	Agriculture unirrigated, water logging, Low	4781	0.05	3065	0.03	1715
8	Tm1	Others, man made, Low	984	0.01	984	0.01	0
9	S	Settlement	23496	0.25	20669	0.22	2828
Total Area Under Desertification/ Land Degradation			**694809**	**7.38**	**659539**	**7.00**	**35270**
10	W	Water body/ Drainage	209663	2.23	229670	2.44	-20007
11	NAD	No Apparent Degradation	8511828	90.39	8527091	90.56	-15263
Total Geographical Area (ha)			**9416300**	**100**	**9416300**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP
BIHAR (2018-19)

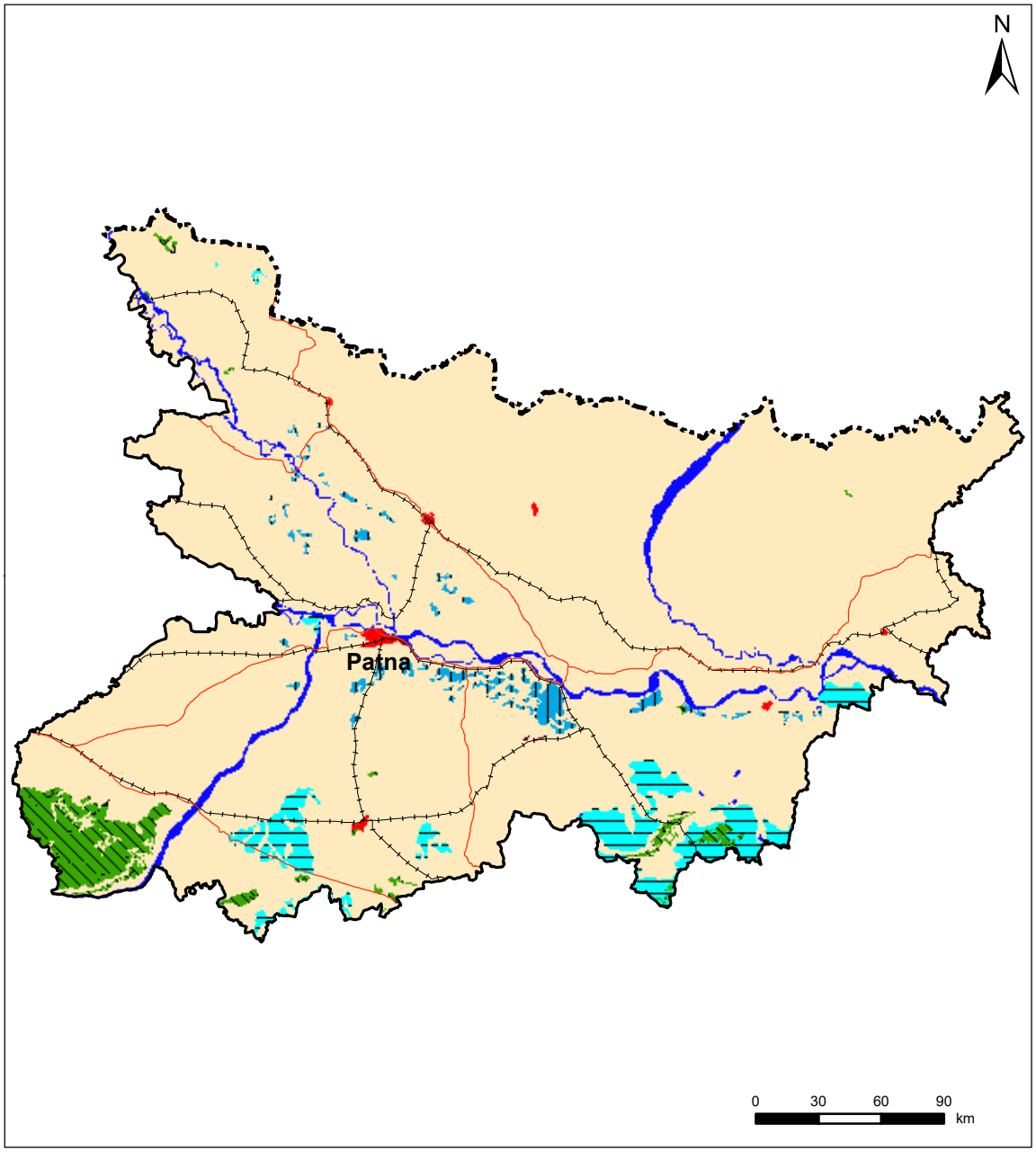
Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Tm1	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
UP Remote Sensing Applications Centre, Lucknow
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP BIHAR (2011-13)

Legend

Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Tm1	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

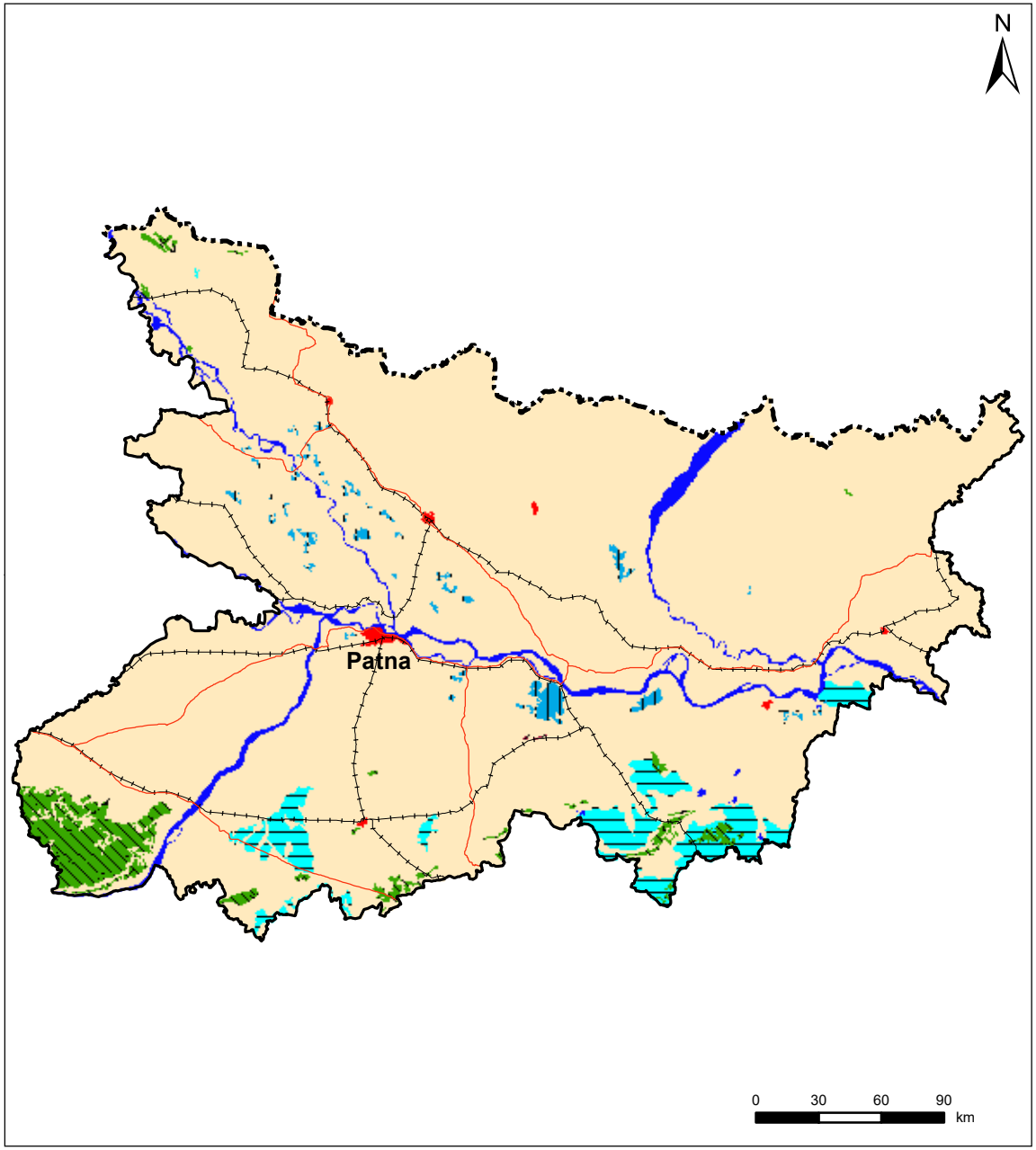
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:

Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP
BIHAR (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Tm1	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

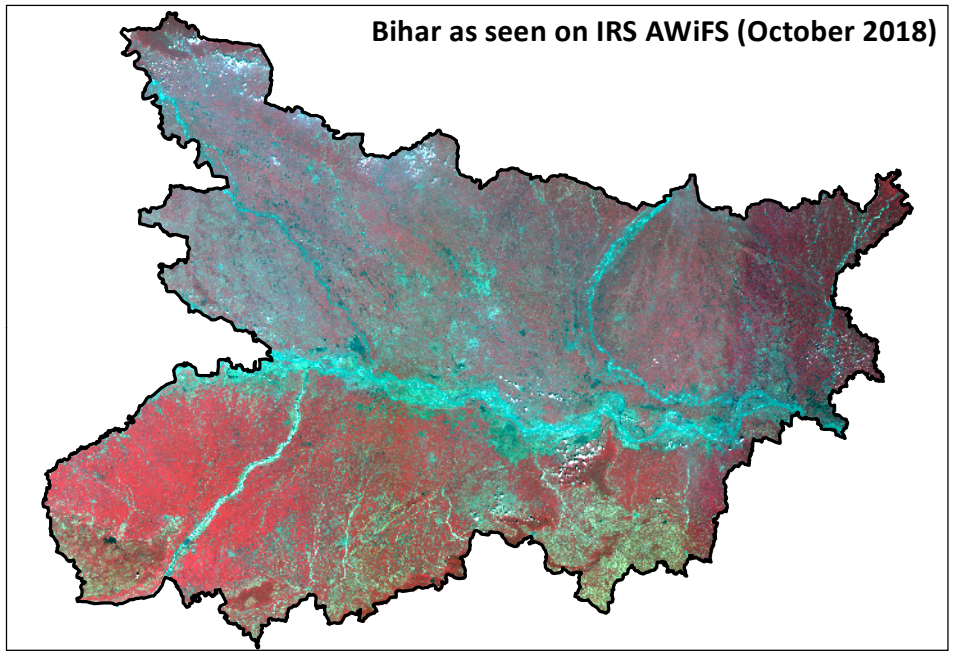
- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

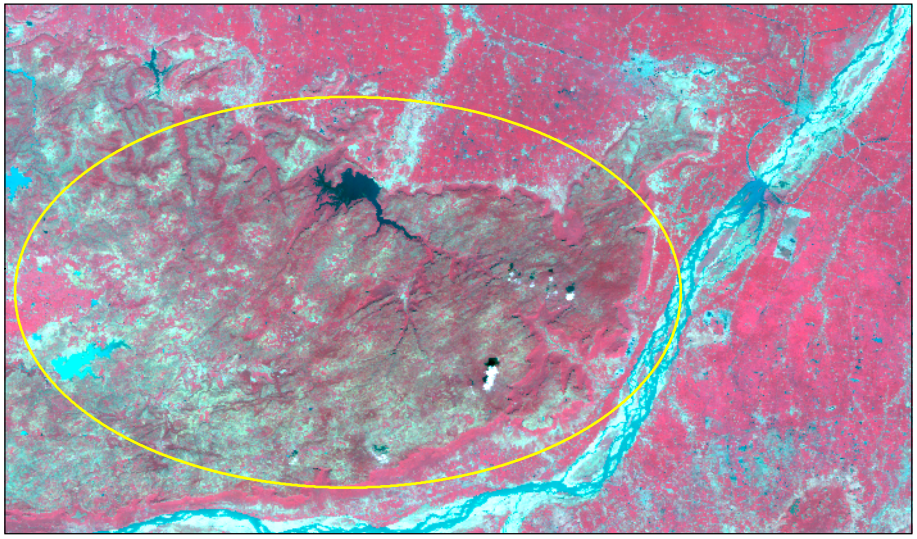
Prepared by:

Space Applications Centre, ISRO, Ahmedabad

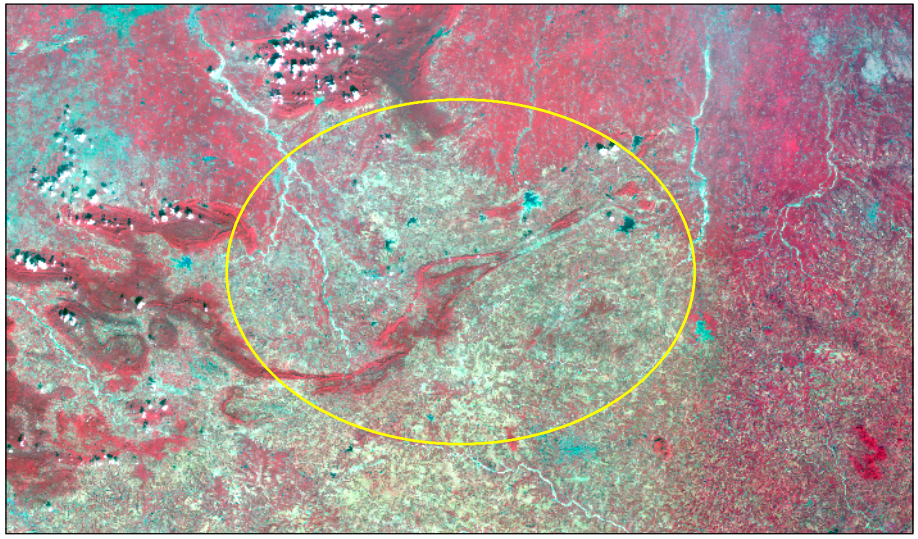
Bihar - Illustrative representation of Land Degradation process on IRS AWiFS data



Forest area under vegetation degrdaation (October 2018)



Agriculture area affected with water erosion (October 2018)



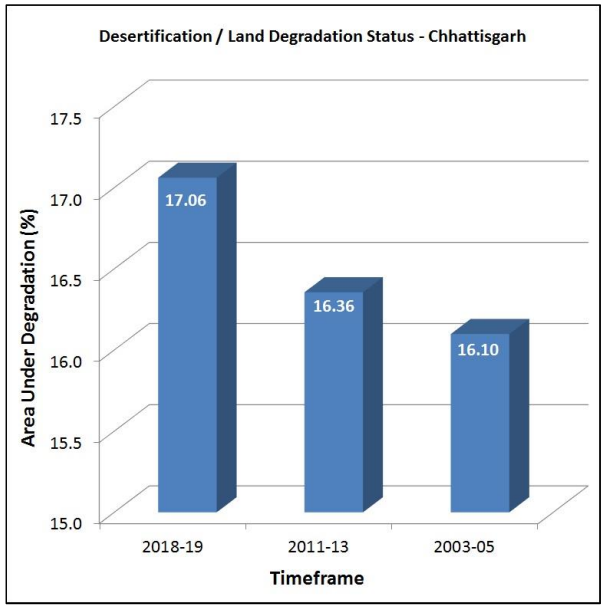
CHHATTISGARH

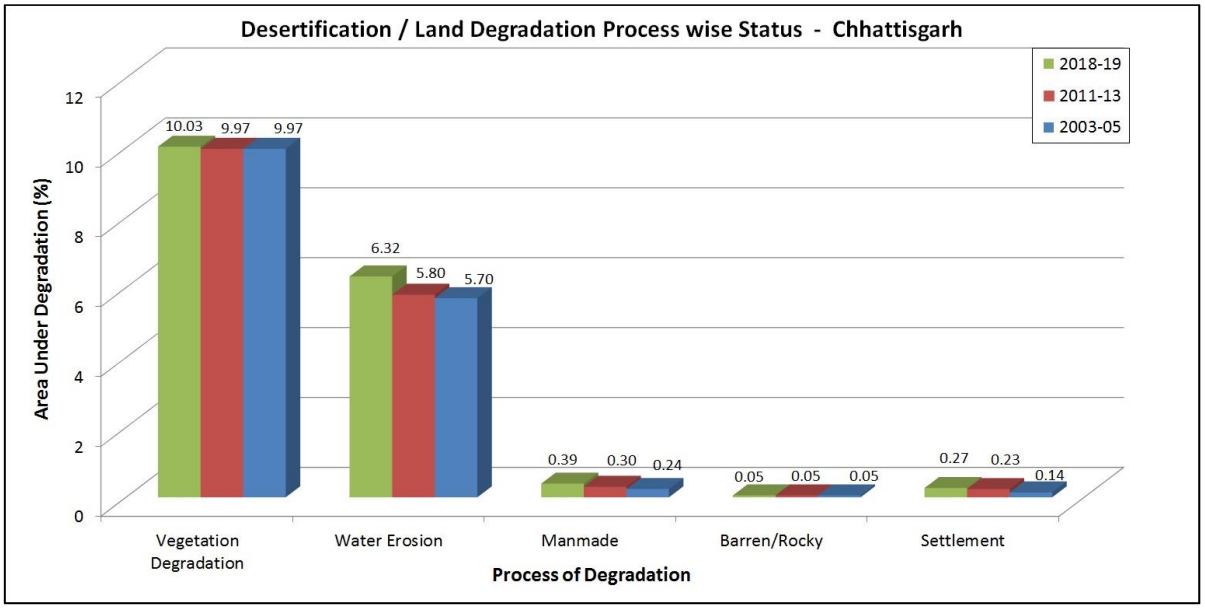
Chhattisgarh is located in central part of India, and covering 1,35,192 sq km area. The state has population of 2,55,45,198; with 189 population density, 991 sex ratio and 70.28% literacy (Census 2011). Raipur is the capital of Chhattisgarh. The major geographic feature of Chhattisgarh is Vindhyan ranges, with four principal rivers namely Narmada, Godavari, Rihand and Mahanadi. The soil is mainly red lateritic soil. The state is endowed with huge mineral deposits and forest resources. The climate of Chhattisgarh is mainly dry and hot, experiencing severe dust storm in summer season and good amount of rainfall in monsoon.

The statistical summary and analysis of the Land Degradation of Chhattisgarh state reveal that 17.06% (2.30 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 16.36% (2.21 million ha) and 16.10% (2.17 million ha) respectively. An increase of 0.70% (95,377 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.26% (34,765 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (10.03% in 2018-19, 9.97% in both 2011-13 and 2003-05) followed by Water Erosion (6.32% in 2018-19, 5.80% in 2011-13 and 5.70% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in agriculture area affected with water erosion, area affected with manmade activities and slight increase in forest area undergoing vegetation degradation is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in agriculture area affected with water erosion and area affected with manmade activities is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

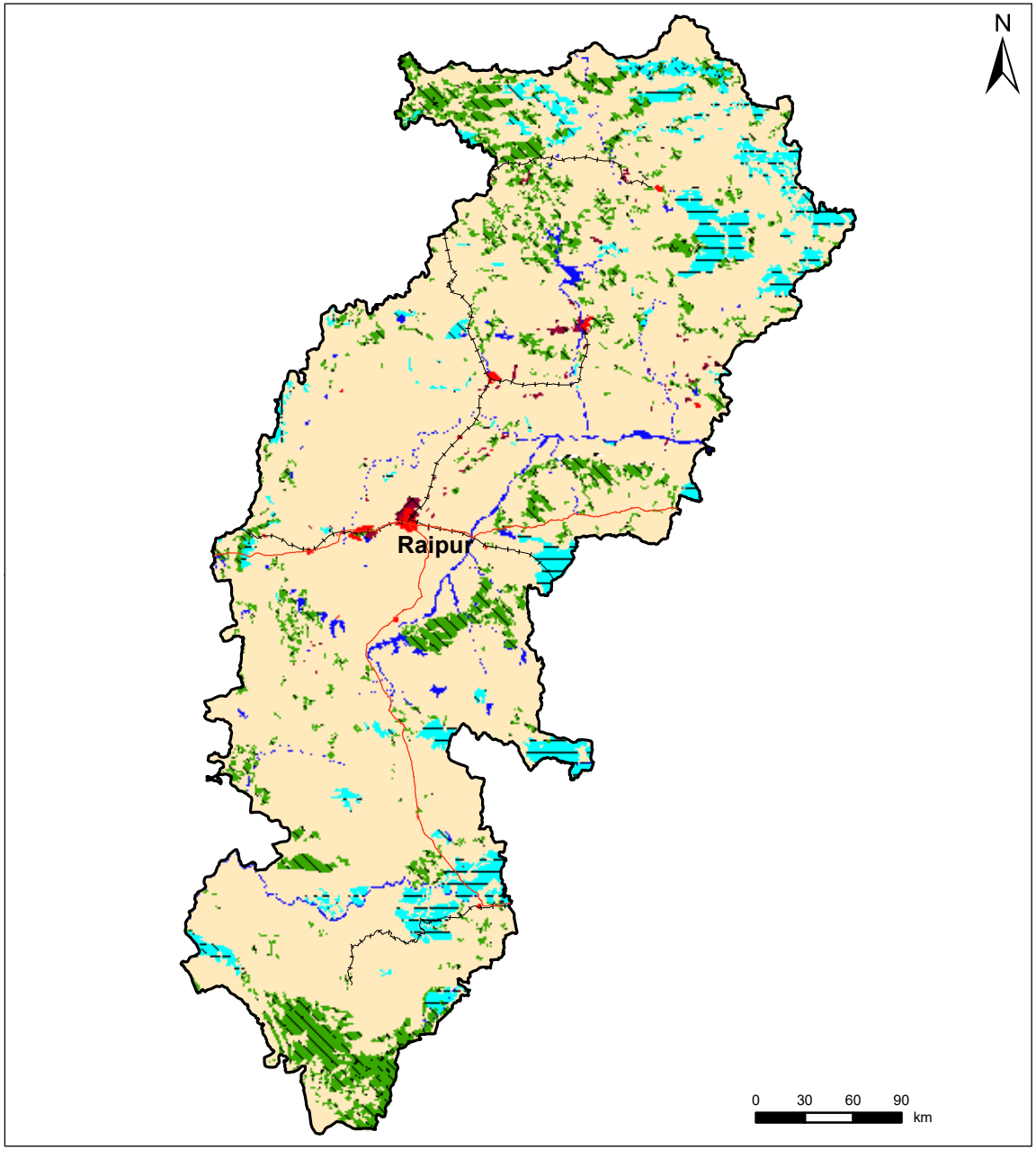




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	1356314	10.03	1348089	9.97	1348122	9.97	8225	-33
Water Erosion	854393	6.32	783645	5.80	770387	5.70	70748	13258
Manmade	52756	0.39	40541	0.30	31972	0.24	12216	8569
Barren/Rocky	7222	0.05	7222	0.05	7222	0.05	0	0
Settlement	35845	0.27	31656	0.23	18685	0.14	4189	12971
Total Area under Desertification	**2306531**	**17.06**	**2211153**	**16.36**	**2176388**	**16.10**	**95377**	**34765**
No Apparent Degradation	**11033053**	**81.61**	**11130592**	**82.33**	**11166012**	**82.59**	**-97539**	**-35420**
Total Geographical Area (ha)	**13519200**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	1079455	7.98	1087547	8.04	-8093
2	Fv2	Forest, vegetation degradation, High	42485	0.31	21761	0.16	20724
3	Sv1	Land with scrub, vegetation degradation, Low	208206	1.54	212550	1.57	-4345
4	Sv2	Land with scrub, vegetation degradation, High	26169	0.19	26230	0.19	-61
5	Iw1	Agriculture irrigated, water erosion, Low	18377	0.14	18377	0.14	0
6	Dw1	Agriculture unirrigated, water erosion, Low	663524	4.91	592962	4.39	70562
7	Fw1	Forest, water erosion, Low	106860	0.79	106860	0.79	0
8	Sw1	Land with scrub, water erosion, Low	58926	0.44	58740	0.43	186
9	Sw2	Land with scrub, water erosion, High	6706	0.05	6706	0.05	0
10	Fm1	Forest, man made, Low	1055	0.01	1055	0.01	0
11	Tm1	Others, man made, Low	42159	0.31	33958	0.25	8201
12	Tm2	Others, man made, High	9543	0.07	5528	0.04	4015
13	R	Rocky	7222	0.05	7222	0.05	0
14	S	Settlement	35845	0.27	31656	0.23	4189
Total Area Under Desertification/ Land Degradation			**2306531**	**17.06**	**2211153**	**16.36**	**95377**
15	W	Water body/ Drainage	179614	1.33	177455	1.31	2159
16	NAD	No Apparent Degradation	11033053	81.61	11130592	82.33	-97539
Total Geographical Area (ha)			**13519198**	**100**	**13519200**	**100**	

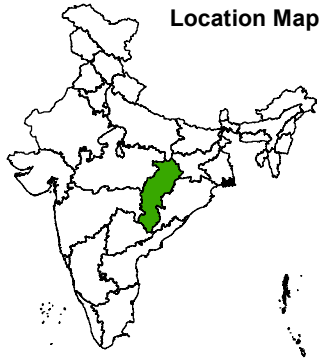
SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	1087547	8.04	1085360	8.03	2188
2	Fv2	Forest, vegetation degradation, High	21761	0.16	21761	0.16	0
3	Sv1	Land with scrub, vegetation degradation, Low	212550	1.57	214772	1.59	-2221
4	Sv2	Land with scrub, vegetation degradation, High	26230	0.19	26230	0.19	0
5	Iw1	Agriculture irrigated, water erosion, Low	18377	0.14	6325	0.05	12052
6	Dw1	Agriculture unirrigated, water erosion, Low	592962	4.39	588835	4.36	4127
7	Fw1	Forest, water erosion, Low	106860	0.79	106860	0.79	0
8	Sw1	Land with scrub, water erosion, Low	58740	0.43	61661	0.46	-2920
9	Sw2	Land with scrub, water erosion, High	6706	0.05	6706	0.05	0
10	Fm1	Forest, man made, Low	1055	0.01	1055	0.01	0
11	Tm1	Others, man made, Low	33958	0.25	26798	0.20	7160
12	Tm2	Others, man made, High	5528	0.04	4119	0.03	1409
13	R	Rocky	7222	0.05	7222	0.05	0
14	S	Settlement	31656	0.23	18685	0.14	12971
Total Area Under Desertification/ Land Degradation			**2211153**	**16.36**	**2176388**	**16.10**	**34765**
15	W	Water body/ Drainage	177455	1.31	176800	1.31	655
16	NAD	No Apparent Degradation	11130592	82.33	11166012	82.59	-35420
Total Geographical Area (ha)			**13519200**	**100**	**13519200**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP CHHATTISGARH (2018-19)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Fm1	Forest, man made
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Location Map

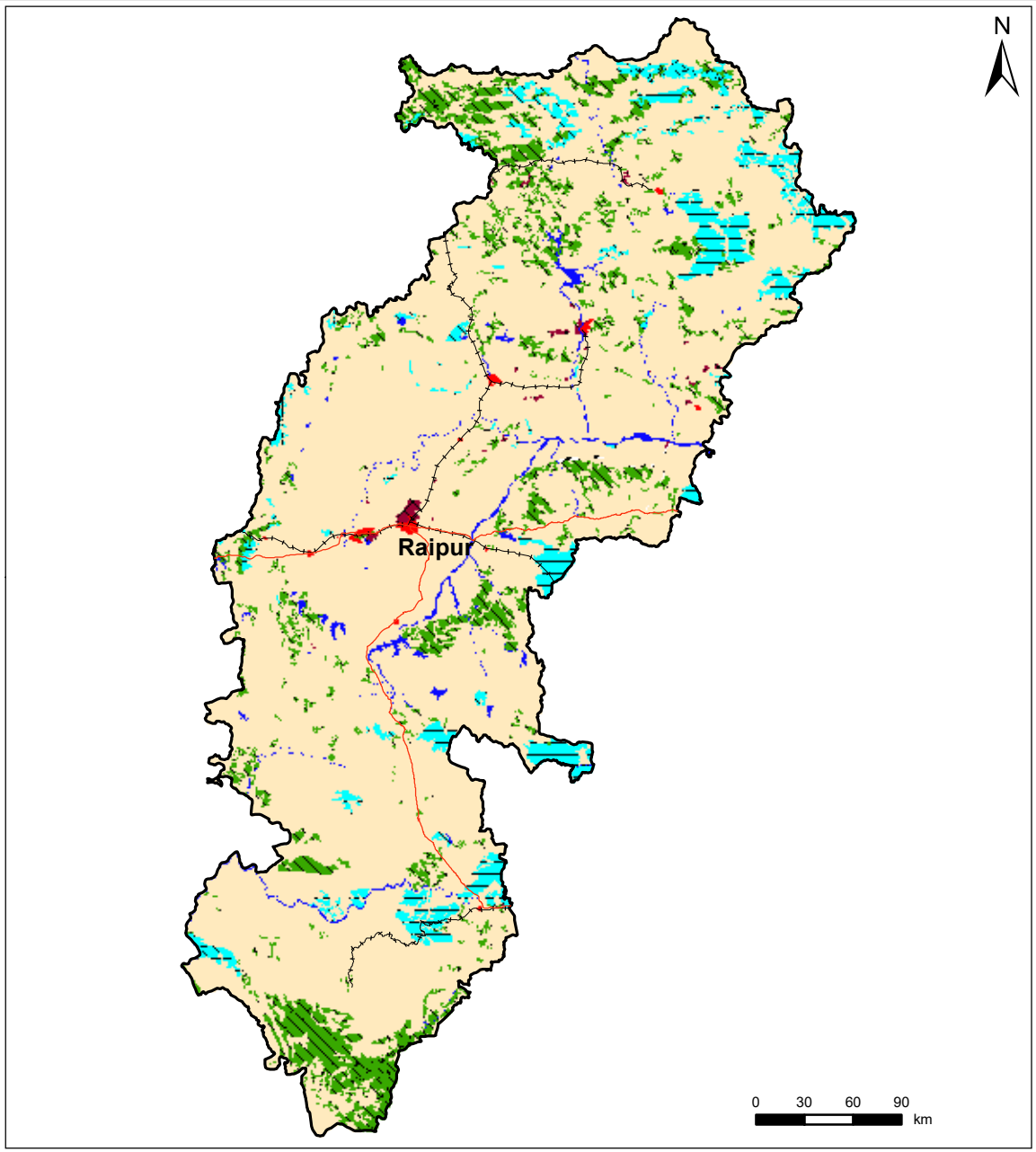


Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

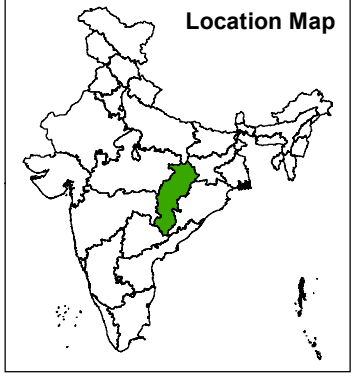
Prepared by:
Madhya Pradesh Council of Science & Technology, Bhopal
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP CHHATTISGARH (2011-13)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Fm1	Forest, man made
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Location Map

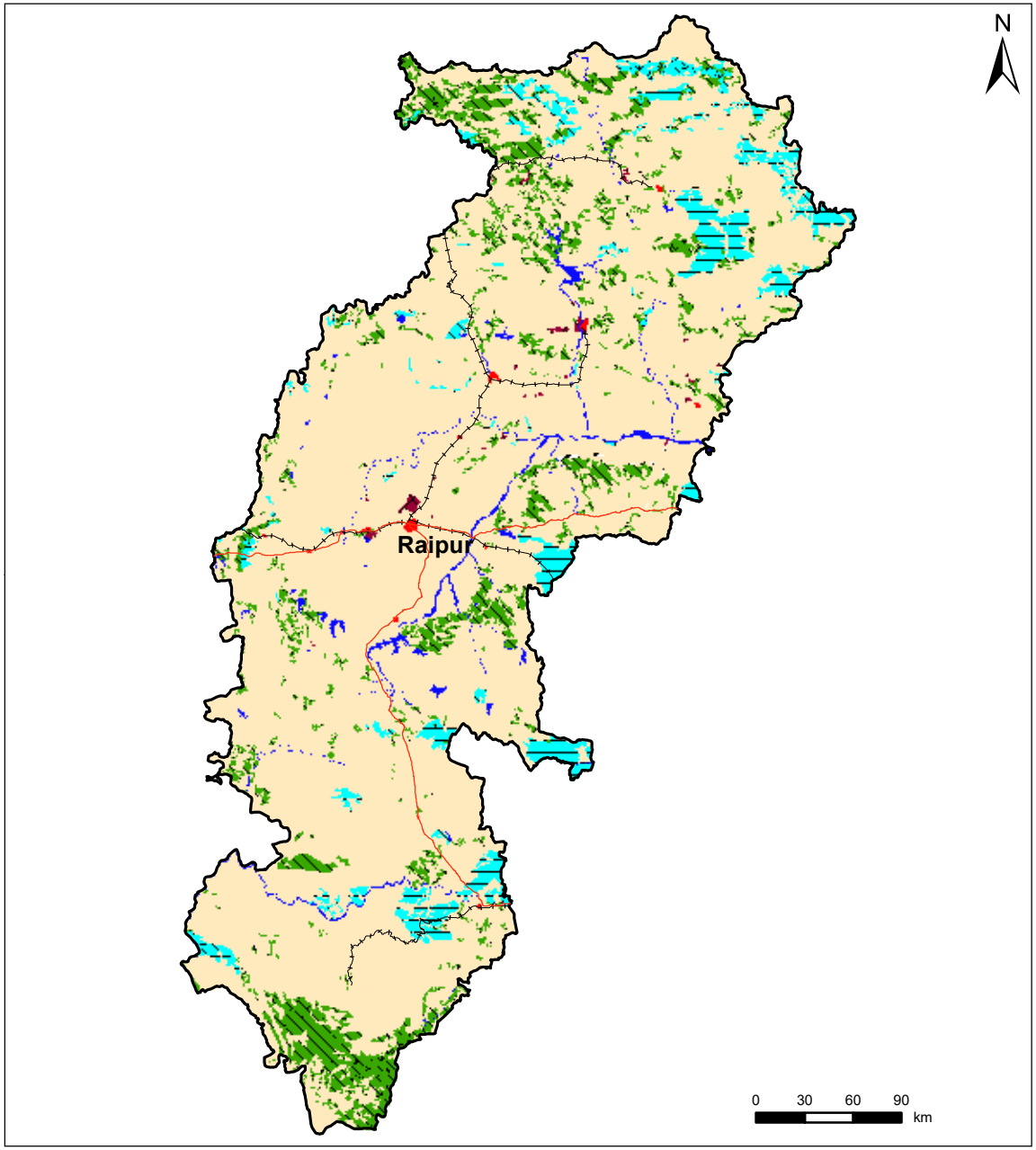


Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
Madhya Pradesh Council of Science & Technology, Bhopal
&
Space Applications Centre, ISRO, Ahmedabad



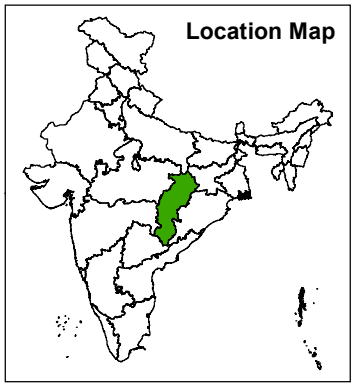
DESERTIFICATION / LAND DEGRADATION STATUS MAP
CHHATTISGARH (2003-05)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Fm1	Forest, man made
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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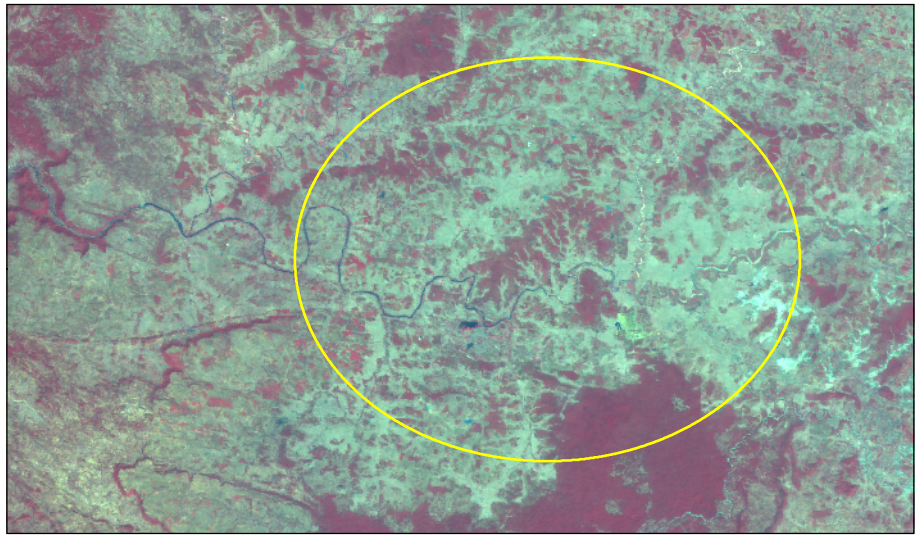
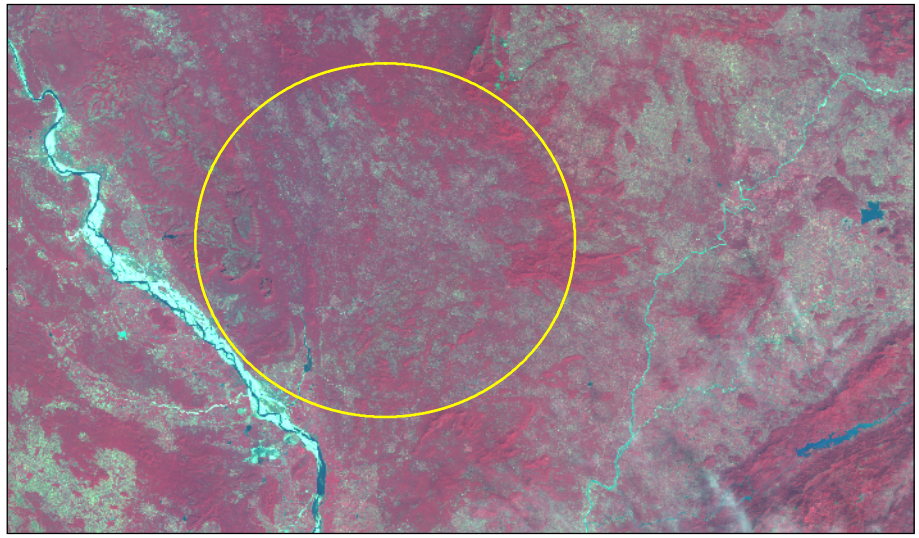
Chhattisgarh - Illustrative representation of Land Degradation process / changes on IRS AWiFS data

Agriculture area affected with water erosion (January 2018)



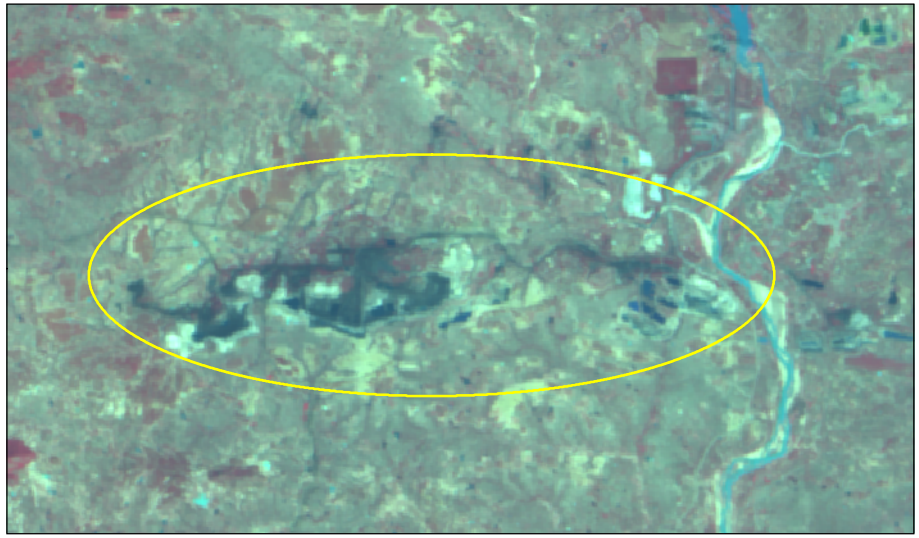
Forest area under vegetation degradation (October 2019)

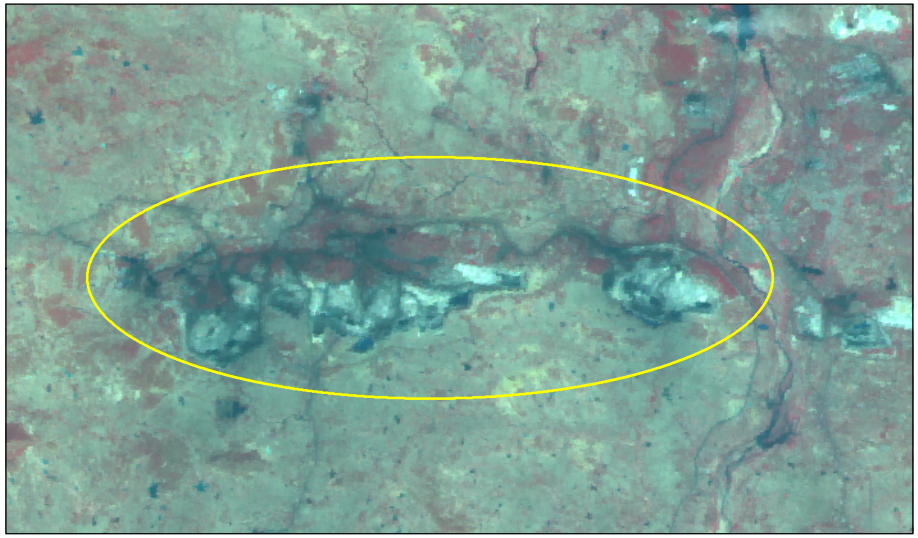


February 2005

Expansion of area affected with manmade (mining) activities

February 2018





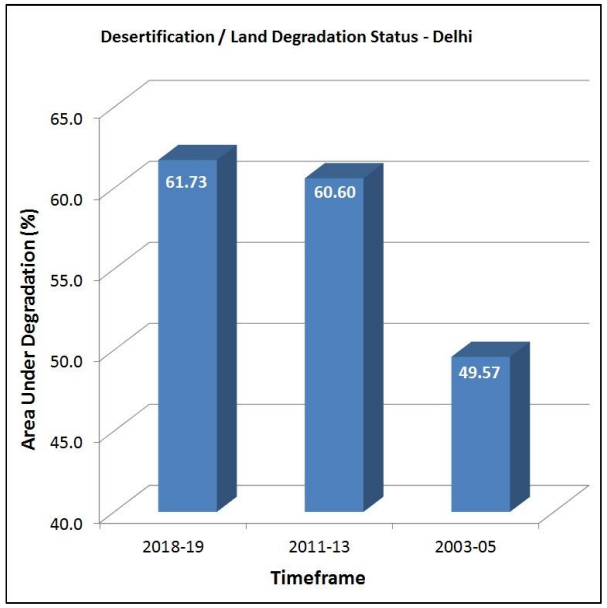
DELHI

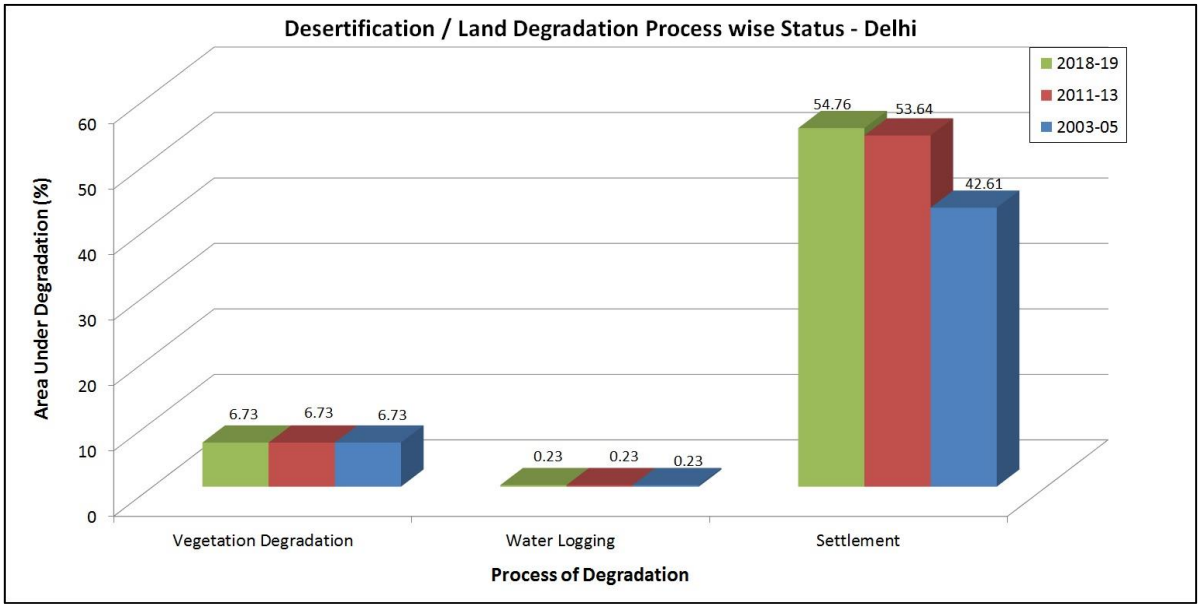
Delhi, the capital city of India, is spread over 1,483 sq km area. The state has a population of 1,67,87,941; with 11320 population density, 868 sex ratio and 86.21% literacy (Census 2011). New Delhi, sprawling over the west bank of the river Yamuna, is one of the fastest growing cities in India. The topography of Delhi is divided into two divisions, the Aravali ridge and the Yamuna Flood Plain. It is interesting to note that either of these regions is marked by distinct type of vegetation, mainly comprising of medium size trees and shrubs. However, Delhi is known for its varied flowering plants. Delhi experiences humid tropical steppe type of climate with extreme temperatures in winter (near 0^{o}C) and summer (more than 45^{o}C).

The statistical summary and analysis of the Land Degradation of Delhi state reveal that 61.73% (91,543 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 60.60% (89,868 ha) and 49.57% (73,514 ha) respectively. An increase of 1.13% (1,674 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 11.03% (16,354 ha).

Almost 54.76% area of the state is occupied by settlement in 2018-19, which was 53.64% and 42.61 % during timeframe 2011-13 and 2003-05 respectively. Other significant process of desertification/ land degradation is Vegetation Degradation (6.73% in 2018-19, 2011-13 and 2003-05). The increase in area undergoing land degradation is primarily due to increase in urbanisation.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

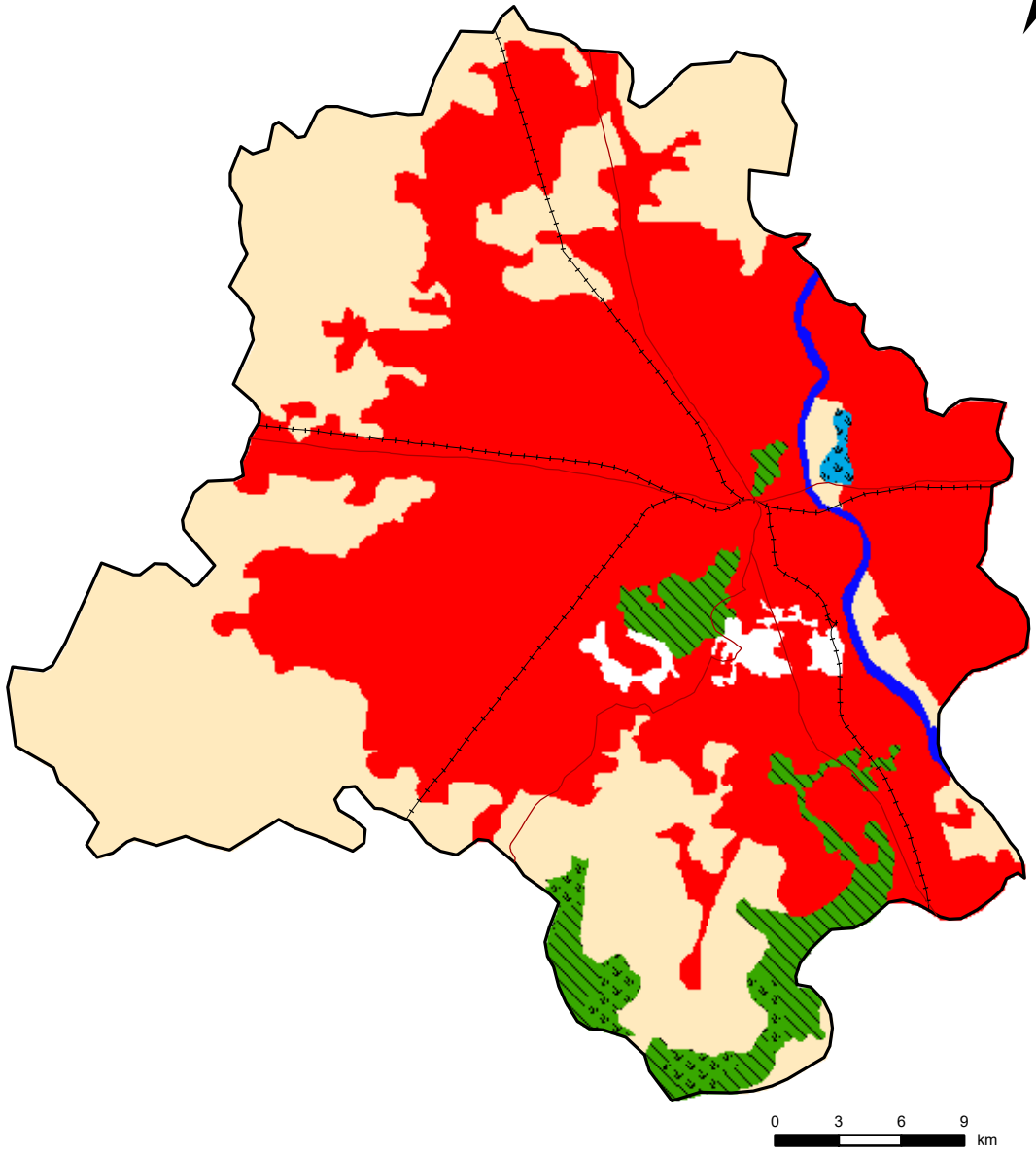




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	9980	6.73	9980	6.73	9980	6.73	0	0
Water Logging	347	0.23	347	0.23	347	0.23	0	0
Settlement	81216	54.76	79541	53.64	63187	42.61	1674	16354
Total Area under Desertification	**91543**	**61.73**	**89868**	**60.60**	**73514**	**49.57**	**1674**	**16354**
No Apparent Degradation	**55633**	**37.51**	**57307**	**38.64**	**73661**	**49.67**	**-1674**	**-16354**
Total Geographical Area (ha)	**148300**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	6499	4.38	6499	4.38	0
2	Fv2	Forest, vegetation degradation, High	1669	1.13	1669	1.13	0
3	Sv1	Land with scrub, vegetation degradation, Low	1812	1.22	1812	1.22	0
4	Sl2	Land with scrub, water logging, High	347	0.23	347	0.23	0
5	S	Settlement	81216	54.76	79541	53.64	1674
Total Area Under Desertification/ Land Degradation			**91543**	**61.73**	**89868**	**60.60**	**1674**
6	W	Water body/ Drainage	1125	0.76	1125	0.76	0
7	NAD	No Apparent Degradation	55633	37.51	57307	38.64	-1674
Total Geographical Area (ha)			**148300**	**100**	**148300**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	6499	4.38	8168	5.51	-1669
2	Fv2	Forest, vegetation degradation, High	1669	1.13	-	-	1669
3	Sv1	Land with scrub, vegetation degradation, Low	1812	1.22	1812	1.22	0
4	Sl2	Land with scrub, water logging, High	347	0.23	347	0.23	0
5	S	Settlement	79541	53.64	63187	42.61	16354
Total Area Under Desertification/ Land Degradation			**89868**	**60.60**	**73514**	**49.57**	**16354**
6	W	Water body/ Drainage	1125	0.76	1125	0.76	0
7	NAD	No Apparent Degradation	57307	38.64	73661	49.67	-16354
Total Geographical Area (ha)			**148300**	**100**	**148300**	**100**	



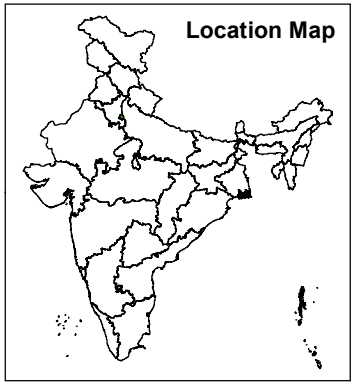
DESERTIFICATION / LAND DEGRADATION STATUS MAP DELHI (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Sl2	Land with scrub, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

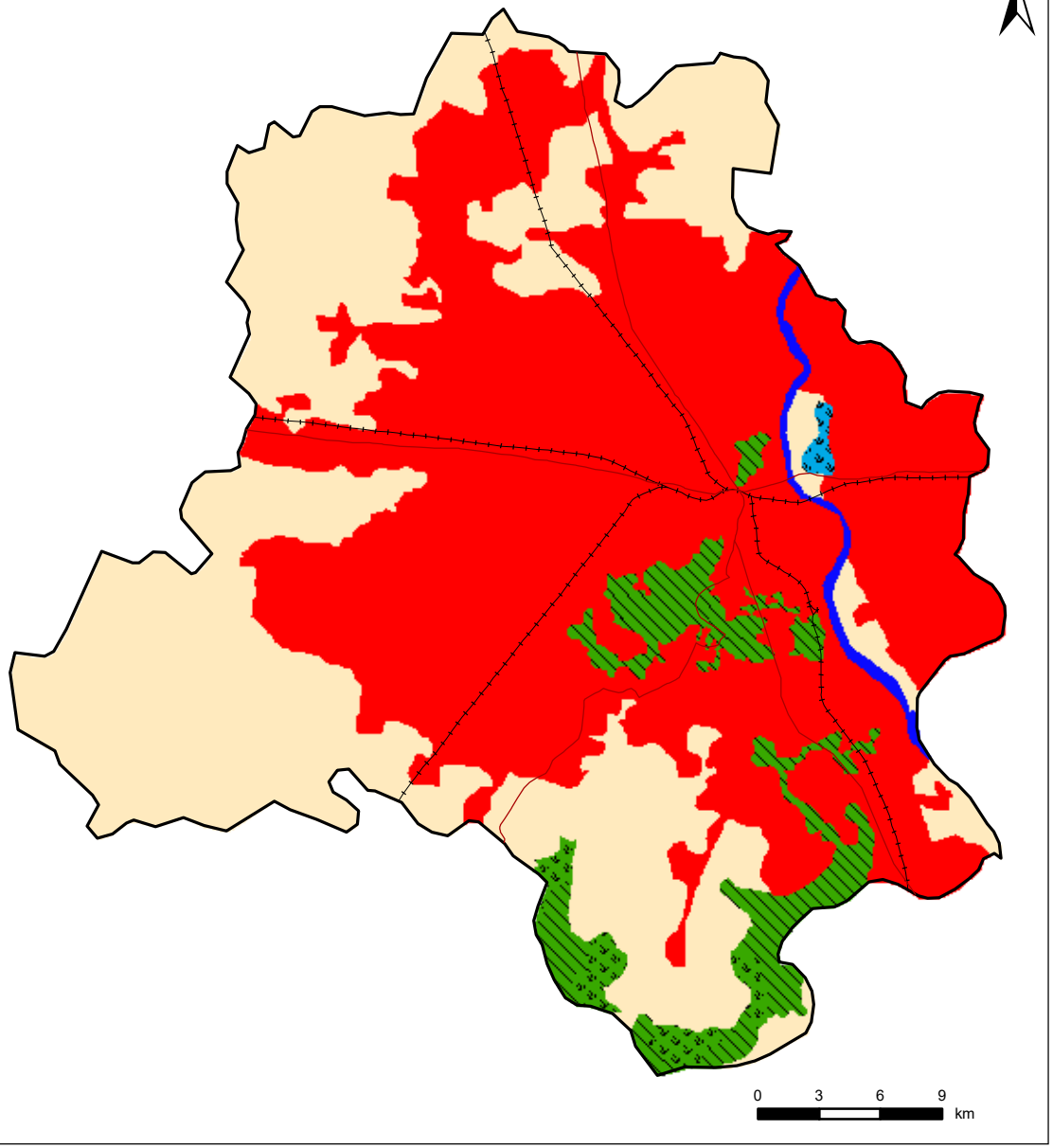
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Jawaharlal Nehru University, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP
DELHI (2011-13)

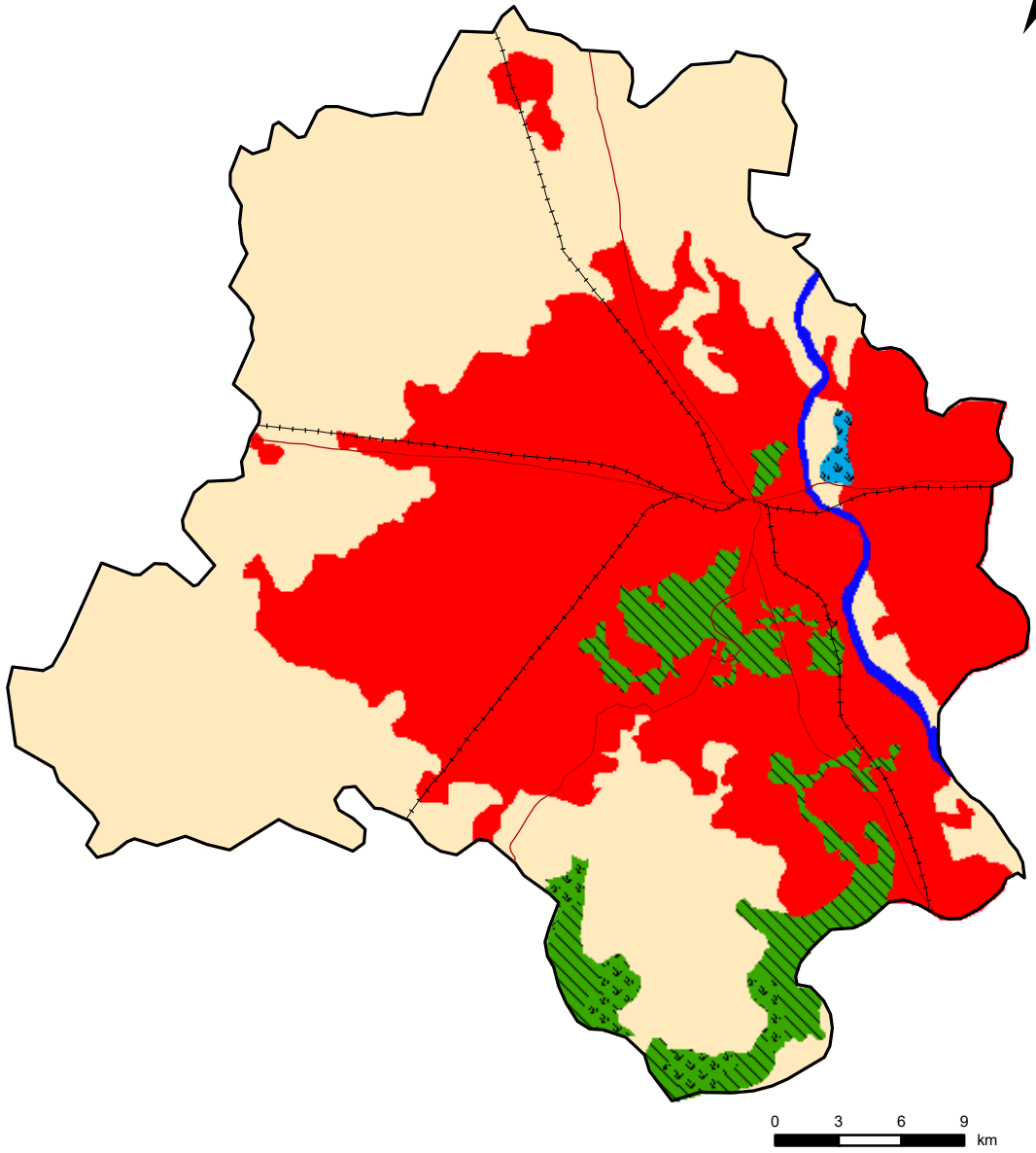
Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Sl2	Land with scrub, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 – 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
Soil and Land Use Survey of India, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad



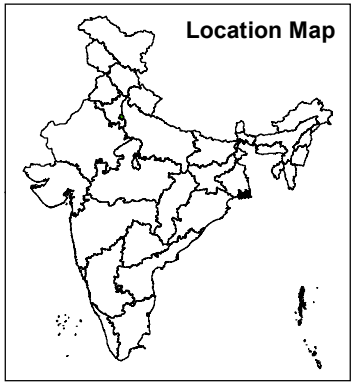
DESERTIFICATION / LAND DEGRADATION STATUS MAP DELHI (2003-05)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Sl2	Land with scrub, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

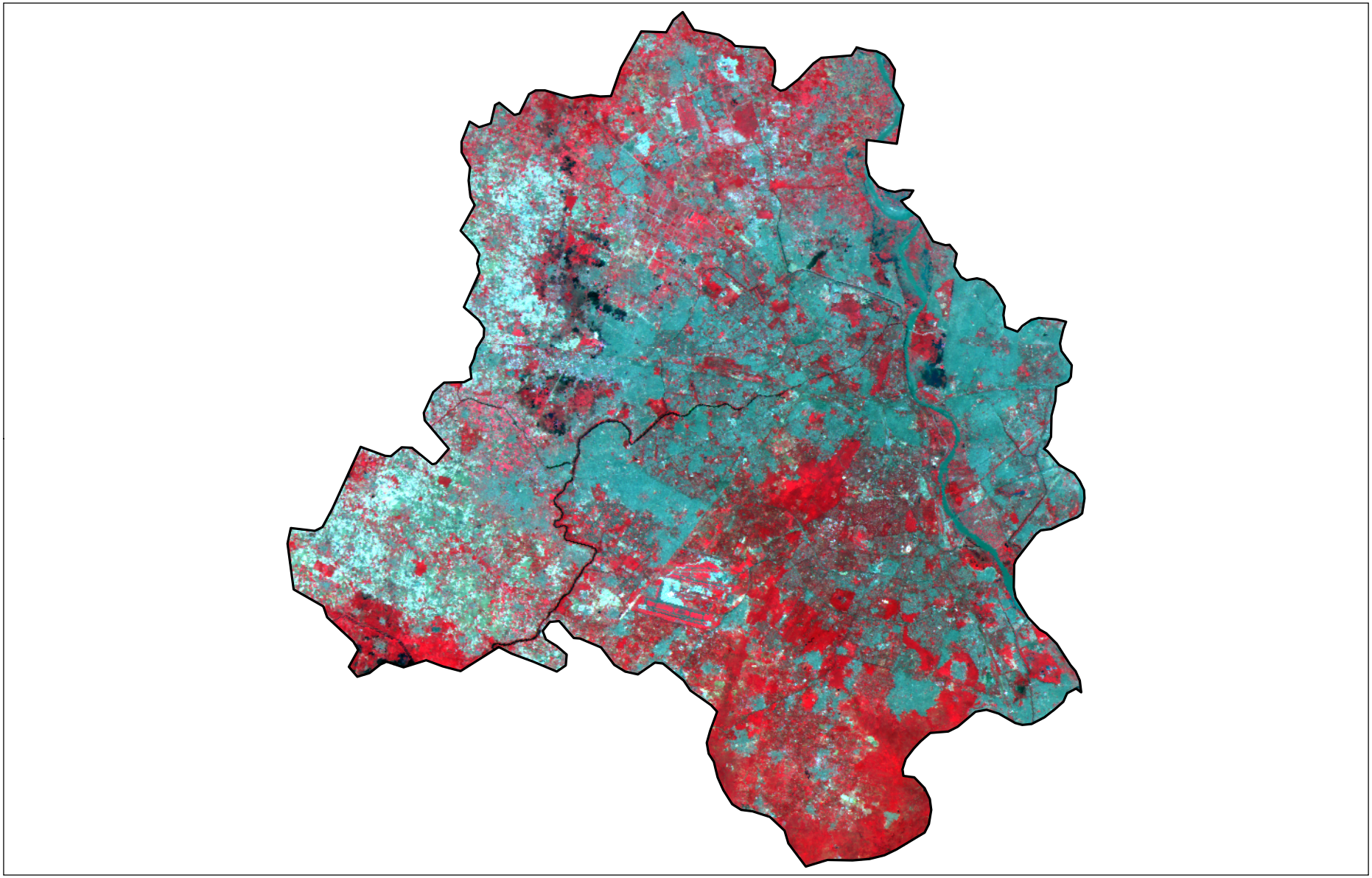
- IRS AWiFS (2003 – 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Soil and Land Use Survey of India, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad

Delhi - As seen on IRS AWiFS (October 2018)



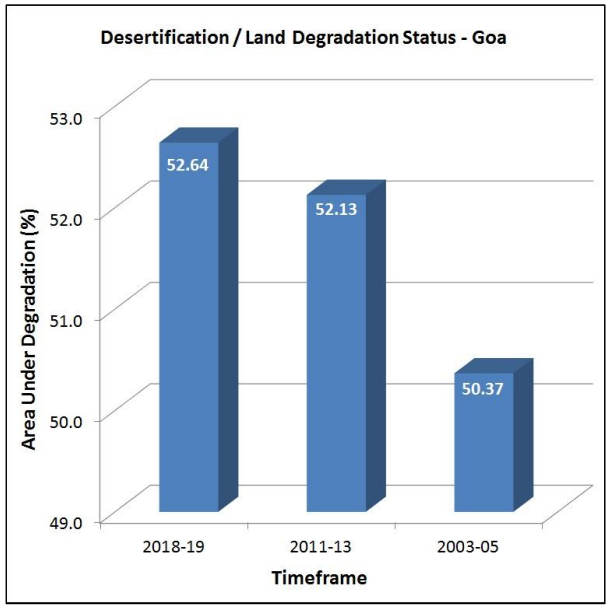
GOA

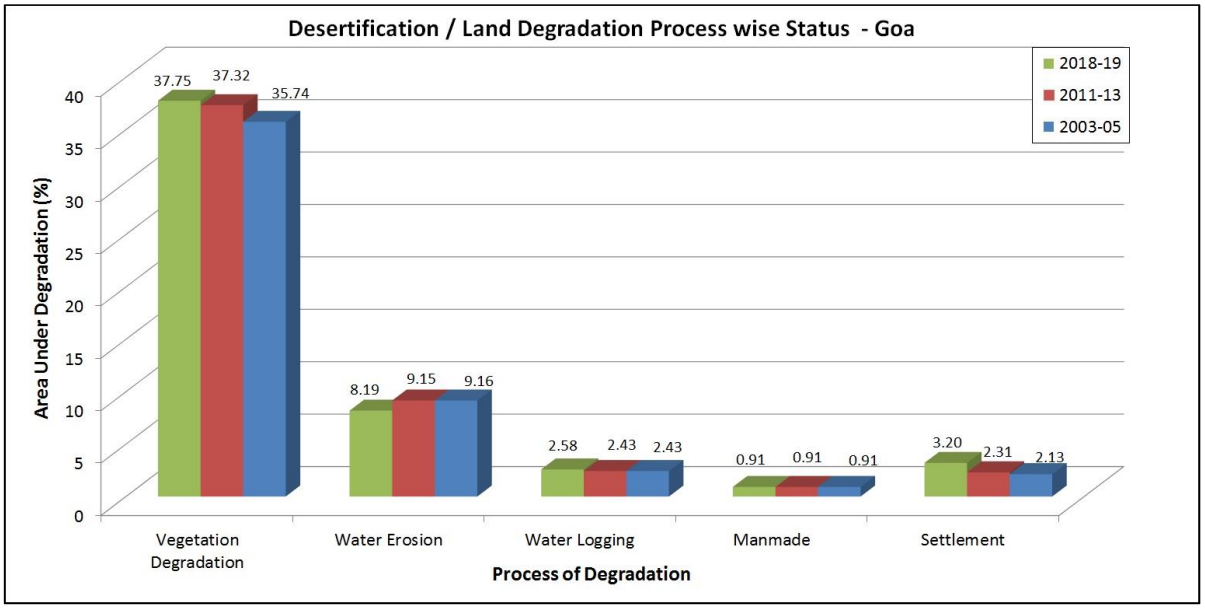
Goa is situated on the western coast of the Indian Peninsula covering 3,702 sq km area. The state has population of 14,58,545; with 394 population density, 973 sex ratio and 88.70% literacy (Census 2011). Panaji is the capital of Goa. The Goa landscape is characterised by hills of Western Ghats and coastal plain. Terekhol River separates Goa from Maharashtra. Other major rivers are Zuari and Mandovi. One third of Goa is covered by forests. The Western Ghats form the drainage area for most of the rivers flowing in the coastal region. The soil is mainly black cotton soil. The climate of Goa is of a tropical monsoon type with a searing heat in the summer months, and cold winter. The monsoons have varied influence over different regions, causing heavy rain at some places and mild rainfall in others.

The statistical summary and analysis of the Land Degradation of Goa state reveal that 52.64% (1,94,877 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 52.13% (1,92,973 ha) and 50.37% (1,86,458 ha) respectively. An increase of 0.51% (1,905 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.76% (6,514 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (37.75% in 2018-19, 37.32% in 2011-13 and 35.74% in 2003-05) followed by Water Erosion (8.19% in 2018-19, 9.15% in 2011-13 and 9.16% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in scrub land undergoing vegetation degradation and slight decrease in forest area undergoing vegetation degradation is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

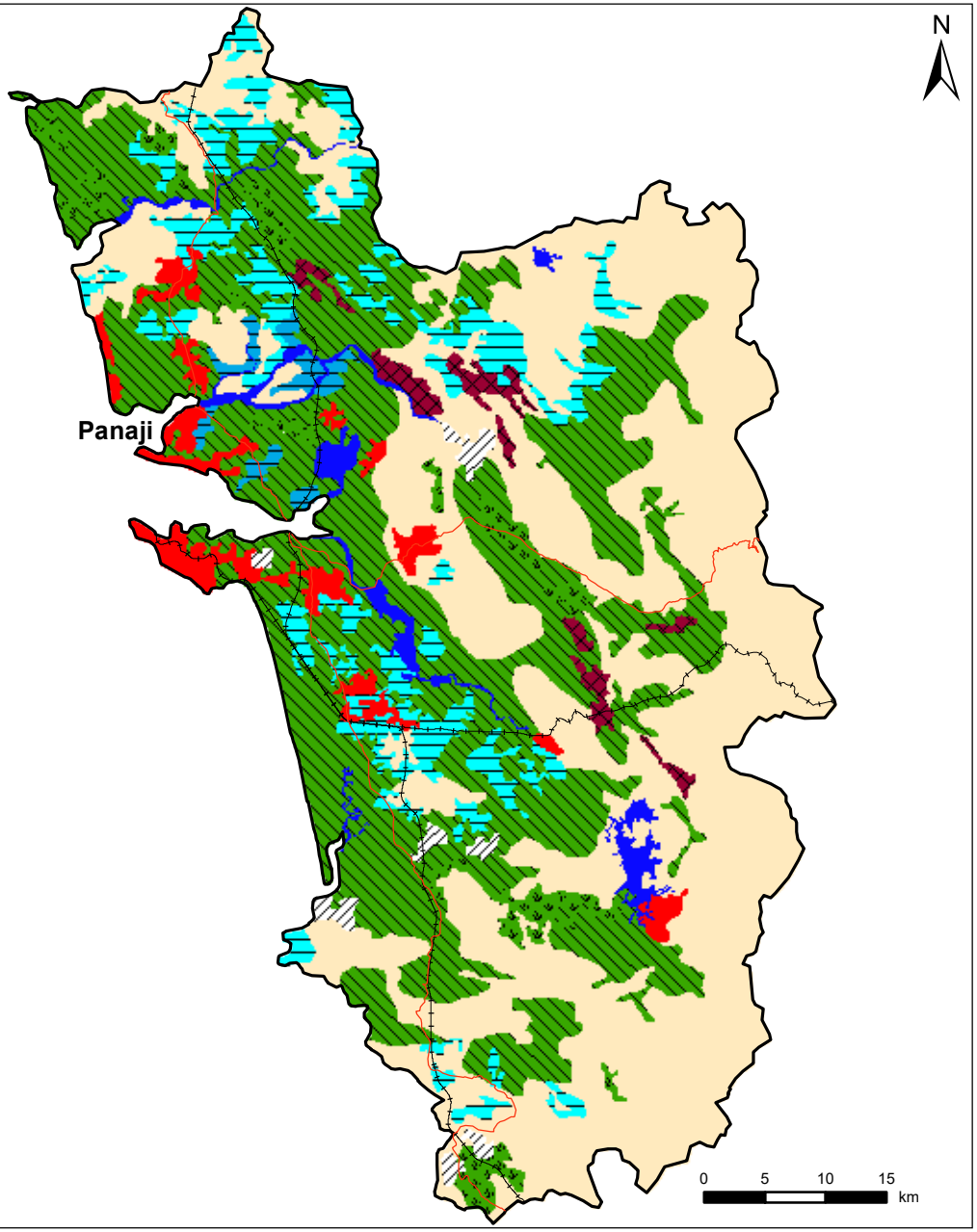




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	139765	37.75	138172	37.32	132301	35.74	1593	5871
Water Erosion	30328	8.19	33889	9.15	33892	9.16	-3560	-3
Water Logging	9551	2.58	9005	2.43	9003	2.43	546	2
Manmade	3374	0.91	3374	0.91	3374	0.91	0	0
Settlement	11860	3.20	8533	2.31	7889	2.13	3326	645
Total Area under Desertification	**194877**	**52.64**	**192973**	**52.13**	**186458**	**50.37**	**1905**	**6514**
No Apparent Degradation	**167388**	**45.22**	**168648**	**45.56**	**174991**	**47.27**	**-1260**	**-6343**
Total Geographical Area (ha)	**370200**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	128579	34.73	129086	34.87	-507
2	Fv2	Forest, vegetation degradation, High	-	-	-	-	-
3	Sv1	Land with scrub, vegetation degradation, Low	8919	2.41	5458	1.47	3462
4	Sv2	Land with scrub, vegetation degradation, High	2267	0.61	3629	0.98	-1362
5	Dw1	Agriculture unirrigated, water erosion, Low	30328	8.19	33889	9.15	-3560
6	Il1	Agriculture irrigated, water logging, Low	3679	0.99	3133	0.85	546
7	Dl1	Agriculture unirrigated, water logging, Low	5872	1.59	5872	1.59	0
8	Tm2	Others, man made, High	3374	0.91	3374	0.91	0
9	S	Settlement	11860	3.20	8533	2.31	3326
Total Area Under Desertification/ Land Degradation			**194877**	**52.64**	**192973**	**52.13**	**1905**
10	W	Water body/ Drainage	7935	2.14	8579	2.32	-645
11	NAD	No Apparent Degradation	167388	45.22	168648	45.56	-1260
Total Geographical Area (ha)			**370200**	**100**	**370200**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	129086	34.87	122836	33.18	6249
2	Fv2	Forest, vegetation degradation, High	-	-	379	0.10	-379
3	Sv1	Land with scrub, vegetation degradation, Low	5458	1.47	5458	1.47	0
4	Sv2	Land with scrub, vegetation degradation, High	3629	0.98	3629	0.98	0
5	Dw1	Agriculture unirrigated, water erosion, Low	33889	9.15	33892	9.16	-3
6	Il1	Agriculture irrigated, water logging, Low	3133	0.85	3131	0.85	2
7	Dl1	Agriculture unirrigated, water logging, Low	5872	1.59	5872	1.59	0
8	Tm2	Others, man made, High	3374	0.91	3374	0.91	0
9	S	Settlement	8533	2.31	7889	2.13	645
Total Area Under Desertification/ Land Degradation			**192973**	**52.13**	**186458**	**50.37**	**6514**
10	W	Water body/ Drainage	8579	2.32	8750	2.36	-171
11	NAD	No Apparent Degradation	168648	45.56	174991	47.27	-6343
Total Geographical Area (ha)			**370200**	**100**	**370200**	**100**	



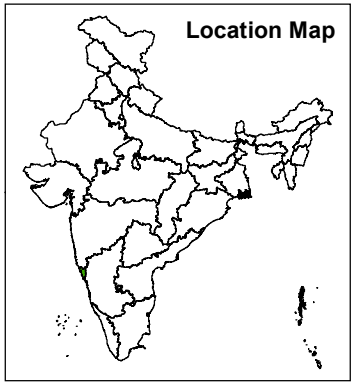
DESERTIFICATION / LAND DEGRADATION STATUS MAP GOA (2018-19)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation Degradation
	Sv1,2	Land with scrub, vegetation Degradation
	Dw1	Agriculture unirrigated, water erosion
	Dl1	Land with scrub, water erosion
	Tm2	Others, man made
	B	Barren
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

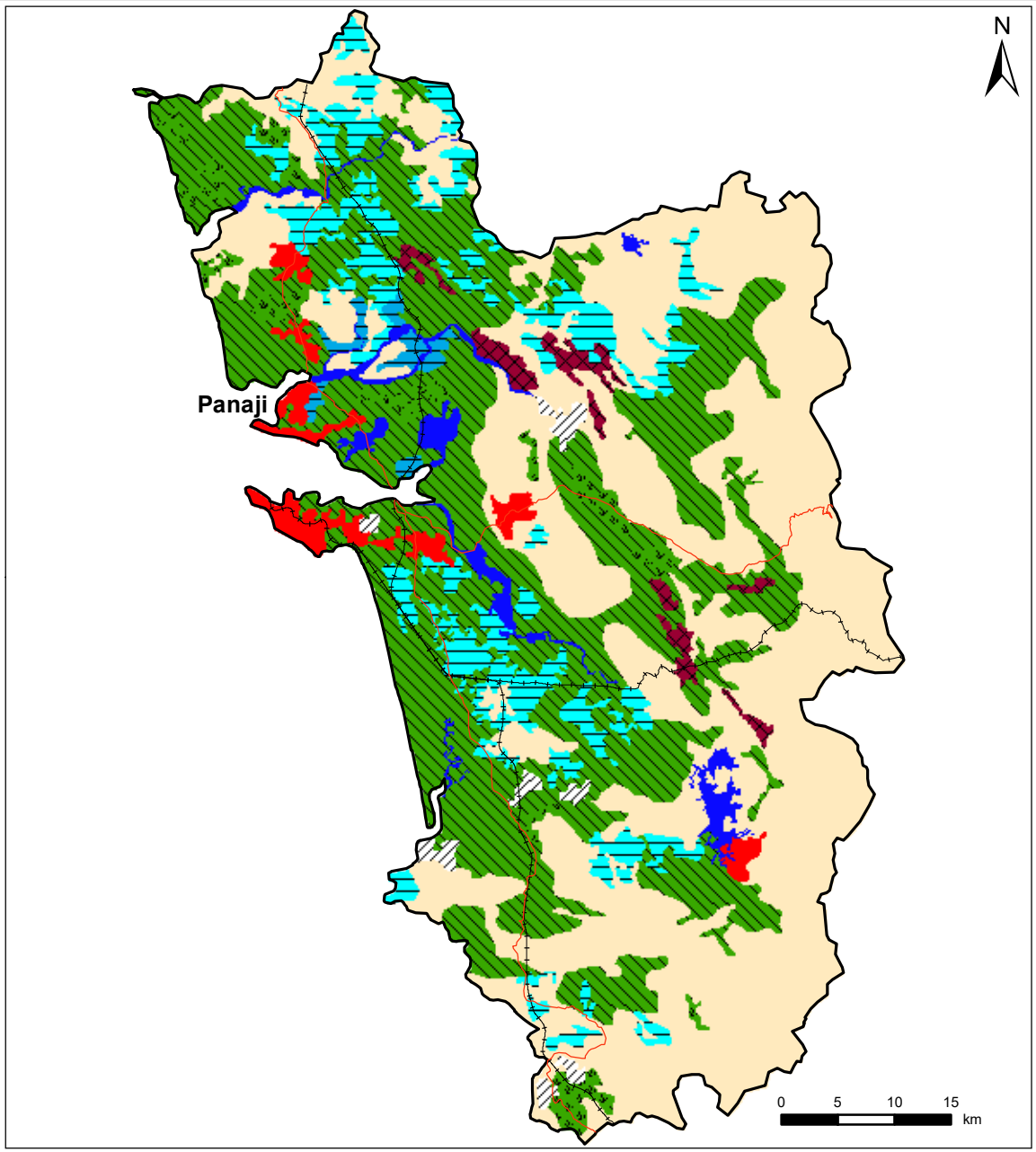
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Maharashtra Remote Sensing Applications Centre, Nagpur
&
Space Applications Centre, ISRO, Ahmedabad



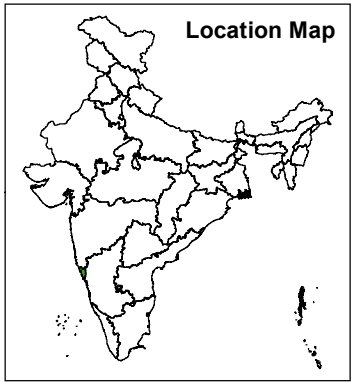
DESERTIFICATION / LAND DEGRADATION STATUS MAP GOA (2011-13)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation Degradation
	Sv1,2	Land with scrub, vegetation Degradation
	Dw1	Agriculture unirrigated, water erosion
	Dl1	Land with scrub, water erosion
	Tm2	Others, man made
	B	Barren
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

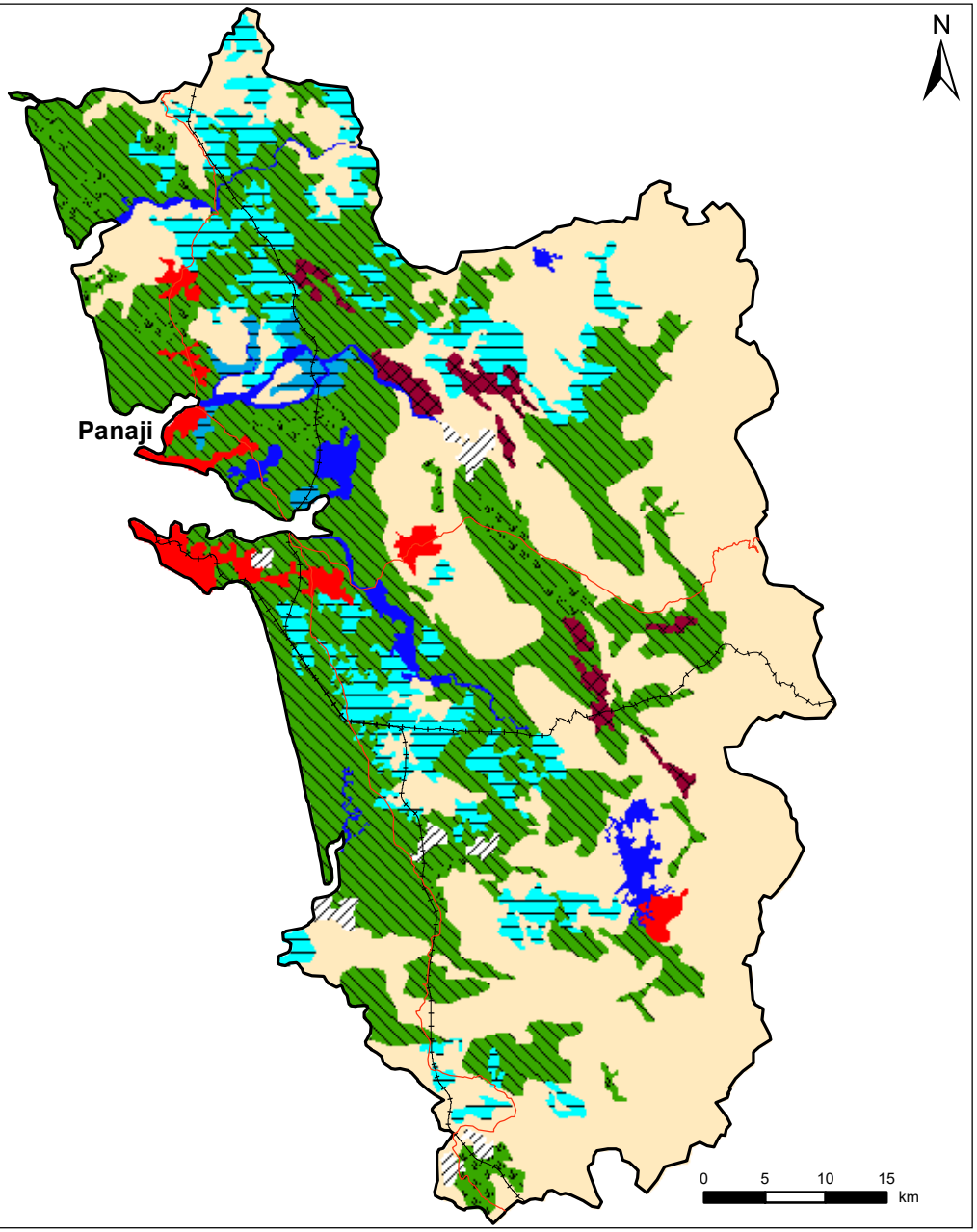
Data Source:

- IRS AWiFS (2011 – 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Maharashtra Remote Sensing Applications Centre, Nagpur
&
Space Applications Centre, ISRO, Ahmedabad



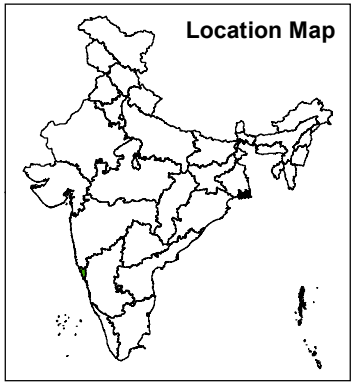
DESERTIFICATION / LAND DEGRADATION STATUS MAP GOA (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation Degradation
	Sv1,2	Land with scrub, vegetation Degradation
	Dw1	Agriculture unirrigated, water erosion
	Dl1	Land with scrub, water erosion
	Tm2	Others, man made
	B	Barren
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 – 2005)
- Ancillary Information

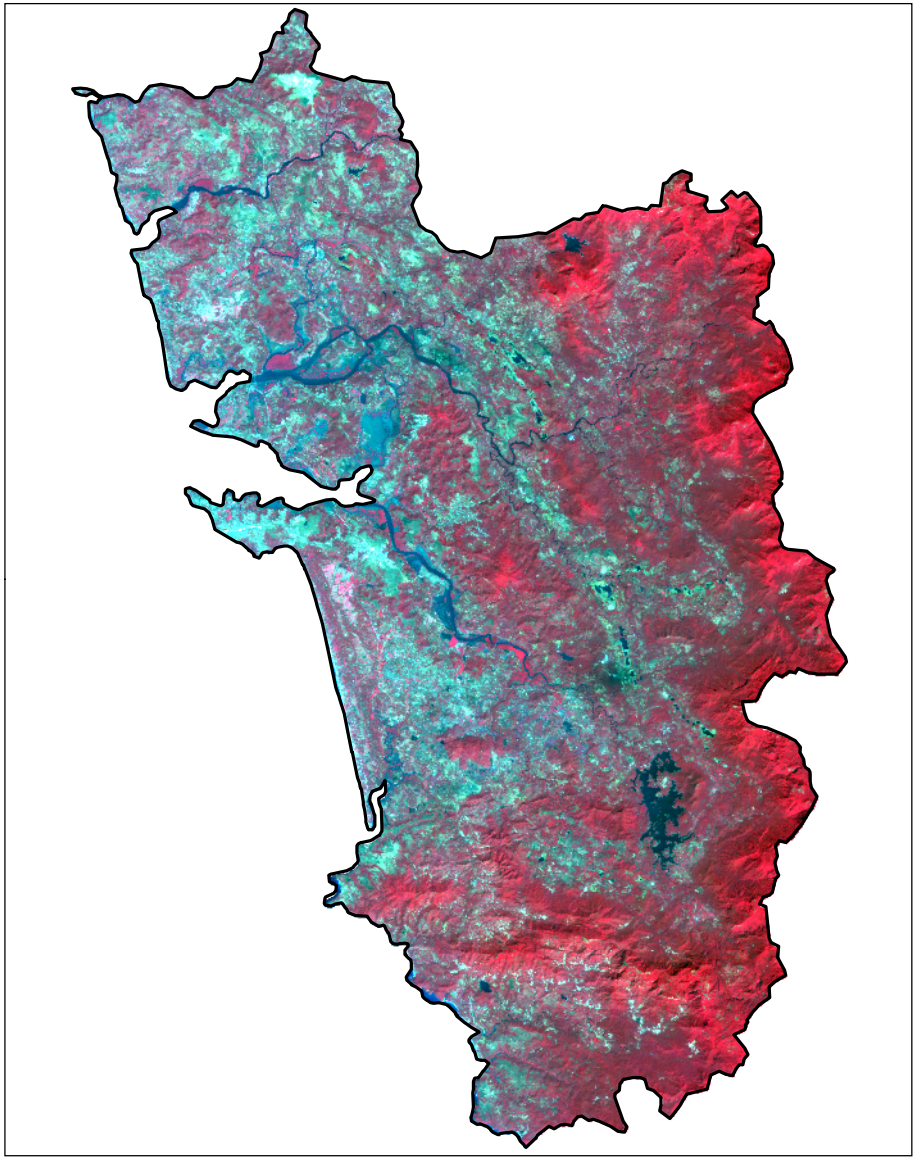
	International boundary
	State boundary
	Major roads
	Rail



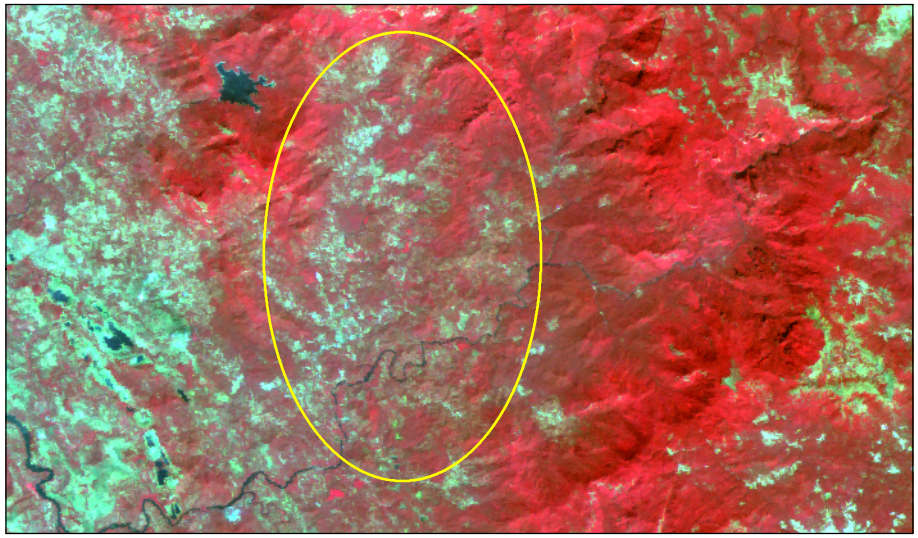
Prepared by:
Maharashtra Remote Sensing Applications Centre, Nagpur
&
Space Applications Centre, ISRO, Ahmedabad

Goa - Illustrative representation of Land Degradation process on IRS AWiFS data

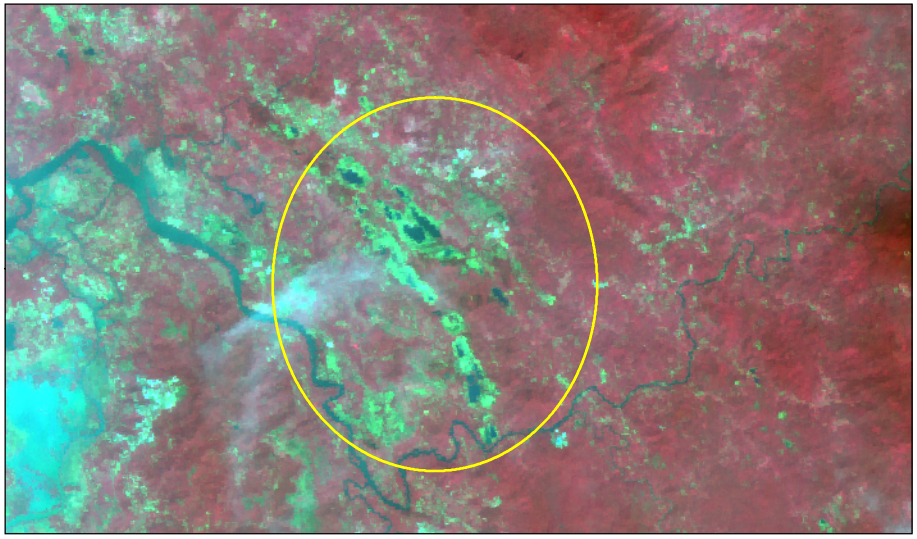
Goa as seen on IRS AWiFS (January 2019)



Forest area under vegetation degradation (January 2019)



Area affected with manmade (mining) activities (January2019)



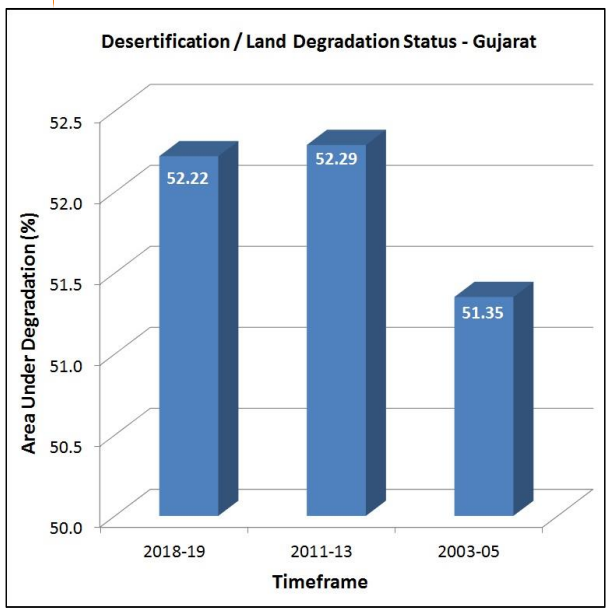
GUJARAT

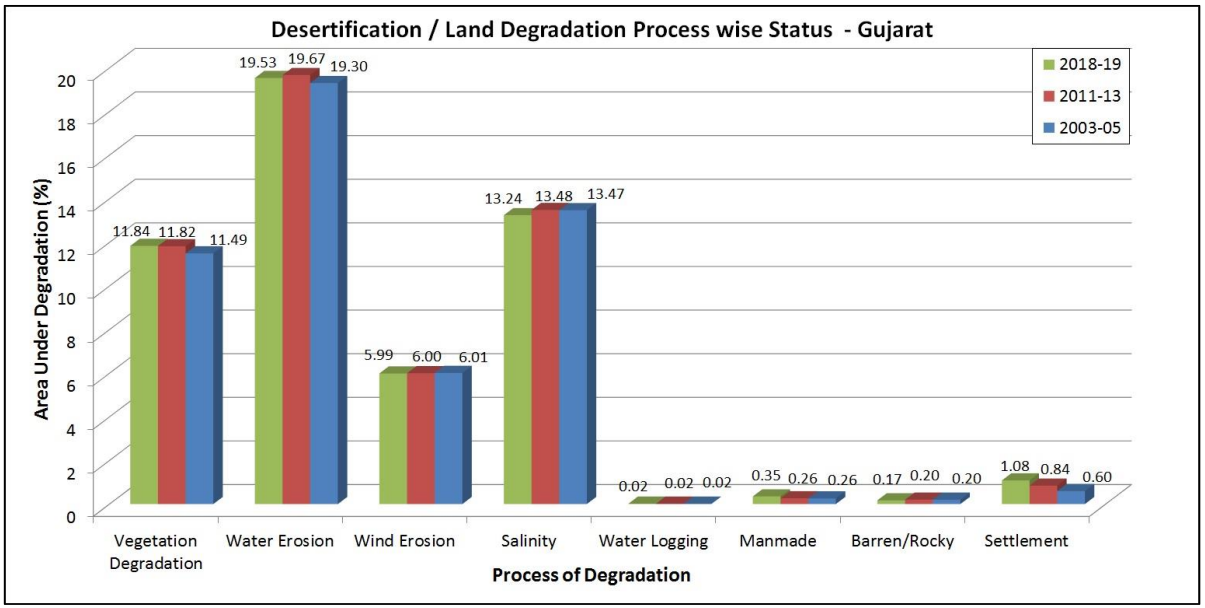
Gujarat is located in western part of India, with 1,96,244 sq km area. The state has population of 6,04,39,692; with 308 population density, 919 sex ratio and 78.03% literacy (Census 2011). Gandhinagar is the capital of Gujarat. The major geographic features of Gujarat are Rann of Katchh, alluvial plain, Sourashtra peninsula, Girnar hills, Vindhyan ranges and coastal plain. The main rivers of the state include Sabasmati, Mahi, Narmada, Tapi, Bhadar and Shetrunji. Gujarat soils are of various types like sandy, saline, Clay, loamy and black cotton soil. The state comprises characteristics of arid region in western and northern part, and semi-arid region in southern and eastern part. Gujarat experiences extreme climate of very hot and dry summer and very cold winter with average annual rainfall of 625 mm.

The statistical summary and analysis of the Land Degradation of Gujarat state reveal that 52.22% (10.24 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 52.29% (10.26 million ha) and 51.39% (10.07 million ha) respectively. A slight decrease of 0.07% (13,584 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.94% (1,84,186 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (19.53% in 2018-19, 19.67% in 2011-13 and 19.30% in 2003-05) followed by Salinity (13.24% in 2018-19, 13.48% in 2011-13 and 13.47% in 2003-05), Vegetation Degradation (11.84% in 2018-19, 11.82% in 2011-13 and 11.49% in 2003-05) and Wind Erosion (5.99% in 2018-19, 6.00% in 2011-13 and 6.01% in 2003-05). Between timeframe 2011-13 & 2018-19, slight increase in forest area undergoing vegetation degradation, and decrease in areas under salinity & water erosion is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area undergoing vegetation degradation and areas affected with water erosion is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

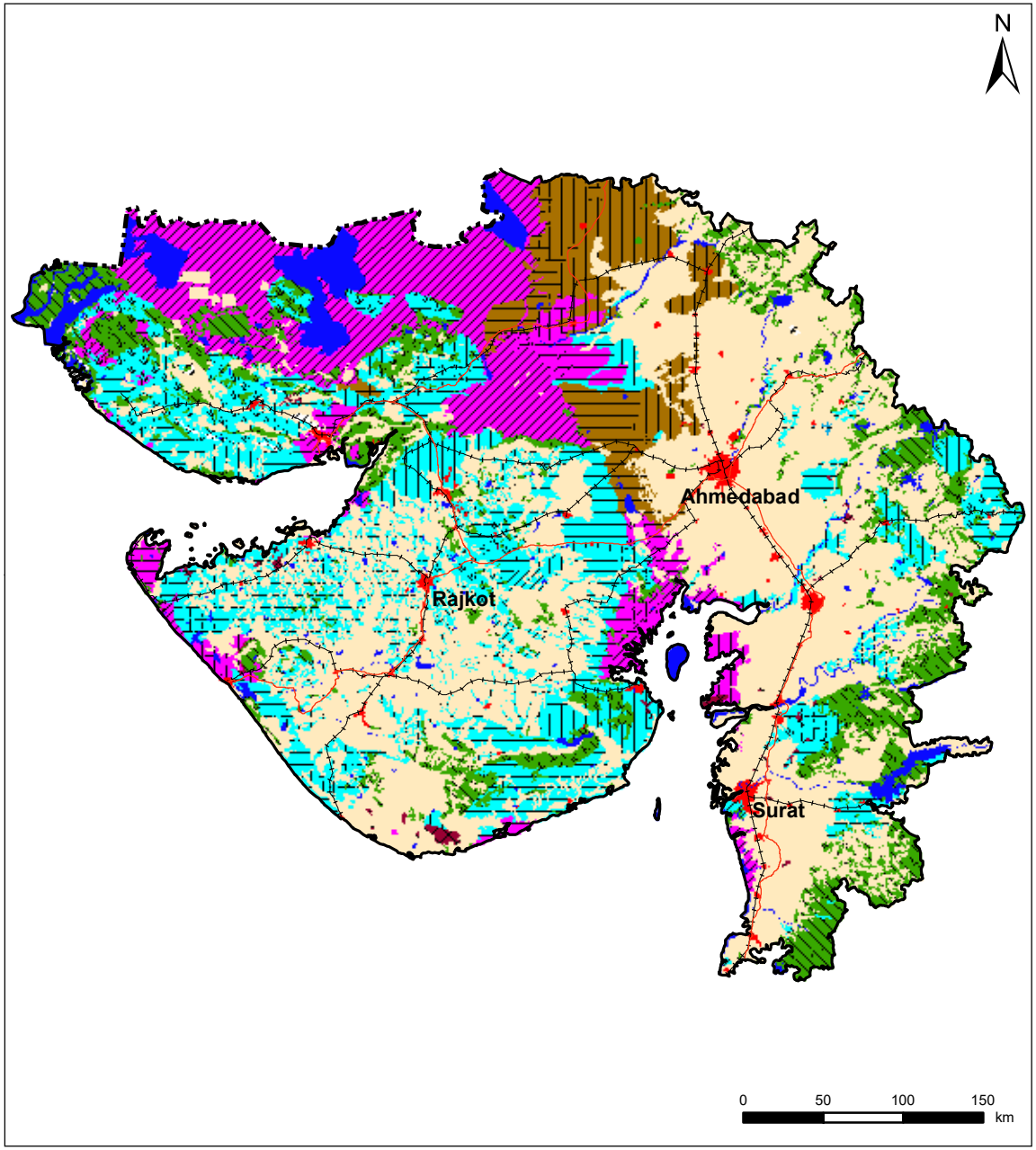




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	2322802	11.84	2319826	11.82	2255417	11.49	2976	64409
Water Erosion	3833330	19.53	3859497	19.67	3788099	19.30	-26167	71398
Wind Erosion	1174936	5.99	1177105	6.00	1179548	6.01	-2169	-2443
Salinity	2598828	13.24	2645405	13.48	2643828	13.47	-46578	1578
Water Logging	3375	0.02	3375	0.02	3375	0.02	0	0
Manmade	68649	0.35	51637	0.26	50524	0.26	17013	1113
Barren/Rocky	33484	0.17	39218	0.20	39218	0.20	-5734	0
Settlement	212653	1.08	165578	0.84	117447	0.60	47075	48131
Total Area under Desertification	**10248057**	**52.22**	**10261641**	**52.29**	**10077455**	**51.35**	**-13584**	**184186**
No Apparent Degradation	**8545265**	**43.54**	**8533439**	**43.48**	**8718876**	**44.43**	**11826**	**-185437**
Total Geographical Area (ha)	**19624400**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	978228	4.98	996011	5.08	-17783
2	Fv2	Forest, vegetation degradation, High	353635	1.80	330431	1.68	23204
3	Gv1	Grassland / Grazing land, vegetation degradation, Low	326	0.00	326	0.00	0
4	Gv2	Grassland / Grazing land, vegetation degradation, High	753	0.00	753	0.00	0
5	Sv1	Land with scrub, vegetation degradation, Low	810721	4.13	813165	4.14	-2445
6	Sv2	Land with scrub, vegetation degradation, High	179140	0.91	179140	0.91	0
7	Iw1	Agriculture irrigated, water erosion, Low	1074069	5.47	814119	4.15	259951
8	Iw2	Agriculture irrigated, water erosion, High	30056	0.15	30056	0.15	0
9	Dw1	Agriculture unirrigated, water erosion, Low	1940152	9.89	2218365	11.30	-278213
10	Dw2	Agriculture unirrigated, water erosion, High	114763	0.58	114763	0.58	0
11	Fw1	Forest, water erosion, Low	3635	0.02	3635	0.02	0
12	Sw1	Land with scrub, water erosion, Low	494135	2.52	497389	2.53	-3254
13	Sw2	Land with scrub, water erosion, High	101489	0.52	104855	0.53	-3366
14	Bw1	Barren, water erosion, Low	75031	0.38	76315	0.39	-1284
15	Ie1	Agriculture irrigated, wind erosion, Low	729659	3.72	632811	3.22	96847
16	De1	Agriculture unirrigated, wind erosion, Low	225623	1.15	324639	1.65	-99016
17	De2	Agriculture unirrigated, wind erosion, High	219655	1.12	219655	1.12	0
18	Is1	Agriculture irrigated, salinity / alkalinity, Low	199600	1.02	141119	0.72	58481
19	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	338032	1.72	401391	2.05	-63360
20	Ds2	Agriculture unirrigated, salinity / alkalinity, High	9424	0.05	9424	0.05	0
21	Gs1	Grassland / Grazing land, salinity / alkalinity, Low	8384	0.04	8384	0.04	0
22	Gs2	Grassland / Grazing land, salinity / alkalinity, High	9550	0.05	9550	0.05	0
23	Ss1	Land with scrub, salinity / alkalinity, Low	60426	0.31	60426	0.31	0
24	Ss2	Land with scrub, salinity / alkalinity, High	1541	0.01	1541	0.01	0
25	Bs1	Barren, salinity / alkalinity, Low	162743	0.83	164042	0.84	-1299
26	Bs2	Barren, salinity / alkalinity, High	1809127	9.22	1849528	9.42	-40400
27	Dl1	Agriculture unirrigated, water logging, Low	3375	0.02	3375	0.02	0
28	Tm1	Others, man made, Low	37805	0.19	29342	0.15	8463
29	Tm2	Others, man made, High	30845	0.16	22295	0.11	8550
30	B	Barren	23664	0.12	23664	0.12	0
31	R	Rocky	9820	0.05	15554	0.08	-5734
32	S	Settlement	212653	1.08	165578	0.84	47075
Total Area Under Desertification/ Land Degradation			**10248057**	**52.22**	**10261641**	**52.29**	**-13584**
33	W	Water body/ Drainage	831078	4.23	829320	4.23	1758
34	NAD	No Apparent Degradation	8545265	43.54	8533439	43.48	11826
Total Geographical Area (ha)			**19624400**	**100**	**19624400**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	996011	5.08	915630	4.67	80381
2	Fv2	Forest, vegetation degradation, High	330431	1.68	341637	1.74	-11206
3	Gv1	Grassland / Grazing land, vegetation degradation, Low	326	0.00	326	0.00	0
4	Gv2	Grassland / Grazing land, vegetation degradation, High	753	0.00	753	0.00	0
5	Sv1	Land with scrub, vegetation degradation, Low	813165	4.14	815377	4.15	-2211
6	Sv2	Land with scrub, vegetation degradation, High	179140	0.91	181694	0.93	-2555
7	Iw1	Agriculture irrigated, water erosion, Low	814119	4.15	784519	4.00	29599
8	Iw2	Agriculture irrigated, water erosion, High	30056	0.15	30056	0.15	0
9	Dw1	Agriculture unirrigated, water erosion, Low	2218365	11.30	2156985	10.99	61380
10	Dw2	Agriculture unirrigated, water erosion, High	114763	0.58	123716	0.63	-8953
11	Fw1	Forest, water erosion, Low	3635	0.02	3635	0.02	0
12	Sw1	Land with scrub, water erosion, Low	497389	2.53	526898	2.68	-29509
13	Sw2	Land with scrub, water erosion, High	104855	0.53	84016	0.43	20839
14	Bw1	Barren, water erosion, Low	76315	0.39	78273	0.40	-1958
15	Ie1	Agriculture irrigated, wind erosion, Low	632811	3.22	634764	3.23	-1952
16	De1	Agriculture unirrigated, wind erosion, Low	324639	1.65	325129	1.66	-490
17	De2	Agriculture unirrigated, wind erosion, High	219655	1.12	219655	1.12	0
18	Is1	Agriculture irrigated, salinity / alkalinity, Low	141119	0.72	141119	0.72	0
19	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	401391	2.05	399754	2.04	1637
20	Ds2	Agriculture unirrigated, salinity / alkalinity, High	9424	0.05	9424	0.05	0
21	Gs1	Grassland / Grazing land, salinity / alkalinity, Low	8384	0.04	8384	0.04	0
22	Gs2	Grassland / Grazing land, salinity / alkalinity, High	9550	0.05	9550	0.05	0
23	Ss1	Land with scrub, salinity / alkalinity, Low	60426	0.31	60486	0.31	-59
24	Ss2	Land with scrub, salinity / alkalinity, High	1541	0.01	1541	0.01	0
25	Bs1	Barren, salinity / alkalinity, Low	164042	0.84	164042	0.84	0
26	Bs2	Barren, salinity / alkalinity, High	1849528	9.42	1849528	9.42	0
27	Dl1	Agriculture unirrigated, water logging, Low	3375	0.02	3375	0.02	0
28	Tm1	Others, man made, Low	29342	0.15	29342	0.15	0
29	Tm2	Others, man made, High	22295	0.11	21182	0.11	1113
30	B	Barren	23664	0.12	23664	0.12	0
31	R	Rocky	15554	0.08	15554	0.08	0
32	S	Settlement	165578	0.84	117447	0.60	48131
Total Area Under Desertification/ Land Degradation			**10261641**	**52.29**	**10077455**	**51.35**	**184186**
33	W	Water body/ Drainage	829320	4.23	828069	4.22	1251
34	NAD	No Apparent Degradation	8533439	43.48	8718876	44.43	-185437
Total Geographical Area (ha)			**19624400**	**100**	**19624400**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP GUJARAT (2018-19)

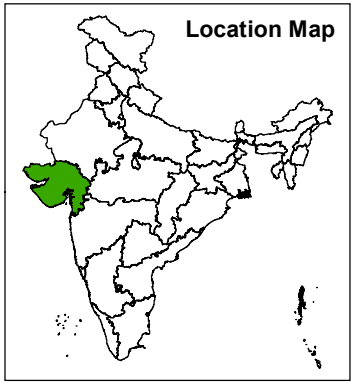
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Gv1,2	Grassland / Grazing land, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ie1	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Gs1,2	Grassland / Grazing land, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Dl1	Agriculture unirrigated, water logging
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

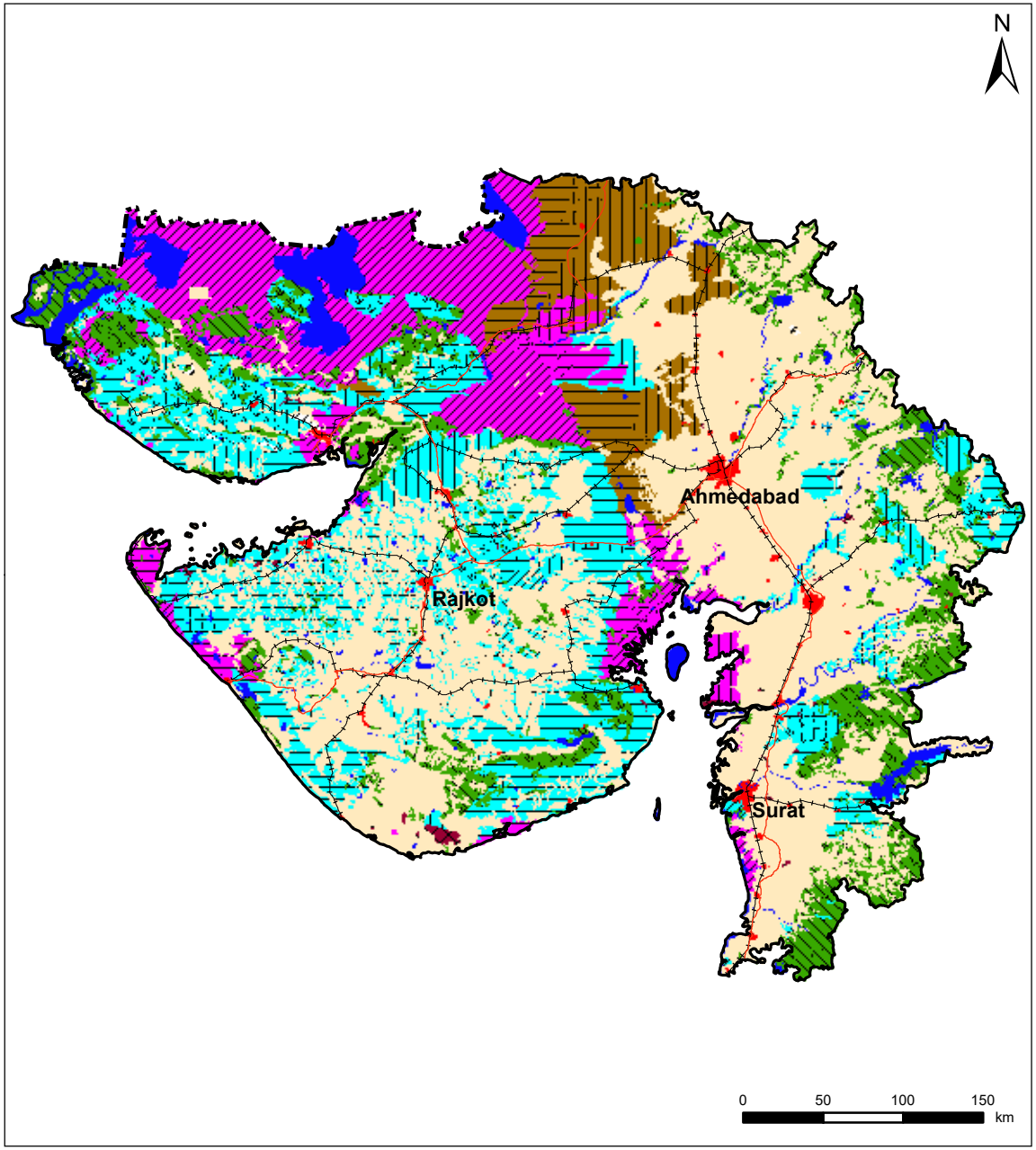
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Dhirubhai Ambani Institute of Information & Communication Technology, Gandhi Nagar
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP GUJARAT (2011-13)

Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Gv1,2	Grassland / Grazing land, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ie1	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Gs1,2	Grassland / Grazing land, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Dl1	Agriculture unirrigated, water logging
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

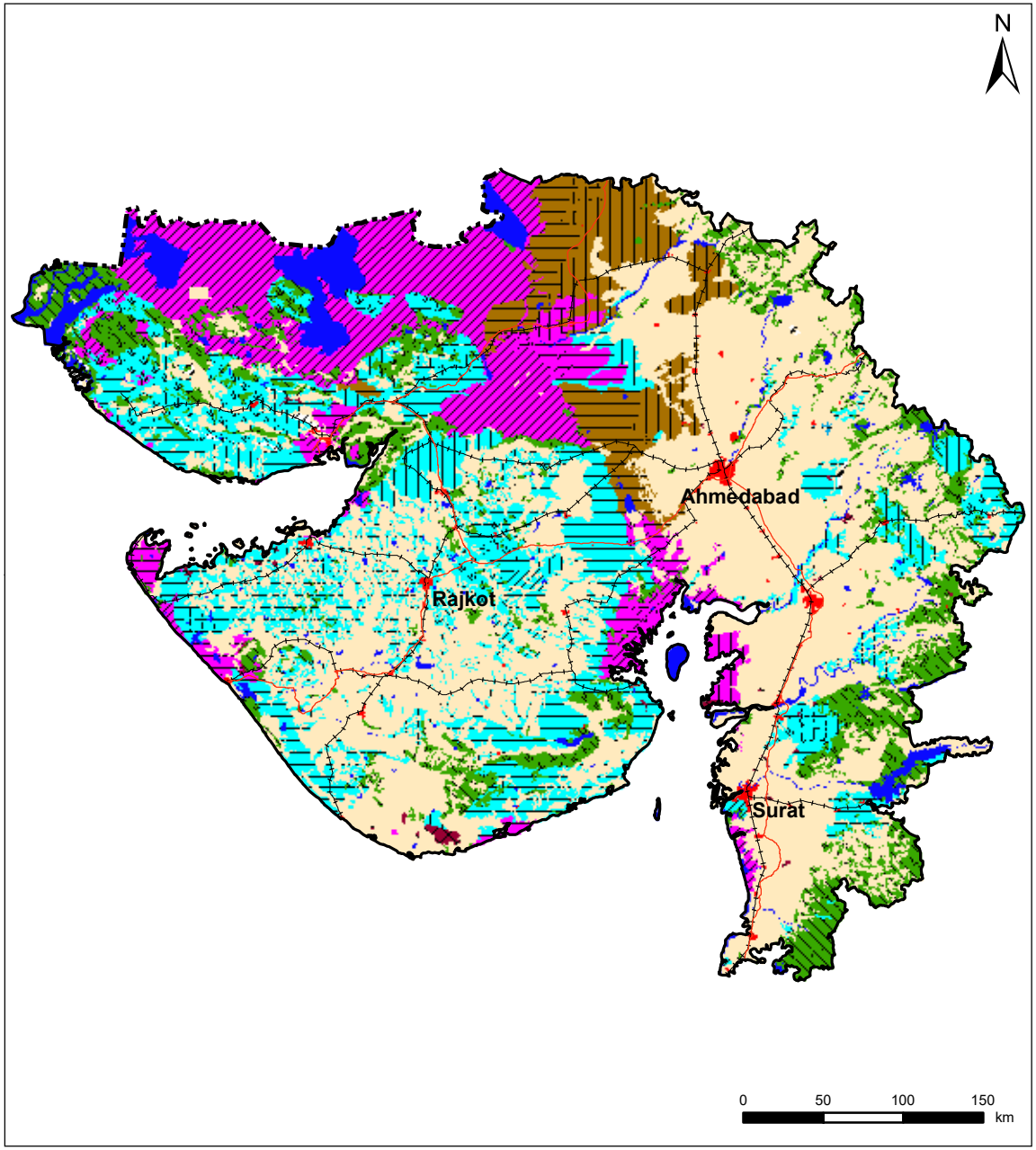
Data Source:

- IRS AWiFS (2011 – 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Location Map

Prepared by:
Centre for Environment Planning and Technology University, Ahmedabad
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP GUJARAT (2003-05)

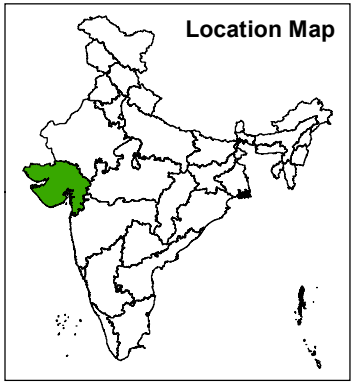
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Gv1,2	Grassland / Grazing land, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ie1	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Gs1,2	Grassland / Grazing land, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Dl1	Agriculture unirrigated, water logging
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 – 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



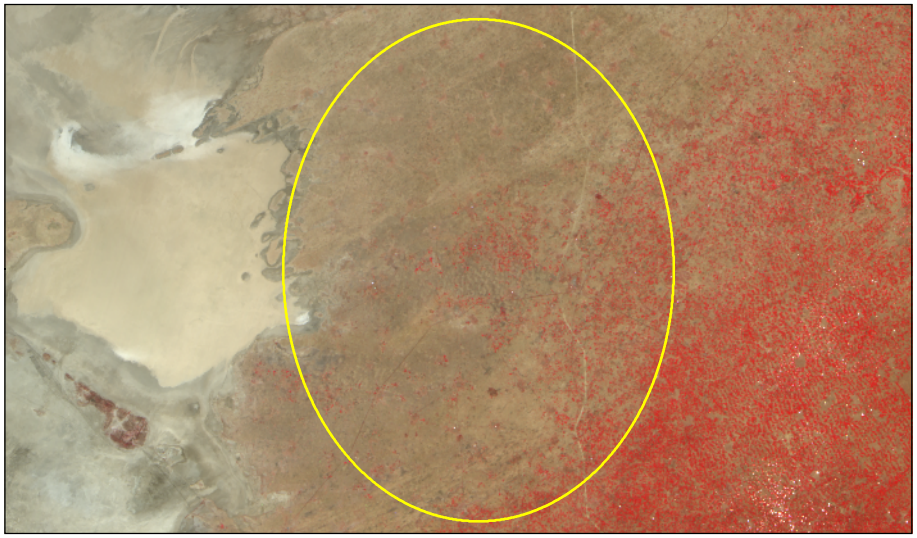
Prepared by:
Centre for Environment Planning and Technology University, Ahmedabad
&
Space Applications Centre, ISRO, Ahmedabad

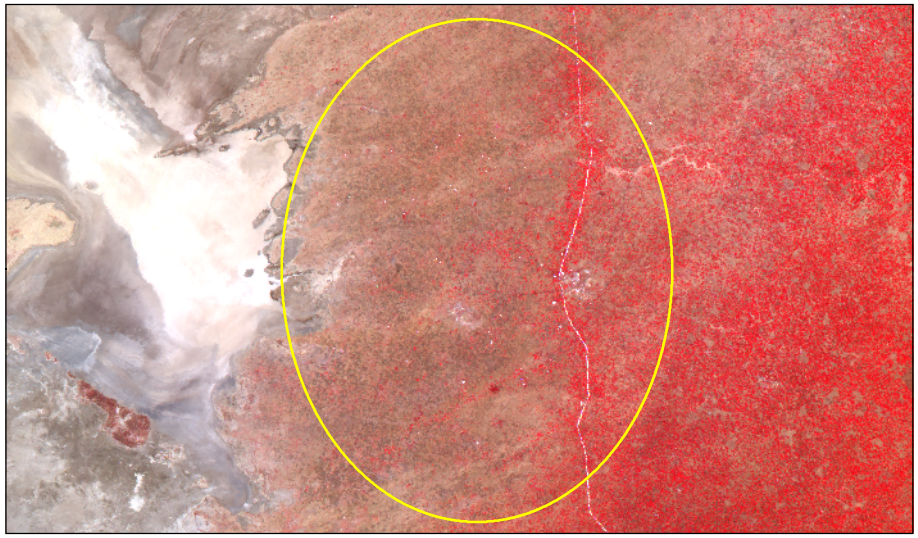
Gujarat - Illustrative representation of Land Degradation processes / changes on IRS AWiFS data

May 2005

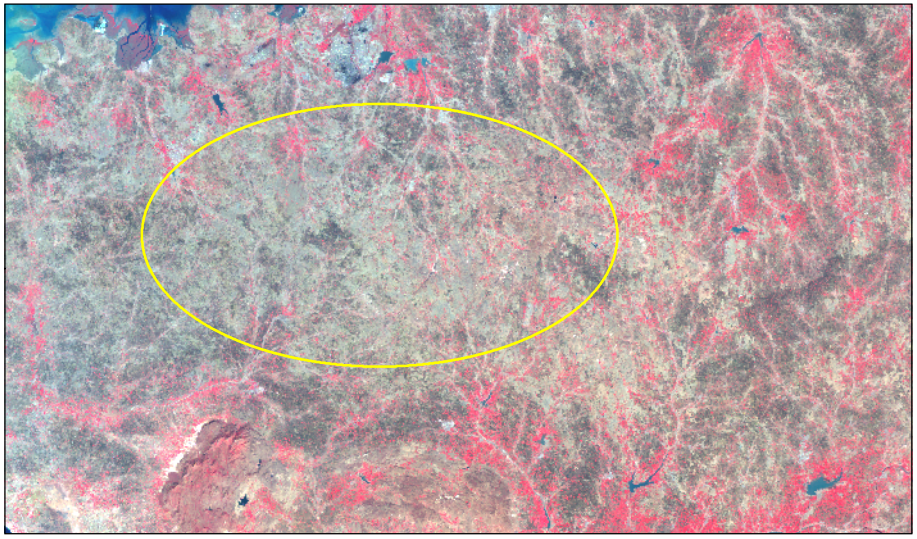
Expansion/ Increase in frequency of agriculture with water availability through canal network

June 2019

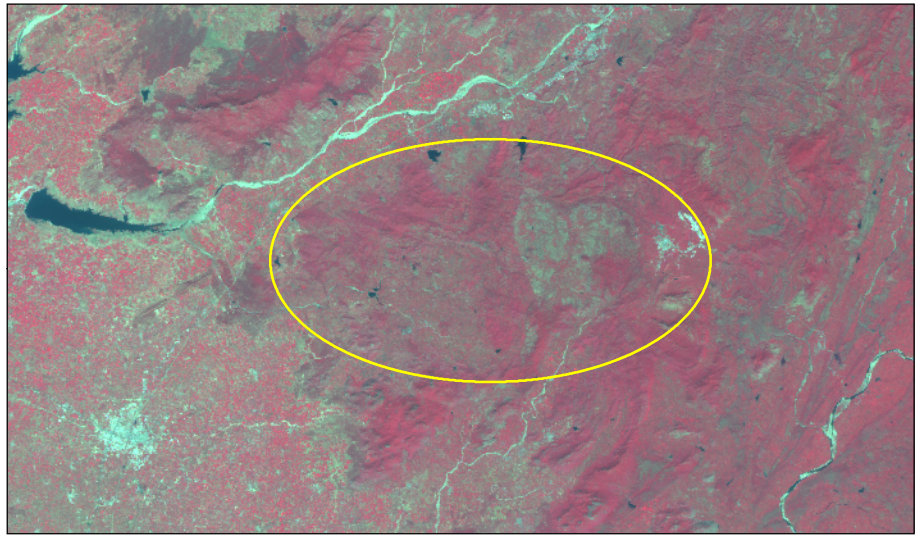




Agriculture area affected with water erosion (January 2019)



Forest area under vegetation degradation (October 2018)



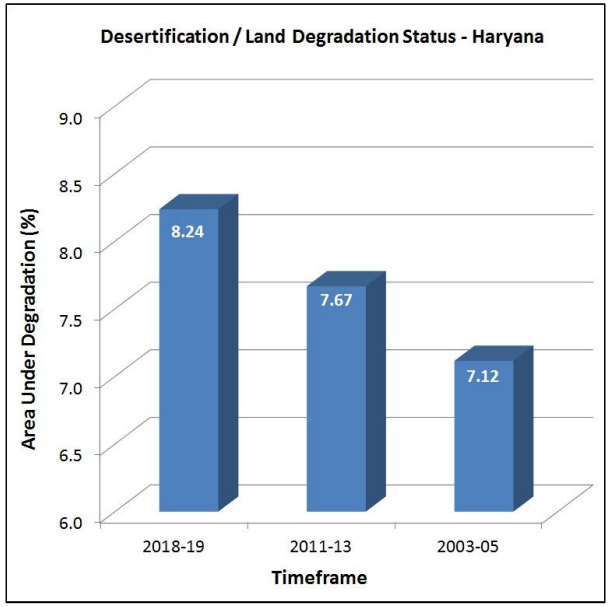
HARYANA

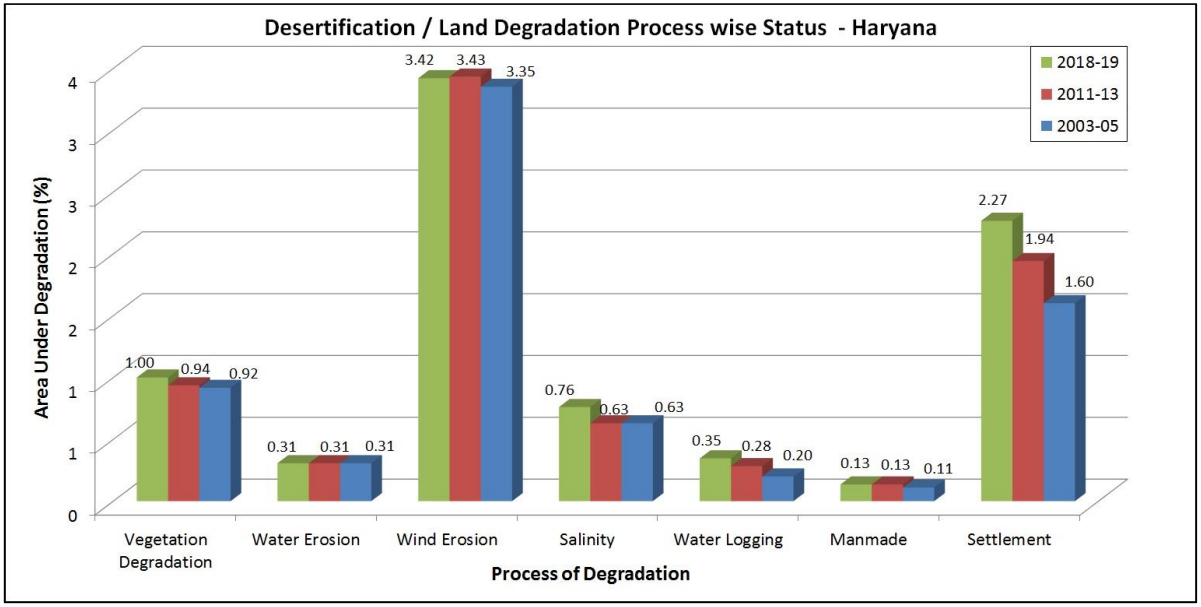
Haryana state falls in the northern part of India, covering 44,212 sq km area. The state has a population of 2,53,51,462; with 573 population density, 879 sex ratio and 75.55% literacy (Census 2011). Chandigarh is the capital of Haryana. The major physiographic divisions of Haryana are sub-Himalayan Terai, Aravali range and Indo-Gangetic plain. The plain is fertile and slopes from north to south with 700 and 900 ft altitude above sea level. south-western part of Haryana is dry, sandy and barren. The Ghaggar river passes through northern fringes of the state. The location of the state in the northern plains of India makes it very hot during summer and too cold during winter. The state experiences very hot summer (45° C in May-June) and too cold winter (4° C - 5° C in December-January) and with a maximum rainfall in month of July-September.

The statistical summary and analysis of the Land Degradation of Haryana state reveal that 8.24% (3,64,154 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 7.67% (3,38,964 ha) and 7.12% (3,14,583 ha) respectively. An increase of 0.57% (25,190 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.55% (24, 382 ha).

The most significant process of desertification/ land degradation in the state is Wind Erosion (3.42% in 2018-19, 3.43% in 2011-13 and 3.35% in 2003-05) followed by Vegetation Degradation (1.00% in 2018-19, 0.94% in 2011-13 and 0.92% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in agriculture areas affected with salinity & water logging and forest area undergoing vegetation degradation is observed. Whereas, from timeframe 2003-05 to 2011-13, increase agriculture areas affected with salinity & wind erosion and forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

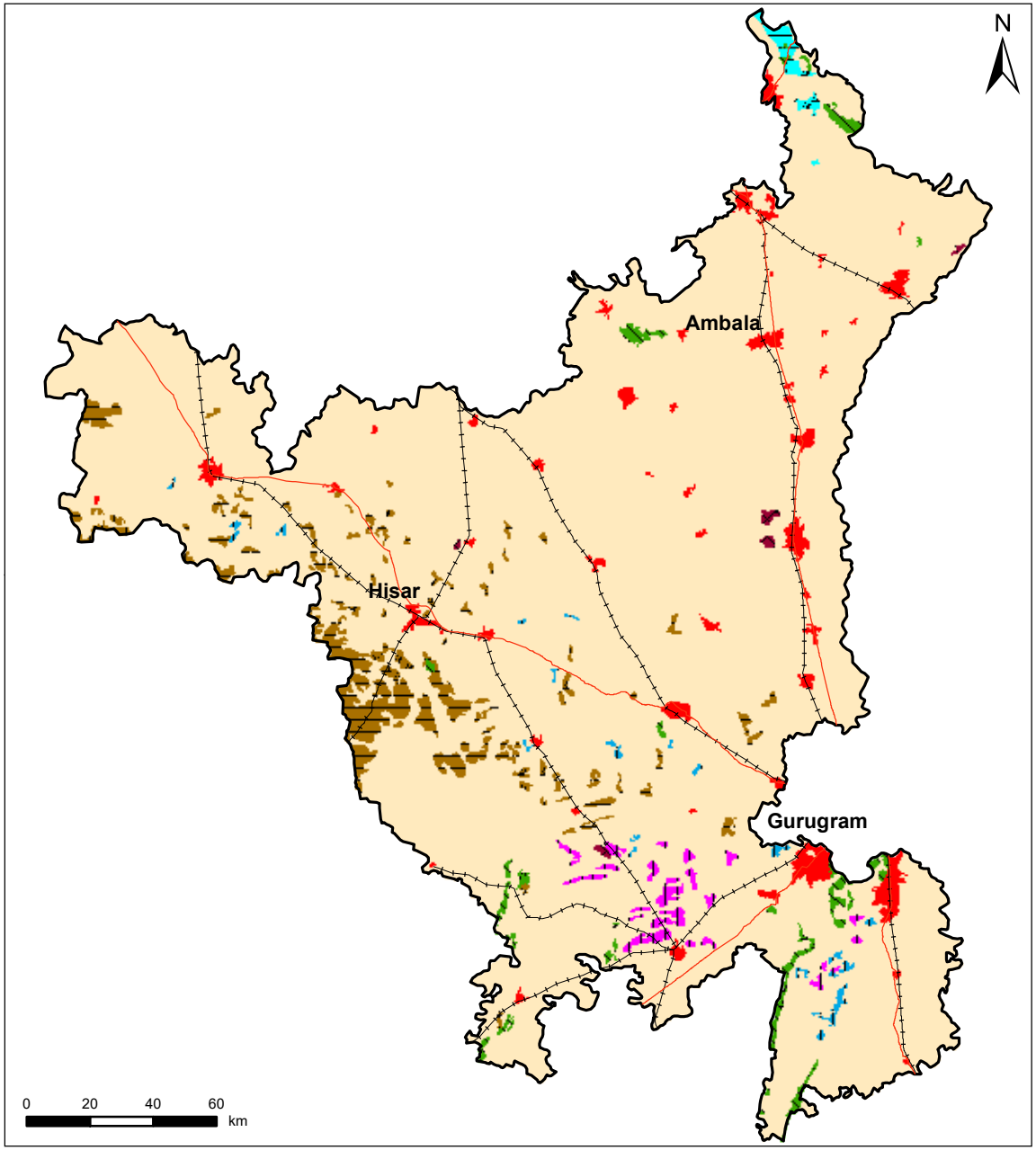




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	44226	1.00	41411	0.94	40514	0.92	2815	897
Water Erosion	13568	0.31	13568	0.31	13568	0.31	0	0
Wind Erosion	151224	3.42	151797	3.43	148151	3.35	-572	3646
Salinity	33640	0.76	27841	0.63	27841	0.63	5799	0
Water Logging	15293	0.35	12530	0.28	8822	0.20	2763	3708
Manmade	5962	0.13	5962	0.13	4894	0.11	0	1068
Settlement	100241	2.27	85855	1.94	70792	1.60	14386	15063
Total Area under Desertification	**364154**	**8.24**	**338964**	**7.67**	**314583**	**7.12**	**25190**	**24382**
No Apparent Degradation	**4057046**	**91.76**	**4082236**	**92.33**	**4106617**	**92.88**	**-25190**	**-24382**
Total Geographical Area (ha)	**4421200**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	34040	0.77	31225	0.71	2815
2	Fv2	Forest, vegetation degradation, High	6500	0.15	6500	0.15	0
3	Sv1	Land with scrub, vegetation degradation, Low	1269	0.03	1269	0.03	0
4	Sv2	Land with scrub, vegetation degradation, High	2417	0.05	2417	0.05	0
5	Iw1	Agriculture irrigated, water erosion, Low	320	0.01	320	0.01	0
6	Dw1	Agriculture unirrigated, water erosion, Low	7906	0.18	7906	0.18	0
7	Sw1	Land with scrub, water erosion, Low	5342	0.12	5342	0.12	0
8	Ie1	Agriculture irrigated, wind erosion, Low	5122	0.12	6310	0.14	-1188
9	De1	Agriculture unirrigated, wind erosion, Low	129040	2.92	128973	2.92	66
10	Se1	Land with scrub, wind erosion, Low	17063	0.39	16513	0.37	549
11	Is1	Agriculture irrigated, salinity / alkalinity, Low	33640	0.76	27841	0.63	5799
12	Il1	Agriculture irrigated, water logging, Low	9553	0.22	10840	0.25	-1287
13	Il2	Agriculture irrigated, water logging, High	5740	0.13	1690	0.04	4050
14	Tm2	Others, man made, High	5962	0.13	5962	0.13	0
15	S	Settlement	100241	2.27	85855	1.94	14386
Total Area Under Desertification/ Land Degradation			**364154**	**8.24**	**338964**	**7.67**	**25190**
16	NAD	No Apparent Degradation	4057046	91.76	4082236	92.33	-25190
Total Geographical Area (ha)			**4421200**	**100**	**4421200**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	31225	0.71	29302	0.66	1924
2	Fv2	Forest, vegetation degradation, High	6500	0.15	7527	0.17	-1027
3	Sv1	Land with scrub, vegetation degradation, Low	1269	0.03	1269	0.03	0
4	Sv2	Land with scrub, vegetation degradation, High	2417	0.05	2417	0.05	0
5	Iw1	Agriculture irrigated, water erosion, Low	320	0.01	320	0.01	0
6	Dw1	Agriculture unirrigated, water erosion, Low	7906	0.18	7906	0.18	0
7	Sw1	Land with scrub, water erosion, Low	5342	0.12	5342	0.12	0
8	Ie1	Agriculture irrigated, wind erosion, Low	6310	0.14	6310	0.14	0
9	De1	Agriculture unirrigated, wind erosion, Low	128973	2.92	127555	2.89	1419
10	Se1	Land with scrub, wind erosion, Low	16513	0.37	14286	0.32	2227
11	Is1	Agriculture irrigated, salinity / alkalinity, Low	27841	0.63	27841	0.63	0
12	Il1	Agriculture irrigated, water logging, Low	10840	0.25	7568	0.17	3273
13	Il2	Agriculture irrigated, water logging, High	1690	0.04	1254	0.03	435
14	Tm2	Others, man made, High	5962	0.13	4894	0.11	1068
15	S	Settlement	85855	1.94	70792	1.60	15063
Total Area Under Desertification/ Land Degradation			**338964**	**7.67**	**314583**	**7.12**	**24382**
16	NAD	No Apparent Degradation	4082236	92.33	4106617	92.88	-24382
Total Geographical Area (ha)			**4421200**	**100**	**4421200**	**100**	



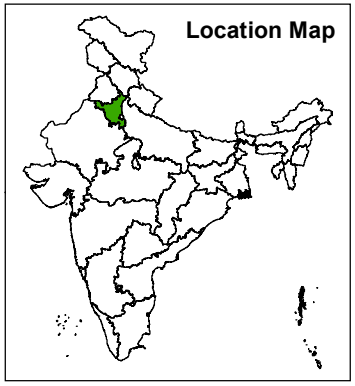
DESERTIFICATION / LAND DEGRADATION STATUS MAP HARYANA (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ie1	Agriculture irrigated, wind erosion
	De1	Agriculture unirrigated, wind erosion
	Se1	Land with scrub, water erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Il1, 2	Agriculture irrigated, water logging
	Tm2	Others, man made
	S	Settlement
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
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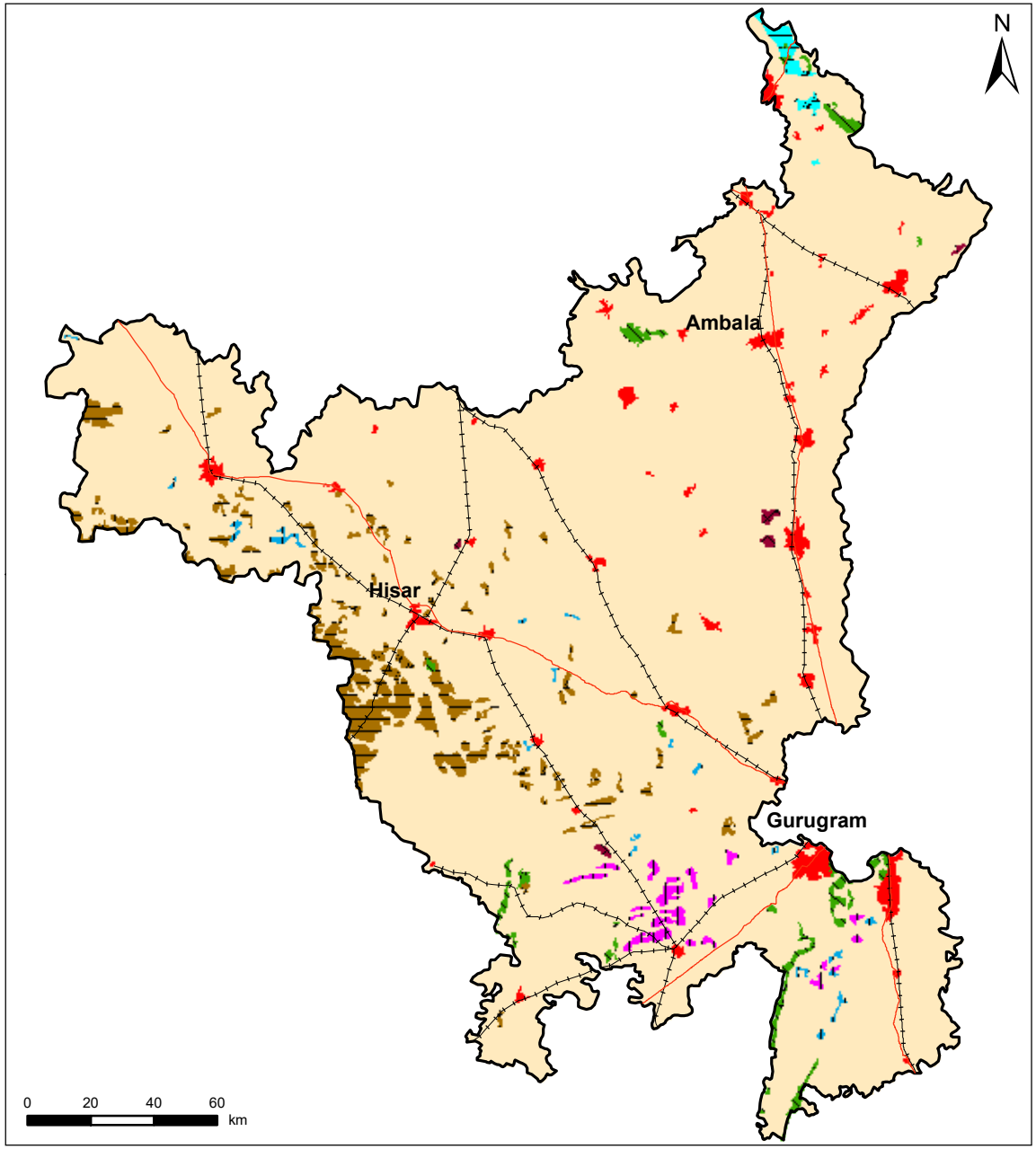
&
Space Applications Centre, ISRO, Ahmedabad



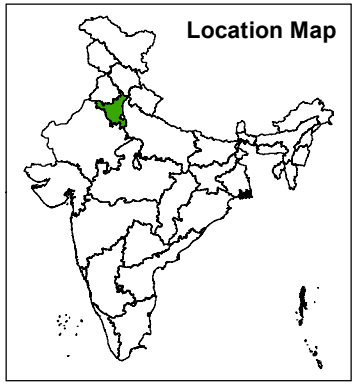
DESERTIFICATION / LAND DEGRADATION STATUS MAP HARYANA (2011-13)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ie1	Agriculture irrigated, wind erosion
	De1	Agriculture unirrigated, wind erosion
	Se1	Land with scrub, water erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Il1, 2	Agriculture irrigated, water logging
	Tm2	Others, man made
	S	Settlement
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 – 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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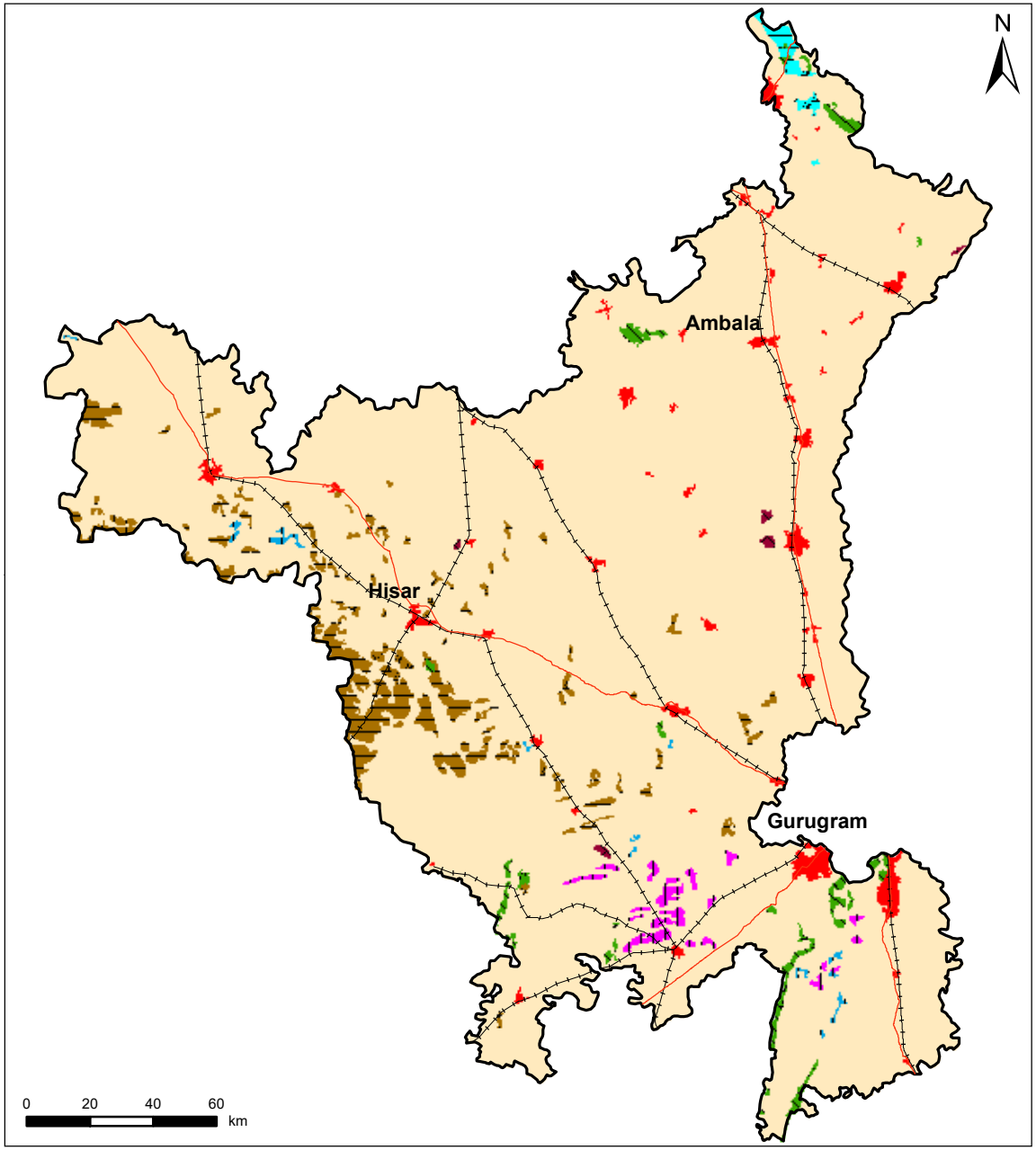
Haryana Space Applications Centre, Hisar
&
Space Applications Centre, ISRO, Ahmedabad



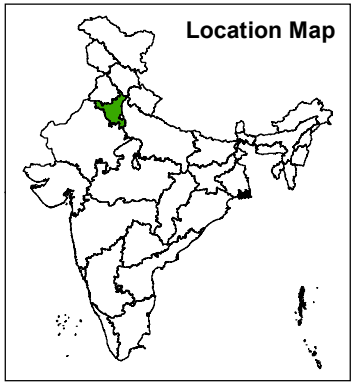
DESERTIFICATION / LAND DEGRADATION STATUS MAP HARYANA (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ie1	Agriculture irrigated, wind erosion
	De1	Agriculture unirrigated, wind erosion
	Se1	Land with scrub, water erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Il1, 2	Agriculture irrigated, water logging
	Tm2	Others, man made
	S	Settlement
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 – 2005)
- Ancillary Information

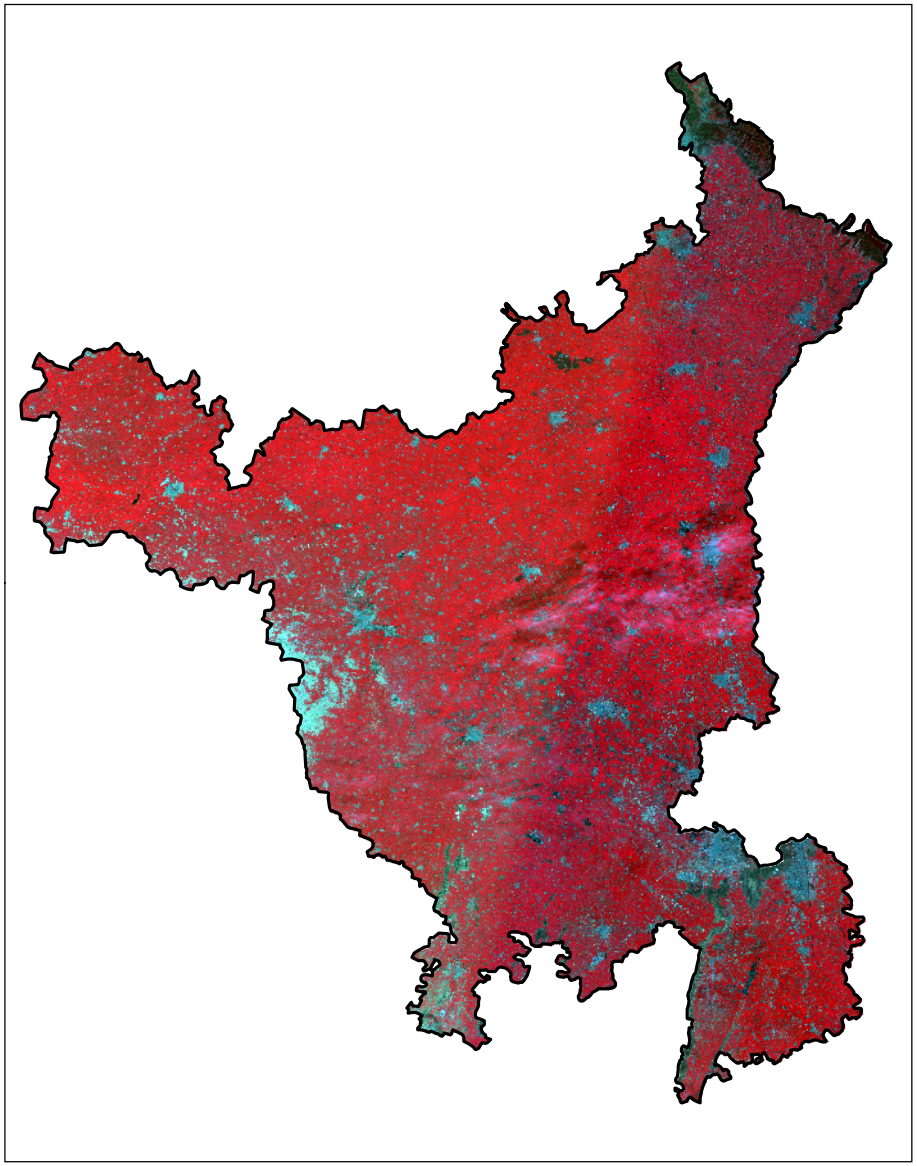
	International boundary
	State boundary
	Major roads
	Rail



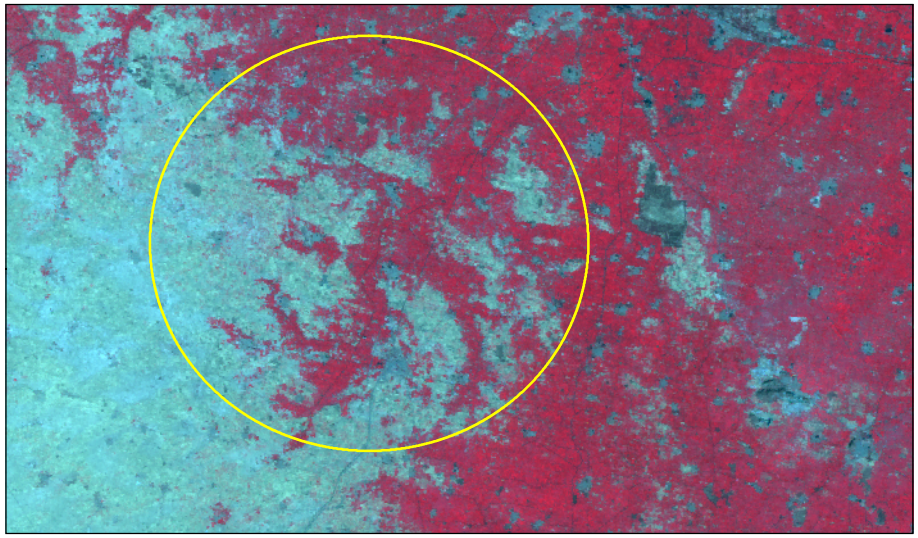
Prepared by:
Haryana Space Applications Centre, Hisar
&
Space Applications Centre, ISRO, Ahmedabad

Haryana - Illustrative representation of Land Degradation processes on IRS AWiFS data

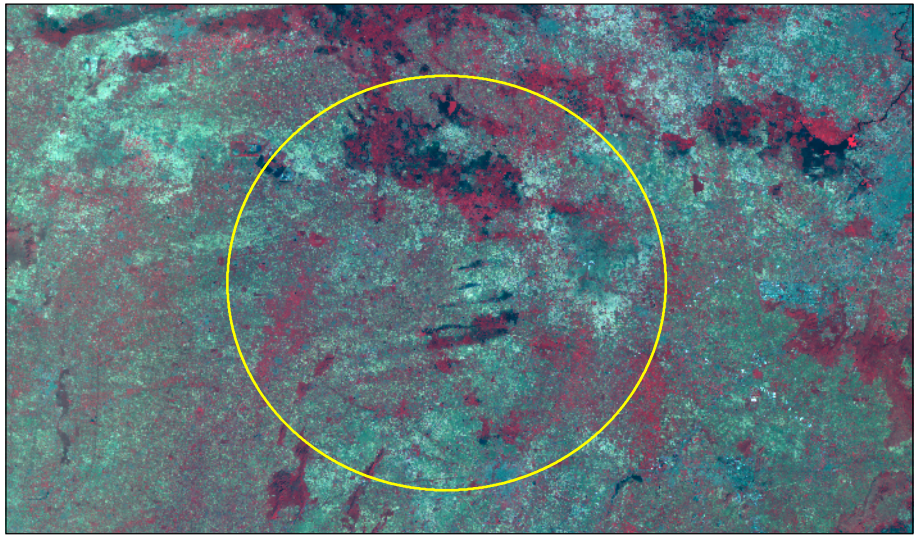
Haryana as seen on IRS AWiFS (February 2019)



Agriculture area affected with wind erosion (February 2019)



Agriculture area affected with Salinity (October 2018)



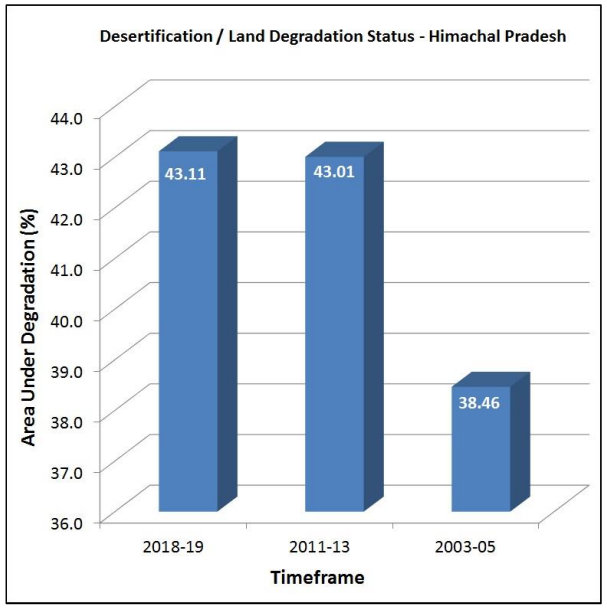
HIMACHAL PRADESH

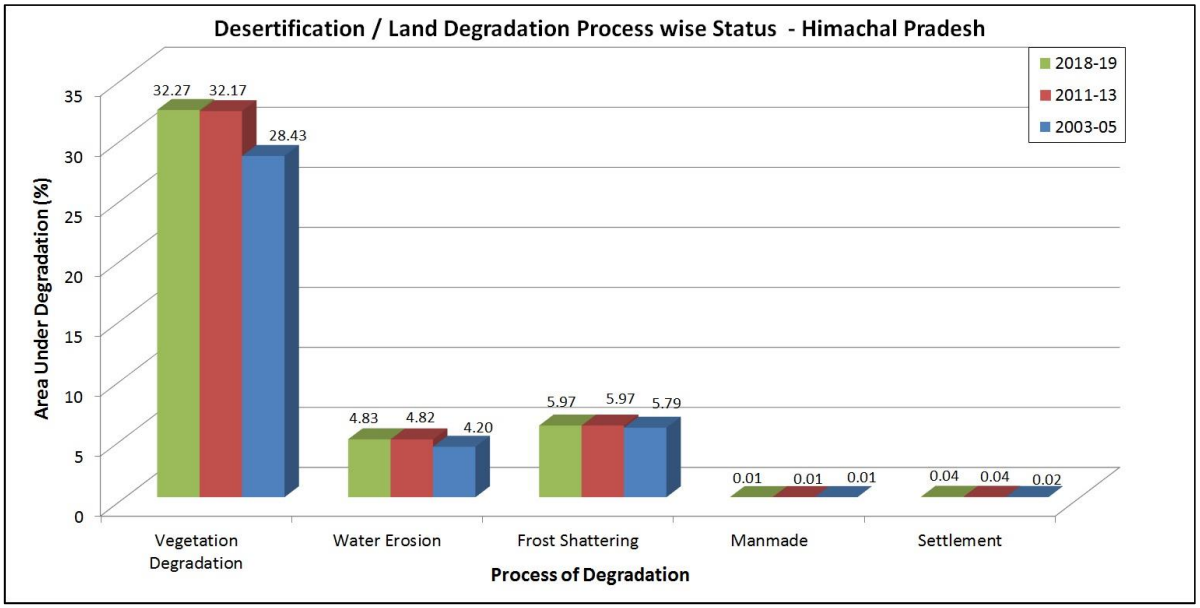
Himachal Pradesh state is located in northern part of India, spread over 55,673 sq km area. The state has a population of 68,64,602; with 123 population density, 972 sex ratio and 82.80% literacy (Census 2011). Shimla is the capital of Himachal Pradesh. The major physiographic divisions of Himachal Pradesh from south to north are outer Himalayas or Shivaliks in the southern part, lesser Himalayas in central zone, greater Himalayas in northern zone and a small part of the trans Himalaya in the north-eastern part. The major mountain ranges of the state are the Dhauladhar, Pir Panjal and the Great Himalayan range, donned by drainage expression of Chandrabhaga, Ravi, Beas and Sutlej rivers. Himachal is also well known for its rich flora and fauna. Forests cover about 38% total area of the state. The state experiences Alpine climate with cool dry summer and very cold winter.

The statistical summary and analysis of the Land Degradation of Himachal Pradesh state reveal that 43.11% (2.4 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 43.01% (2.39 million ha) and 38.46% (2.14 million ha) respectively. A slight increase of 0.10% (6,060 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 4.55% (2,52,874 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (32.27% in 2018-19, 32.17% in 2011-13 and 28.43% in 2003-05), followed by Frost Shattering (5.97% in 2018-19, 5.97% in 2011-13 and 5.79% in 2003-05) and Water Erosion (4.83% in 2018-19, 4.82% in 2011-13 and 4.20% in 2003-05). Between timeframe 2011-13 & 2018-19, slight increase in forest area undergoing vegetation degradation is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area undergoing vegetation degradation, agriculture areas undergoing water erosion and area affected with frost shattering is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

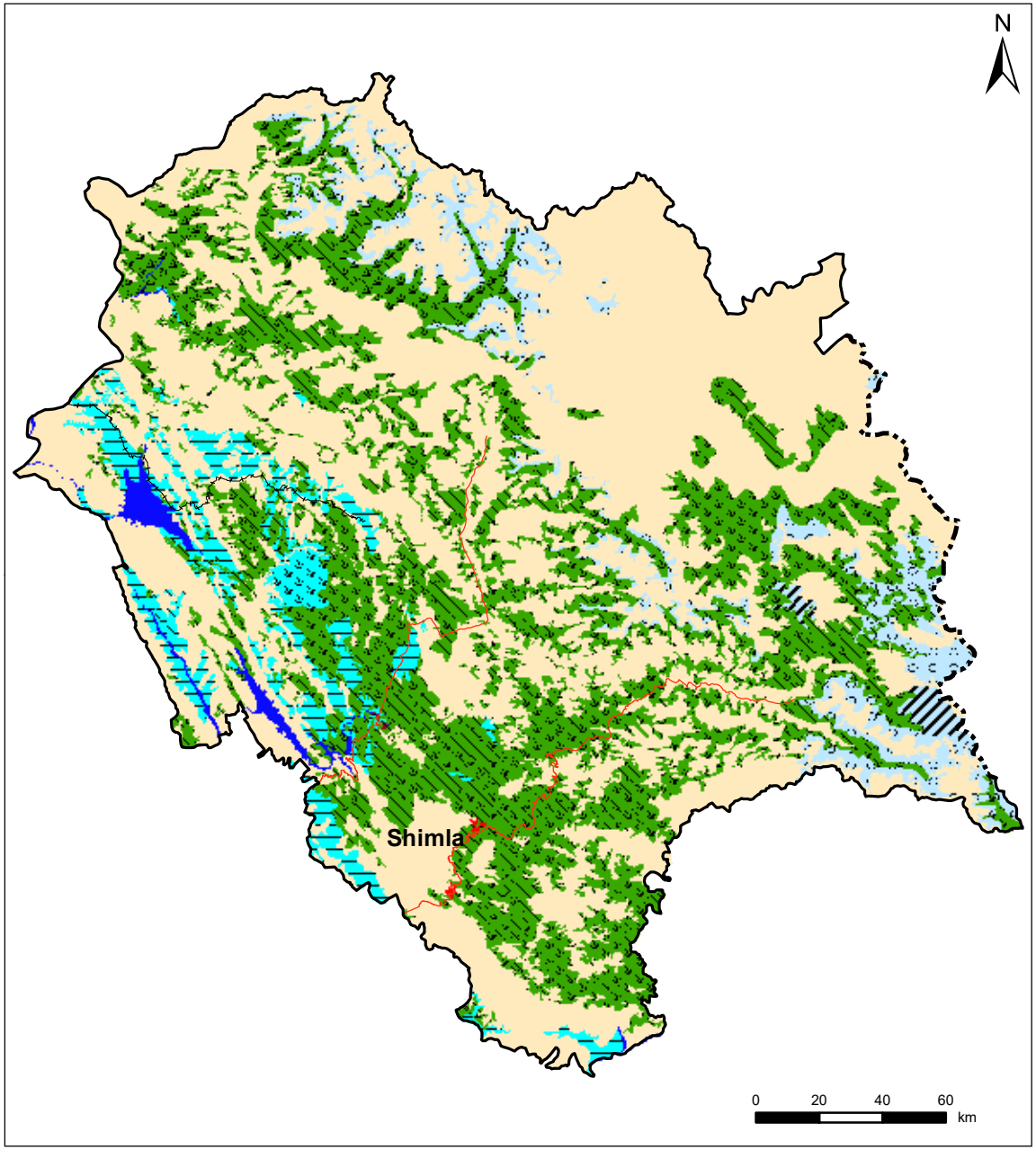




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	1796300	32.27	1790803	32.17	1582938	28.43	5497	207866
Water Erosion	268824	4.83	268261	4.82	233990	4.20	563	34271
Frost Shattering	332423	5.97	332423	5.97	322417	5.79	0	10005
Manmade	656	0.01	656	0.01	656	0.01	0	0
Settlement	2097	0.04	2097	0.04	1365	0.02	0	732
Total Area under Desertification	**2400300**	**43.11**	**2394240**	**43.01**	**2141366**	**38.46**	**6060**	**252874**
No Apparent Degradation	**3117564**	**56.00**	**3123624**	**56.11**	**3376690**	**60.65**	**-6060**	**-253067**
Total Geographical Area (ha)	**5567300**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	442524	7.95	439490	7.89	3034
2	Fv2	Forest, vegetation degradation, High	58431	1.05	58431	1.05	0
3	Sv1	Land with scrub, vegetation degradation, Low	960292	17.25	957829	17.20	2463
4	Sv2	Land with scrub, vegetation degradation, High	335053	6.02	335053	6.02	0
5	Dw1	Agriculture unirrigated, water erosion, Low	238911	4.29	238348	4.28	563
6	Fw1	Forest, water erosion, Low	4727	0.08	4727	0.08	0
7	Sw1	Land with scrub, water erosion, Low	25186	0.45	25186	0.45	0
8	Lf1	Periglacial, frost shattering, Low	105613	1.90	105613	1.90	0
9	Lf2	Periglacial, frost shattering, High	197093	3.54	197093	3.54	0
10	Rf1	Rocky, frost shattering, Low	29717	0.53	29717	0.53	0
11	Tm2	Others, man made, High	656	0.01	656	0.01	0
12	S	Settlement	2097	0.04	2097	0.04	0
Total Area Under Desertification/ Land Degradation			**2400300**	**43.11**	**2394240**	**43.01**	**6060**
13	W	Water body/ Drainage	49436	0.89	49436	0.89	0
14	NAD	No Apparent Degradation	3117564	56.00	3123624	56.11	-6060
Total Geographical Area (ha)			**5567300**	**100**	**5567300**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	439490	7.89	345669	6.21	93821
2	Fv2	Forest, vegetation degradation, High	58431	1.05	57380	1.03	1051
3	Sv1	Land with scrub, vegetation degradation, Low	957829	17.20	871875	15.66	85954
4	Sv2	Land with scrub, vegetation degradation, High	335053	6.02	308013	5.53	27039
5	Dw1	Agriculture unirrigated, water erosion, Low	238348	4.28	204561	3.67	33787
6	Fw1	Forest, water erosion, Low	4727	0.08	4727	0.08	0
7	Sw1	Land with scrub, water erosion, Low	25186	0.45	24702	0.44	484
8	Lf1	Periglacial, frost shattering, Low	105613	1.90	105220	1.89	393
9	Lf2	Periglacial, frost shattering, High	197093	3.54	187481	3.37	9612
10	Rf1	Rocky, frost shattering, Low	29717	0.53	29717	0.53	0
11	Tm2	Others, man made, High	656	0.01	656	0.01	0
12	S	Settlement	2097	0.04	1365	0.02	732
Total Area Under Desertification/ Land Degradation			**2394240**	**43.01**	**2141366**	**38.46**	**252874**
13	W	Water body/ Drainage	49436	0.89	49243	0.88	193
14	NAD	No Apparent Degradation	3123624	56.11	3376690	60.65	-253067
Total Geographical Area (ha)			**5567300**	**100**	**5567300**	**100**	



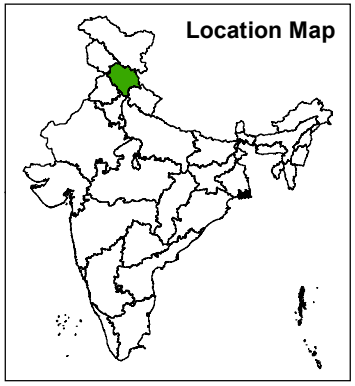
DESERTIFICATION / LAND DEGRADATION STATUS MAP
HIMACHAL PRADESH (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1	Land with scrub, water erosion
	Lf1,2	Periglacial, frost shattering
	Rf1	Rocky, frost shattering
	Tm2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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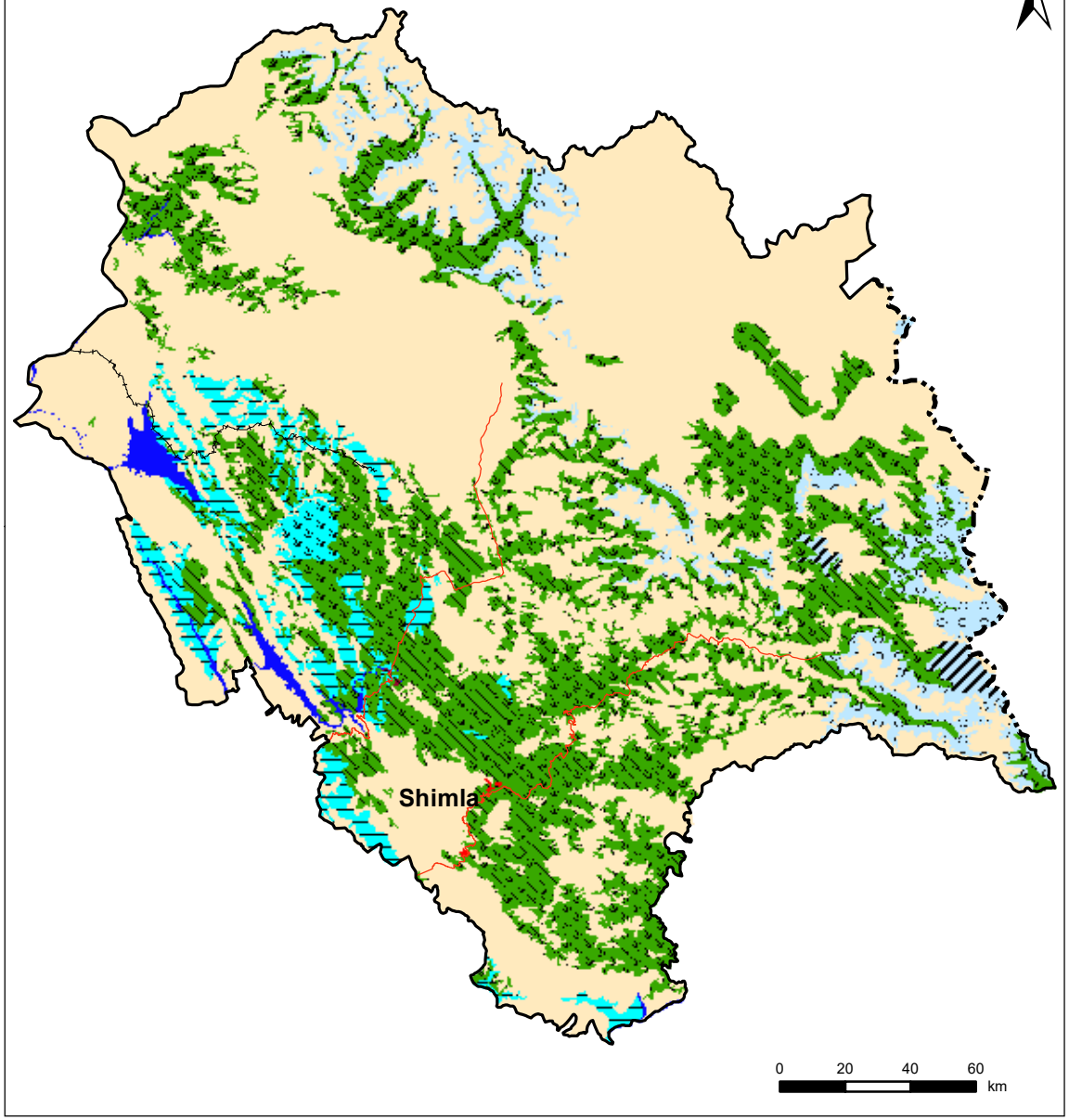
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP HIMACHAL PRADESH (2011-13)

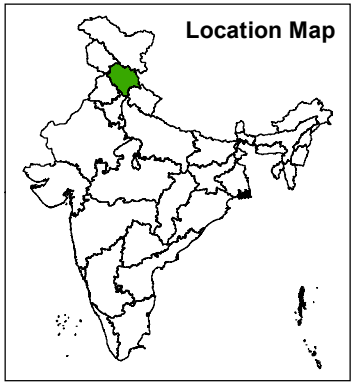
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1	Land with scrub, water erosion
	Lf1,2	Periglacial, frost shattering
	Rf1	Rocky, frost shattering
	Tm2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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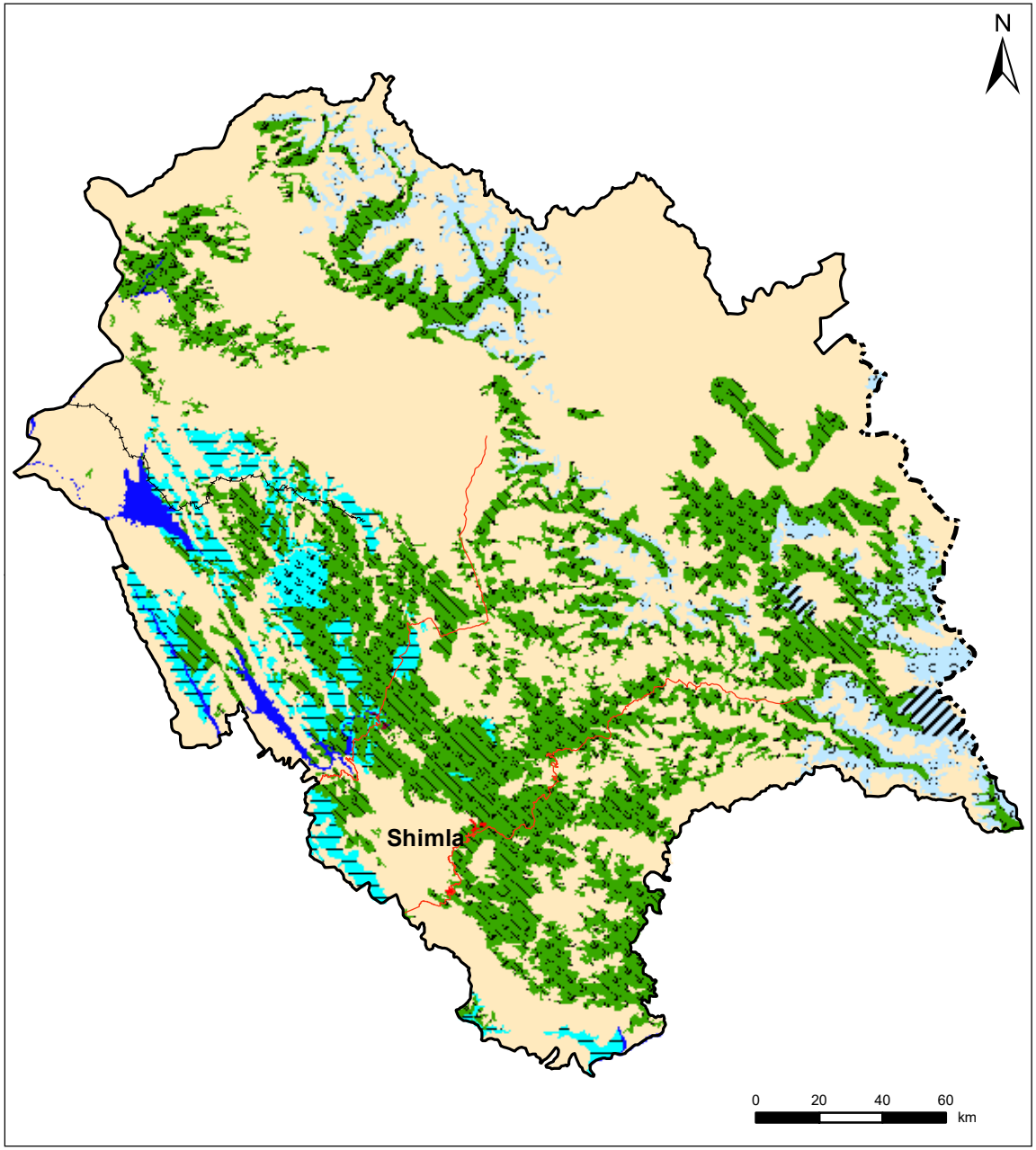


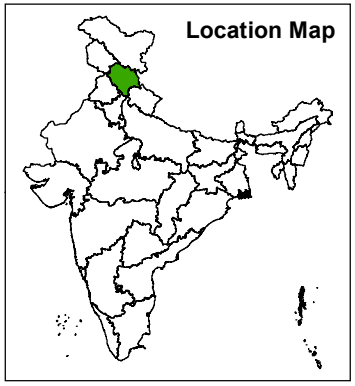
DESERTIFICATION / LAND DEGRADATION STATUS MAP
HIMACHAL PRADESH (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1	Land with scrub, water erosion
	Lf1,2	Periglacial, frost shattering
	Rf1	Rocky, frost shattering
	Tm2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

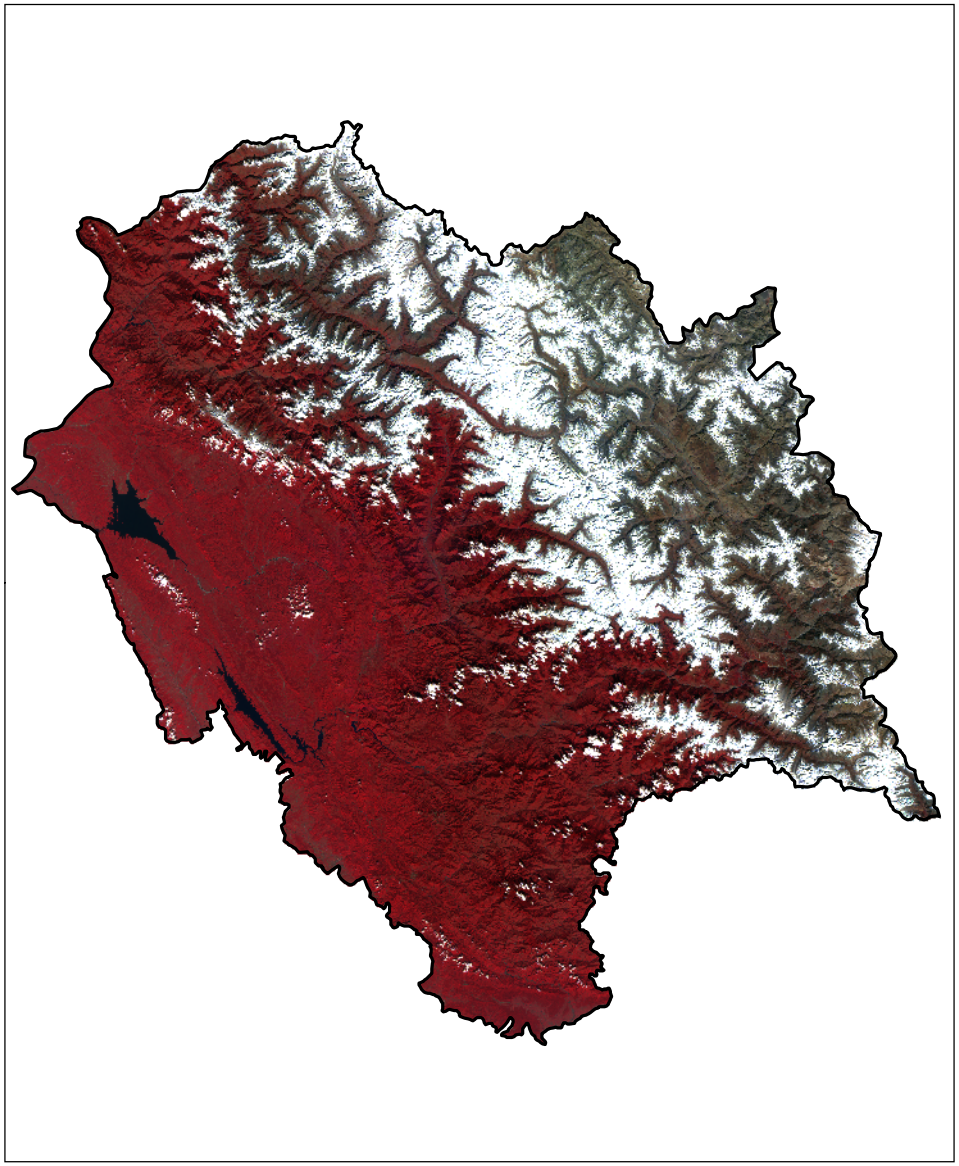
	International boundary
	State boundary
	Major roads
	Rail



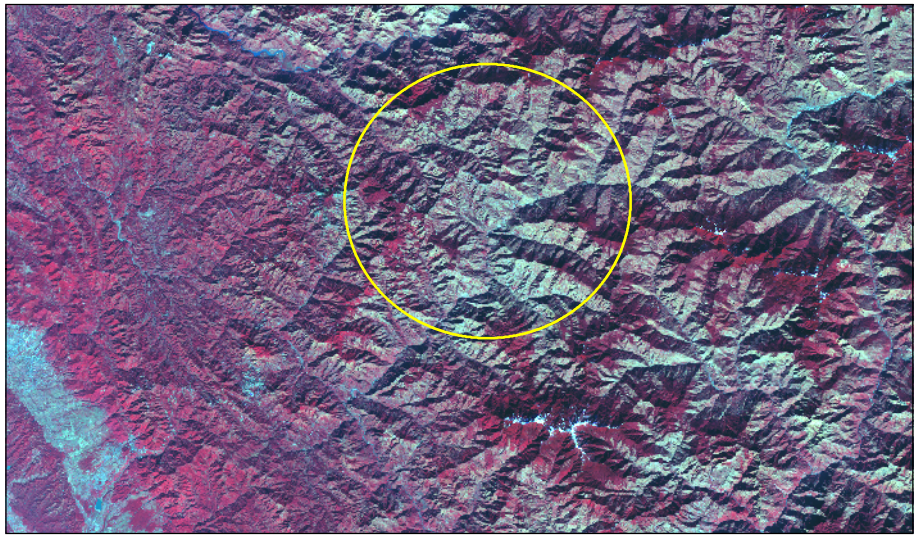
Prepared by:
Jawaharlal Nehru University, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad

Himachal Pradesh - Illustrative representation of Land Degradation processes on IRS AWiFS data

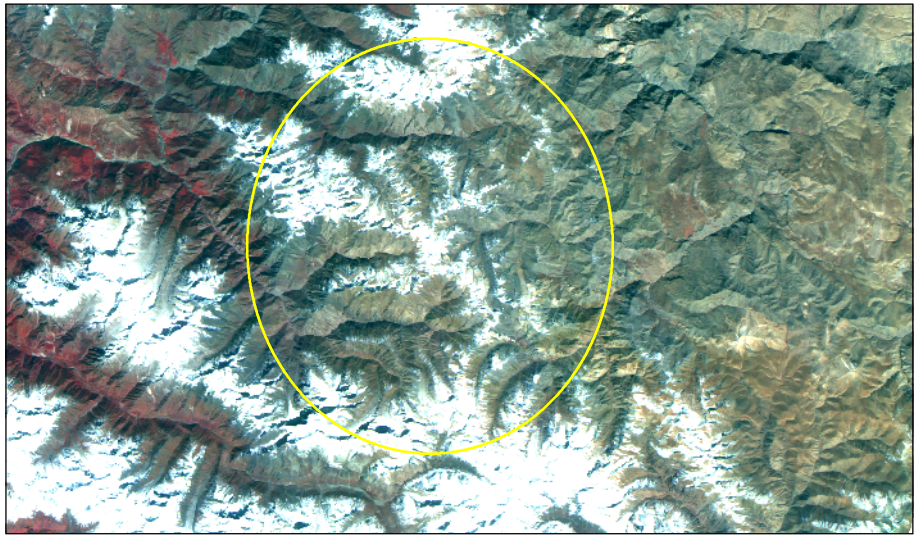
Himachal Pradesh as seen on IRS AWiFS (October 2019)



Forest area under vegetation degradation December 2019)



Area affected with frost Shattering (October 2019)



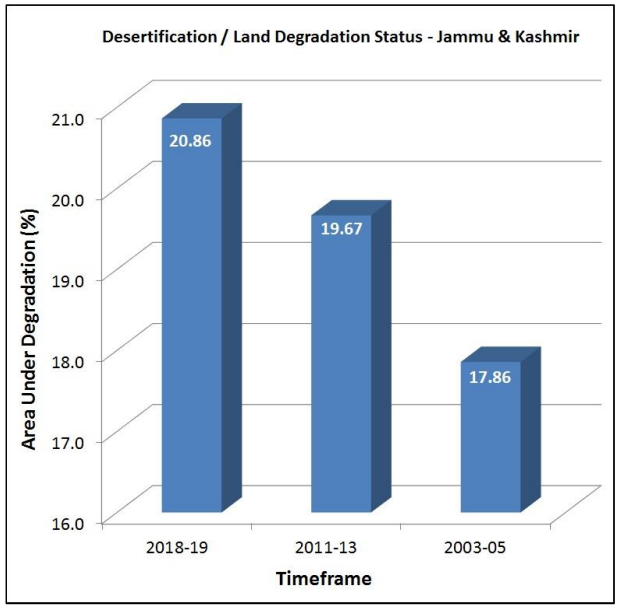
JAMMU & KASHMIR

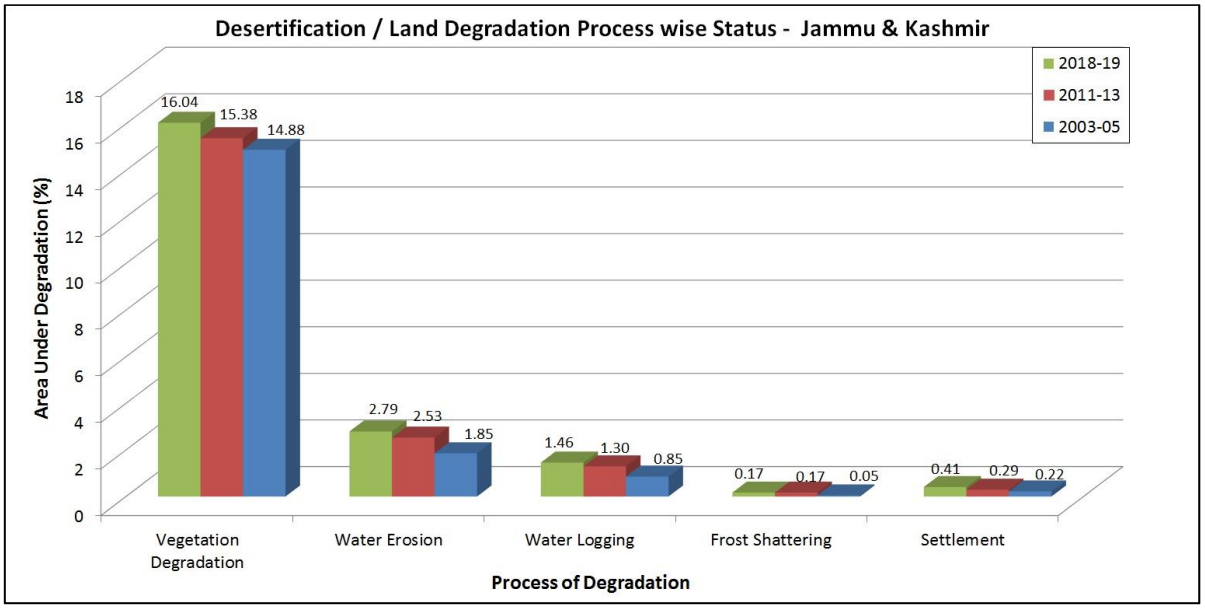
Jammu and Kashmir is the Union Territory (UT) and located in the northern most past of India, bordering with Pakistan and spread over 54,139 sq km area. The UT has population of 1,22,67,013; with 225 population density and 56.14% literacy (Census 2011). Srinagar is the summer capital, and Jammu is the winter capital of the state. Jammu and Kashmir consists of two major provinces; Jammu and Kashmir Valley with each province having ten districts. The UT has several mountain ranges like The Siwalik, the Greater Himalaya, Pir Panjal and Shamasbari. There are several picturesque valleys in the UT such as the Kashmir, Gurez, Bangus, Chenab and Pirpanjal etc. Jhelum, Chenab, Ravi and Tawi are the major rivers. The higher reaches of the UT host thousands of glaciers which are a source of perennial water to a large population in the downstream areas. The climate of the UT varies greatly owing to its rugged topography and experiences variable precipitation in the form of snow and rains.

The statistical summary and analysis of the Land Degradation of Jammu & Kashmir UT reveal that 20.86% (1.12 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 19.67% (1.06 million ha) and 17.86% (0.96 million ha) respectively. An increase of 1.19% (64,783 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.81% (97,942 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (16.04% in 2018-19, 15.38% in 2011-13 and 14.88% in 2003-05) followed by Water Erosion (2.79% in 2018-19, 2.53% in 2011-13 and 1.85% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area/ scrub land undergoing vegetation degradation and agriculture area undergoing water erosion is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area/ scrub land undergoing vegetation degradation is observed, agriculture area effected with water logging and water erosion is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

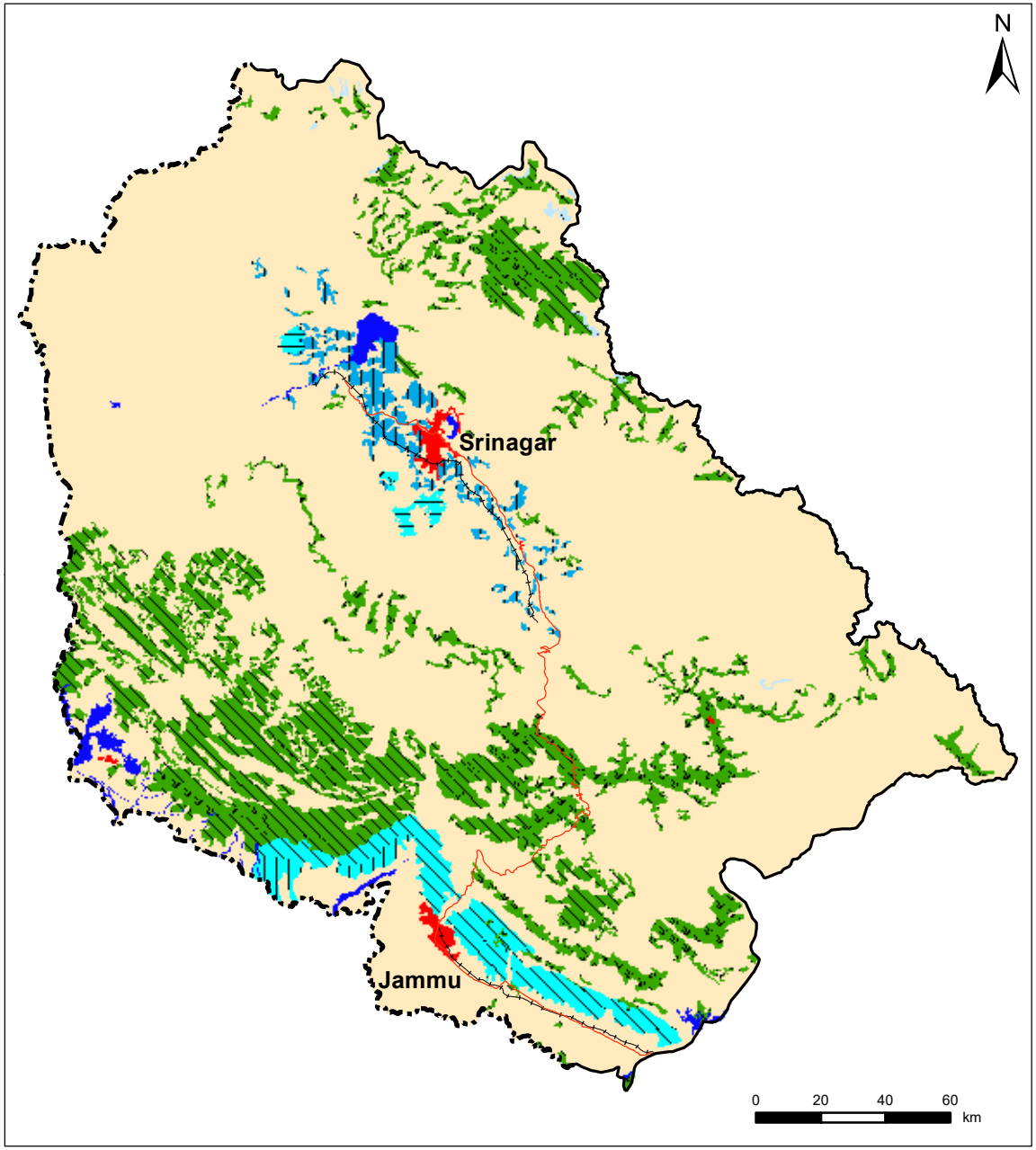




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	868556	16.04	832760	15.38	805788	14.88	35796	26972
Water Erosion	151031	2.79	136918	2.53	100419	1.85	14113	36500
Water Logging	78858	1.46	70159	1.30	46282	0.85	8699	23878
Frost Shattering	9051	0.17	9051	0.17	2584	0.05	0	6467
Settlement	22008	0.41	15832	0.29	11723	0.22	6175	4110
Total Area under Desertification	**1129503**	**20.86**	**1064721**	**19.67**	**966795**	**17.86**	**64783**	**97926**
No Apparent Degradation	**4241000**	**78.34**	**4305782**	**79.53**	**4403724**	**81.34**	**-64783**	**-97942**
Total Geographical Area (ha)	**5413900**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	492741	9.10	475991	8.79	16750
2	Fv2	Forest, vegetation degradation, High	59875	1.11	46026	0.85	13848
3	Sv1	Land with scrub, vegetation degradation, Low	297482	5.49	292285	5.40	5197
4	Sv2	Land with scrub, vegetation degradation, High	18457	0.34	18457	0.34	0
5	Iw1	Agriculture irrigated, water erosion, Low	21033	0.39	21033	0.39	0
6	Dw1	Agriculture unirrigated, water erosion, Low	14113	0.26	0	0.00	14113
7	Fw1	Forest, water erosion, Low	98297	1.82	98297	1.82	0
8	Fw2	Forest, water erosion, High	15470	0.29	15470	0.29	0
9	Sw1	Land with scrub, water erosion, Low	2117	0.04	2117	0.04	0
10	Il1	Agriculture irrigated, water logging, Low	78858	1.46	70159	1.30	8699
11	Lf1	Periglacial, frost shattering, Low	9051	0.17	9051	0.17	0
12	S	Settlement	22008	0.41	15832	0.29	6175
Total Area Under Desertification/ Land Degradation			**1129503**	**20.86**	**1064721**	**19.67**	**64783**
13	W	Water body/ Drainage	43397	0.80	43397	0.80	0
14	NAD	No Apparent Degradation	4241000	78.34	4305782	79.53	-64783
Total Geographical Area (ha)			**5413900**	**100**	**5413900**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	475991	8.79	500476	9.24	-24485
2	Fv2	Forest, vegetation degradation, High	46026	0.85	33872	0.63	12155
3	Sv1	Land with scrub, vegetation degradation, Low	292285	5.40	198569	3.67	93716
4	Sv2	Land with scrub, vegetation degradation, High	18457	0.34	72871	1.35	-54413
5	Iw1	Agriculture irrigated, water erosion, Low	21033	0.39	13623	0.25	7410
6	Dw1	Agriculture unirrigated, water erosion, Low	0	0.00	0	0.00	0
7	Fw1	Forest, water erosion, Low	98297	1.82	52806	0.98	45491
8	Fw2	Forest, water erosion, High	15470	0.29	15470	0.29	0
9	Sw1	Land with scrub, water erosion, Low	2117	0.04	18519	0.34	-16402
10	Il1	Agriculture irrigated, water logging, Low	70159	1.30	46282	0.85	23878
11	Lf1	Periglacial, frost shattering, Low	9051	0.17	2584	0.05	6467
12	S	Settlement	15832	0.29	11723	0.22	4110
Total Area Under Desertification/ Land Degradation			**1064721**	**19.67**	**966795**	**17.86**	**97926**
13	W	Water body/ Drainage	43397	0.80	43381	0.80	16
14	NAD	No Apparent Degradation	4305782	79.53	4403724	81.34	-97942
Total Geographical Area (ha)			**5413900**	**100**	**5413900**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP
Jammu & Kashmir (2018-19)

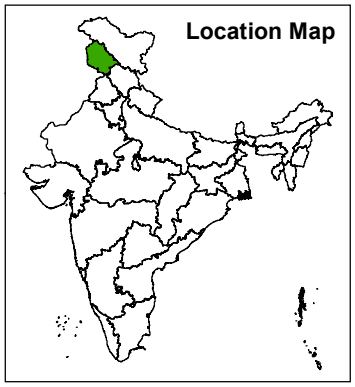
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1	Land with scrub, water erosion
	Il1	Agriculture irrigated, water logging
	Lf1	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

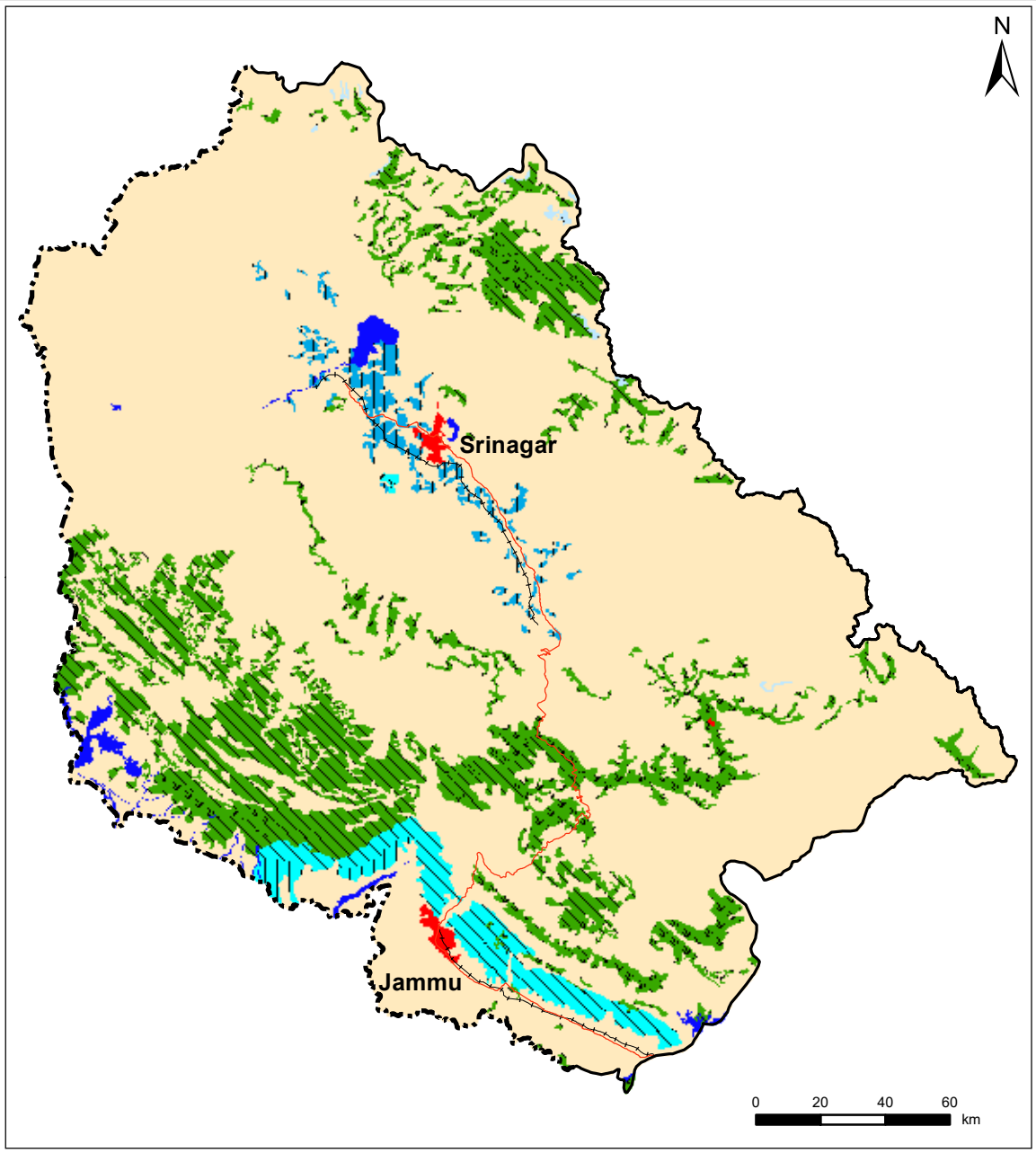
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
University of Kashmir, Srinagar
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP
Jammu & Kashmir (2011-13)

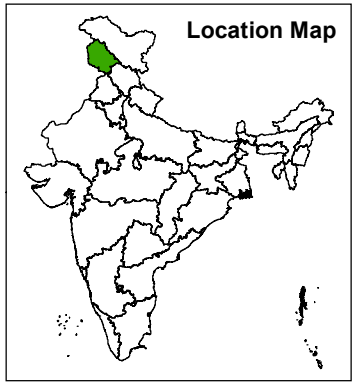
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1	Land with scrub, water erosion
	Il1	Agriculture irrigated, water logging
	Lf1	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

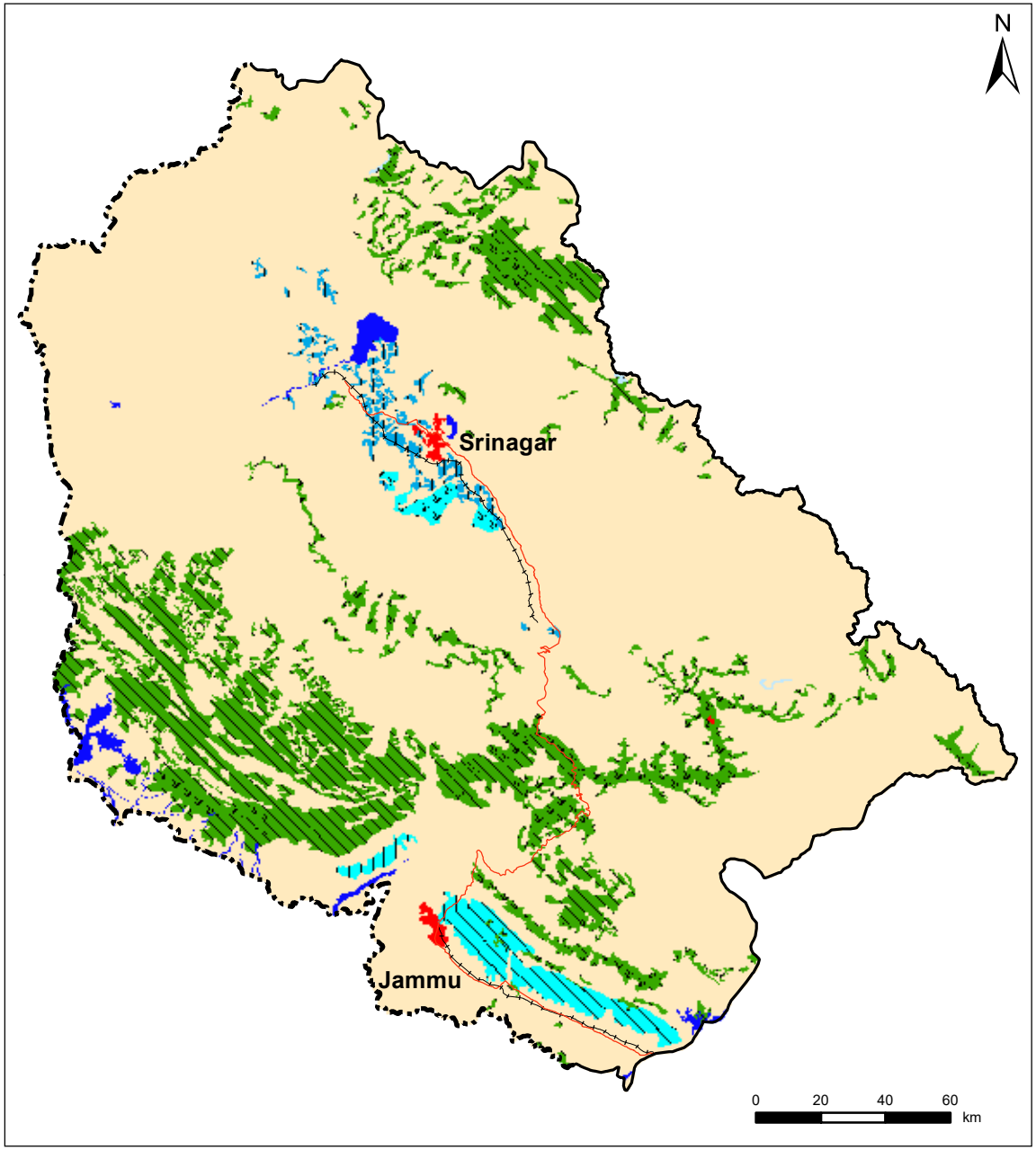
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
University of Kashmir, Srinagar
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP
Jammu & Kashmir (2003-05)

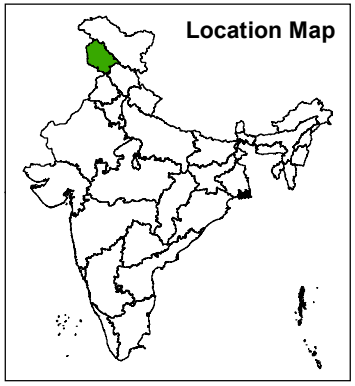
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1	Land with scrub, water erosion
	Il1	Agriculture irrigated, water logging
	Lf1	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

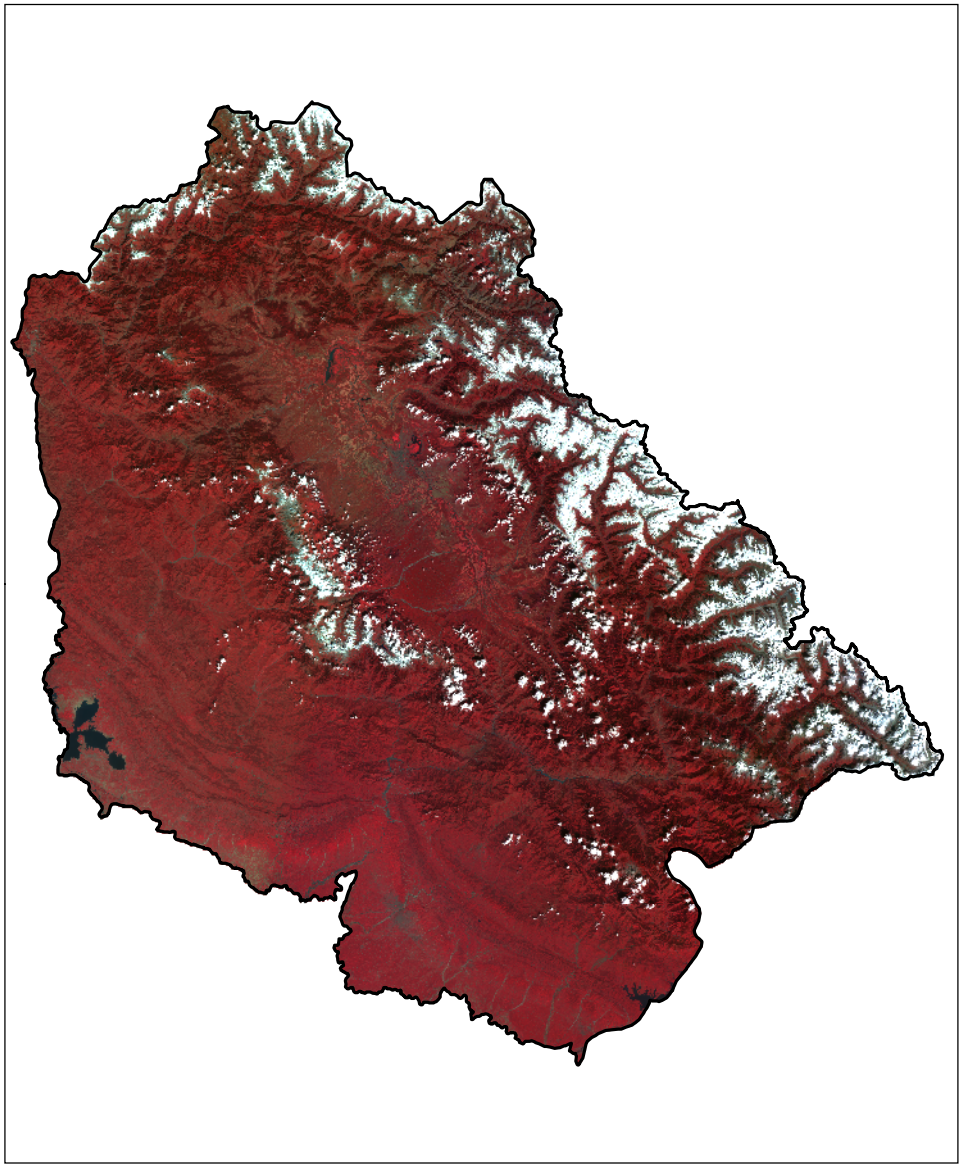
	International boundary
	State boundary
	Major roads
	Rail



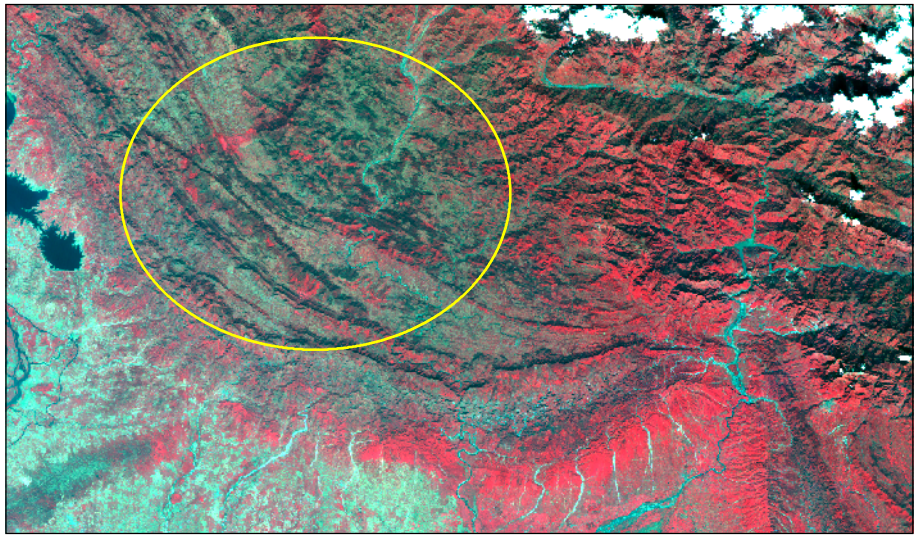
Prepared by:
University of Kashmir, Srinagar
&
Space Applications Centre, ISRO, Ahmedabad

Jammu and Kashmir - Illustrative representation of Land Degradation processes on IRS AWiFS data

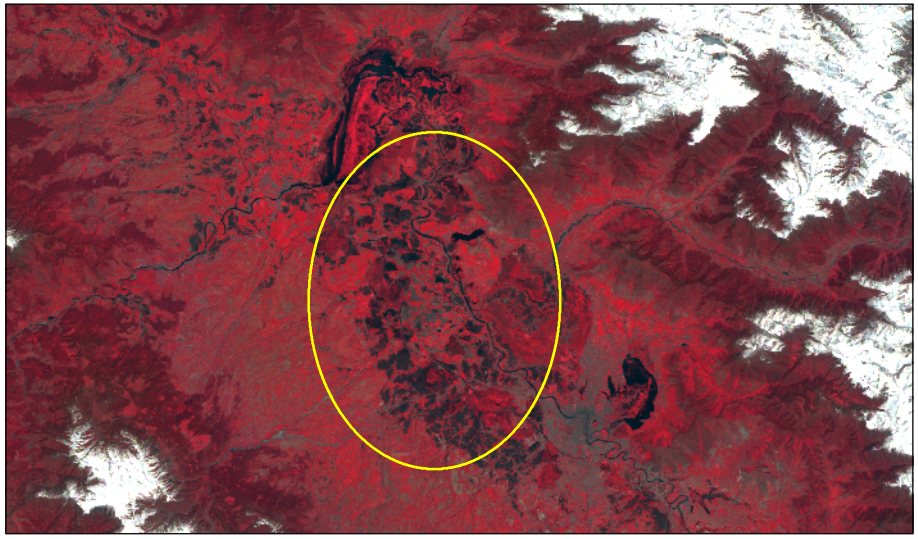
Jammu and Kashmir as seen on IRS AWiFS (September 2018)



Forest area under vegetation degradation (October 2018)



Agriculture area affected with water logging (May 2019)



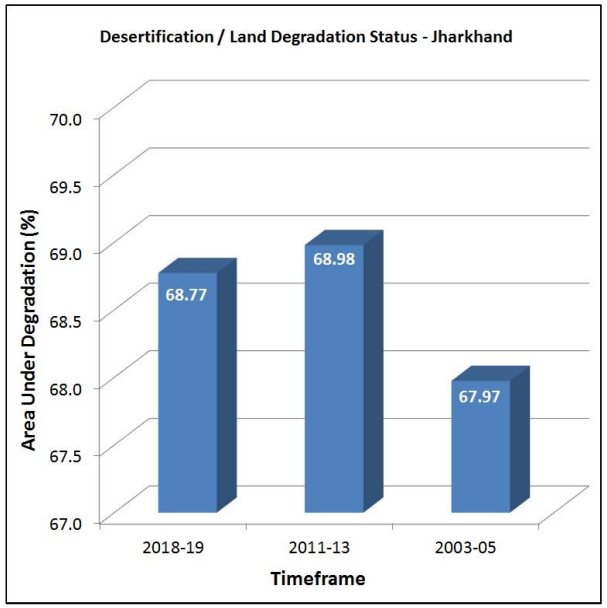
JHARKHAND

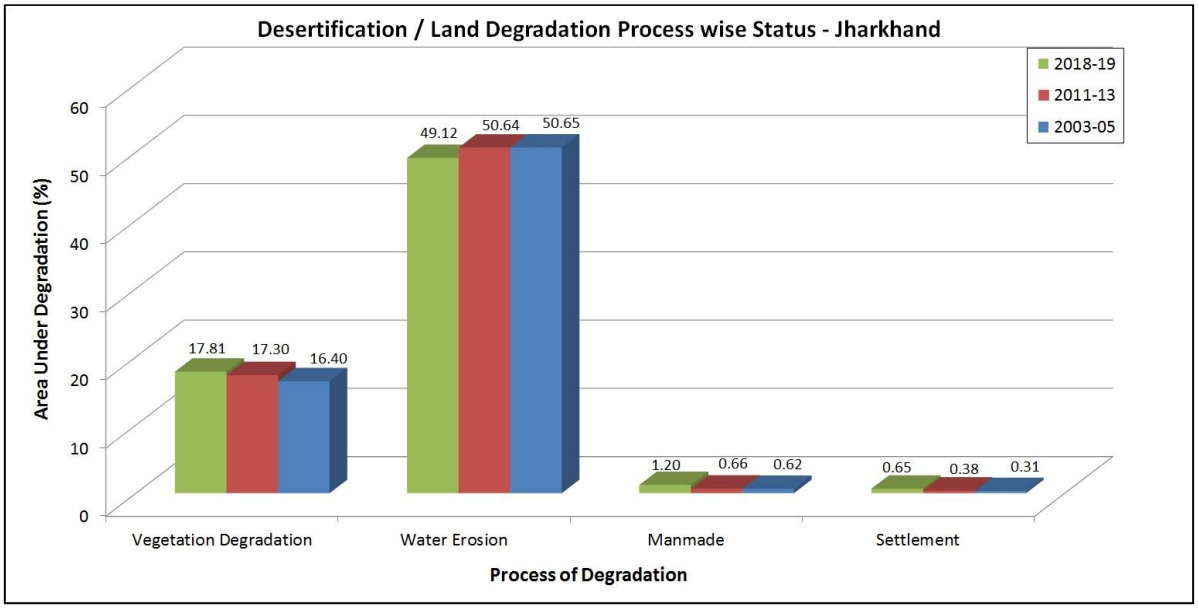
Jharkhand state is located in east part of India, covering 79,716 sq km area. The state has population of 3,29,88,134; with 414 population density, 948 sex ratio and 66.41% literacy (Census 2011). Ranchi is the capital of Jharkhand. The major part of Jharkhand state comprises Chota Nagpur Plateau being rich in minerals and is covered with dense forests. The state has a diverse topography of plain land and hilly regions. A number of rivers like Damodar, Brahmani, Koel, Subarnarekha and Kharkai flow through the state forming majestic waterfalls in the hilly regions. The plains of Jharkhand are very fertile and have different types of soil like the Red soil, Micacious soil (having mica particles), Sandy soil, Black soil, Laterite soil. The climate of the state is moderate (neither extreme hot nor cold) with heavy rainfall in monsoon season from 1,000 mm to 1,500 mm.

The statistical summary and analysis of the Land Degradation of Jharkhand state reveal that 68.77% (5.48 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 68.98% (5.49 million ha) and 67.97% (5.41 million ha) respectively. A slight decrease of 0.21% (16,466 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.01% (80,070 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (49.12% in 2018-19, 50.64% in 2011-13 and 50.65% in 2003-05) followed by Vegetation Degradation (17.81% in 2018-19, 17.30% in 2011-13 and 16.40% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in area affected with manmade activities, forest area/ scrub land undergoing vegetation degradation and decrease agriculture area undergoing water erosion is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

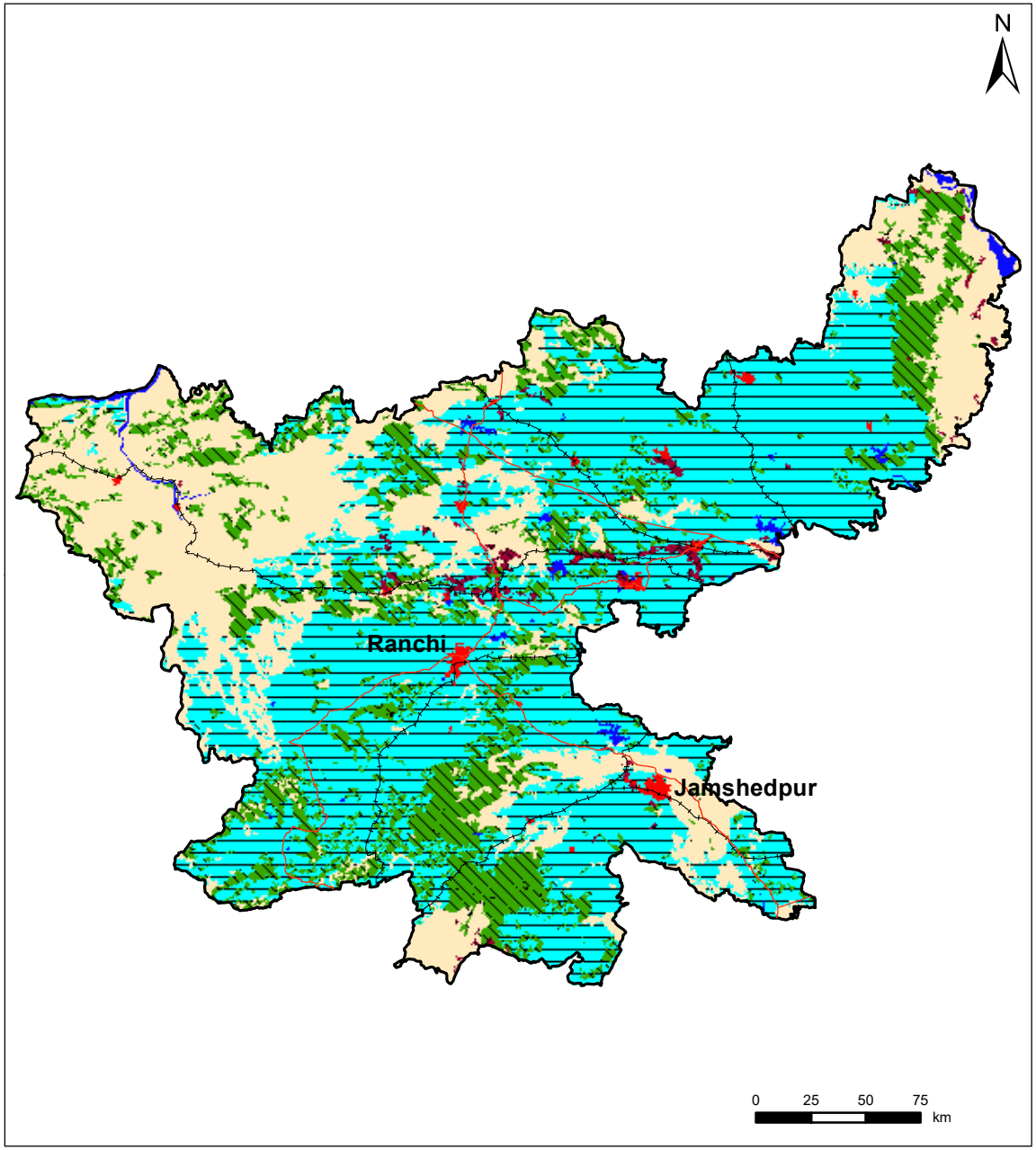




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	1419362	17.81	1379038	17.30	1307162	16.40	40324	71876
Water Erosion	3915868	49.12	4036785	50.64	4037261	50.65	-120918	-476
Manmade	95301	1.20	52734	0.66	49730	0.62	42567	3004
Settlement	51730	0.65	30169	0.38	24503	0.31	21561	5666
Total Area under Desertification	**5482260**	**68.77**	**5498726**	**68.98**	**5418657**	**67.97**	**-16466**	**80070**
No Apparent Degradation	**2411930**	**30.26**	**2398866**	**30.09**	**2469577**	**30.98**	**13065**	**-70711**
Total Geographical Area (ha)	**7971600**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	1281325	16.07	1322056	16.58	-40731
2	Fv2	Forest, vegetation degradation, High	56937	0.71	2039	0.03	54898
3	Sv1	Land with scrub, vegetation degradation, Low	51792	0.65	49156	0.62	2636
4	Sv2	Land with scrub, vegetation degradation, High	29307	0.37	5787	0.07	23521
5	Dw1	Agriculture unirrigated, water erosion, Low	3913128	49.09	4034046	50.61	-120918
6	Fw1	Forest, water erosion, Low	2739	0.03	2739	0.03	0
7	Fm1	Forest, man made, Low	2206	0.03	0	0.00	2206
8	Fm2	Forest, man made, High	20305	0.25	11610	0.15	8694
9	Tm1	Others, man made, Low	20993	0.26	5095	0.06	15898
10	Tm2	Others, man made, High	51796	0.65	36028	0.45	15768
11	S	Settlement	51730	0.65	30169	0.38	21561
Total Area Under Desertification/ Land Degradation			**5482260**	**68.77**	**5498726**	**68.98**	**-16466**
12	W	Water body/ Drainage	77410	0.97	74008	0.93	3402
13	NAD	No Apparent Degradation	2411930	30.26	2398866	30.09	13065
Total Geographical Area (ha)			**7971600**	**100**	**7971600**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	1322056	16.58	1239016	15.54	83040
2	Fv2	Forest, vegetation degradation, High	2039	0.03	13203	0.17	-11164
3	Sv1	Land with scrub, vegetation degradation, Low	49156	0.62	49156	0.62	0
4	Sv2	Land with scrub, vegetation degradation, High	5787	0.07	5787	0.07	0
5	Dw1	Agriculture unirrigated, water erosion, Low	4034046	50.61	4034522	50.61	-476
6	Fw1	Forest, water erosion, Low	2739	0.03	2739	0.03	0
7	Fm1	Forest, man made, Low	0	0.00	0	0.00	0
8	Fm2	Forest, man made, High	11610	0.15	11610	0.15	0
9	Tm1	Others, man made, Low	5095	0.06	4655	0.06	440
10	Tm2	Others, man made, High	36028	0.45	33465	0.42	2564
11	S	Settlement	30169	0.38	24503	0.31	5666
Total Area Under Desertification/ Land Degradation			**5498726**	**68.98**	**5418657**	**67.97**	**80070**
12	W	Water body/ Drainage	74008	0.93	83366	1.05	-9358
13	NAD	No Apparent Degradation	2398866	30.09	2469577	30.98	-70711
Total Geographical Area (ha)			**7971600**	**100**	**7971600**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP JHARKHAND (2018-19)

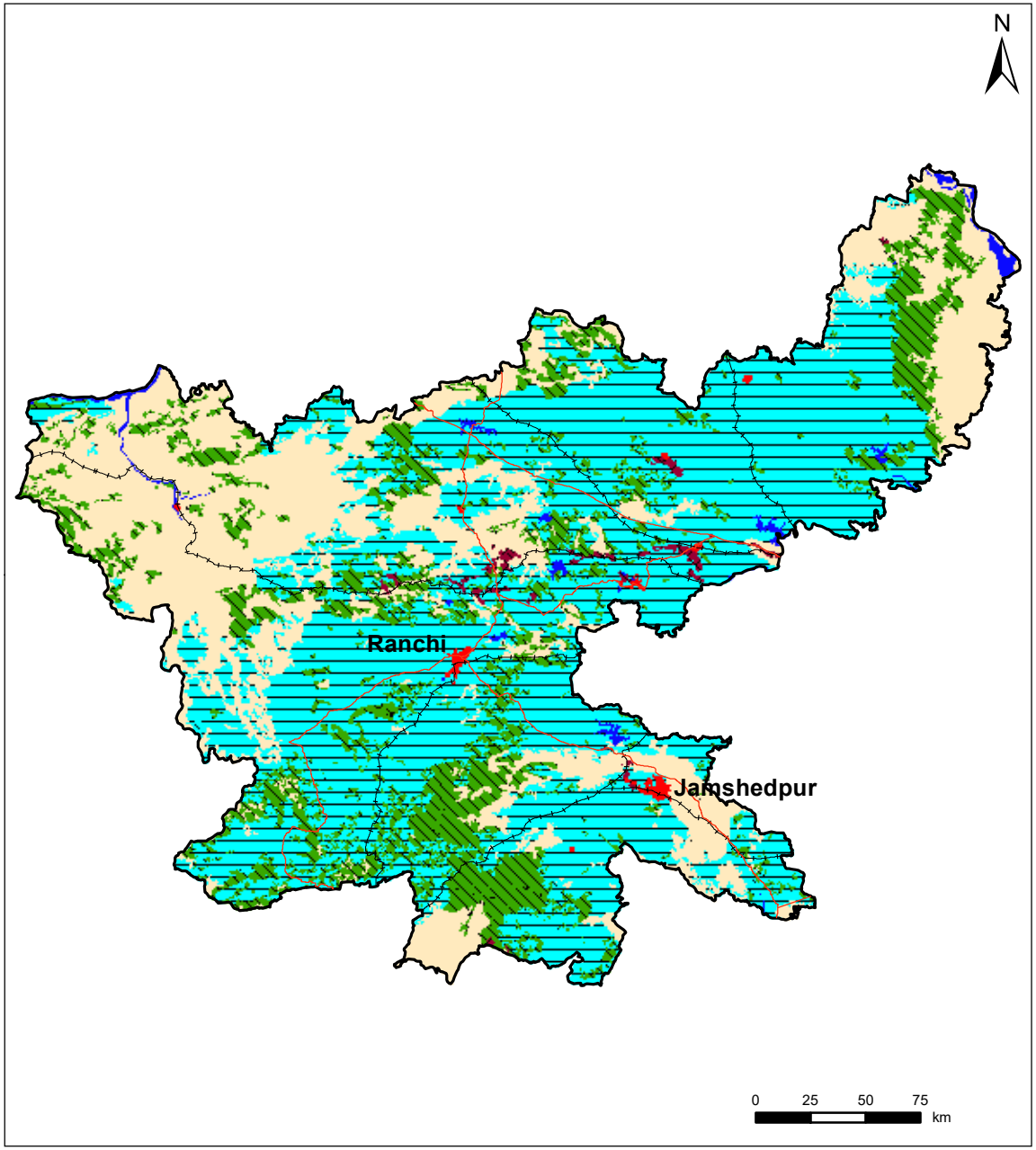
Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water logging
	Fm1,2	Forest, man made
	Tm1,2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
Jharkhand Space Applications Centre, Ranchi
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP JHARKHAND (2011-13)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water logging
	Fm2	Forest, man made
	Tm1,2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

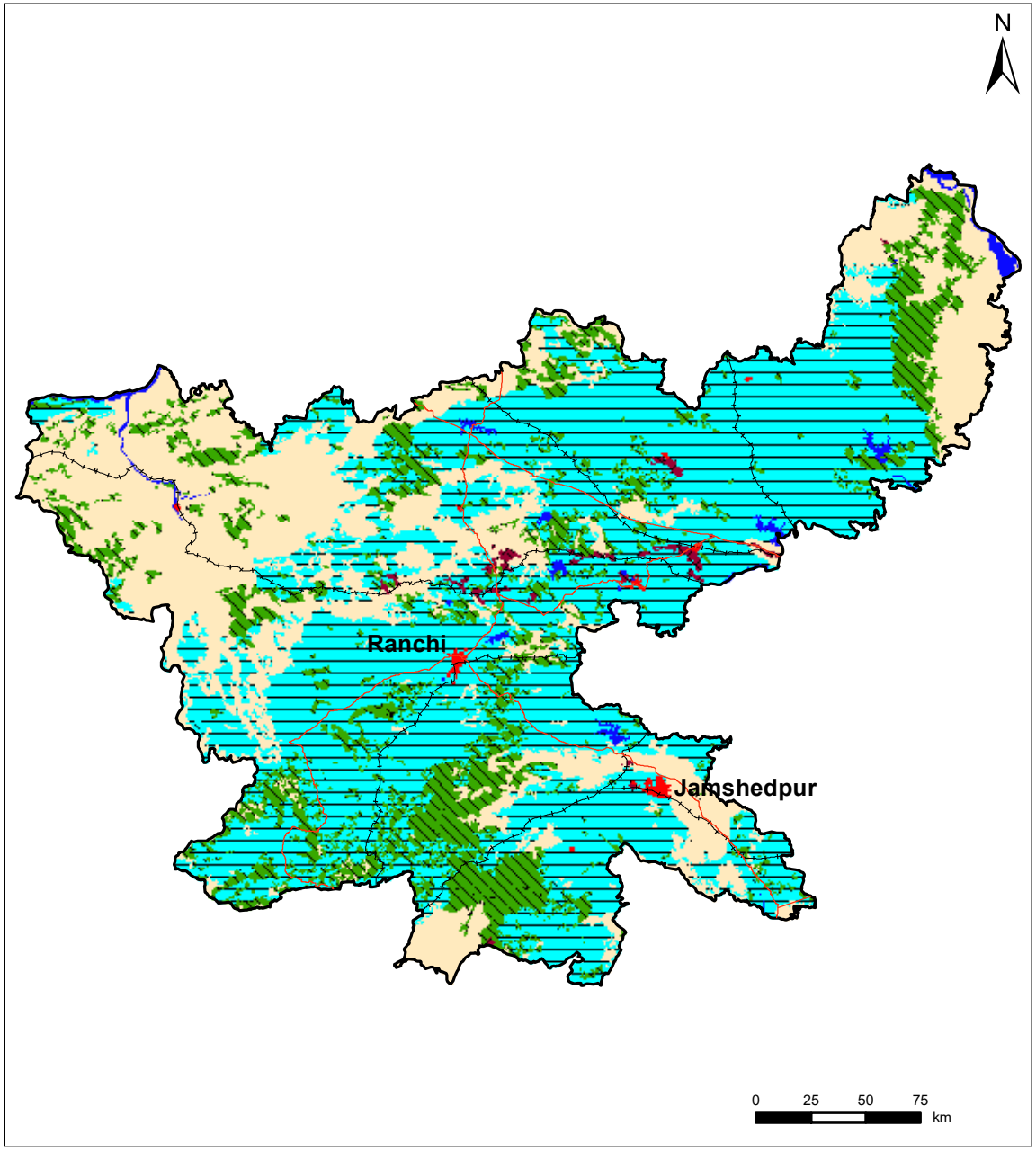
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:

Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP JHARKHAND (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water logging
	Fm2	Forest, man made
	Tm1,2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

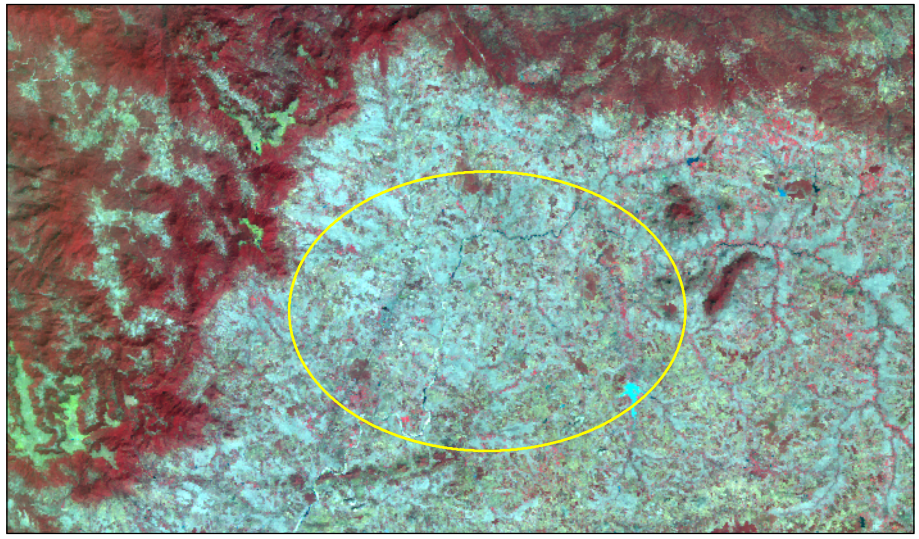
	International boundary
	State boundary
	Major roads
	Rail

Prepared by:

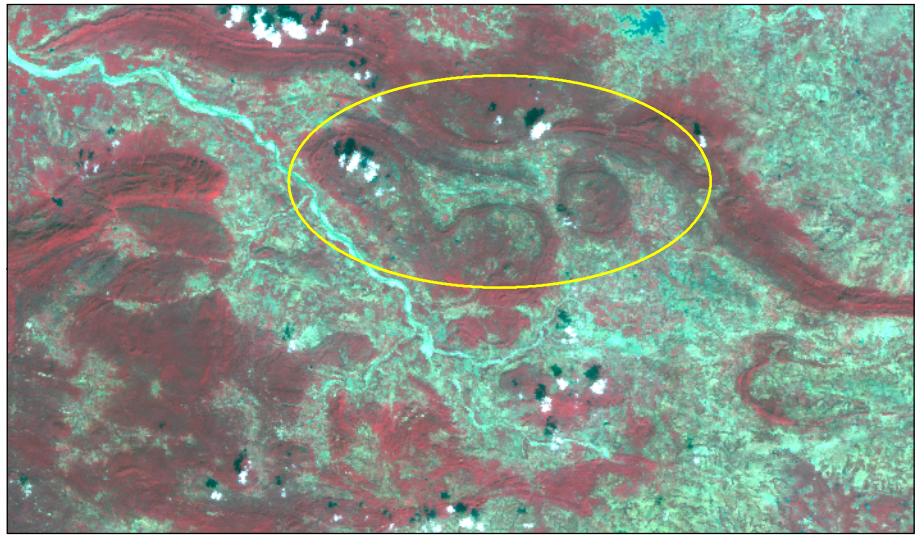
Space Applications Centre, ISRO, Ahmedabad

Jharkhand - Illustrative representation of Land Degradation processes / changes on IRS AWiFS data

Agriculture area affected with water erosion (January 2018)



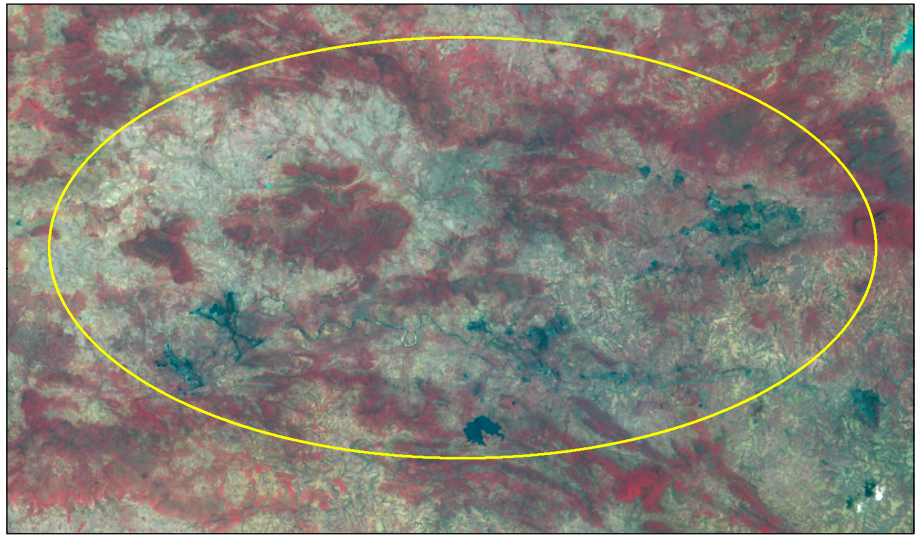
Forest area under vegetation degradation (October 2018)

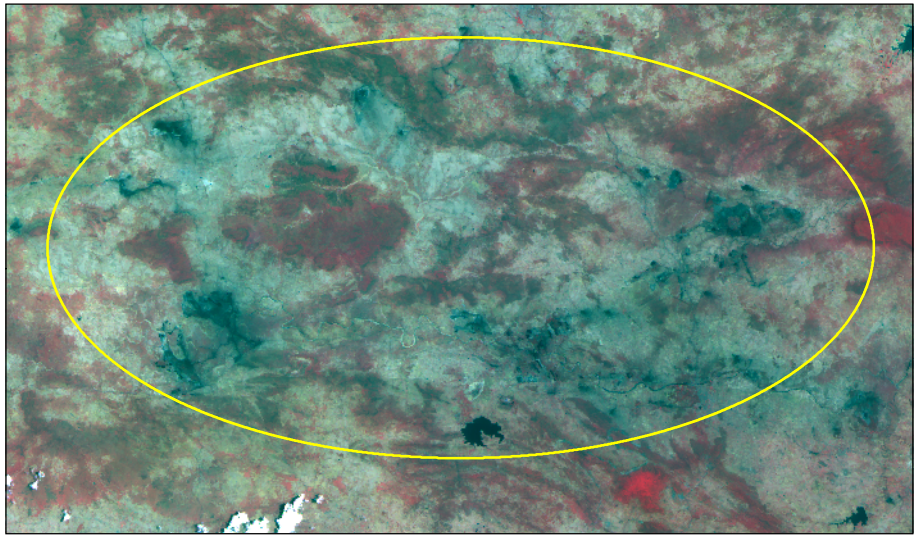


May 2004

Expansion of area affected with manmade (mining) activities

May 2019





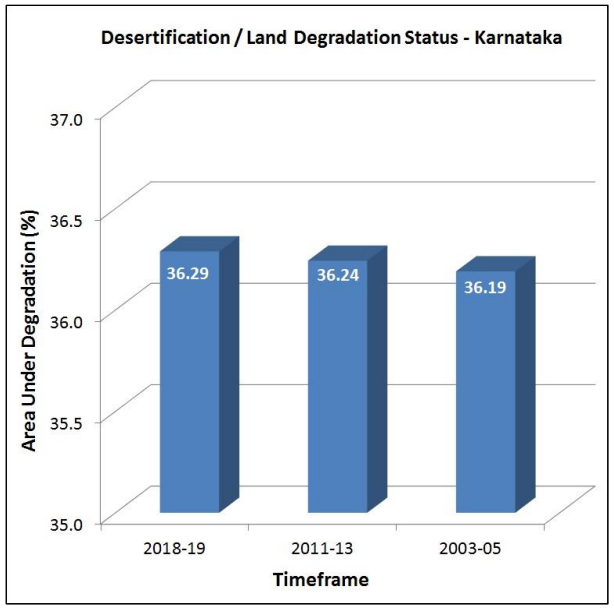
KARNATAKA

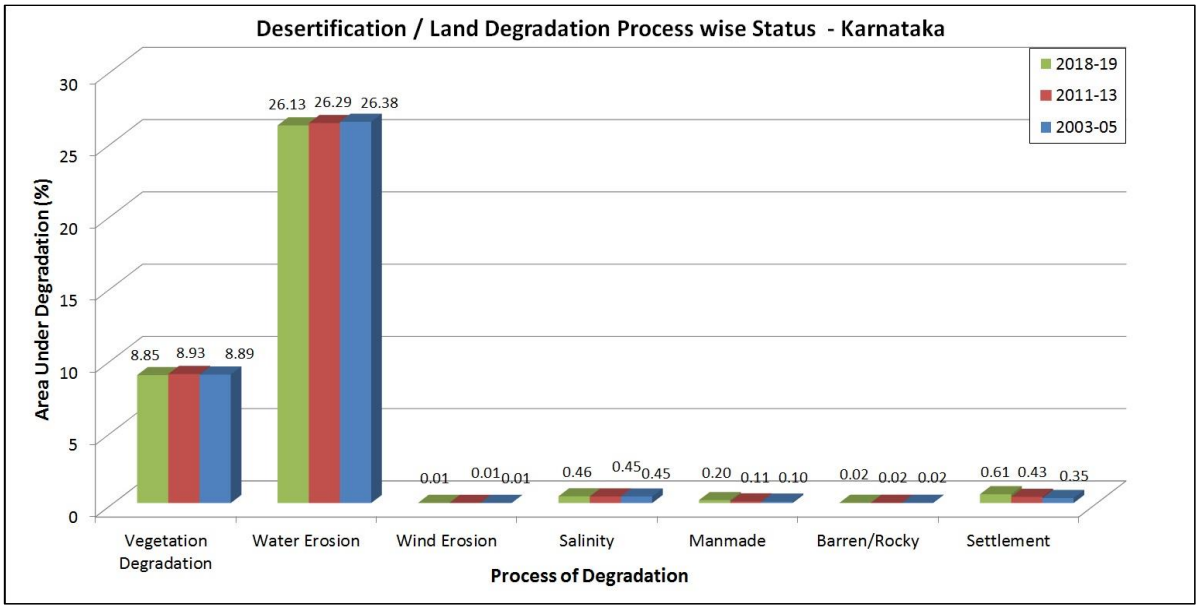
Karnataka is located in southern part of India with 1,91,791 sq km area. The state has population of 6,10,95,297; with 319 population density, 973 sex ratio and 75.36% literacy (Census 2011). Bengaluru is the capital of Karnataka. Karnataka has three natural regions viz. the Coastal strip (Paschima Karavali), the Western Ghats (Malenadu or Sahyadris) and the Deccan plateau (Bayaluseema). The Sahyadris region is covered with evergreen forests. Krishna and the Kaveri are the main rivers flowing through the state, which drain the plateau regions of the state. The state experiences semi-arid tropical climate. The average annual temperature ranges from 10^{o}C to 45^{o}C. Rainfall is very high in coastal region, about 3500mm but low in interior areas.

The statistical summary and analysis of the Land Degradation of Karnataka state reveal that 36.29% (6.96 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 36.24% (6.95 million ha) and 36.19% (6.94 million ha) respectively. A slight increase of 0.05% (8,847 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.05% (10,057 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (26.13% in 2018-19, 26.29% in 2011-13 and 26.38% in 2003-05) followed by Vegetation Degradation (8.85% in 2018-19, 8.93% in 2011-13 and 8.89% in 2003-05). Between timeframe 2011-13 & 2018-19, decrease in forest area undergoing vegetation degradation, agriculture area undergoing water erosion and increase in area affected with manmade activities is observed. Whereas, from timeframe 2003-05 to 2011-13, decrease in agriculture area undergoing water erosion and slight increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

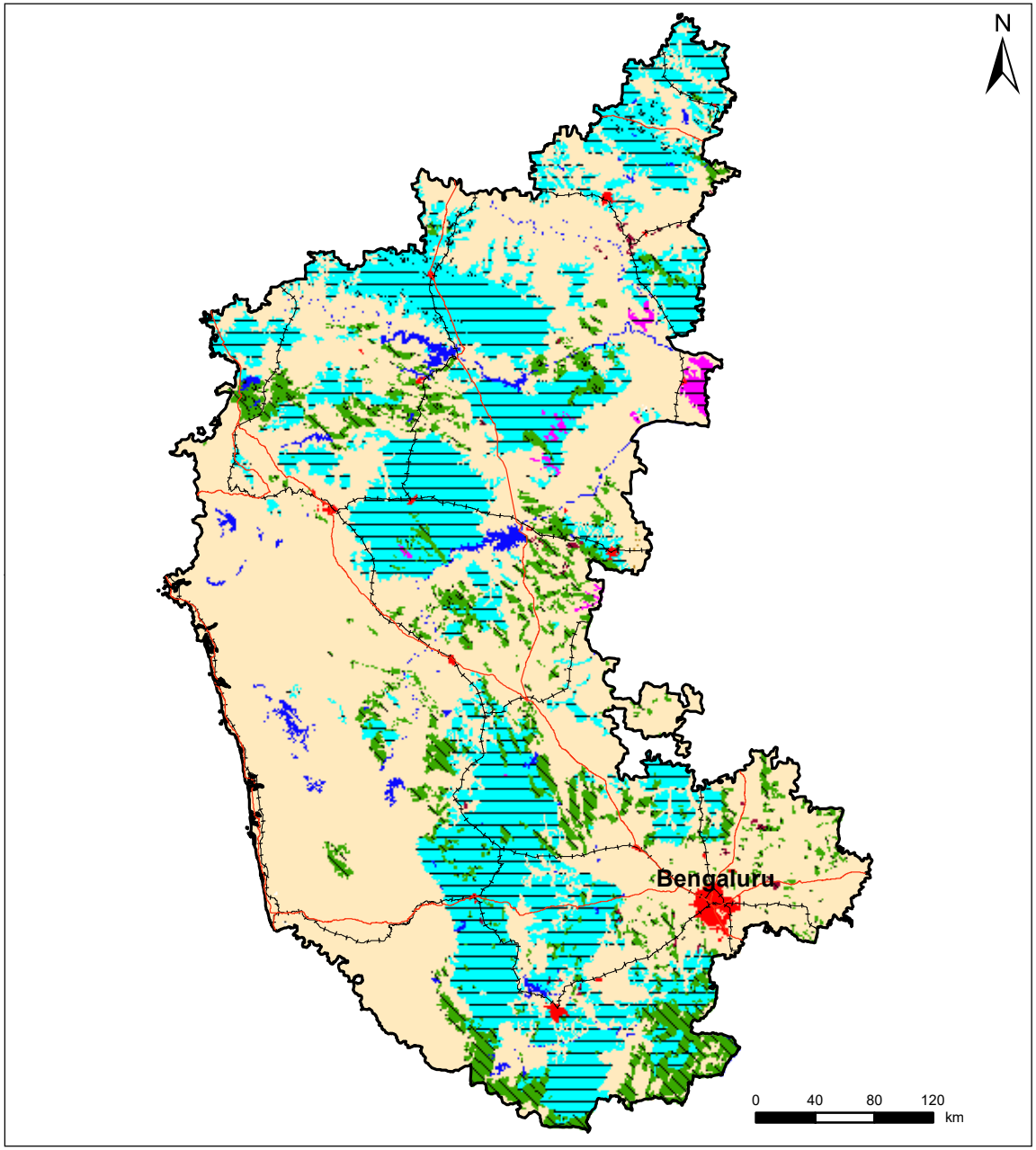




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	1697479	8.85	1712386	8.93	1704569	8.89	-14907	7817
Water Erosion	5012171	26.13	5043041	26.29	5059629	26.38	-30870	-16588
Wind Erosion	2159	0.01	2159	0.01	2159	0.01	0	0
Salinity	89122	0.46	86740	0.45	86582	0.45	2382	158
Manmade	38794	0.20	20876	0.11	18704	0.10	17918	2172
Barren/Rocky	3252	0.02	3389	0.02	2887	0.02	-137	502
Settlement	116871	0.61	82409	0.43	66413	0.35	34462	15996
Total Area under Desertification	**6959847**	**36.29**	**6951000**	**36.24**	**6940943**	**36.19**	**8847**	**10057**
No Apparent Degradation	**11975482**	**62.44**	**11984329**	**62.49**	**11994157**	**62.54**	**-8847**	**-9828**
Total Geographical Area (ha)	**19179100**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	1001666	5.22	1020270	5.32	-18603
2	Fv2	Forest, vegetation degradation, High	357115	1.86	356658	1.86	457
3	Sv1	Land with scrub, vegetation degradation, Low	47444	0.25	43904	0.23	3540
4	Sv2	Land with scrub, vegetation degradation, High	291254	1.52	291555	1.52	-301
5	Iw1	Agriculture irrigated, water erosion, Low	7359	0.04	7225	0.04	134
6	Iw2	Agriculture irrigated, water erosion, High	1938	0.01	0	0.00	1938
7	Dw1	Agriculture unirrigated, water erosion, Low	4728789	24.66	4763027	24.83	-34238
8	Dw2	Agriculture unirrigated, water erosion, High	2020	0.01	0	0.00	2020
9	Sw1	Land with scrub, water erosion, Low	272065	1.42	272790	1.42	-725
10	Ee1	Dune / Sandy area, wind erosion, Low	1556	0.01	1556	0.01	0
11	Ee2	Dune / Sandy area, wind erosion, High	604	0.00	604	0.00	0
12	Is1	Agriculture irrigated, salinity / alkalinity, Low	8365	0.04	6407	0.03	1958
13	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	80757	0.42	80333	0.42	424
14	Fm1	Forest, man made, Low	1958	0.01	0	0.00	1958
15	Tm1	Others, man made, Low	17691	0.09	4613	0.02	13078
16	Tm2	Others, man made, High	19145	0.10	16263	0.08	2882
17	B	Barren	962	0.01	1099	0.01	-137
18	R	Rocky	2290	0.01	2290	0.01	0
19	S	Settlement	116871	0.61	82409	0.43	34462
Total Area Under Desertification/ Land Degradation			**6959847**	**36.29**	**6951000**	**36.24**	**8847**
20	W	Water body/ Drainage	243771	1.27	243771	1.27	0
21	NAD	No Apparent Degradation	11975482	62.44	11984329	62.49	-8847
Total Geographical Area (ha)			**19179100**	**100**	**19179100**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	1020270	5.32	1049116	5.47	-28846
2	Fv2	Forest, vegetation degradation, High	356658	1.86	317471	1.66	39187
3	Sv1	Land with scrub, vegetation degradation, Low	43904	0.23	45862	0.24	-1958
4	Sv2	Land with scrub, vegetation degradation, High	291555	1.52	292120	1.52	-566
5	Iw1	Agriculture irrigated, water erosion, Low	7225	0.04	7225	0.04	0
6	Iw2	Agriculture irrigated, water erosion, High	0	0.00	0	0.00	0
7	Dw1	Agriculture unirrigated, water erosion, Low	4763027	24.83	4779131	24.92	-16104
8	Dw2	Agriculture unirrigated, water erosion, High	0	0.00	0	0.00	0
9	Sw1	Land with scrub, water erosion, Low	272790	1.42	273273	1.42	-484
10	Ee1	Dune / Sandy area, wind erosion, Low	1556	0.01	1556	0.01	0
11	Ee2	Dune / Sandy area, wind erosion, High	604	0.00	604	0.00	0
12	Is1	Agriculture irrigated, salinity / alkalinity, Low	6407	0.03	6249	0.03	158
13	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	80333	0.42	80333	0.42	0
14	Fm1	Forest, man made, Low	0	0.00	0	0.00	0
15	Tm1	Others, man made, Low	4613	0.02	4613	0.02	0
16	Tm2	Others, man made, High	16263	0.08	14091	0.07	2172
17	B	Barren	1099	0.01	597	0.00	502
18	R	Rocky	2290	0.01	2290	0.01	0
19	S	Settlement	82409	0.43	66413	0.35	15996
Total Area Under Desertification/ Land Degradation			**6951000**	**36.24**	**6940943**	**36.19**	**10057**
20	W	Water body/ Drainage	243771	1.27	244000	1.27	-229
21	NAD	No Apparent Degradation	11984329	62.49	11994157	62.54	-9828
Total Geographical Area (ha)			**19179100**	**100**	**19179100**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP KARNATAKA (2018-19)

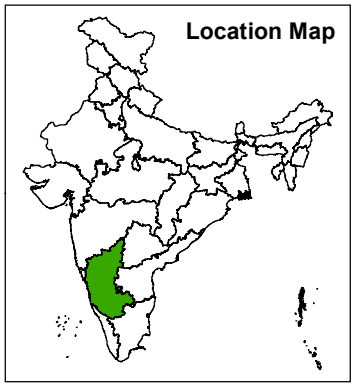
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ee1, 2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Fm1	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

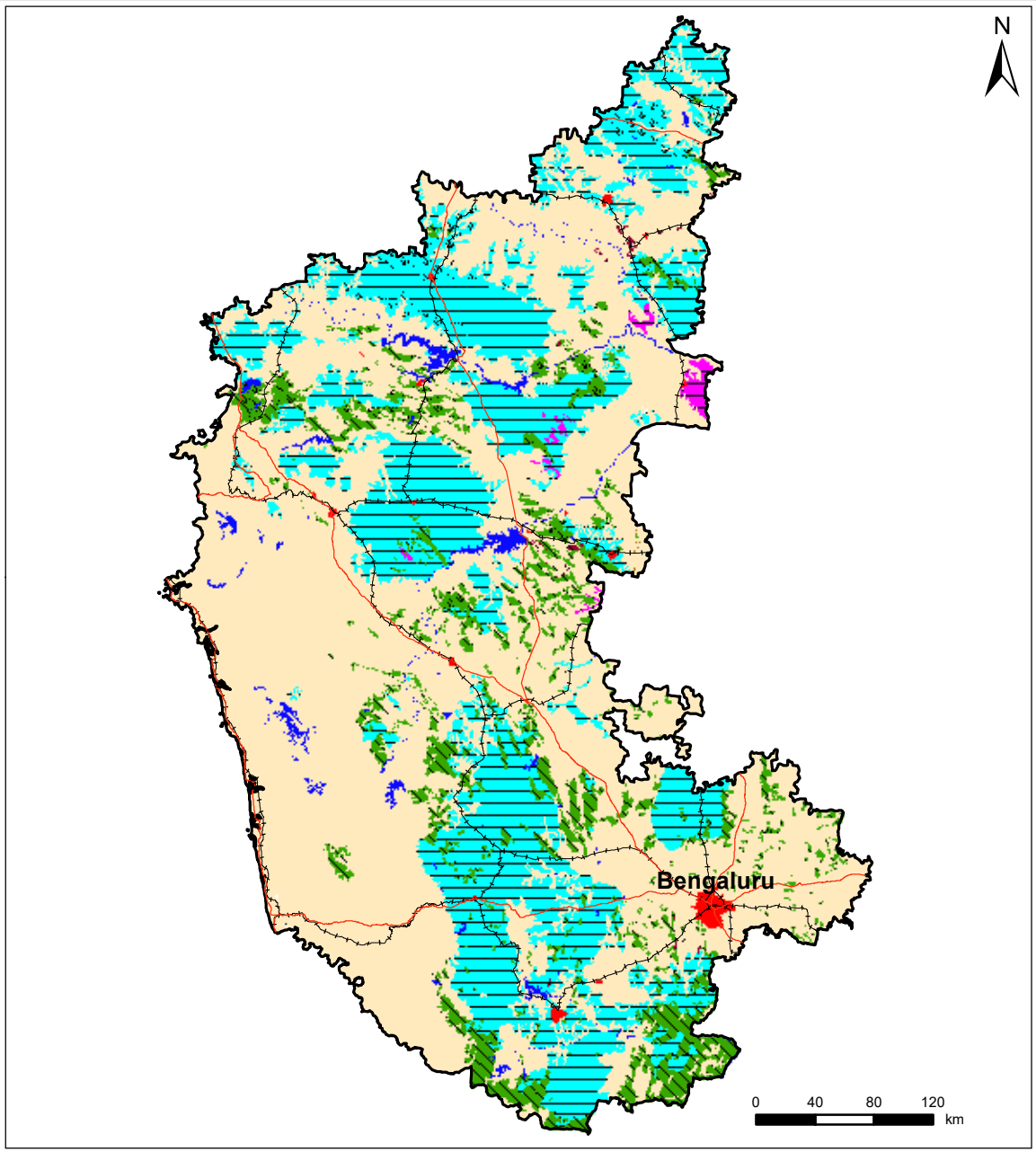
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
National Bureau of Soil Survey and Land Use Planning, Bengaluru
&
Space Applications Centre, ISRO, Ahmedabad



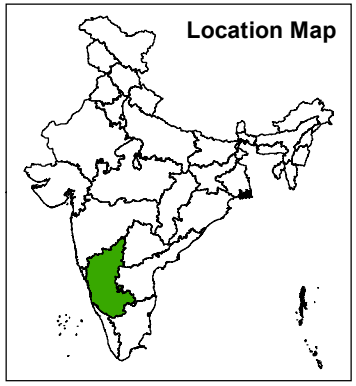
DESERTIFICATION / LAND DEGRADATION STATUS MAP KARNATAKA (2011-13)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ee1, 2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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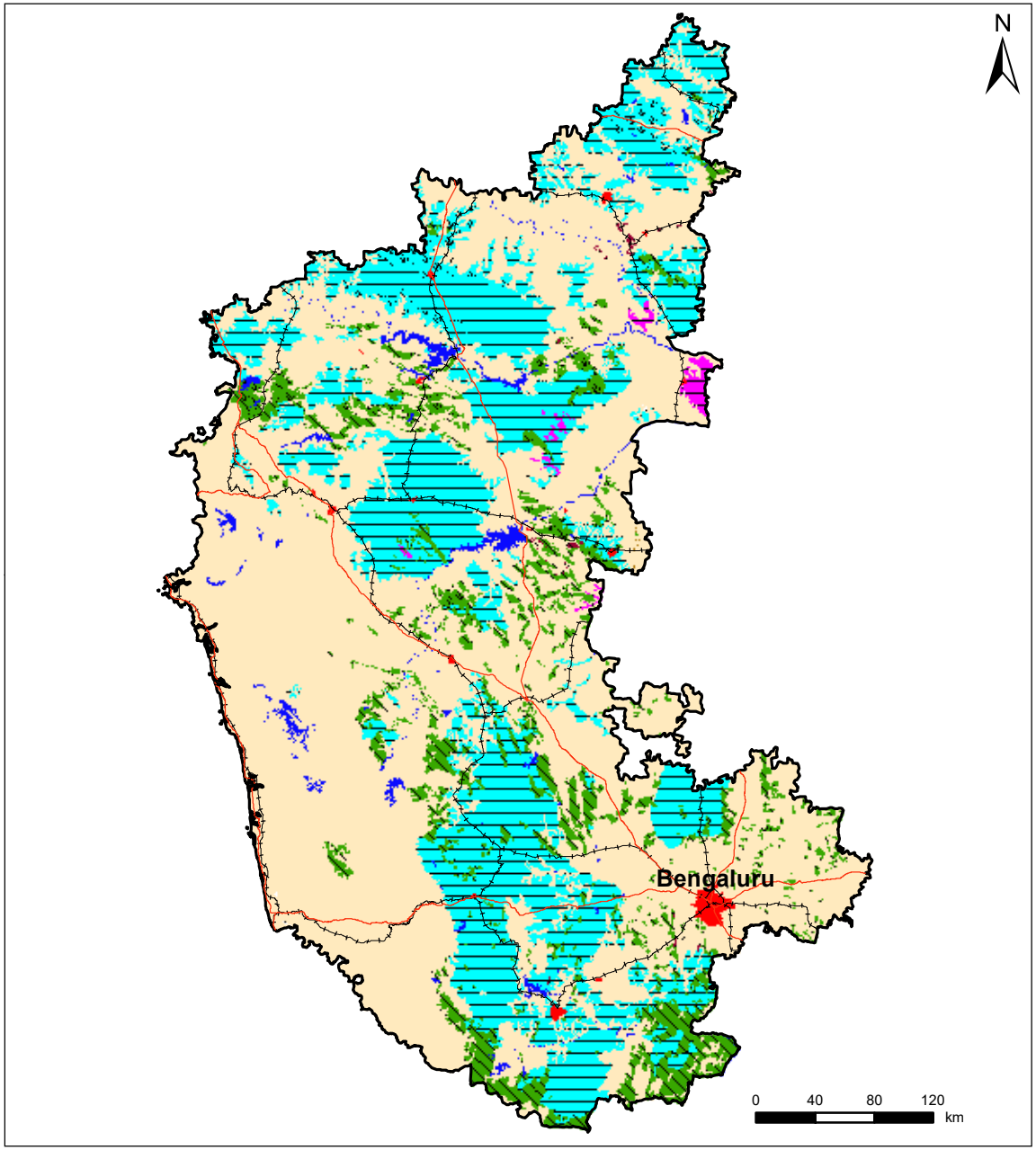
&
Space Applications Centre, ISRO, Ahmedabad



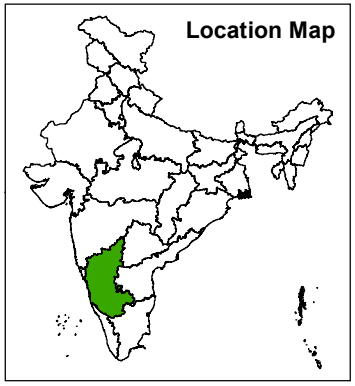
DESERTIFICATION / LAND DEGRADATION STATUS MAP KARNATAKA (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ee1, 2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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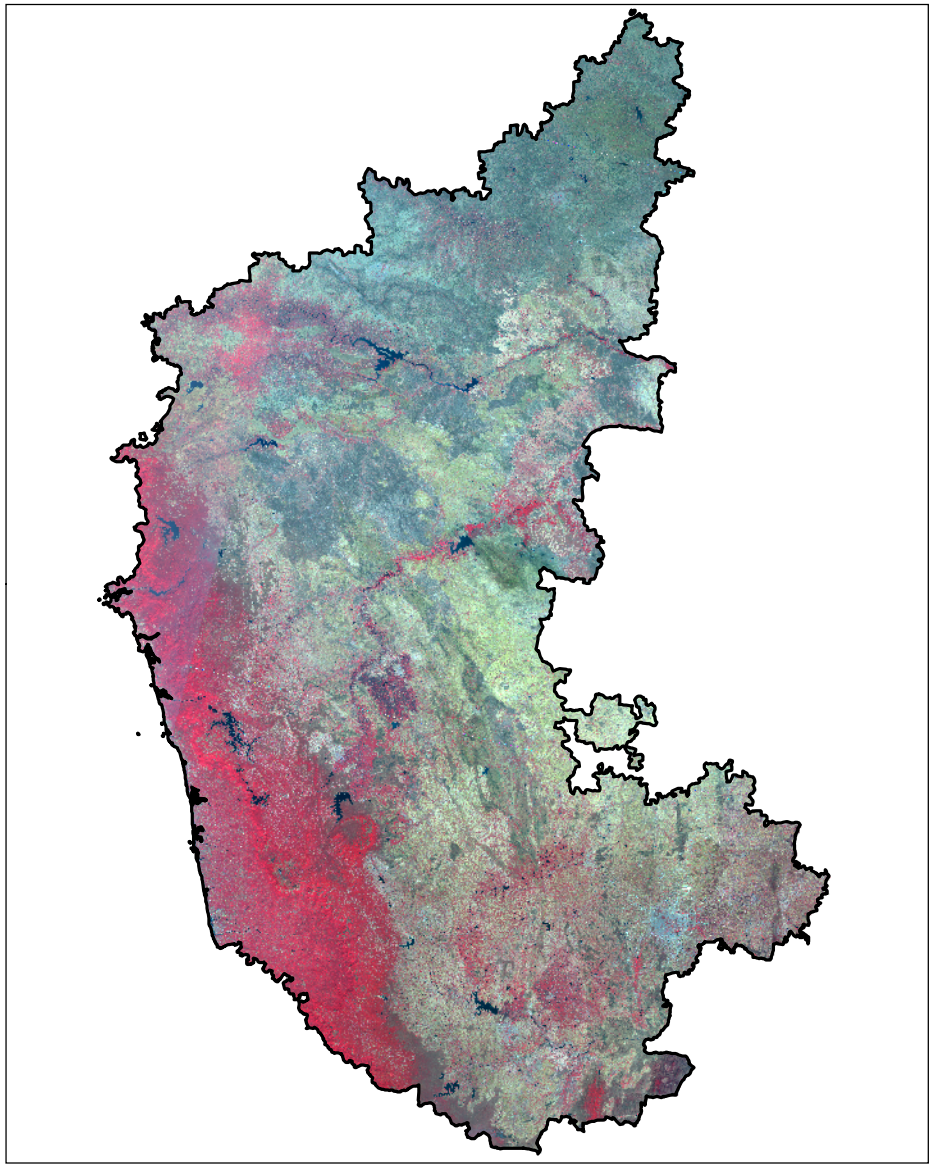
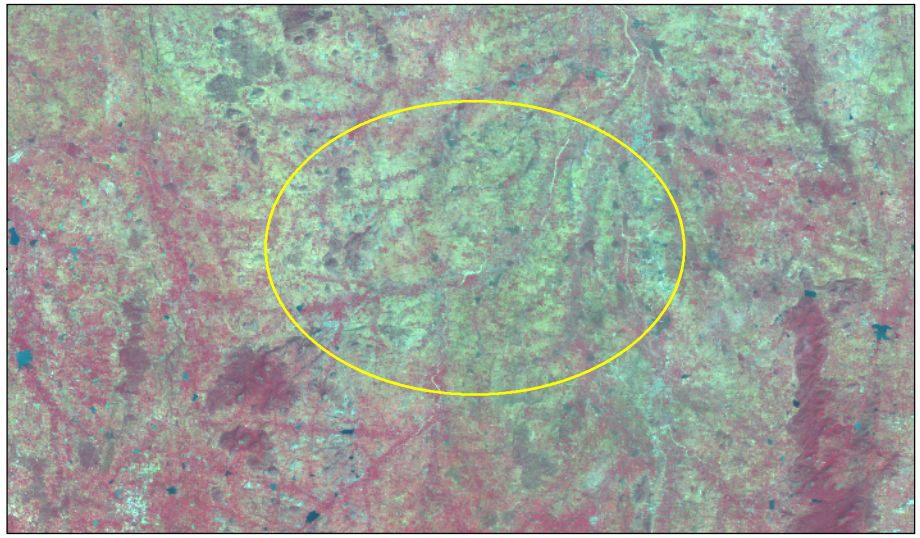
Karnataka - Illustrative representation of Land Degradation processes on IRS AWiFS data

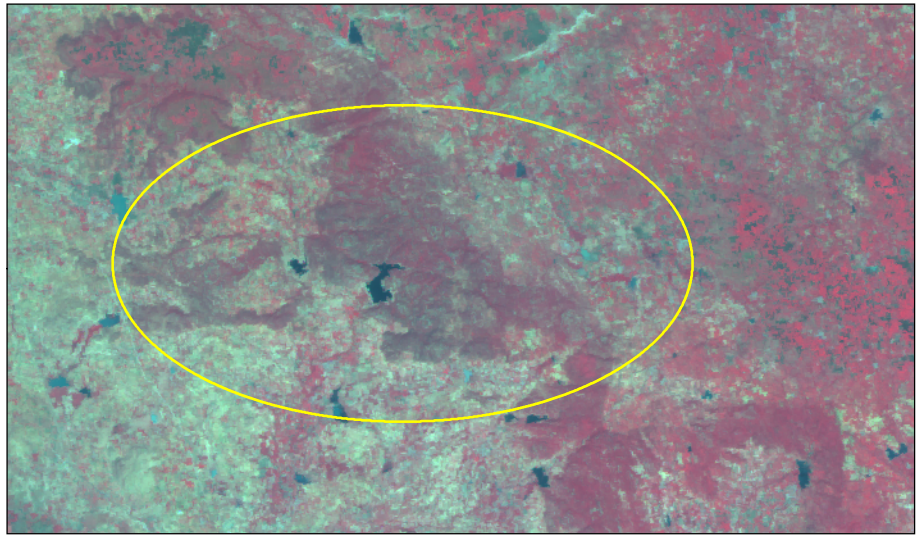
Karnataka as seen on IRS AWiFS (February 2019)



Agriculture area affected with water erosion (February 2019)



Forest area under vegetation degradation (October 2018)



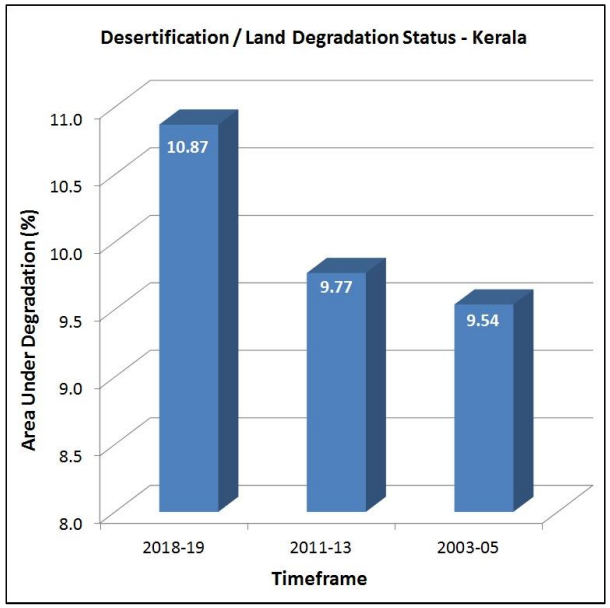
KERALA

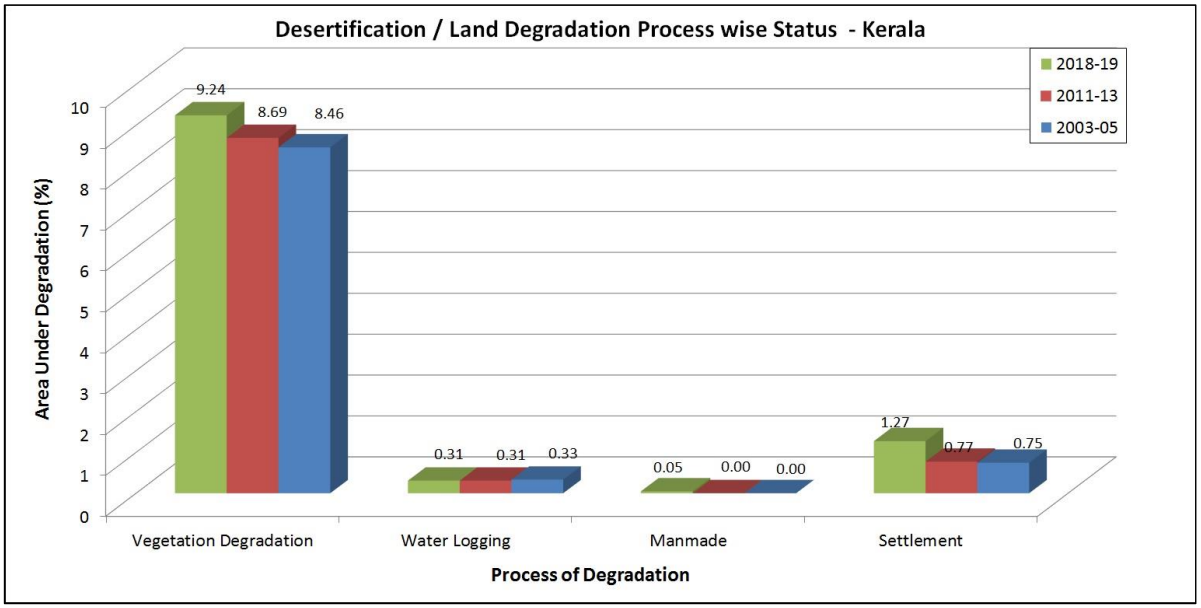
Kerala state is located in south west corner of India covering 38,852 sq km area. The state has population of 3,34,06,061; with 860 population density, 1084 sex ratio and 94% literacy (Census 2011). Thiruvananthapuram is the capital of Kerala. Kerala may be divided into three geographical regions high land of Western Ghats, undulating hills and valleys and coastal plain. Peryar, Bharatapuzha and Pampa are the three major rivers of Kerala. Kerala experiences tropical climate with average annual temperature of 35^{o} C. rainfall both in monsoon and winter. The climate is characterised by rainfall both in monsoon and winter season.

The statistical summary and analysis of the Land Degradation of Kerala state reveal that 10.87% (4,22,299 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 9.77% (3,79,587 ha) and 9.54% (3,70,512 ha) respectively. An increase of 1.10% (42,712 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.23% (9,075 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (9.24% in 2018-19, 8.69% in 2011-13 and 8.46% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation and area affected with manmade activities is observed. Whereas, from timeframe 2003-05 to 2011-13, slight increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages..

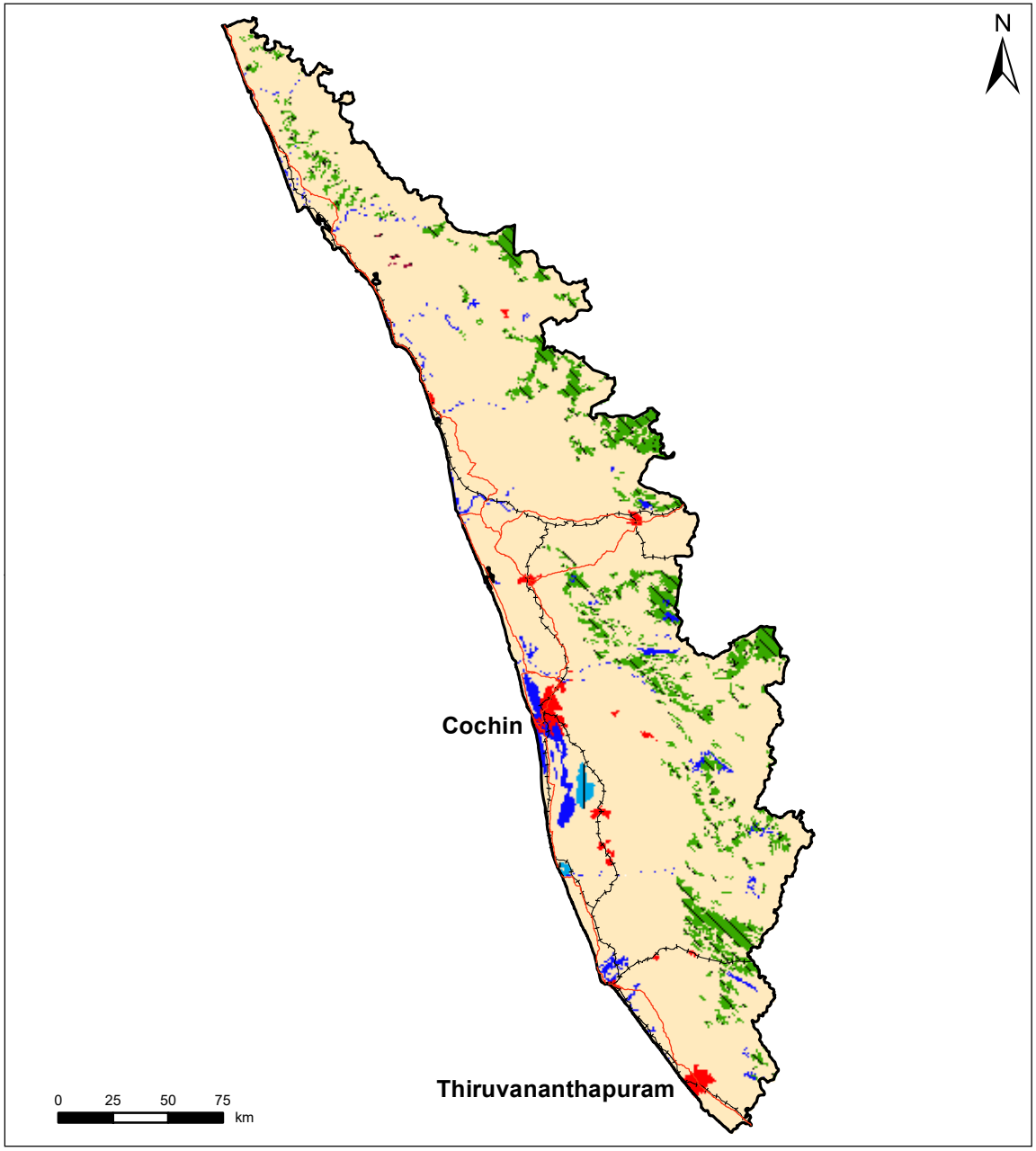




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	359046	9.24	337613	8.69	328638	8.46	21433	8975
Water Logging	11989	0.31	11989	0.31	12906	0.33	0	-917
Manmade	1759	0.05	0	0.00	0	0.00	1759	0
Settlement	49505	1.27	29984	0.77	28968	0.75	19520	1017
Total Area under Desertification	**422299**	**10.87**	**379587**	**9.77**	**370512**	**9.54**	**42712**	**9075**
No Apparent Degradation	**3381160**	**87.03**	**3455238**	**88.93**	**3464358**	**89.17**	**-74077**	**-9121**
Total Geographical Area (ha)	**3885200**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	254294	6.55	234646	6.04	19648
2	Fv2	Forest, vegetation degradation, High	23267	0.60	22964	0.59	303
3	Sv1	Land with scrub, vegetation degradation, Low	73428	1.89	71947	1.85	1481
4	Sv2	Land with scrub, vegetation degradation, High	8057	0.21	8057	0.21	0
5	Il1	Agriculture irrigated, water logging, Low	11989	0.31	11989	0.31	0
6	Fm1	Forest, man made, Low	436	0.01	0	0.00	436
7	Tm1	Others, man made, Low	1323	0.03	0	0.00	1323
8	S	Settlement	49505	1.27	29984	0.77	19520
Total Area Under Desertification/ Land Degradation			**422299**	**10.87**	**379587**	**9.77**	**42712**
9	W	Water body/ Drainage	81741	2.10	50376	1.30	31365
10	NAD	No Apparent Degradation	3381160	87.03	3455238	88.93	-74077
Total Geographical Area (ha)			**3885200**	**100**	**3885200**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	234646	6.04	227159	5.85	7487
2	Fv2	Forest, vegetation degradation, High	22964	0.59	21572	0.56	1392
3	Sv1	Land with scrub, vegetation degradation, Low	71947	1.85	71850	1.85	97
4	Sv2	Land with scrub, vegetation degradation, High	8057	0.21	8057	0.21	0
5	Il1	Agriculture irrigated, water logging, Low	11989	0.31	12906	0.33	-917
6	Fm1	Forest, man made, Low	0	0.00	0	0.00	0
7	Tm1	Others, man made, Low	0	0.00	0	0.00	0
8	S	Settlement	29984	0.77	28968	0.75	1017
Total Area Under Desertification/ Land Degradation			**379587**	**9.77**	**370512**	**9.54**	**9075**
9	W	Water body/ Drainage	50376	1.30	50330	1.30	46
10	NAD	No Apparent Degradation	3455238	88.93	3464358	89.17	-9121
Total Geographical Area (ha)			**3885200**	**100**	**3885200**	**100**	



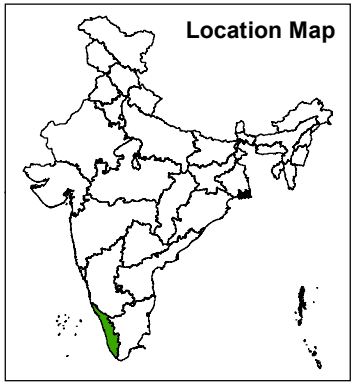
DESERTIFICATION / LAND DEGRADATION STATUS MAP KERALA (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Il1	Agriculture irrigated, water logging
	Fm1	Forest, man made
	Tm1	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

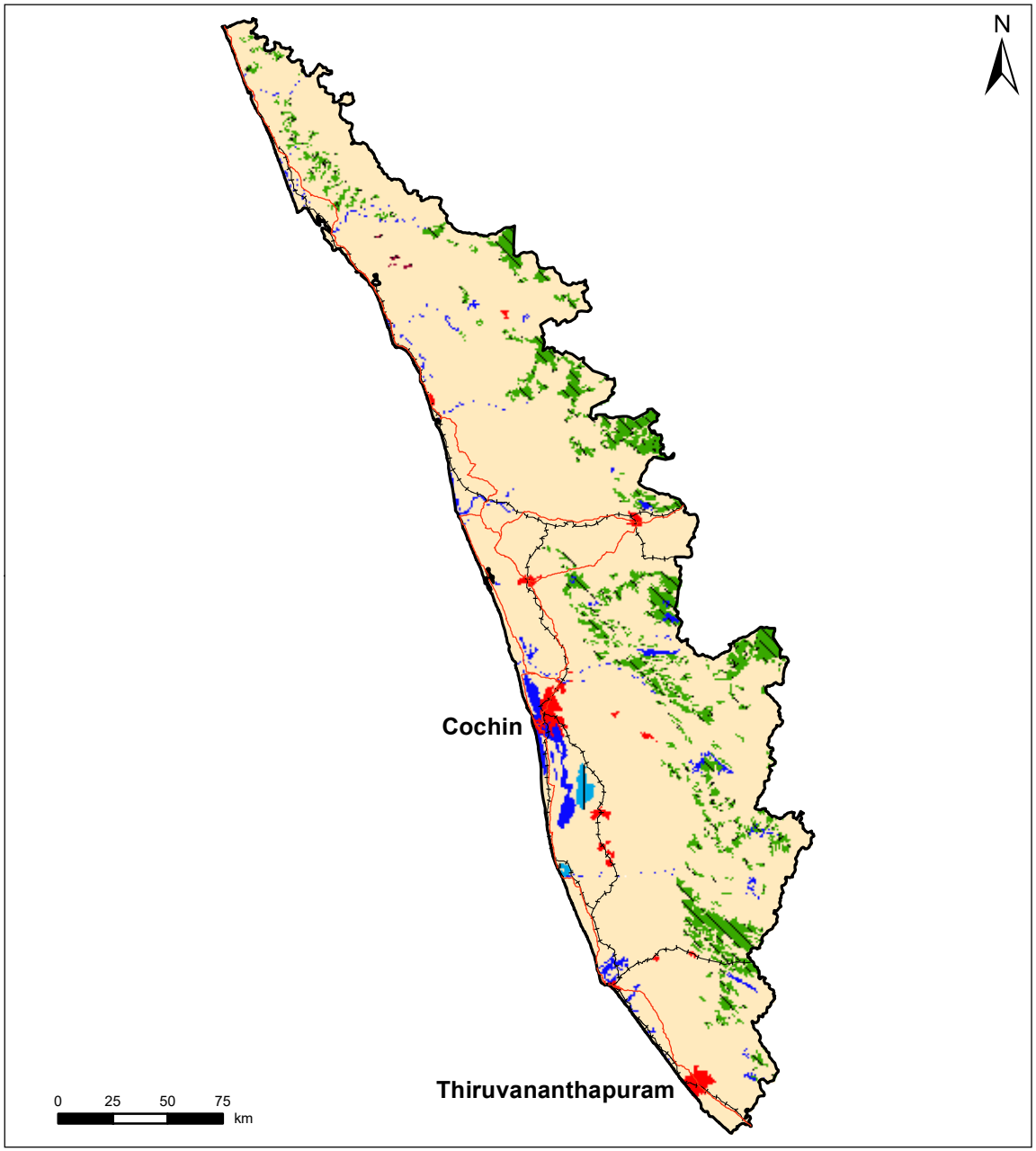
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
National Centre for Earth Science Studies, Thiruvananthapuram
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP KERALA (2011-13)

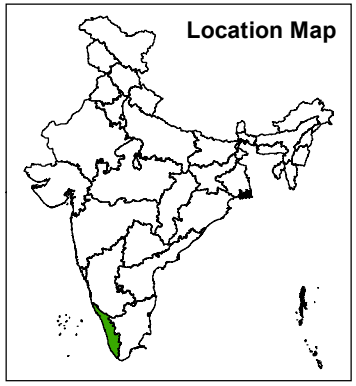
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	II1	Agriculture irrigated, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
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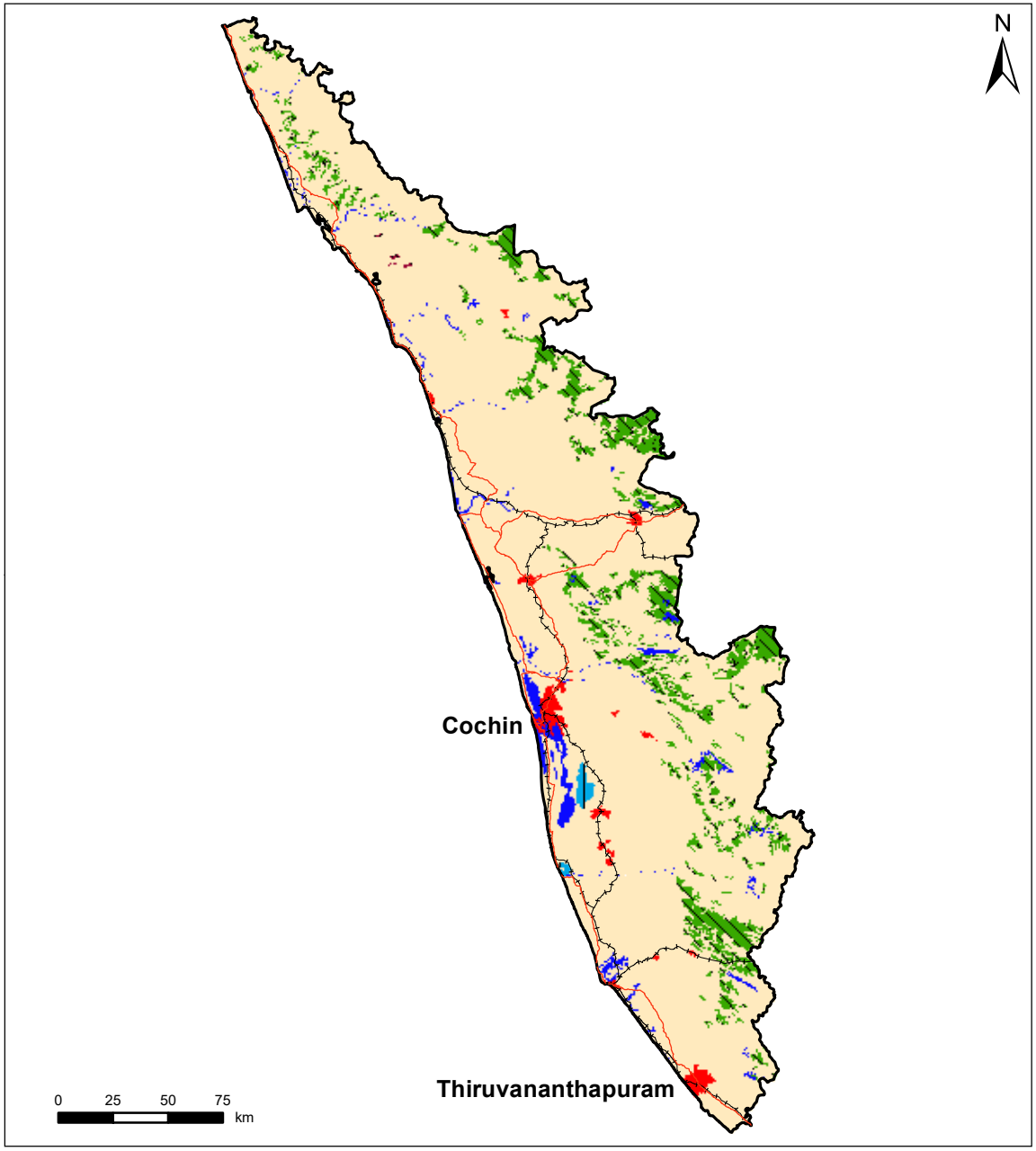
&
Space Applications Centre, ISRO, Ahmedabad



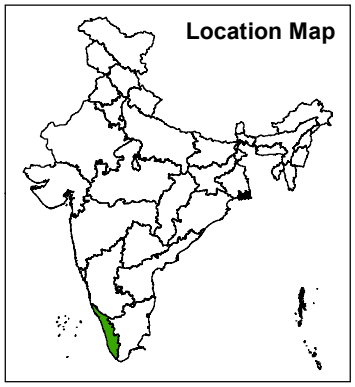
DESERTIFICATION / LAND DEGRADATION STATUS MAP KERALA (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Il1	Agriculture irrigated, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

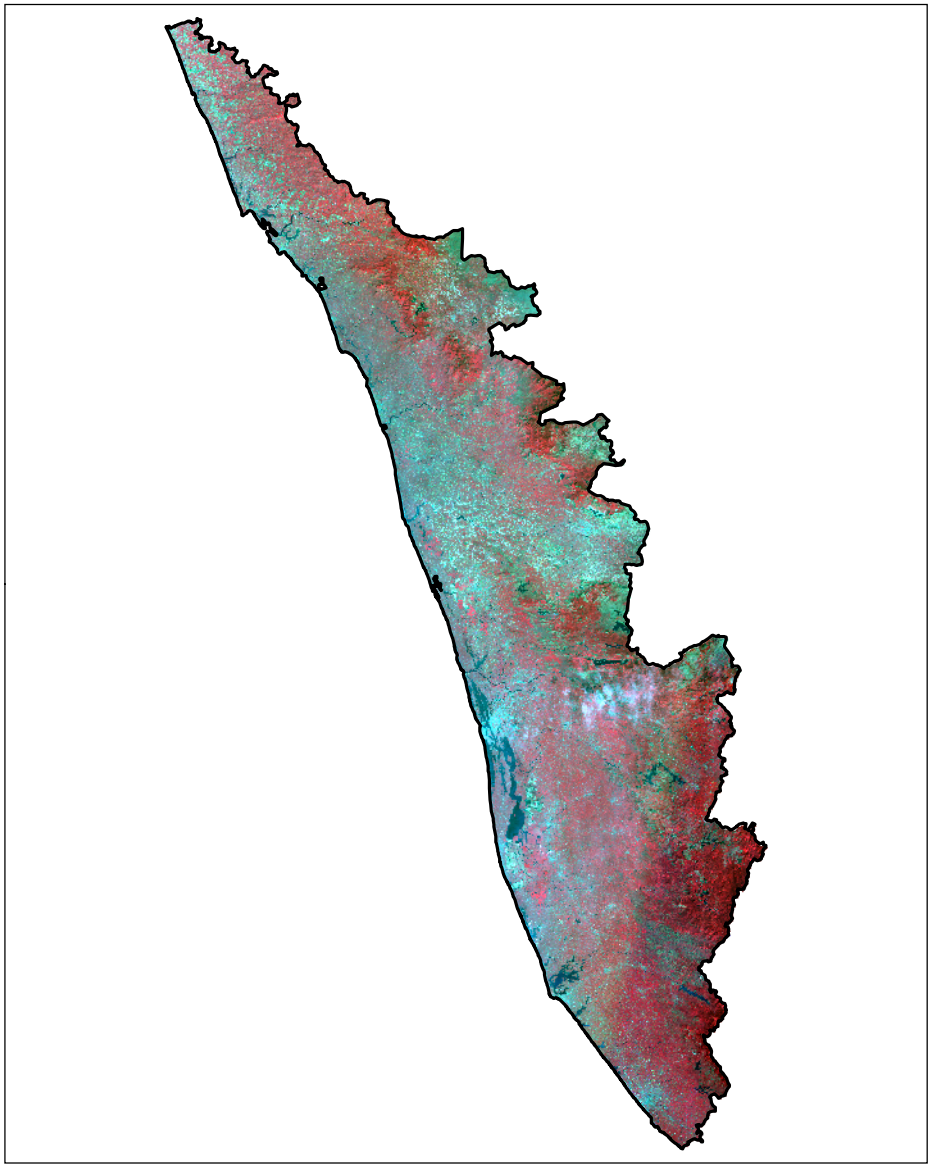
	International boundary
	State boundary
	Major roads
	Rail



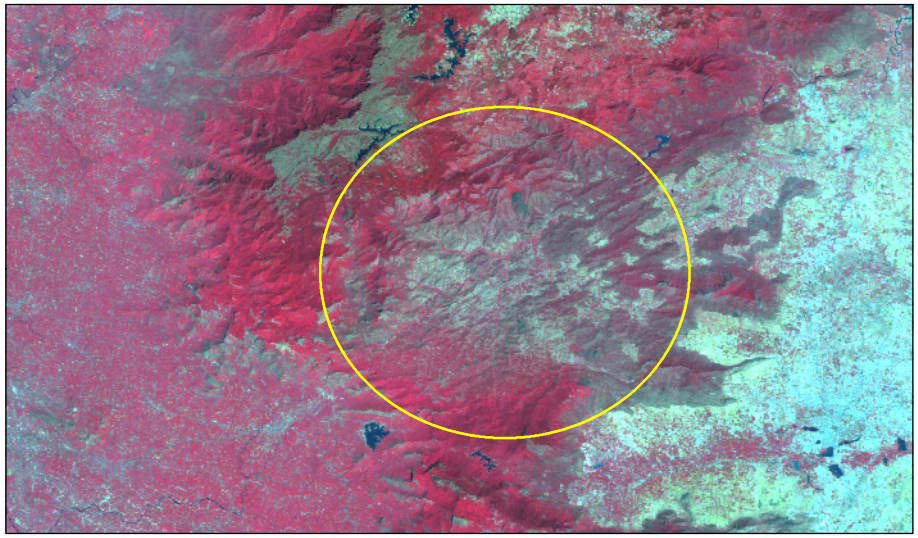
Prepared by:
Institute of Remote Sensing Anna University, Chennai
&
Space Applications Centre, ISRO, Ahmedabad

Kerala - Illustrative representation of Land Degradation processes on IRS AWiFS data

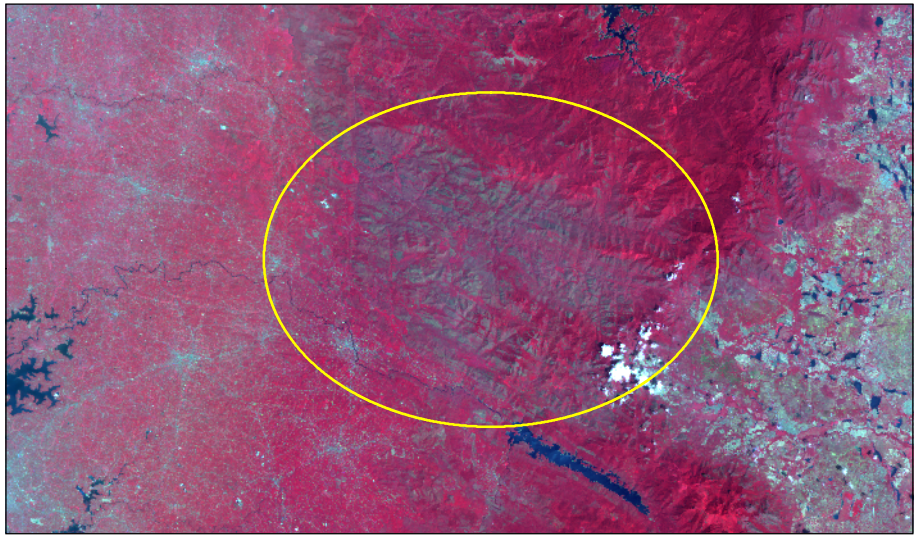
Kerala as seen on IRS AWiFS (February 2019)



Forest area under vegetation degradation (February 2019)



Forest area under vegetation degradation (February 2019)



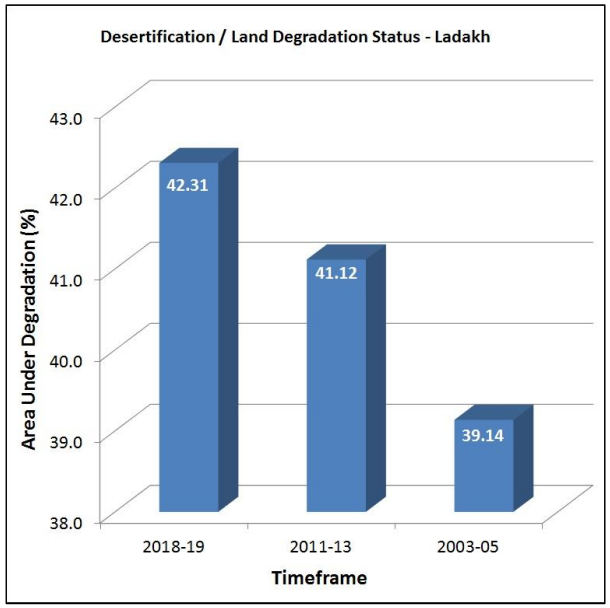
LADAKH

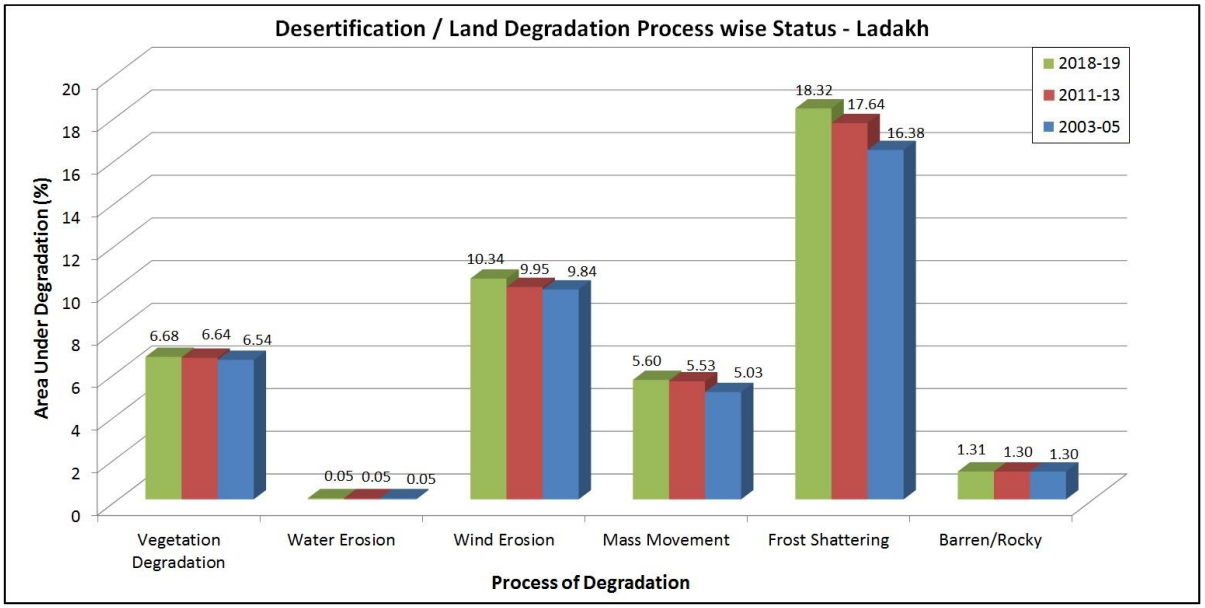
Ladakh is the northern most mountainous Union Territory (UT) of India, bordering with Afghanistan, China, Pakistan and spread over 1,68,097 sq km area. The UT has population of 2,74,289; with 1.63 population density and 65.63% literacy (Census 2011). The largest town in Ladakh is Leh, followed by Kargil, each of which headquarters a district. The Union Territory has several ranges like Ladakh, Zanskar and Karakorum ranges and several valleys viz. Suru, Nubra, Shyok, Zanskar Valley etc. Indus, Shyok, Suru and Zanaskar are the major rivers in the region. Ladakh host a large number of glaciers outside the polar region and some of the larger glaciers are Siachen, Hari parbat, Drang-Drung, Baltaro, Nun Kun etc. The climate in the UT varies greatly owing to its rugged topography. The climate usually is cold and dry, with scanty precipitation that falls mainly as snow during winters.

The statistical summary and analysis of the Land Degradation of Ladakh UT reveal that 42.31% (7.11 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 41.12% (6.91 million ha) and 39.14% (6.57 million ha) respectively. An increase of 1.19% (2,00,395 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.98% (3,32,920 ha).

The most significant process of desertification/ land degradation in the state is Frost Shattering (18.32% in 2018-19, 17.64% in 2011-13 and 16.38% in 2003-05) followed by Wind Erosion (10.34% in 2018-19, 9.95% in 2011-13 and 9.84% in 2003-05) and Vegetation Degradation (6.68% in 2018-19, 6.64% in 2011-13 and 6.54% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in area affected with frost shattering and wind erosion is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in area affected with frost shattering and mass movement is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

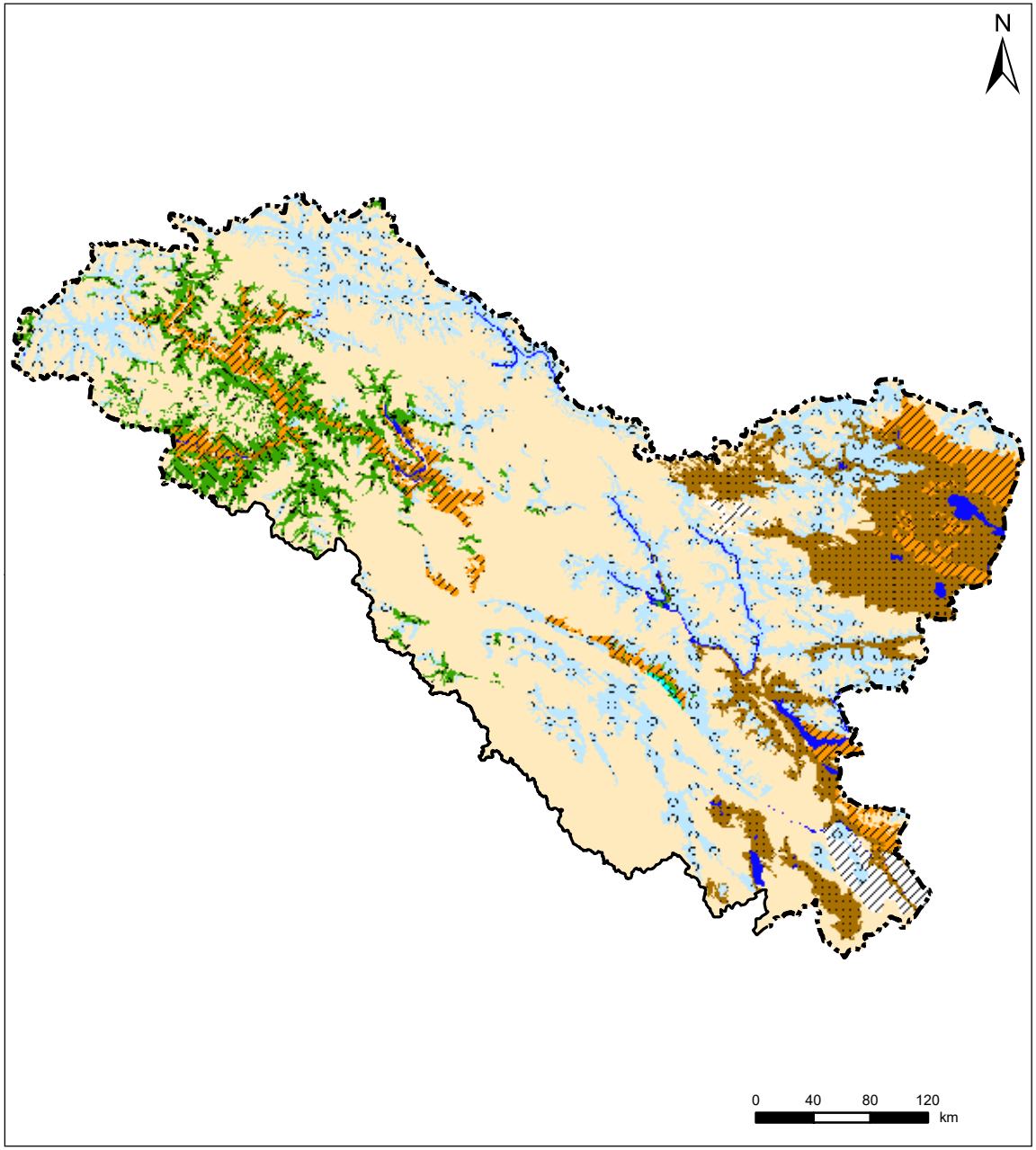




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	1122940	6.68	1115514	6.64	1098797	6.54	7426	16717
Water Erosion	9243	0.05	9243	0.05	9243	0.05	0	0
Wind Erosion	1738937	10.34	1673347	9.95	1653644	9.84	65590	19703
Mass Movement	941083	5.60	929710	5.53	845121	5.03	11373	84589
Frost Shattering	3080041	18.32	2964674	17.64	2752763	16.38	115367	211911
Barren/Rocky	219725	1.31	219085	1.30	219085	1.30	640	0
Total Area under Desertification	**7111968**	**42.31**	**6911573**	**41.12**	**6578653**	**39.14**	**200395**	**332920**
No Apparent Degradation	**9513355**	**56.59**	**9714757**	**57.79**	**10044881**	**59.76**	**-201402**	**-330124**
Total Geographical Area (ha)	**16809700**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	184173	1.10	165543	0.98	18630
2	Fv2	Forest, vegetation degradation, High	152546	0.91	163807	0.97	-11261
3	Sv1	Land with scrub, vegetation degradation, Low	749047	4.46	758153	4.51	-9106
4	Sv2	Land with scrub, vegetation degradation, High	37175	0.22	28012	0.17	9163
5	Bw1	Barren, water erosion, Low	9243	0.05	9243	0.05	0
6	Ee1	Dune / Sandy area, wind erosion, Low	1643624	9.78	1673347	9.95	-29723
7	Ee2	Dune / Sandy area, wind erosion, High	95313	0.57	0	0.00	95313
8	Bg2	Barren, mass movement, High	941083	5.60	929710	5.53	11373
9	Lf1	Periglacial, frost shattering, Low	1787293	10.63	1809939	10.77	-22646
10	Lf2	Periglacial, frost shattering, High	1292748	7.69	1154735	6.87	138013
11	B	Barren	219725	1.31	219085	1.30	640
Total Area Under Desertification/ Land Degradation			**7111968**	**42.31**	**6911573**	**41.12**	**200395**
12	W	Water body/ Drainage	184377	1.10	183370	1.09	1007
13	NAD	No Apparent Degradation	9513355	56.59	9714757	57.79	-201402
Total Geographical Area (ha)			**16809700**	**100**	**16809700**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	165543	0.98	191731	1.14	-26188
2	Fv2	Forest, vegetation degradation, High	163807	0.97	160834	0.96	2973
3	Sv1	Land with scrub, vegetation degradation, Low	758153	4.51	715133	4.25	43020
4	Sv2	Land with scrub, vegetation degradation, High	28012	0.17	31099	0.19	-3088
5	Bw1	Barren, water erosion, Low	9243	0.05	9243	0.05	0
6	Ee1	Dune / Sandy area, wind erosion, Low	1673347	9.95	1653644	9.84	19703
7	Ee2	Dune / Sandy area, wind erosion, High	0	0.00	0	0.00	0
8	Bg2	Barren, mass movement, High	929710	5.53	845121	5.03	84589
9	Lf1	Periglacial, frost shattering, Low	1809939	10.77	1953179	11.62	-143240
10	Lf2	Periglacial, frost shattering, High	1154735	6.87	799584	4.76	355151
11	B	Barren	219085	1.30	219085	1.30	0
Total Area Under Desertification/ Land Degradation			**6911573**	**41.12**	**6578653**	**39.14**	**332920**
12	W	Water body/ Drainage	183370	1.09	186167	1.11	-2797
13	NAD	No Apparent Degradation	9714757	57.79	10044881	59.76	-330124
Total Geographical Area (ha)			**16809700**	**100**	**16809700**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP
Ladakh (2018-19)

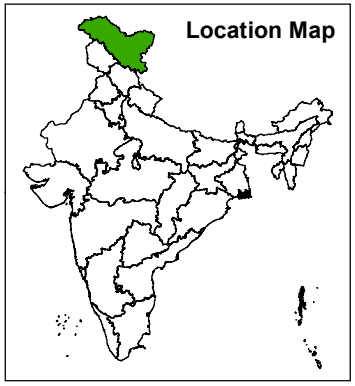
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Bw1	Barren, water erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Bg2	Barren, mass movement
	Lf1,2	Periglacial, frost shattering
	B	Barren
	W	Water body / Drainage
	NAD	No Apparent Degradation

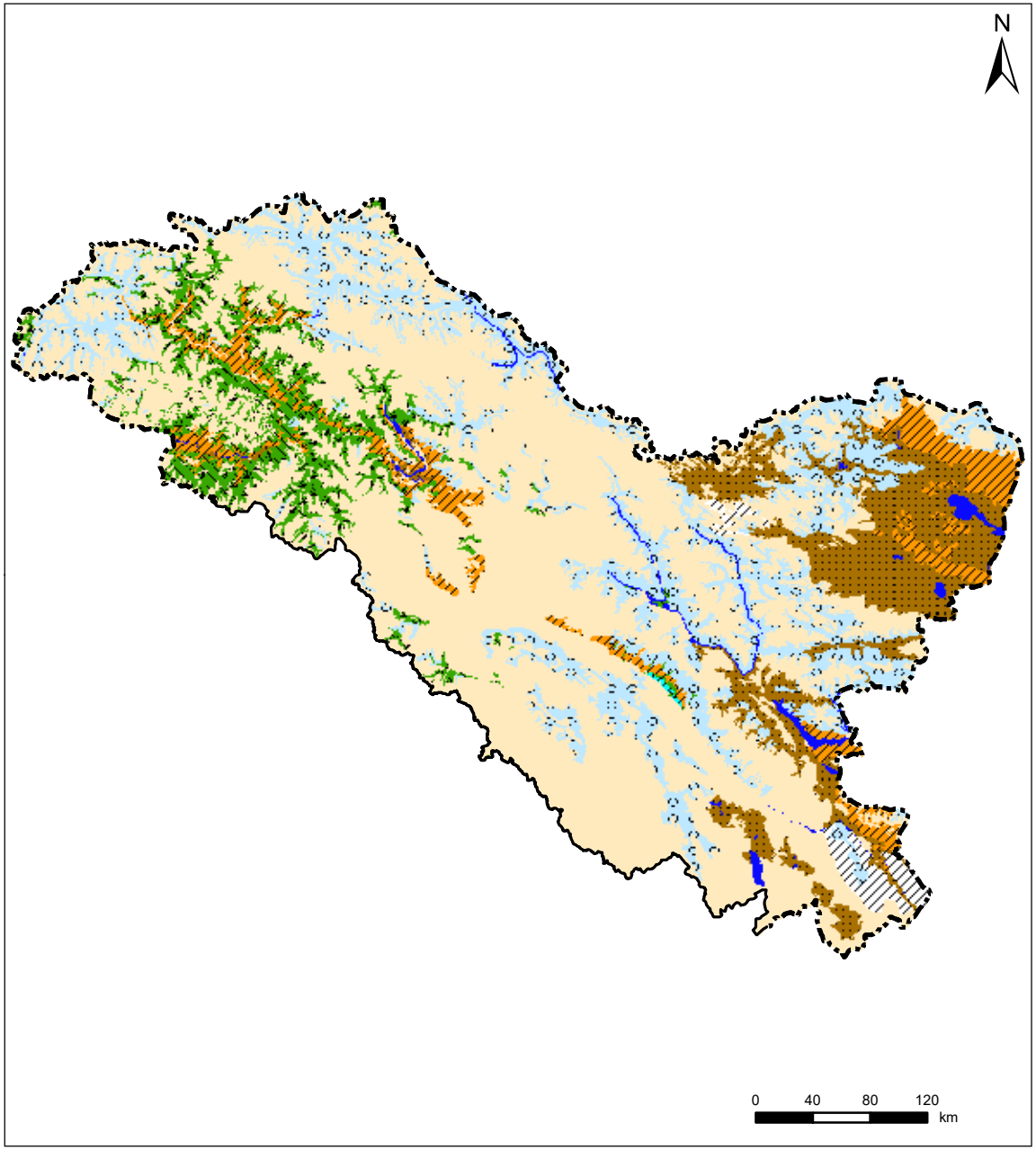
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
University of Kashmir, Srinagar
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP
Ladakh (2011-13)

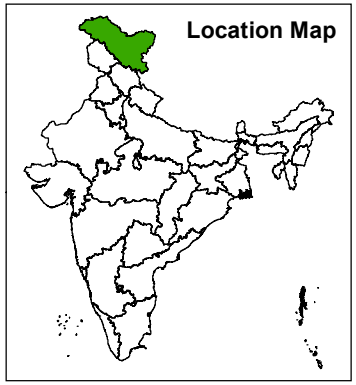
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Bw1	Barren, water erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Bg2	Barren, mass movement
	Lf1,2	Periglacial, frost shattering
	B	Barren
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
University of Kashmir, Srinagar
&
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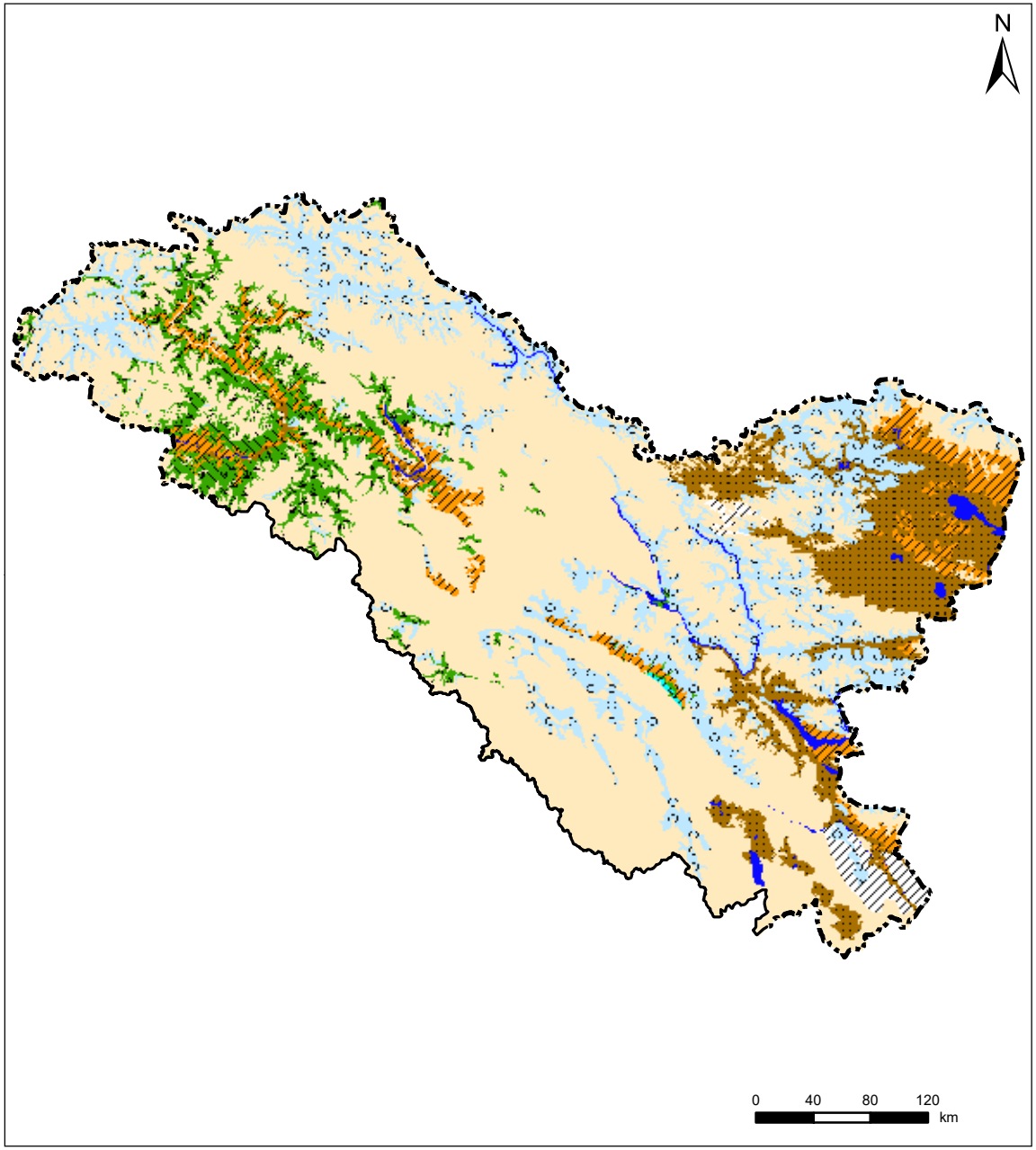


DESERTIFICATION / LAND DEGRADATION STATUS MAP
Ladakh (2003-05)

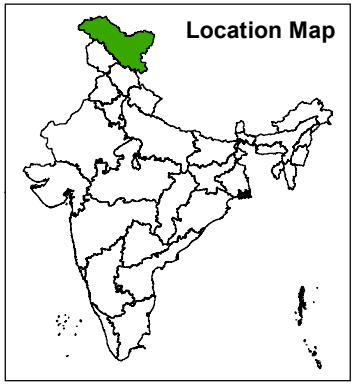
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Bw1	Barren, water erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Bg2	Barren, mass movement
	Lf1,2	Periglacial, frost shattering
	B	Barren
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

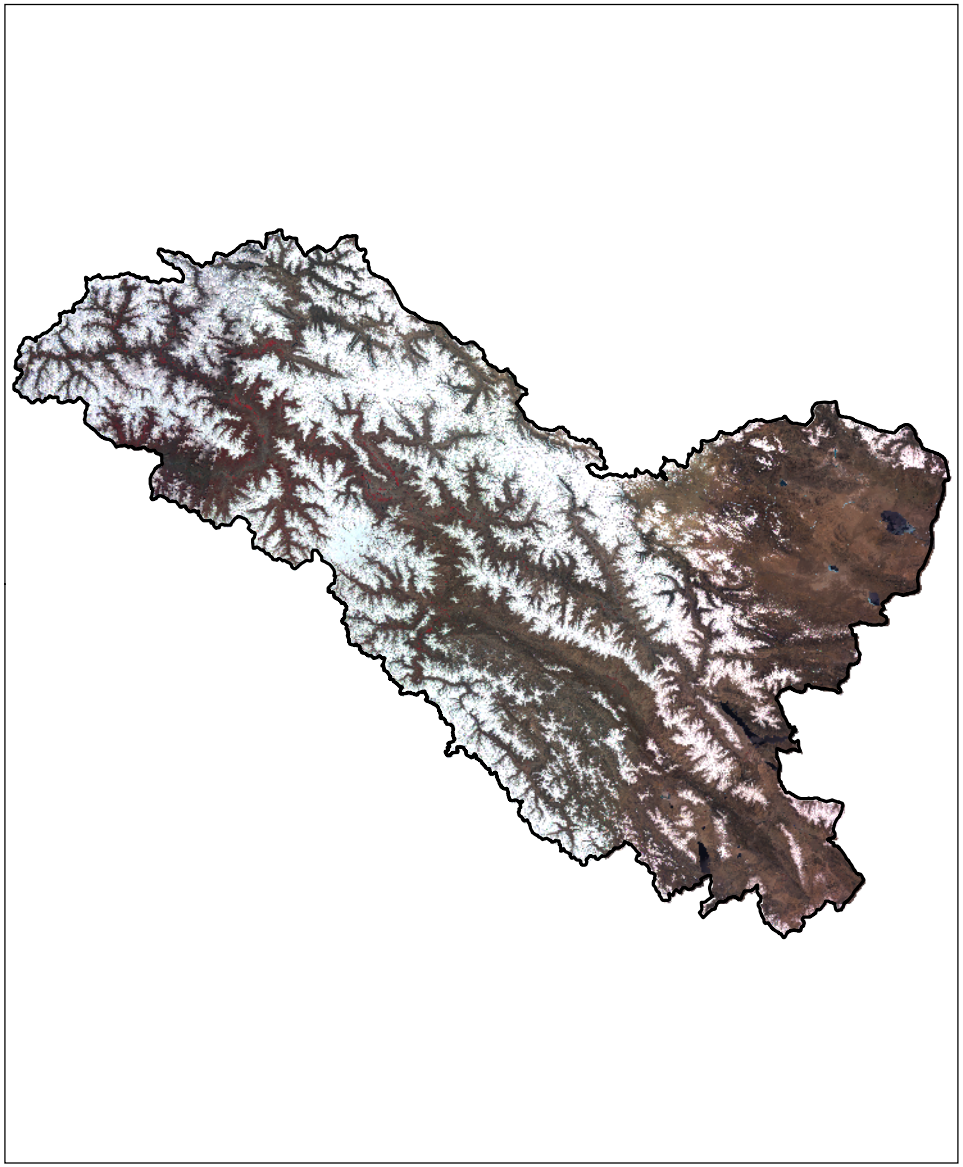
	International boundary
	State boundary
	Major roads
	Rail



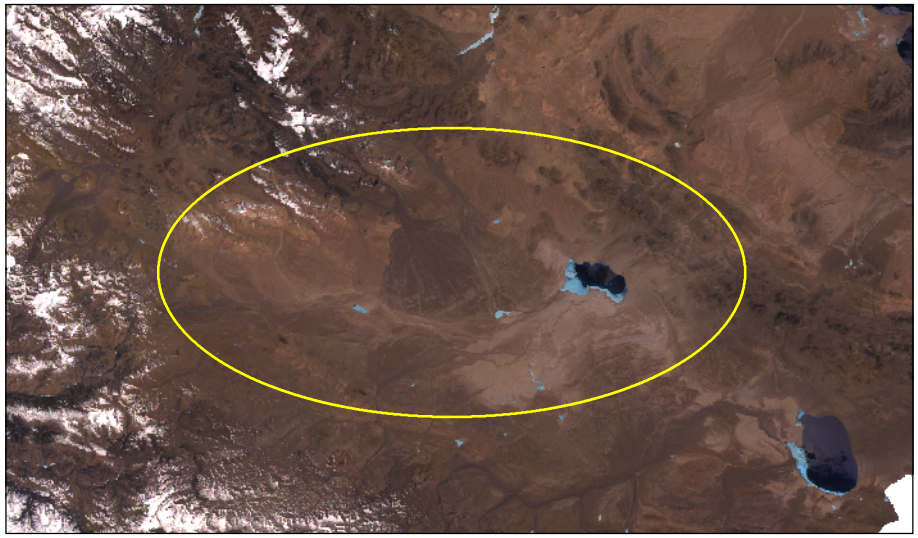
Prepared by:
University of Kashmir, Srinagar
&
Space Applications Centre, ISRO, Ahmedabad

Ladakh - Illustrative representation of Land Degradation processes on IRS AWiFS data

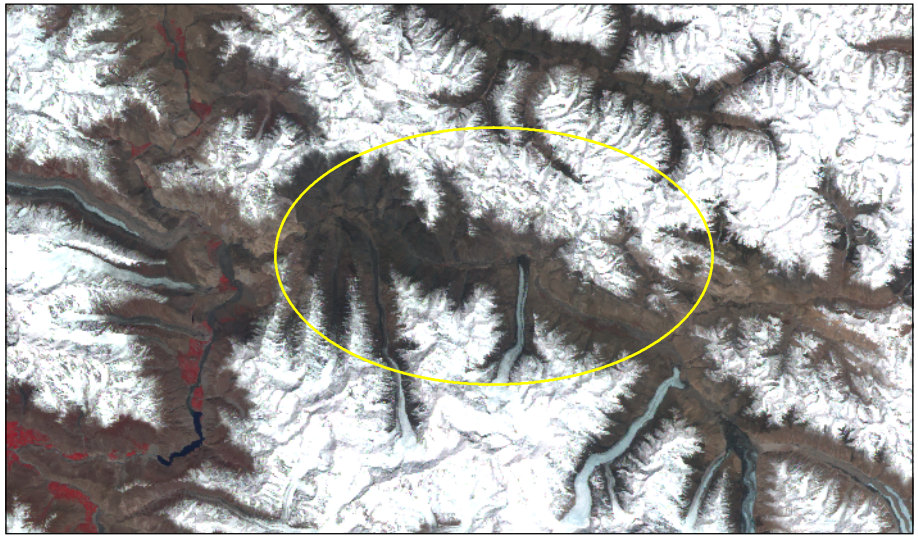
Ladakh as seen on IRS AWiFS (May 2019)



Area under wind erosion (May 2019)



Area under frost shattering (May 2019)



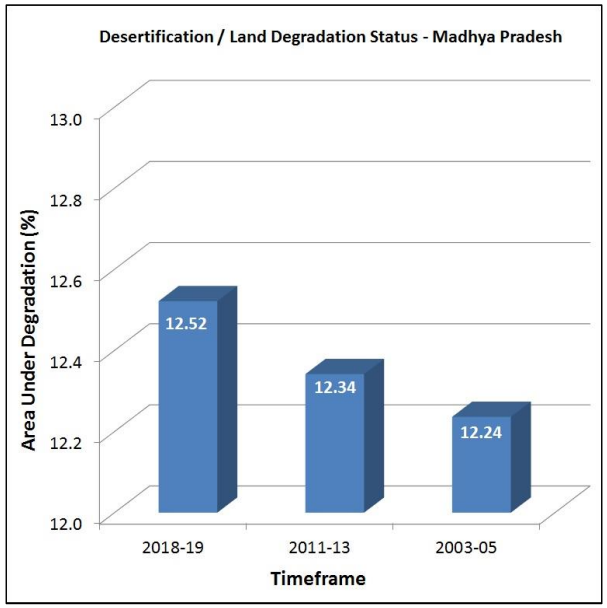
MADHYA PRADESH

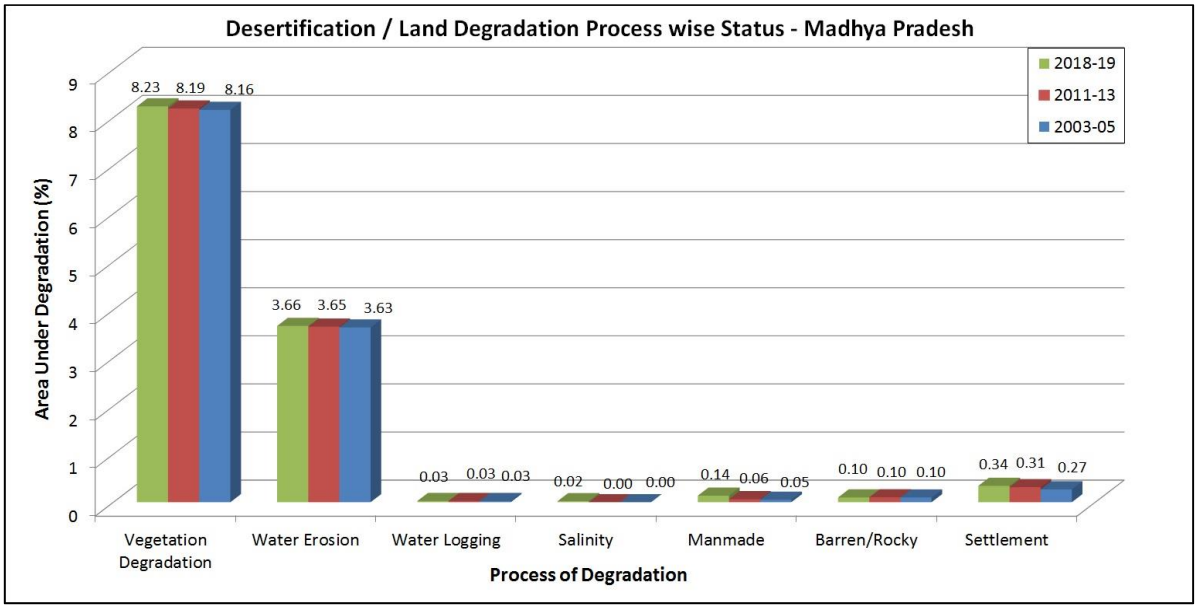
Madhya Pradesh state is located in the heart of the country and is second largest state covering 3,08,252 sq km area. The state has population of 7,26,26,809; with 236 population density, 931 sex ratio and 69.32% literacy (Census 2011). Bhopal is the capital of Madhya Pradesh. Madhya Pradesh has varied geo-structural divisions, viz. undulating plateaus, Vindhya Hills, Escarpments, Bhander-Kaimur ranges, and plains. The major rivers are Chambal, Narmada, Betwa etc. The state has variety of forests like Dry thorn forests, tropical moist deciduous and evergreen forest with a diverse soil like Black cotton soil, light sandy soil and rich alluvial soil. The state experiences hot and dry summer and cold winter with rainfall of 990 mm in monsoon.

The statistical summary and analysis of the Land Degradation of Madhya Pradesh state reveal that 12.52% (3.85 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 12.34% (3.80 million ha) and 12.24% (3.77 million ha) respectively. An increase of 0.18% (55,420 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.10% (32,462 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (8.23% in 2018-19, 8.19% in 2011-13 and 8.16% in 2003-05) followed by Water Erosion (3.66% in 2018-19, 3.65% in 2011-13 and 3.63% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation and area affected with manmade activities is observed. Whereas, from timeframe 2003-05 to 2011-13, slight increase in forest area undergoing vegetation degradation and agriculture area undergoing water erosion is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

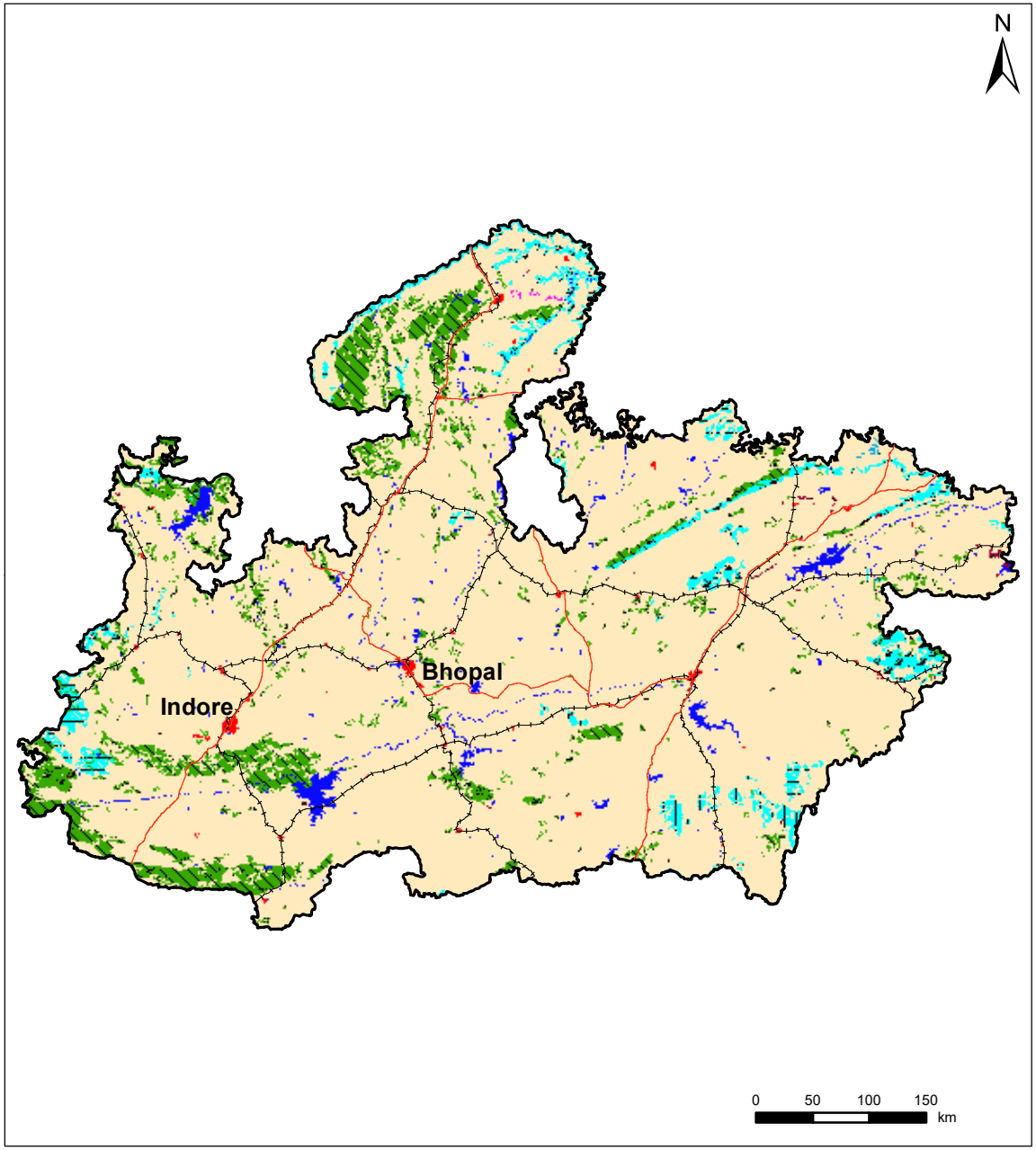




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	2537442	8.23	2523801	8.19	2514983	8.16	13642	8818
Water Erosion	1129718	3.66	1125418	3.65	1120221	3.63	4300	5197
Water Logging	7788	0.03	7788	0.03	7788	0.03	0	0
Salinity	6854	0.02	0	0.00	0	0.00	6854	0
Manmade	42018	0.14	19454	0.06	16024	0.05	22563	3430
Barren/Rocky	30873	0.10	31495	0.10	30457	0.10	-622	1037
Settlement	105043	0.34	96359	0.31	82379	0.27	8683	13980
Total Area under Desertification	**3859735**	**12.52**	**3804315**	**12.34**	**3771853**	**12.24**	**55420**	**32462**
No Apparent Degradation	**26417669**	**85.70**	**26502030**	**85.98**	**26648676**	**86.45**	**-84360**	**-146646**
Total Geographical Area (ha)	**30825200**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	1710937	5.55	1714199	5.56	-3262
2	Fv2	Forest, vegetation degradation, High	105855	0.34	100505	0.33	5350
3	Sv1	Land with scrub, vegetation degradation, Low	578531	1.88	568500	1.84	10032
4	Sv2	Land with scrub, vegetation degradation, High	142118	0.46	140597	0.46	1522
5	Iw1	Agriculture irrigated, water erosion, Low	141708	0.46	141866	0.46	-158
6	Dw1	Agriculture unirrigated, water erosion, Low	216091	0.70	212513	0.69	3578
7	Dw2	Agriculture unirrigated, water erosion, High	38367	0.12	37107	0.12	1260
8	Fw1	Forest, water erosion, Low	102392	0.33	102708	0.33	-316
9	Fw2	Forest, water erosion, High	26930	0.09	26930	0.09	0
10	Sw1	Land with scrub, water erosion, Low	505027	1.64	505091	1.64	-64
11	Sw2	Land with scrub, water erosion, High	99203	0.32	99203	0.32	0
12	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	6854	0.02	0	0.00	6854
13	Il1	Agriculture irrigated, water logging, Low	7788	0.03	7788	0.03	0
14	Fm2	Forest, man made, High	5262	0.02	2533	0.01	2728
15	Tm1	Others, man made, Low	15200	0.05	4407	0.01	10794
16	Tm2	Others, man made, High	21556	0.07	12514	0.04	9041
17	R	Rocky	30873	0.10	31495	0.10	-622
18	S	Settlement	105043	0.34	96359	0.31	8683
Total Area Under Desertification/ Land Degradation			**3859735**	**12.52**	**3804315**	**12.34**	**55420**
19	W	Water body/ Drainage	547795	1.78	518855	1.68	28940
20	NAD	No Apparent Degradation	26417669	85.70	26502030	85.98	-84360
Total Geographical Area (ha)			**30825200**	**100**	**30825200**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	1714199	5.56	1711055	5.55	3144
2	Fv2	Forest, vegetation degradation, High	100505	0.33	101474	0.33	-969
3	Sv1	Land with scrub, vegetation degradation, Low	568500	1.84	561495	1.82	7005
4	Sv2	Land with scrub, vegetation degradation, High	140597	0.46	140958	0.46	-362
5	Iw1	Agriculture irrigated, water erosion, Low	141866	0.46	141866	0.46	0
6	Dw1	Agriculture unirrigated, water erosion, Low	212513	0.69	208277	0.68	4236
7	Dw2	Agriculture unirrigated, water erosion, High	37107	0.12	41602	0.13	-4495
8	Fw1	Forest, water erosion, Low	102708	0.33	102708	0.33	0
9	Fw2	Forest, water erosion, High	26930	0.09	26930	0.09	0
10	Sw1	Land with scrub, water erosion, Low	505091	1.64	499635	1.62	5456
11	Sw2	Land with scrub, water erosion, High	99203	0.32	99203	0.32	0
12	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	0	0.00	0	0.00	0
13	Il1	Agriculture irrigated, water logging, Low	7788	0.03	7788	0.03	0
14	Fm2	Forest, man made, High	2533	0.01	2533	0.01	0
15	Tm1	Others, man made, Low	4407	0.01	2571	0.01	1835
16	Tm2	Others, man made, High	12514	0.04	10920	0.04	1595
17	R	Rocky	31495	0.10	30457	0.10	1037
18	S	Settlement	96359	0.31	82379	0.27	13980
Total Area Under Desertification/ Land Degradation			**3804315**	**12.34**	**3771853**	**12.24**	**32462**
19	W	Water body/ Drainage	518855	1.68	404671	1.31	114184
20	NAD	No Apparent Degradation	26502030	85.98	26648676	86.45	-146646
Total Geographical Area (ha)			**30825200**	**100**	**30825200**	**100**	



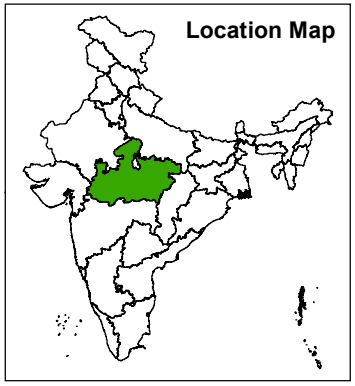
DESERTIFICATION / LAND DEGRADATION STATUS MAP MADHYA PRADESH (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Il1	Agriculture irrigated, water logging
	Fm2	Forest, man made
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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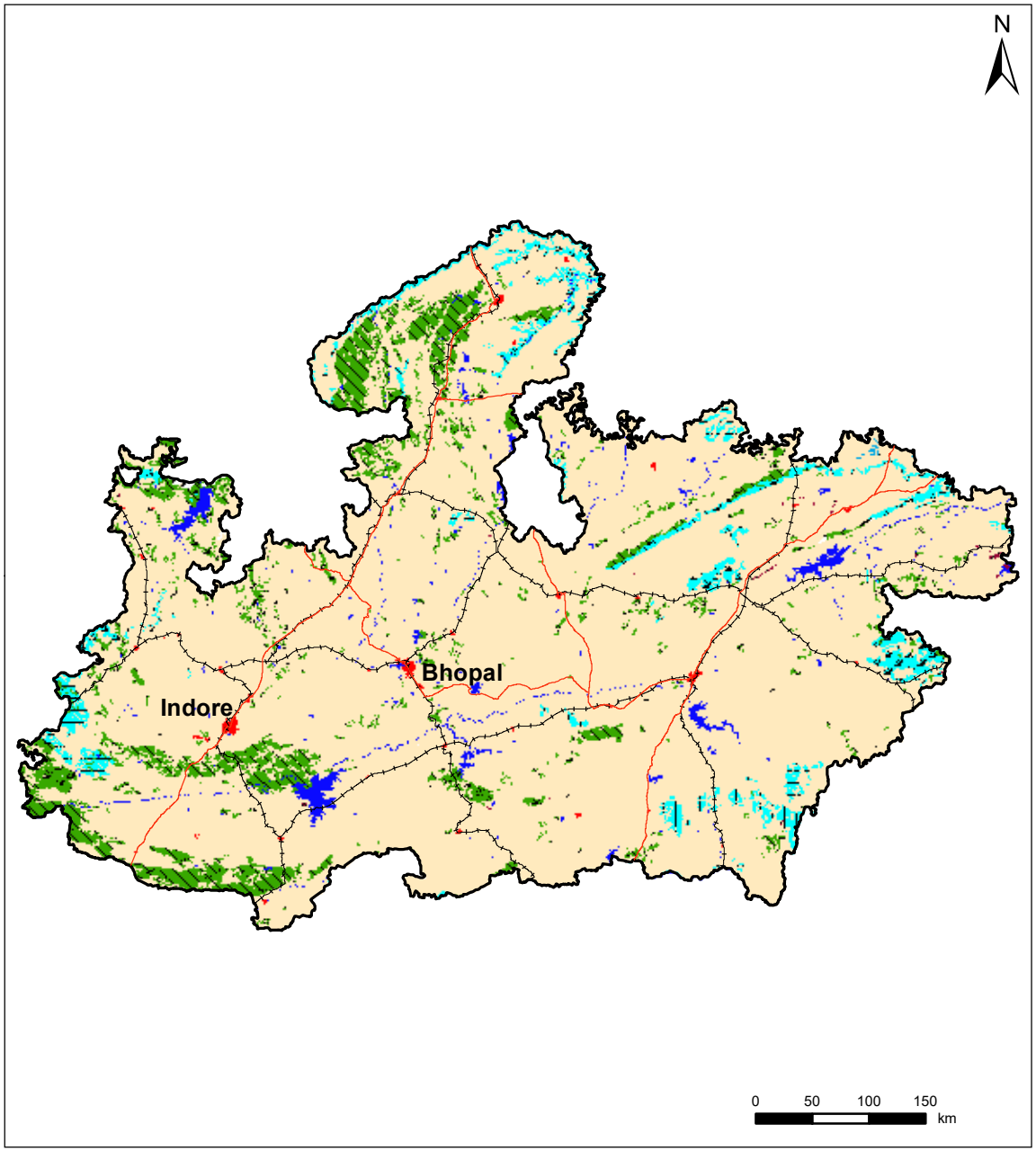
&
Space Applications Centre, ISRO, Ahmedabad



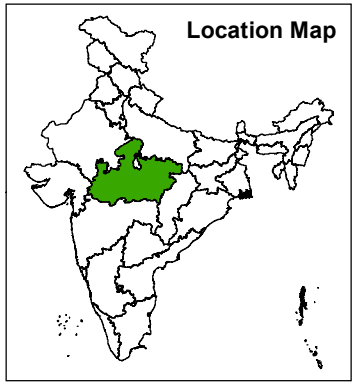
DESERTIFICATION / LAND DEGRADATION STATUS MAP MADHYA PRADESH (2011-13)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Il1	Agriculture irrigated, water logging
	Fm2	Forest, man made
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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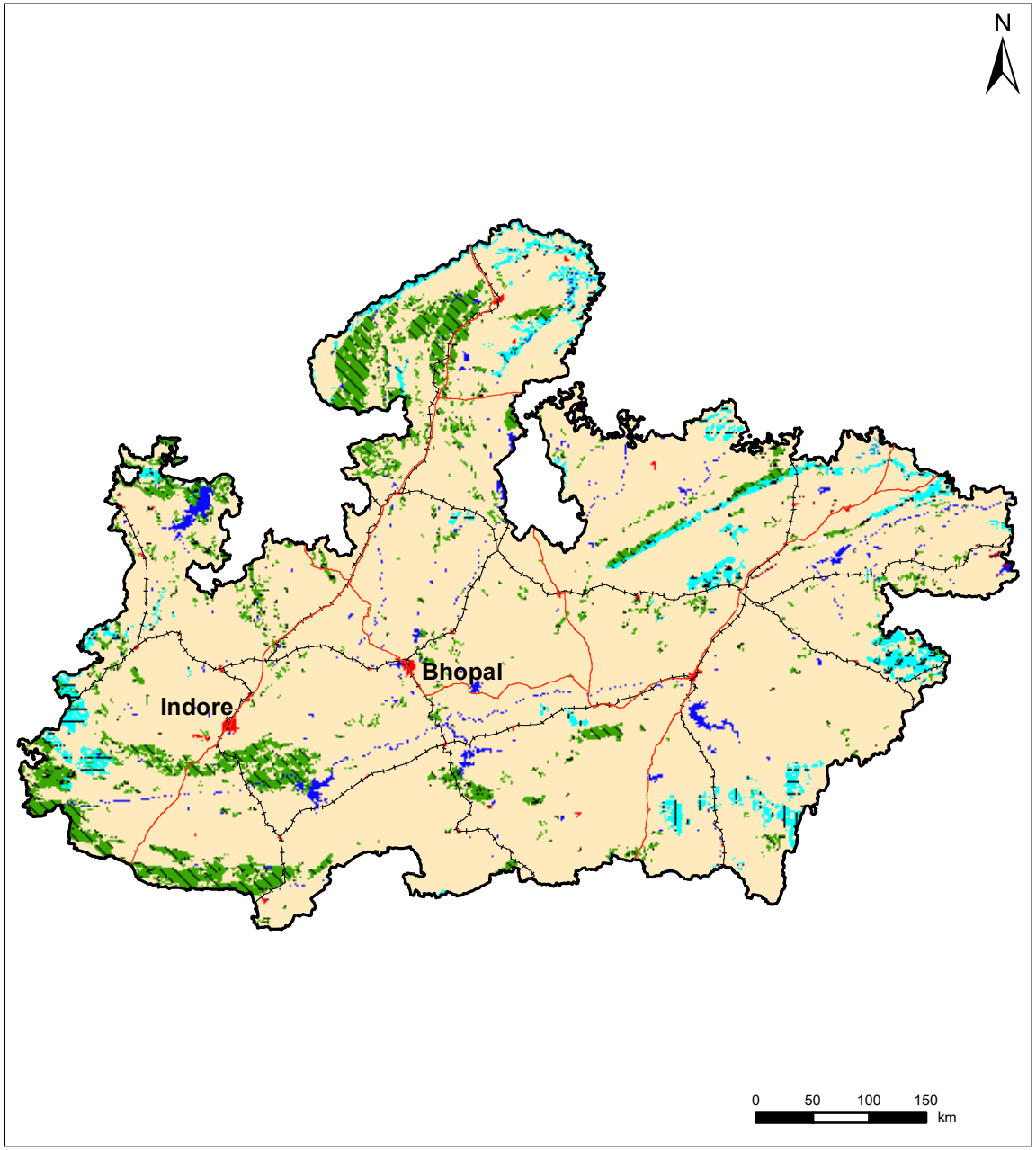


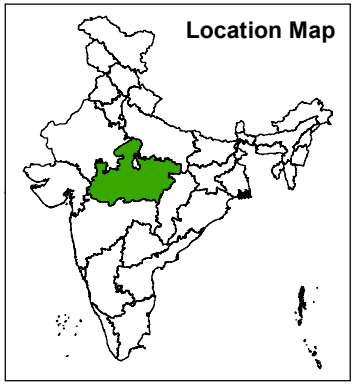
DESERTIFICATION / LAND DEGRADATION STATUS MAP MADHYA PRADESH (2003-05)

Legend		
Symbol	**Code**	**Description**
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Il1	Agriculture irrigated, water logging
	Fm2	Forest, man made
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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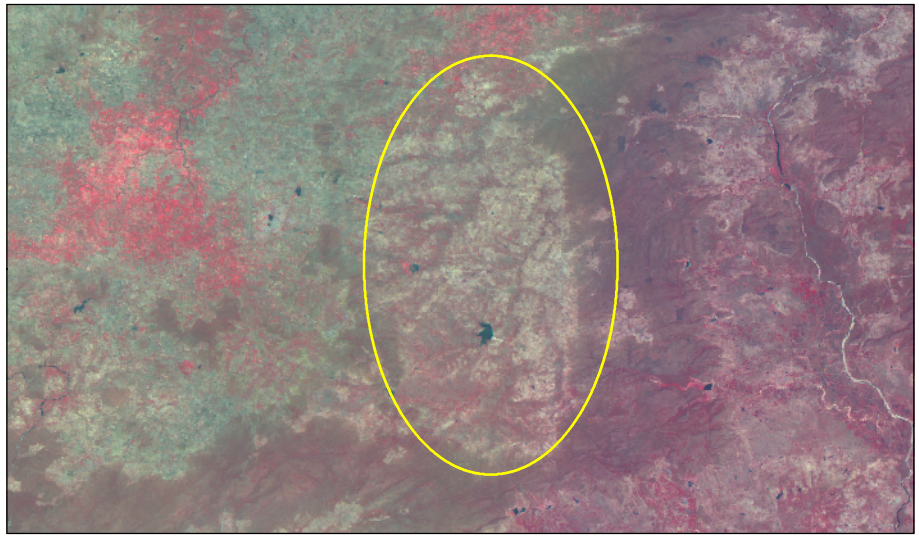
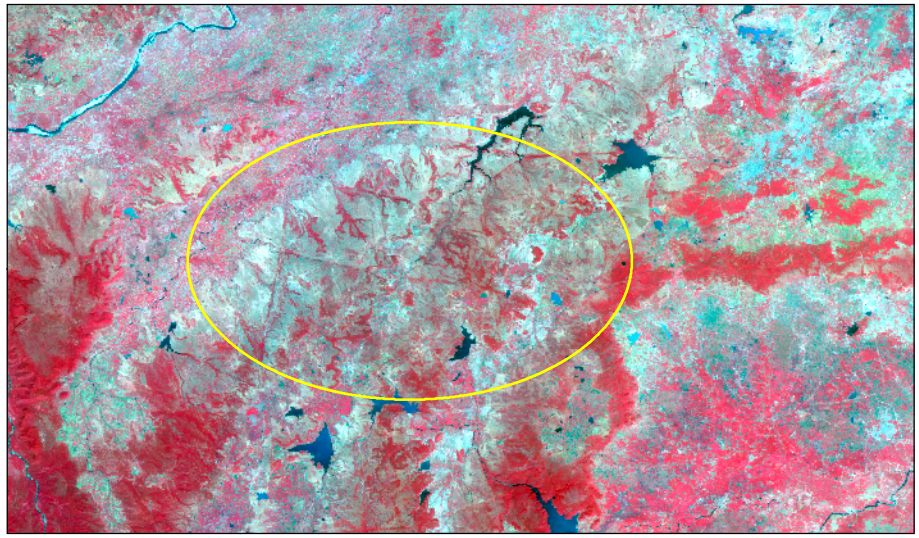
Madhya Pradesh - Illustrative representation of Land Degradation processes / changes on IRS AWiFS data

Agriculture area affected with water erosion (March 2019)



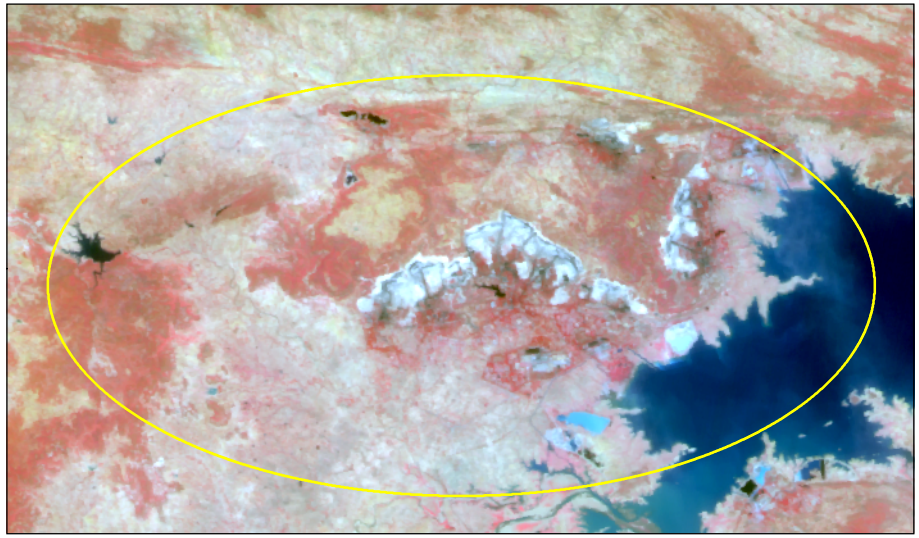
Forest area under vegetation degradation (October 2018)

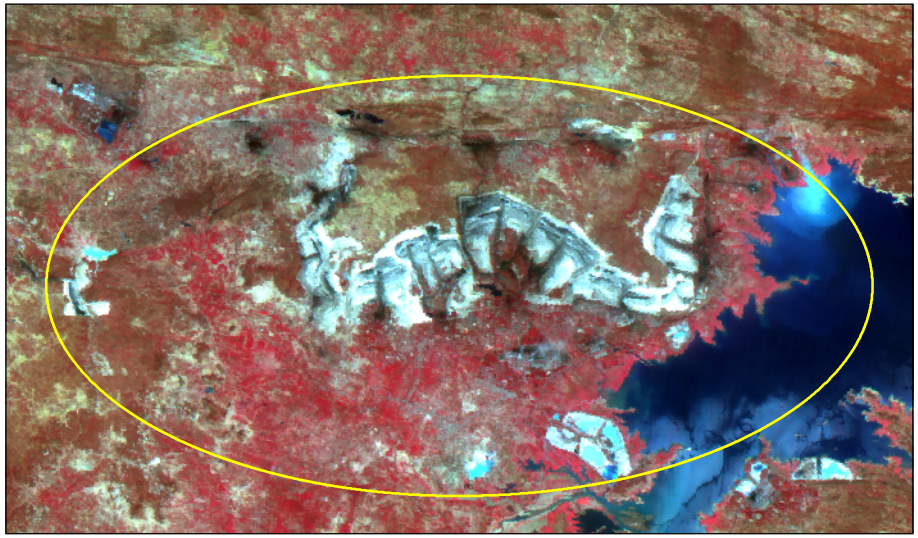


May 2004

Expansion of area affected with manmade (mining) activities

March 2019





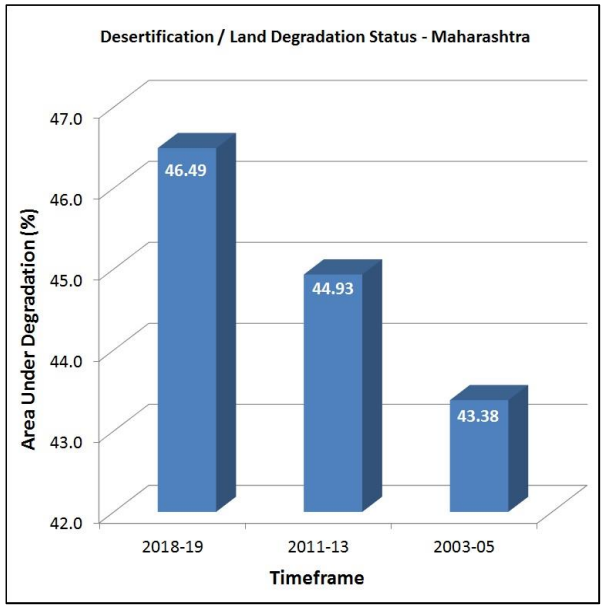
MAHARASHTRA

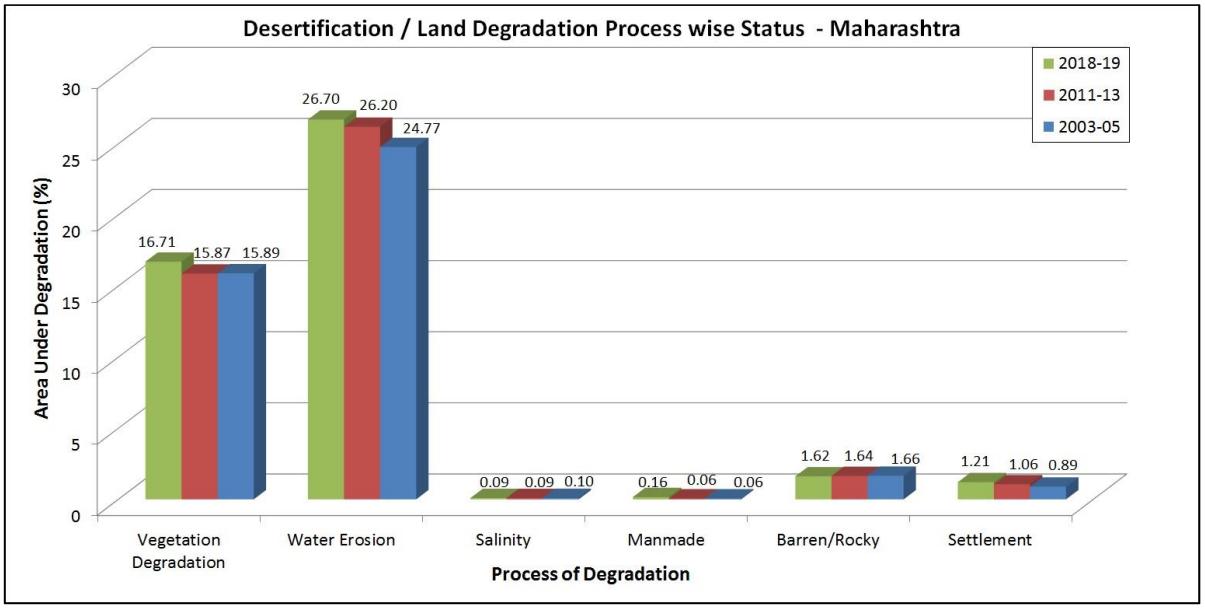
Maharashtra is located in south-western part of India and is the third largest state by area in India with 3,07,713 sq km area. The state has population of 11,23,74,333; with 365 population density, 929 sex ratio and 82.34% literacy (Census 2011). Mumbai is the capital of Maharashtra and also the financial capital of the country. The major geographic features of Maharashtra are Sahyadri Range, Western Ghats, Deccan Plateau, Konkan coastal belt and the river valleys. The main rivers of the state include Krishna, Bhima, Godavari, Tapi-Purna and Wardha-Wainganga. The soil which dominates the state is the black soil, also known as the black cotton soil. The climate is of a tropical monsoon type with a searing heat in the summer months, and cold winter. The monsoons have varied influence over different regions, causing heavy rain at some places and mild rainfall in others.

The statistical summary and analysis of the Land Degradation of Maharashtra state reveal that 46.49% (14.30 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 44.93% (13.82 million ha) and 43.38% (13.34 million ha) respectively. An increase of 1.56% (4,80,094 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.55% (4,77,331 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (26.70% in 2018-19, 26.20% in 2011-13 and 24.77% in 2003-05) followed by Vegetation Degradation (16.71% in 2018-19, 15.87% in 2011-13 and 15.89% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation, agriculture area undergoing water erosion and area affected with manmade activities is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in agriculture area undergoing water erosion is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

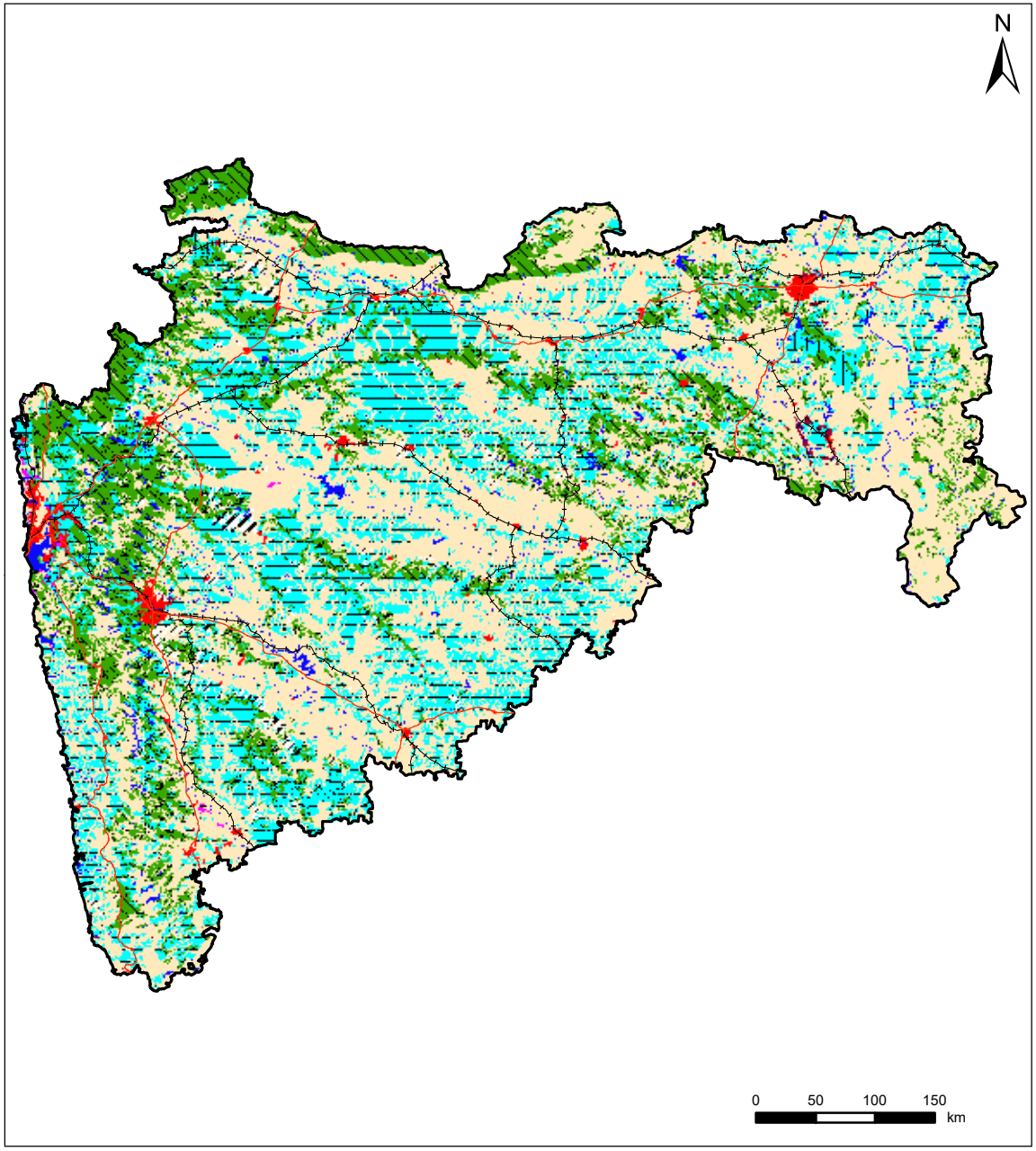




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	5142353	16.71	4884005	15.87	4890778	15.89	258348	-6773
Water Erosion	8217047	26.70	8060753	26.20	7622800	24.77	156294	437953
Salinity	28713	0.09	29089	0.09	30054	0.10	-376	-965
Manmade	49022	0.16	19912	0.06	19912	0.06	29110	0
Barren/Rocky	497661	1.62	506163	1.64	509789	1.66	-8502	-3626
Settlement	371234	1.21	326013	1.06	275272	0.89	45221	50741
Total Area under Desertification	**14306029**	**46.49**	**13825935**	**44.93**	**13348604**	**43.38**	**480094**	**477331**
No Apparent Degradation	**15931281**	**51.77**	**16415568**	**53.35**	**16873660**	**54.84**	**-484287**	**-458092**
Total Geographical Area (ha)	**30771300**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	2078335	6.75	1820506	5.92	257829
2	Fv2	Forest, vegetation degradation, High	910052	2.96	901500	2.93	8552
3	Sv1	Land with scrub, vegetation degradation, Low	1092250	3.55	1095887	3.56	-3637
4	Sv2	Land with scrub, vegetation degradation, High	1061716	3.45	1066113	3.46	-4397
5	Iw1	Agriculture irrigated, water erosion, Low	154347	0.50	11825	0.04	142523
6	Iw2	Agriculture irrigated, water erosion, High	3218	0.01	3218	0.01	0
7	Dw1	Agriculture unirrigated, water erosion, Low	7465260	24.26	7458536	24.24	6724
8	Dw2	Agriculture unirrigated, water erosion, High	8424	0.03	0	0.00	8424
9	Sw1	Land with scrub, water erosion, Low	475764	1.55	477141	1.55	-1377
10	Sw2	Land with scrub, water erosion, High	110034	0.36	110034	0.36	0
11	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	28713	0.09	29089	0.09	-376
12	Tm1	Others, man made, Low	29378	0.10	11445	0.04	17934
13	Tm2	Others, man made, High	19644	0.06	8468	0.03	11176
14	B	Barren	328170	1.07	334594	1.09	-6424
15	R	Rocky	169490	0.55	171569	0.56	-2079
16	S	Settlement	371234	1.21	326013	1.06	45221
Total Area Under Desertification/ Land Degradation			**14306029**	**46.49**	**13825935**	**44.93**	**480094**
17	W	Water body/ Drainage	533810	1.73	529797	1.72	4014
18	NAD	No Apparent Degradation	15931281	51.77	16415568	53.35	-484287
Total Geographical Area (ha)			**30771120**	**100**	**30771300**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	1820506	5.92	1822046	5.92	-1540
2	Fv2	Forest, vegetation degradation, High	901500	2.93	899120	2.92	2380
3	Sv1	Land with scrub, vegetation degradation, Low	1095887	3.56	1097710	3.57	-1823
4	Sv2	Land with scrub, vegetation degradation, High	1066113	3.46	1071902	3.48	-5789
5	Iw1	Agriculture irrigated, water erosion, Low	11825	0.04	11825	0.04	0
6	Iw2	Agriculture irrigated, water erosion, High	3218	0.01	3218	0.01	0
7	Dw1	Agriculture unirrigated, water erosion, Low	7458536	24.24	7019398	22.81	439137
8	Dw2	Agriculture unirrigated, water erosion, High	0	0.00	0	0.00	0
9	Sw1	Land with scrub, water erosion, Low	477141	1.55	477536	1.55	-395
10	Sw2	Land with scrub, water erosion, High	110034	0.36	110823	0.36	-789
11	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	29089	0.09	30054	0.10	-965
12	Tm1	Others, man made, Low	11445	0.04	11445	0.04	0
13	Tm2	Others, man made, High	8468	0.03	8468	0.03	0
14	B	Barren	334594	1.09	338220	1.10	-3626
15	R	Rocky	171569	0.56	171569	0.56	0
16	S	Settlement	326013	1.06	275272	0.89	50741
Total Area Under Desertification/ Land Degradation			**13825935**	**44.93**	**13348604**	**43.38**	**477331**
17	W	Water body/ Drainage	529797	1.72	549036	1.78	-19239
18	NAD	No Apparent Degradation	16415568	53.35	16873660	54.84	-458092
Total Geographical Area (ha)			**30771300**	**100**	**30771300**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP MAHARASHTRA (2018-19)

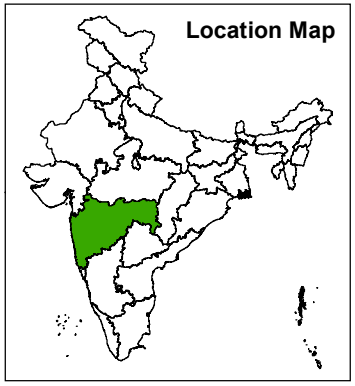
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

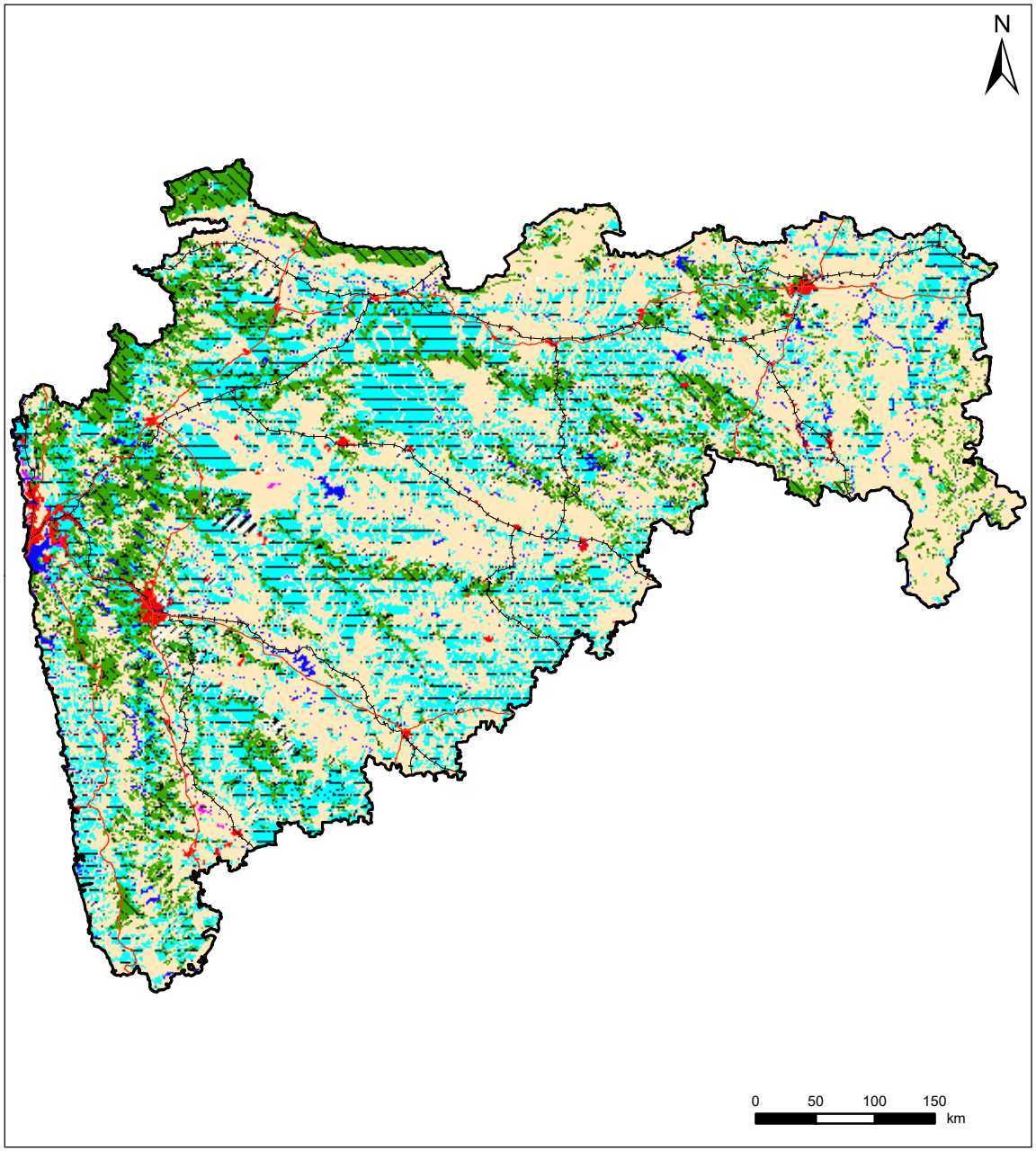
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Maharashtra Remote Sensing Applications Centre, Nagpur
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP MAHARASHTRA (2011-13)

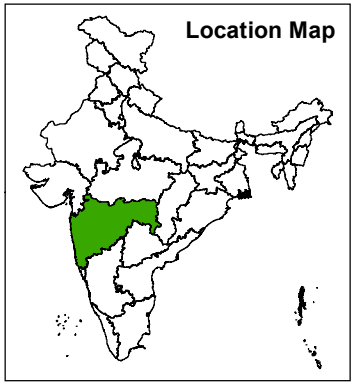
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

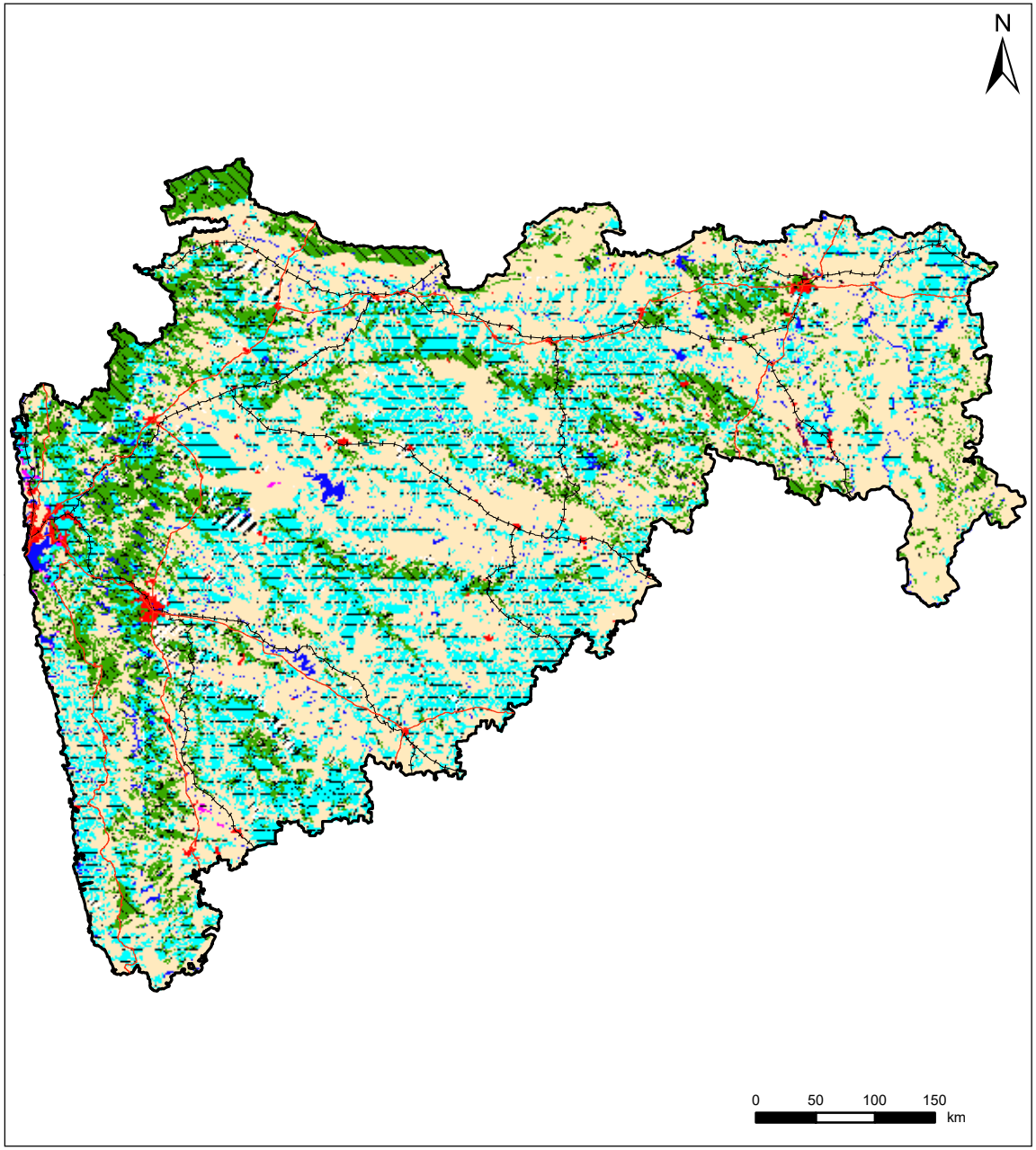
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Maharashtra Remote Sensing Applications Centre, Nagpur
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP MAHARASHTRA (2003-05)

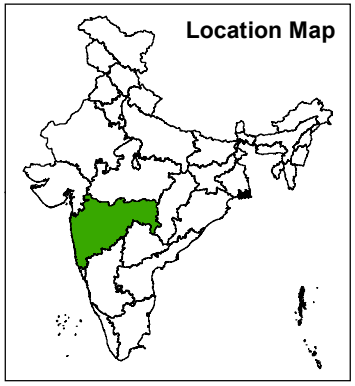
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

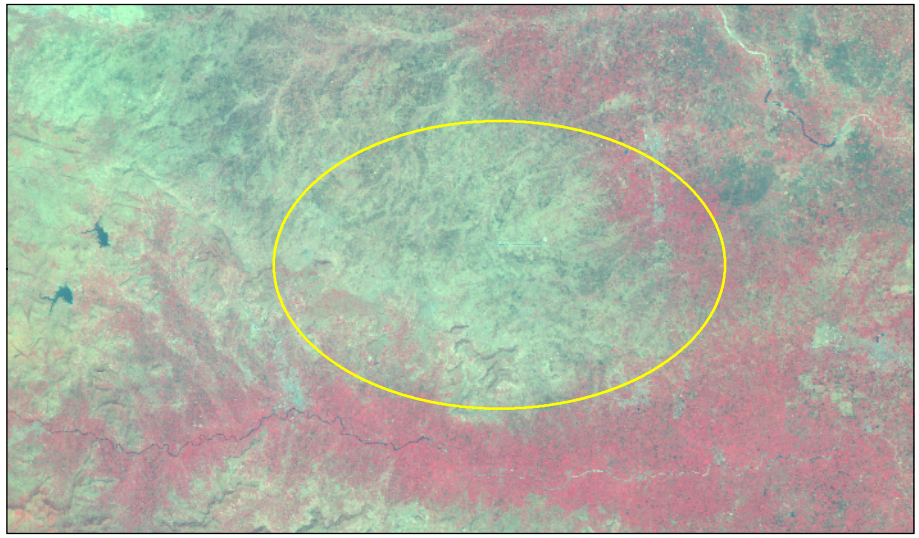
	International boundary
	State boundary
	Major roads
	Rail



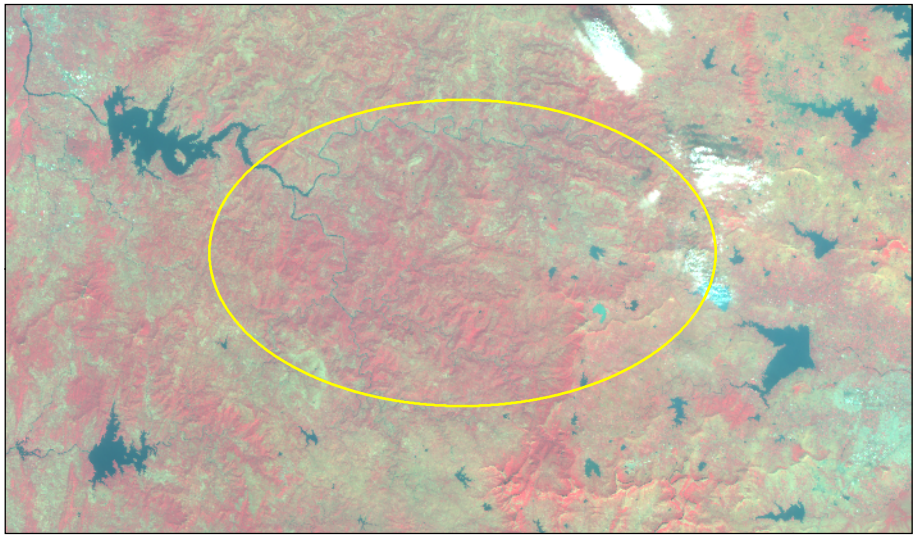
Prepared by:
Maharashtra Remote Sensing Applications Centre, Nagpur
&
Space Applications Centre, ISRO, Ahmedabad

Maharashtra - Illustrative representation of Land Degradation processes on IRS AWiFS data

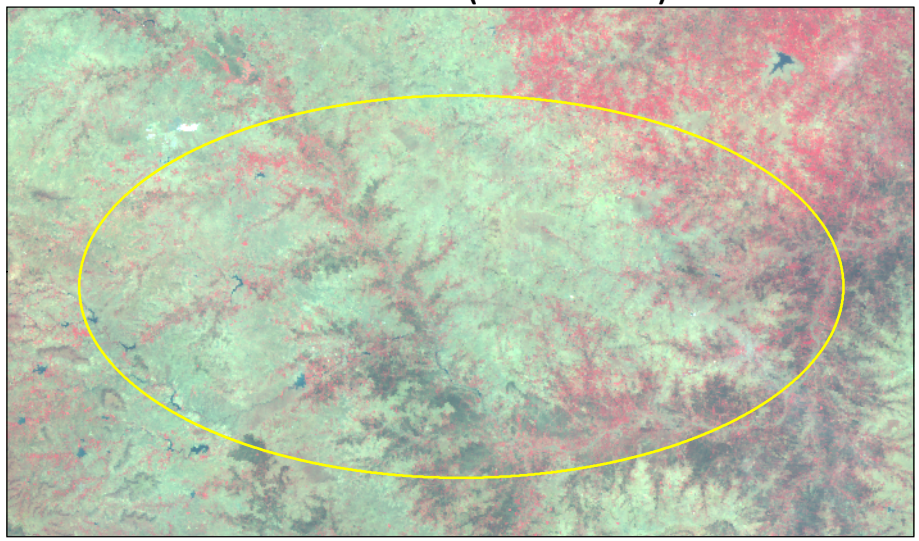
Agriculture area affected with water erosion (October 2018)



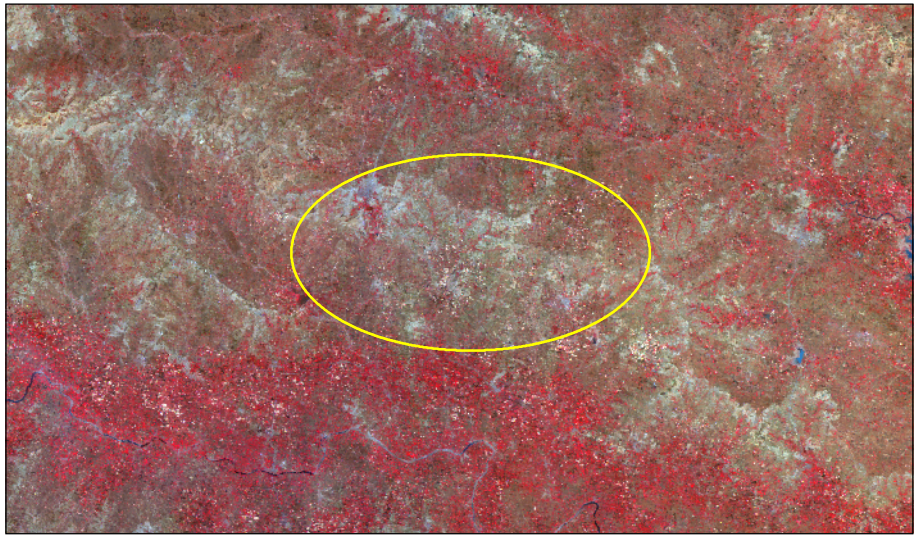
Forest area under vegetation degradation (October 2018)



Scrub land affected with vegetation degradation and water erosion (October 2018)



Agriculture area affected with water erosion (January 2019)



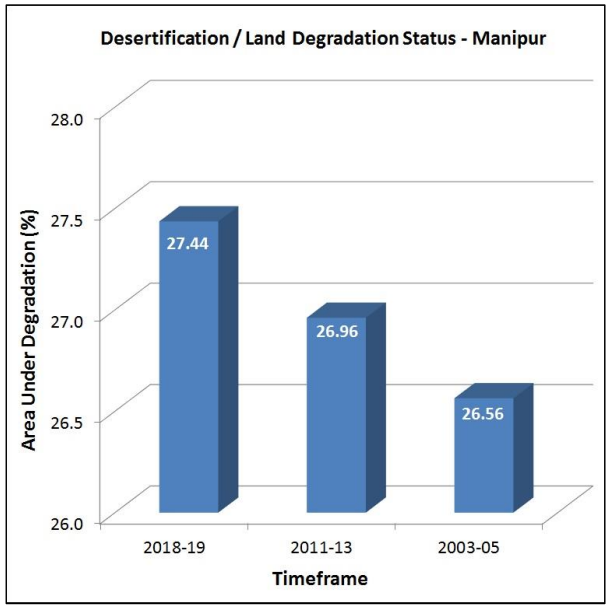
MANIPUR

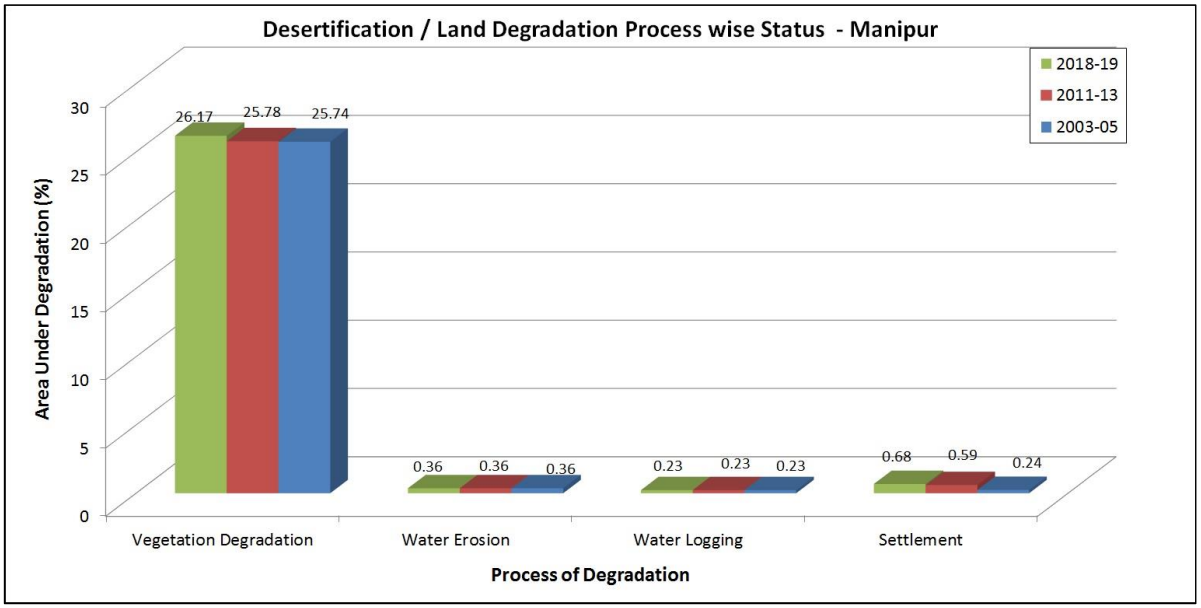
Manipur is northeastern state of India bordering with Myanmar and covers 22,327 sq km area. The state has population of 25,70,390; with 115 population density, 992 sex ratio and 79.21% literacy (Census 2011). Imphal is the capital of Manipur. Geographically, the state is divided into hills and the valleys. The average elevation of the valley is about 790 m above the sea level and that of the hills is between 1500 m and 1800m. The main river basins are Barak, Manipur, Yu and Lanye river basin. Manipur has international fame for its significant wetland, Loktak Lake. The southwest monsoon chiefly determines the weather and rainfall throughout the state. Rainfall varies from 1000 mm to 3500 mm and average rainfall is 1500 mm. Temperature ranges from sub-zero to 36^{o}C.

The statistical summary and analysis of the Land Degradation of Manipur state reveal that 27.44% (6,12,566 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 26.96% (6,01,959 ha) and 26.56% (5,93,093 ha) respectively. An increase of 0.52% (10,607 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.40% (8,867 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (26.17% in 2018-19, 25.78% in 2011-13 and 25.74% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation is observed. Whereas, from timeframe 2003-05 to 2011-13, a slight increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

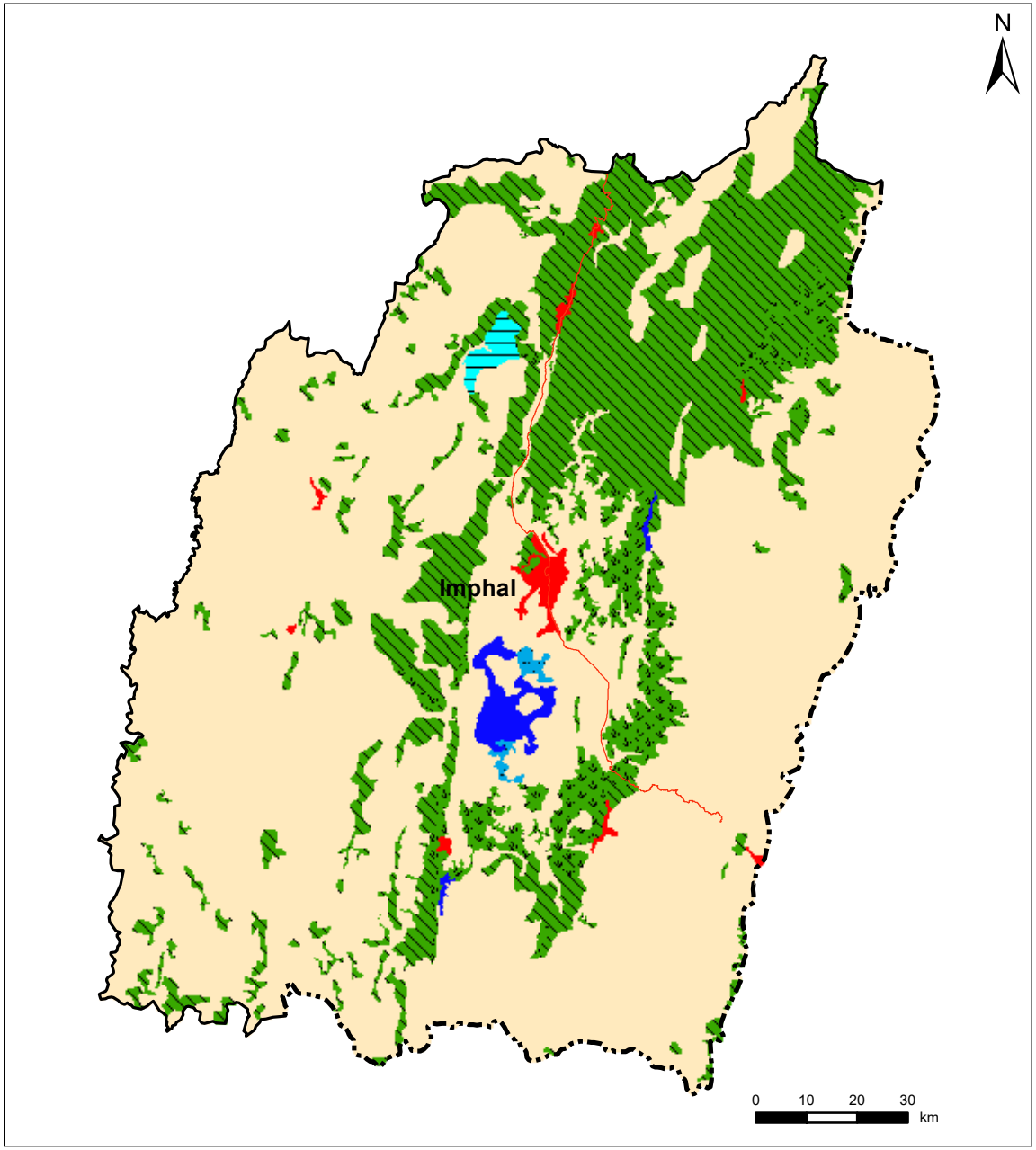




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	584394	26.17	575603	25.78	574706	25.74	8792	896
Water Erosion	8070	0.36	8070	0.36	8070	0.36	0	0
Water Logging	5026	0.23	5026	0.23	5026	0.23	0	0
Settlement	15075	0.68	13260	0.59	5290	0.24	1815	7970
Total Area under Desertification	**612566**	**27.44**	**601959**	**26.96**	**593093**	**26.56**	**10607**	**8867**
No Apparent Degradation	**1601584**	**71.73**	**1613978**	**72.29**	**1622844**	**72.69**	**-12394**	**-8867**
Total Geographical Area (ha)	**2232700**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	410364	18.38	400892	17.96	9472
2	Fv2	Forest, vegetation degradation, High	63141	2.83	63822	2.86	-681
3	Sv1	Land with scrub, vegetation degradation, Low	84262	3.77	84262	3.77	0
4	Sv2	Land with scrub, vegetation degradation, High	26627	1.19	26627	1.19	0
5	Dw1	Agriculture unirrigated, water erosion, Low	8070	0.36	8070	0.36	0
6	Gl2	Grassland / Grazing land, water logging, High	5026	0.23	5026	0.23	0
7	S	Settlement	15075	0.68	13260	0.59	1815
Total Area Under Desertification/ Land Degradation			**612566**	**27.44**	**601959**	**26.96**	**10607**
8	W	Water body/ Drainage	18550	0.83	16763	0.75	1787
9	NAD	No Apparent Degradation	1601584	71.73	1613978	72.29	-12394
Total Geographical Area (ha)			**2232700**	**100**	**2232700**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	400892	17.96	397489	17.80	3403
2	Fv2	Forest, vegetation degradation, High	63822	2.86	64020	2.87	-198
3	Sv1	Land with scrub, vegetation degradation, Low	84262	3.77	86535	3.88	-2273
4	Sv2	Land with scrub, vegetation degradation, High	26627	1.19	26663	1.19	-36
5	Dw1	Agriculture unirrigated, water erosion, Low	8070	0.36	8070	0.36	0
6	Gl2	Grassland / Grazing land, water logging, High	5026	0.23	5026	0.23	0
7	S	Settlement	13260	0.59	5290	0.24	7970
Total Area Under Desertification/ Land Degradation			**601959**	**26.96**	**593093**	**26.56**	**8867**
8	W	Water body/ Drainage	16763	0.75	16763	0.75	0
9	NAD	No Apparent Degradation	1613978	72.29	1622844	72.69	-8867
Total Geographical Area (ha)			**2232700**	**100**	**2232700**	**100**	



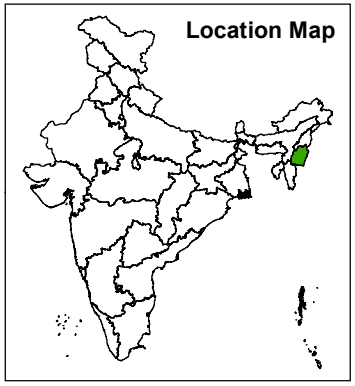
DESERTIFICATION / LAND DEGRADATION STATUS MAP MANIPUR (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Gl2	Grassland / Grazing land, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

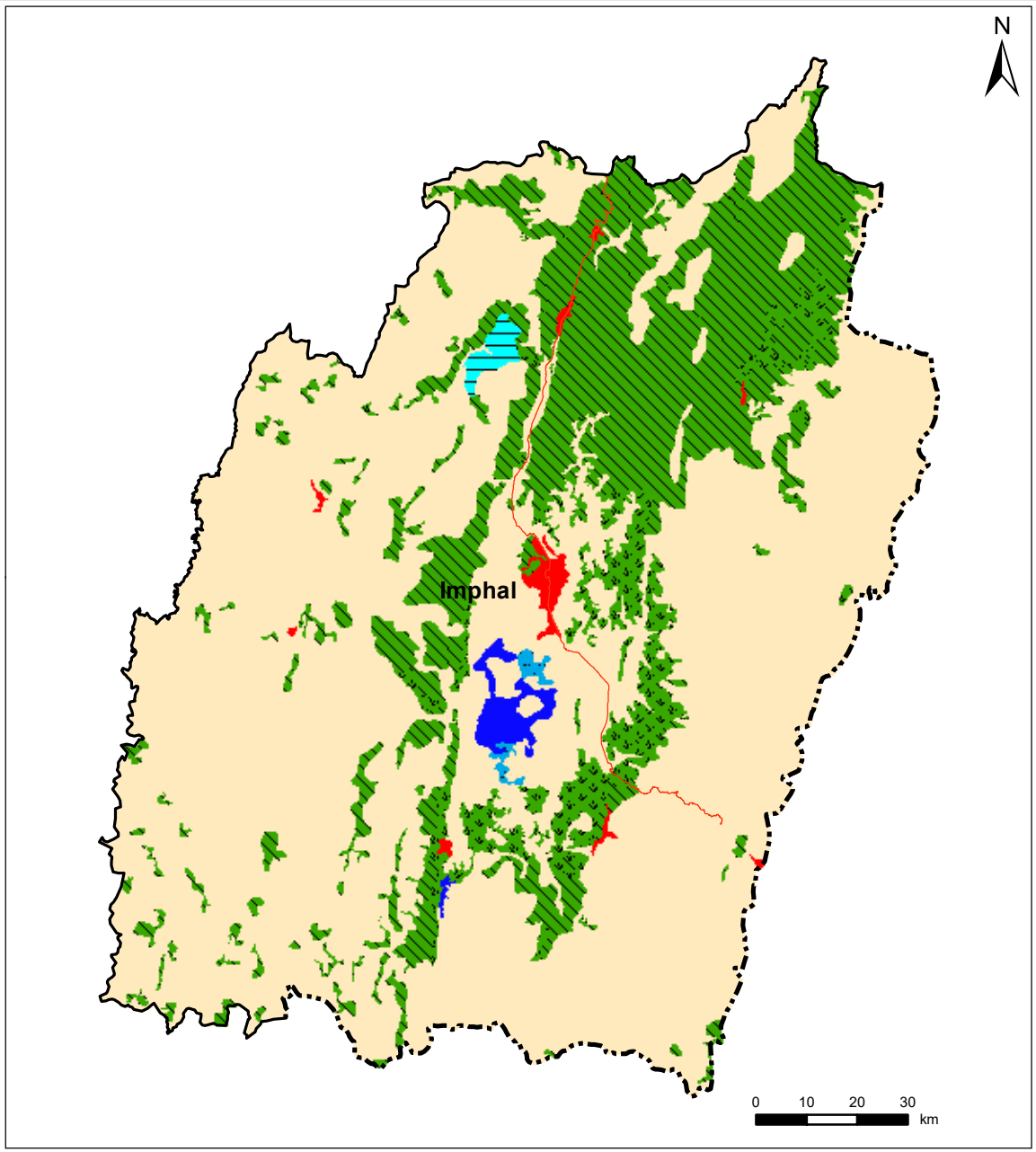
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
North Easrern Space Applications Centre, Meghalaya
&
Space Applications Centre, ISRO, Ahmedabad



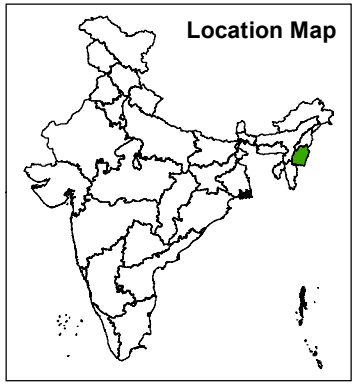
DESERTIFICATION / LAND DEGRADATION STATUS MAP MANIPUR (2011-13)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Gl2	Grassland / Grazing land, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

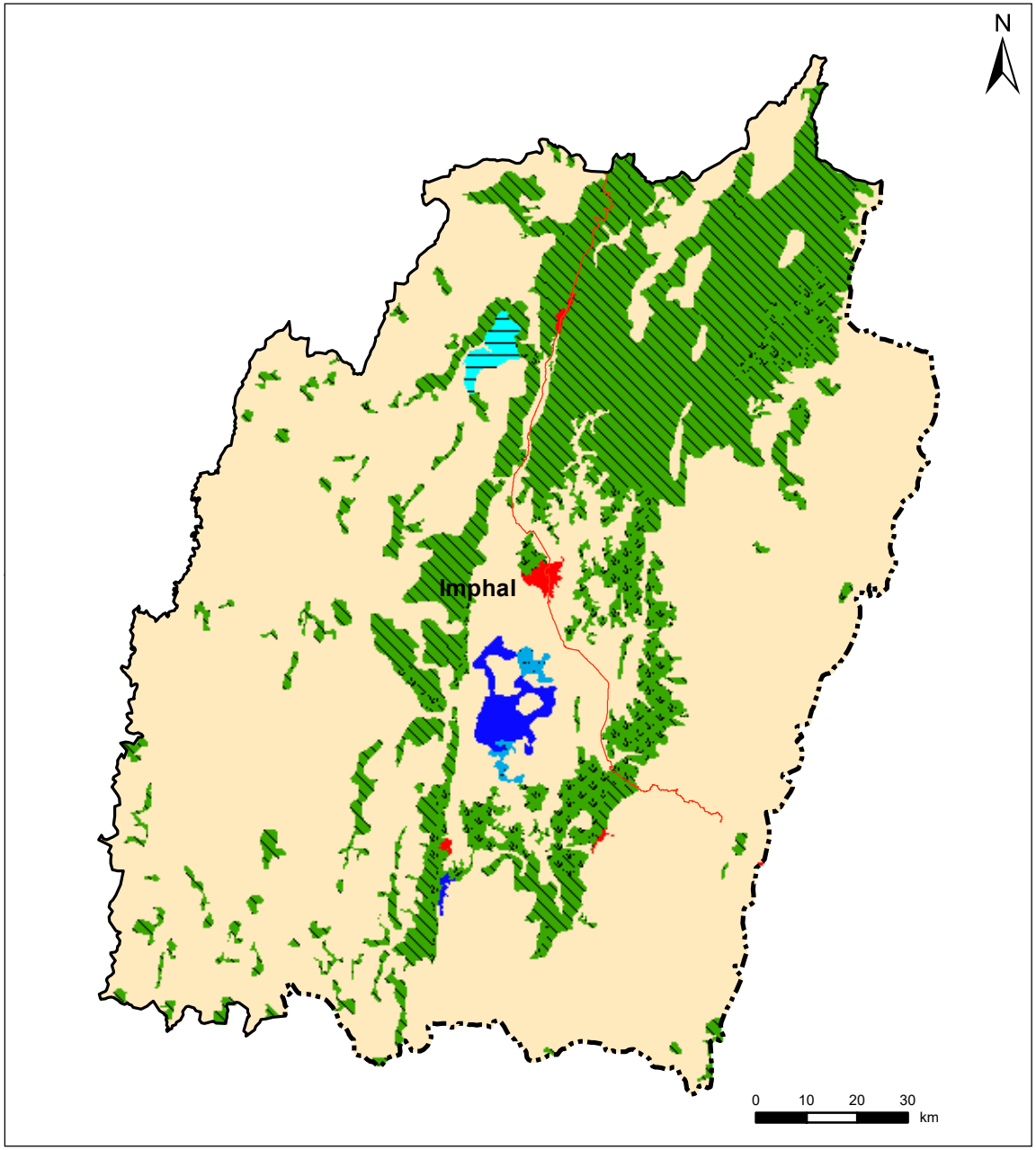
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Nagaland GIS & Remote Sensing Centre, Kohima
&
Space Applications Centre, ISRO, Ahmedabad



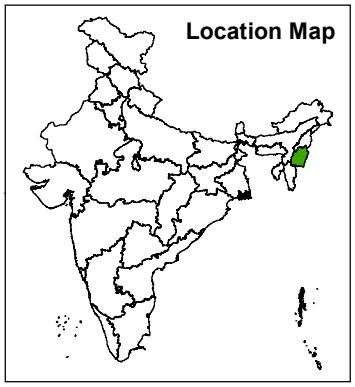
DESERTIFICATION / LAND DEGRADATION STATUS MAP MANIPUR (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Gl2	Grassland / Grazing land, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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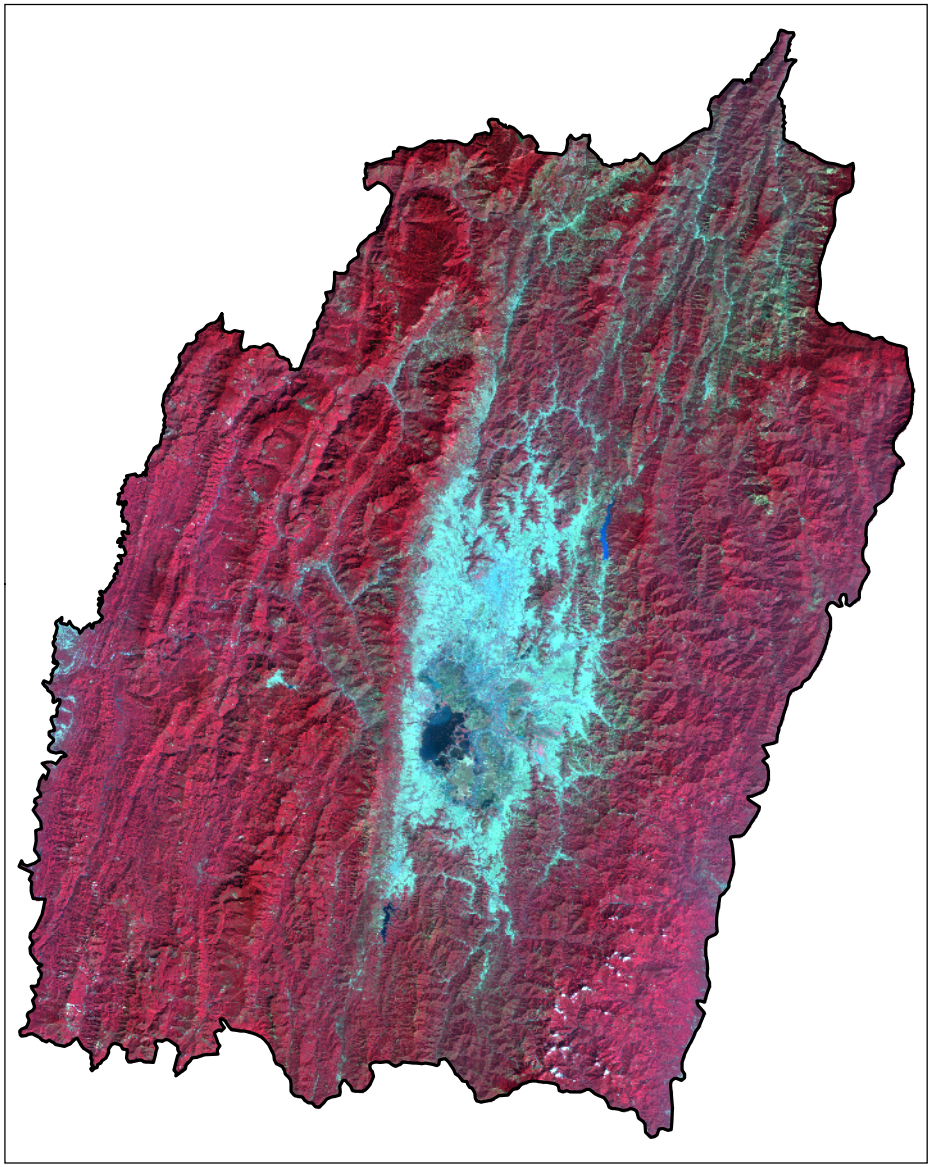
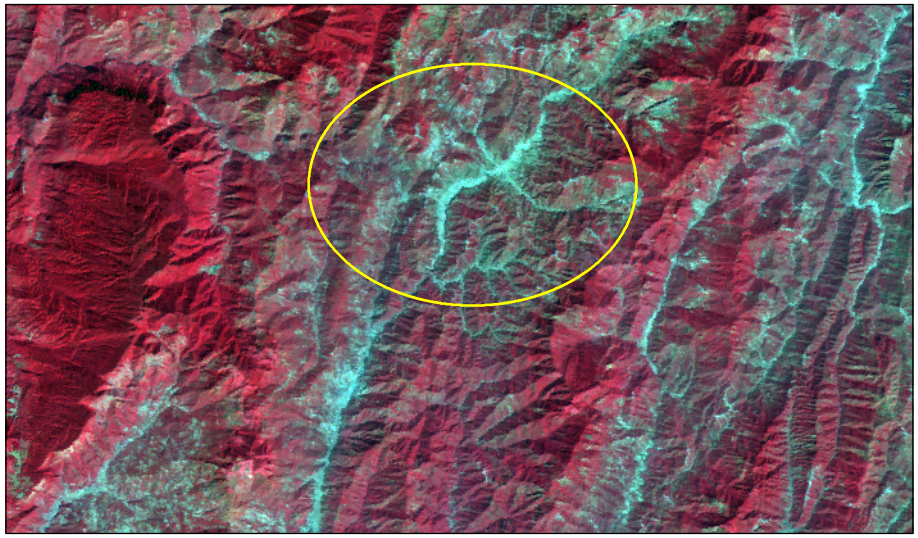
&
Space Applications Centre, ISRO, Ahmedabad

Manipur - Illustrative representation of Land Degradation processes on IRS AWiFS data

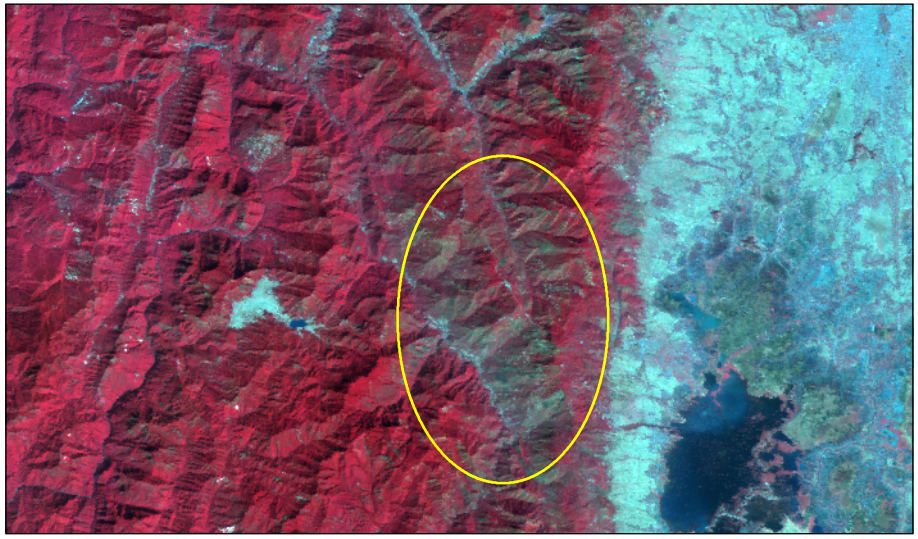
Manipur as seen on IRS AWiFS (February 2019)



Forest area under vegetation degradation (February 2019)



Forest area under vegetation degradation (February 2019)



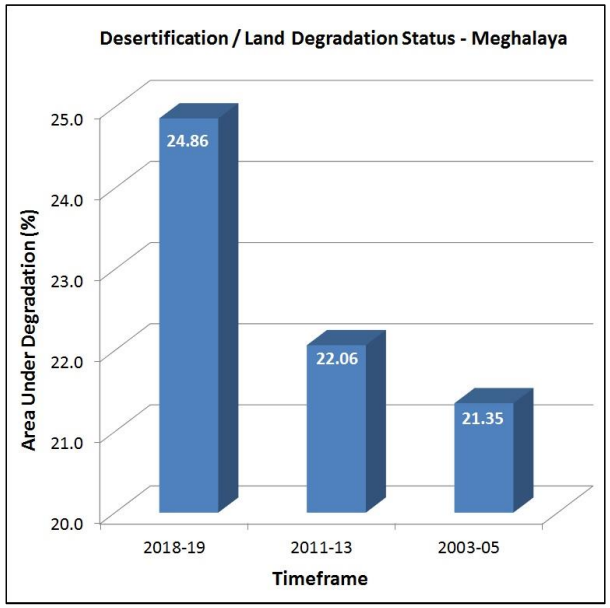
MEGHALAYA

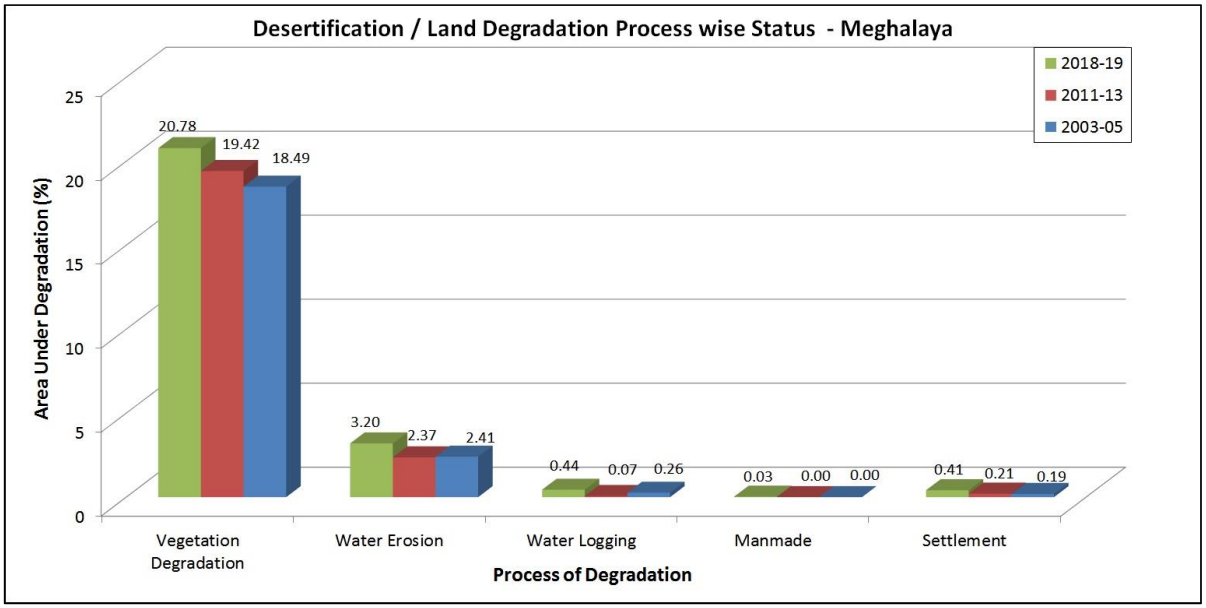
Meghalaya state is located in north-east part of India spread over 22,429 sq km area. The state has population of 29,66,889; with 132 population density, 989 sex ratio and 74.43% literacy (Census 2011). Shillong is the capital of Meghalaya. Meghalaya is a plateau representing the extension of peninsular India towards the north-east. The plateau, older than surrounding Himalayas, formed due to block displacement with some of the oldest rock of the earth. Meghalaya includes the Khasi, the Garo, the Jaintia hills and the Assam ranges at its border. The major rivers are the Ringgi, Kalu, Ajagar, Simsang. Digaru, Umkhri etc. The temperature varies from 25 °C to 4 °C. The average annual rainfall is around 2600 mm, for western part, 2750 mm northern part and 4000 mm for eastern part of the state. Cherrapunji receives the highest rainfall, around 12000 mm annually.

The statistical summary and analysis of the Land Degradation of Meghalaya state reveal that 24.86% (5,57,576 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 22.06% (4,94,880 ha) and 21.35% (4,78,825 ha) respectively. An increase of 2.8% (62,697 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.71% (16,055 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (20.78% in 2018-19, 19.42% in 2011-13 and 18.49% in 2003-05) followed by Water Erosion (3.2% in 2018-19, 2.37% in 2011-13 and 2.41% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area/ scrub land undergoing vegetation degradation and agriculture area undergoing water erosion & water logging is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area undergoing vegetation degradation and decrease in agriculture area affected with water erosion is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

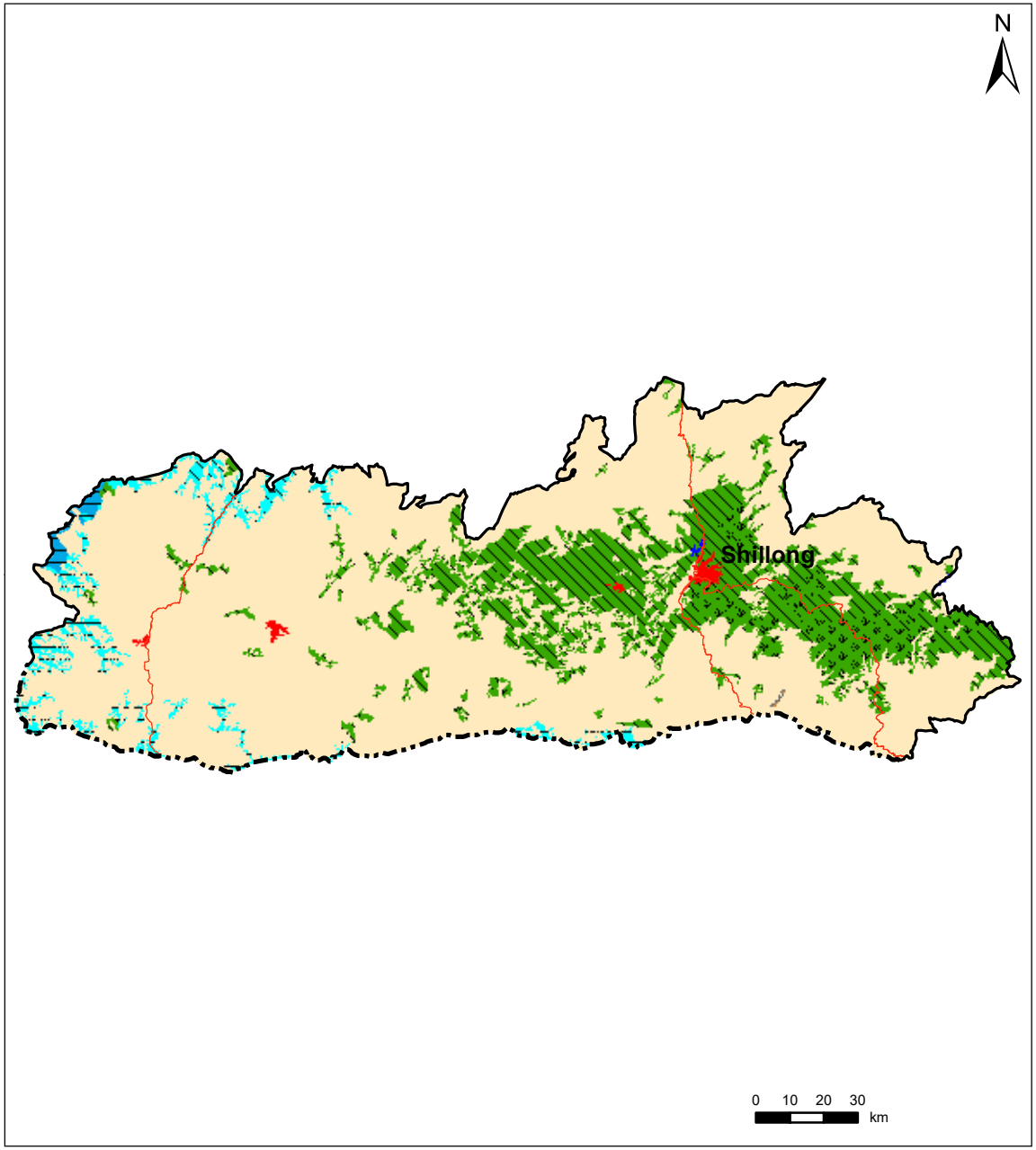




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	466072	20.78	435527	19.42	414659	18.49	30545	20868
Water Erosion	71772	3.20	53149	2.37	54046	2.41	18623	-897
Water Logging	9916	0.44	1548	0.07	5881	0.26	8368	-4333
Manmade	642	0.03	0	0.00	0	0.00	642	0
Settlement	9175	0.41	4656	0.21	4239	0.19	4519	417
Total Area under Desertification	**557576**	**24.86**	**494880**	**22.06**	**478825**	**21.35**	**62697**	**16055**
No Apparent Degradation	**1683879**	**75.08**	**1746580**	**77.87**	**1762634**	**78.59**	**-62701**	**-16055**
Total Geographical Area (ha)	**2242900**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	298240	13.30	289502	12.91	8738
2	Fv2	Forest, vegetation degradation, High	63232	2.82	51510	2.30	11721
3	Sv1	Land with scrub, vegetation degradation, Low	7762	0.35	6119	0.27	1643
4	Sv2	Land with scrub, vegetation degradation, High	96839	4.32	88396	3.94	8443
5	Dw1	Agriculture unirrigated, water erosion, Low	54453	2.43	43998	1.96	10455
6	Fw1	Forest, water erosion, Low	17319	0.77	9151	0.41	8168
7	Dl1	Agriculture unirrigated, water logging, Low	9916	0.44	1548	0.07	8368
8	Fm1	Forest, man made, Low	642	0.03	0	0.00	642
9	S	Settlement	9175	0.41	4656	0.21	9175
Total Area Under Desertification/ Land Degradation			**557576**	**24.86**	**494880**	**22.06**	**62697**
10	W	Water body/ Drainage	1445	0.06	1441	0.06	5
11	NAD	No Apparent Degradation	1683879	75.08	1746580	77.87	-62701
Total Geographical Area (ha)			**2242900**	**100**	**2242900**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	289502	12.91	286242	12.76	3259
2	Fv2	Forest, vegetation degradation, High	51510	2.30	33806	1.51	17704
3	Sv1	Land with scrub, vegetation degradation, Low	6119	0.27	6119	0.27	0
4	Sv2	Land with scrub, vegetation degradation, High	88396	3.94	88492	3.95	-96
5	Dw1	Agriculture unirrigated, water erosion, Low	43998	1.96	44895	2.00	-897
6	Fw1	Forest, water erosion, Low	9151	0.41	9151	0.41	0
7	Dl1	Agriculture unirrigated, water logging, Low	1548	0.07	5881	0.26	-4333
8	Fm1	Forest, man made, Low	0	0.00	0	0.00	0
9	S	Settlement	4656	0.21	4239	0.19	4656
Total Area Under Desertification/ Land Degradation			**494880**	**22.06**	**478825**	**21.35**	**16055**
10	W	Water body/ Drainage	1441	0.06	1441	0.06	0
11	NAD	No Apparent Degradation	1746580	77.87	1762634	78.59	-16055
Total Geographical Area (ha)			**2242900**	**100**	**2242900**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP MEGHALAYA (2018-19)

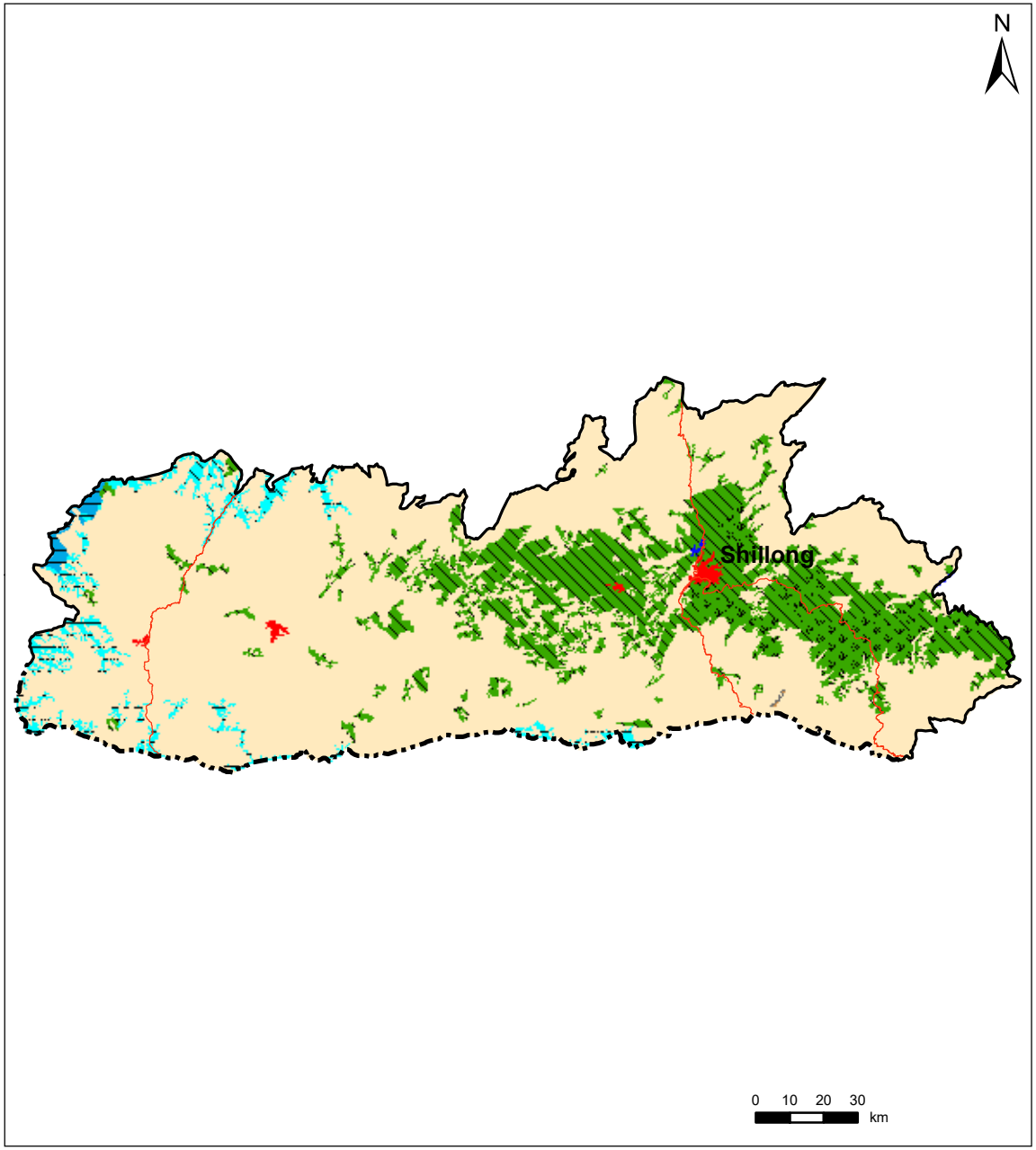
Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Dl1	Agriculture unirrigated, water logging
	Fm1	Forest, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
North Eastern Hill University, Shillong
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP MEGHALAYA (2011-13)

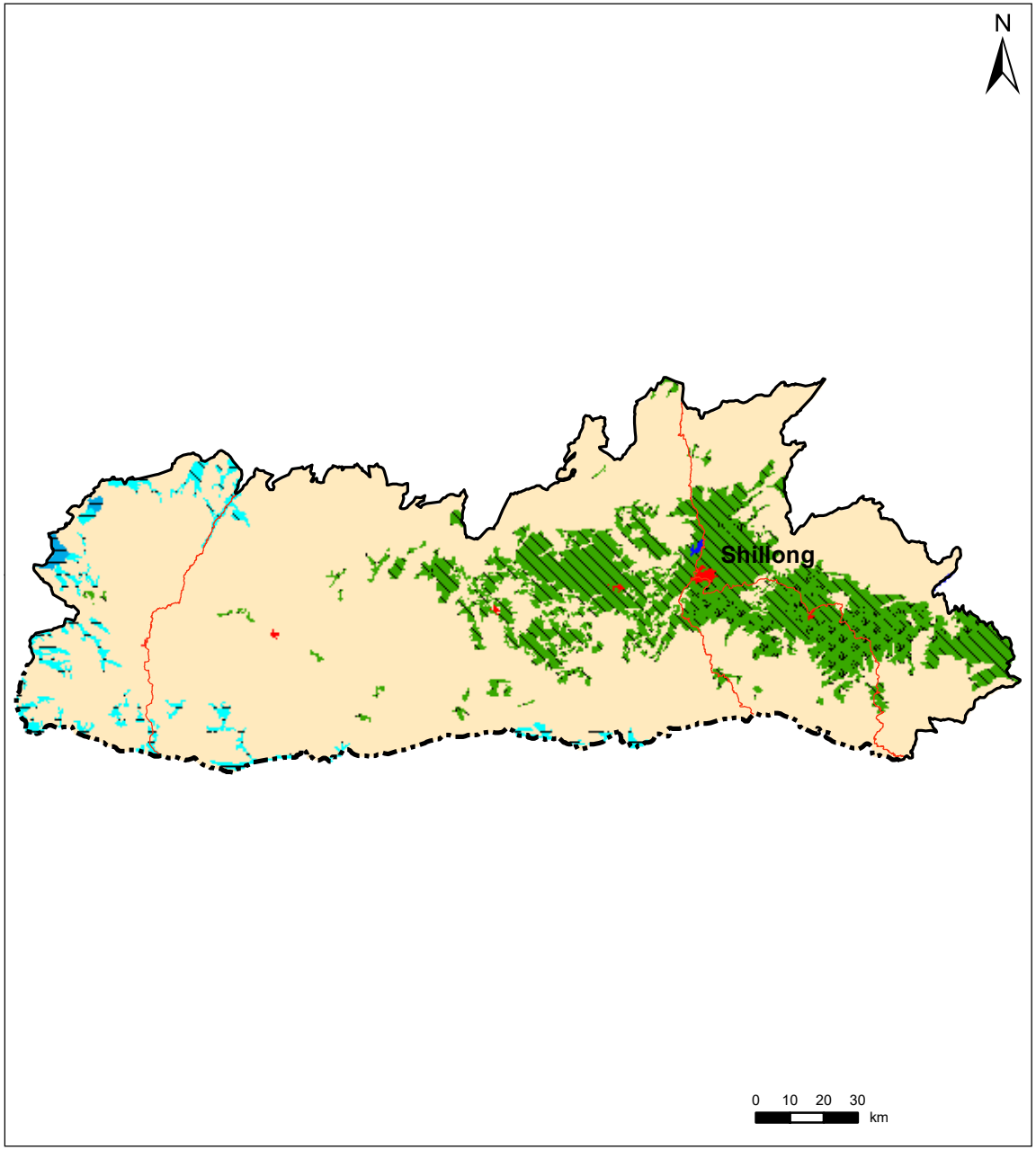
Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Dl1	Agriculture unirrigated, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
North Eastern Hill University, Shillong
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP MEGHALAYA (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Dl1	Agriculture unirrigated, water logging
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

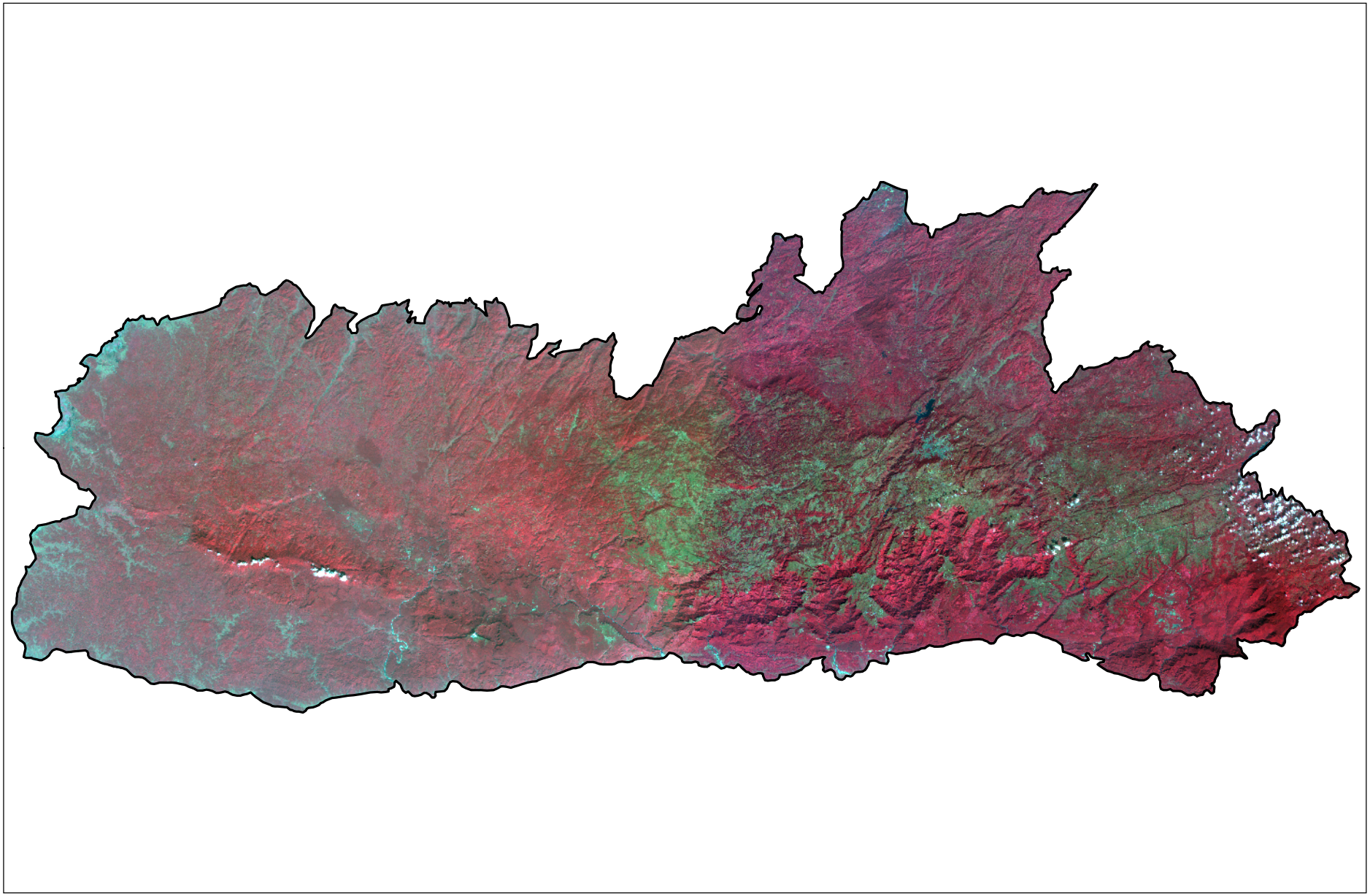
Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
North Eastern Hill University, Shillong
&
Space Applications Centre, ISRO, Ahmedabad

Meghalaya - as seen on IRS AWiFS (October 2018)



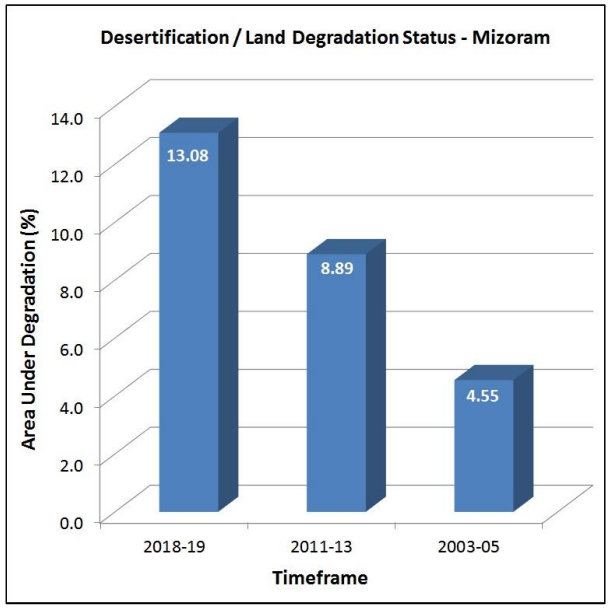
MIZORAM

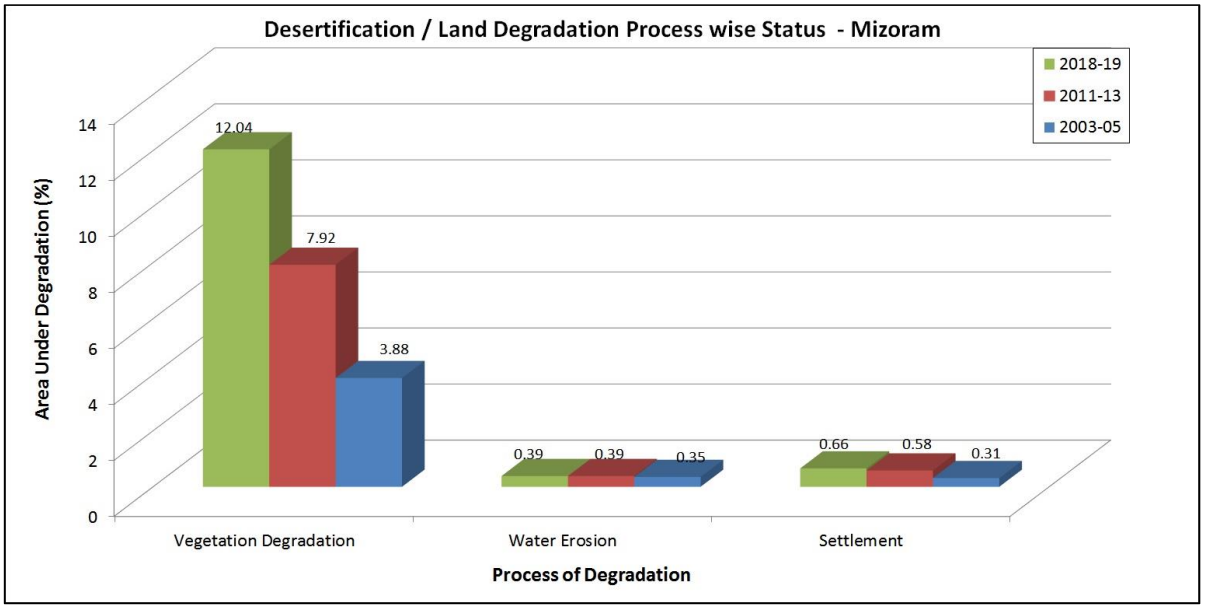
Mizoram state is a border state of northeastern India, covering 21,081 sq km area. The state has population of 10,97,206; with 52 population density, 976 sex ratio and 91.33% literacy (Census 2011). Aizawl is the capital of Mizoram. Mizoram topography is conspicuous with the presence of hills and mountain ranges. The state is adorned with lush green mountains and free flowing rivers, with many natural resources. Major rivers like Tlau, Tlawng, Tuirini, Serlui and Mat. Some of the important lakes are Palak, tamdil, Rengdil etc. The general climate of Mizoram is one of the most pleasing one in the country with moderate temperatures throughout the year. The temperature ranges between 11° to 30° C. Mizoram witnesses heavy rainfall in all parts of the state during the rainy season, with an annual average rainfall of 3000 mm.

The statistical summary and analysis of the Land Degradation of Mizoram state reveal that 13.08% (2,75,827 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 8.89% (1,87,453 ha) and 4.55% (95,873 ha) respectively. An increase of 4.19% (88,374 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 4.34% (91,580 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (12.04% in 2018-19, 7.92% in 2011-13 and 3.88% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation is observed. The same trend is observed between timeframe 2003-05 & 2011-13.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

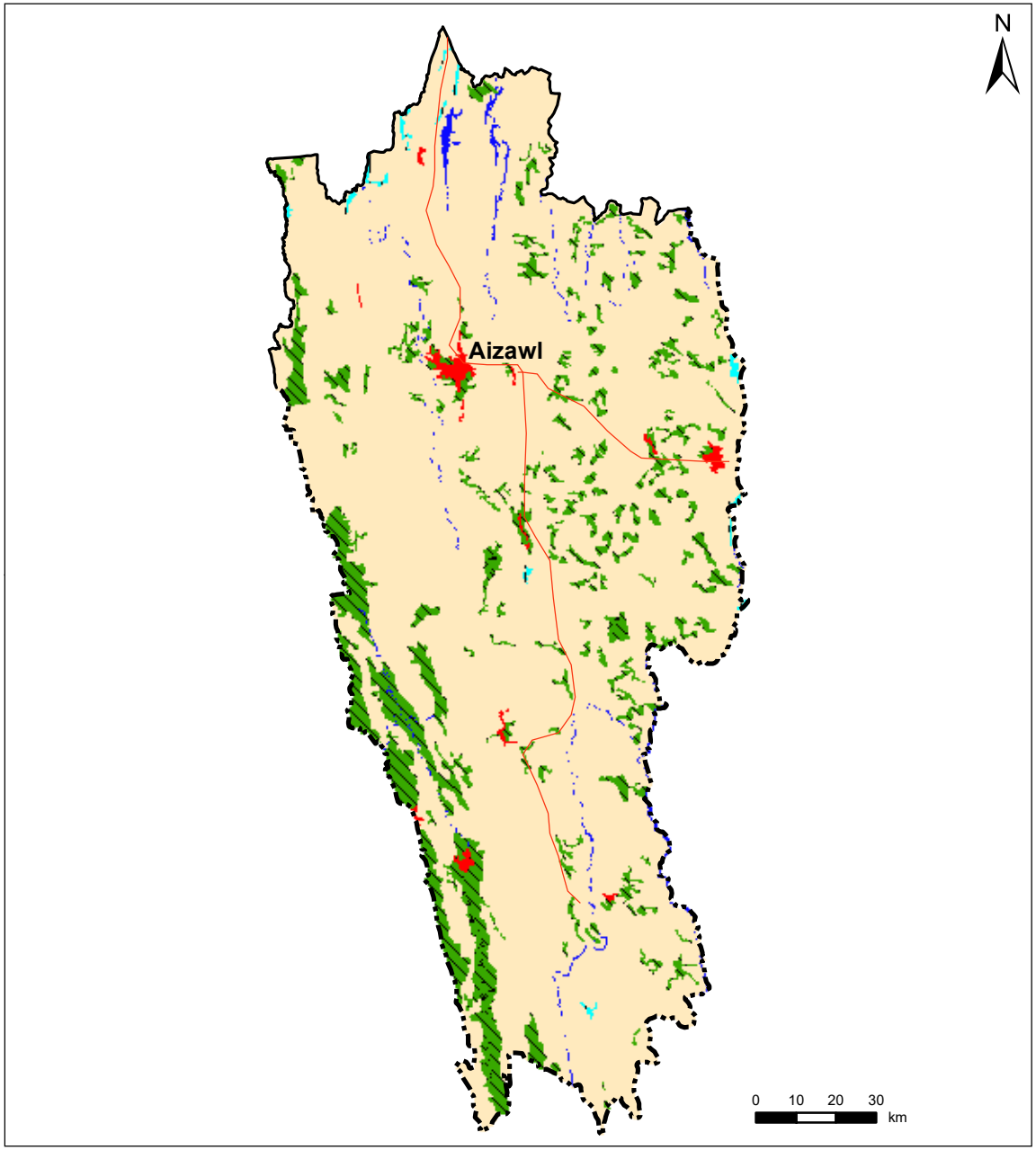




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	253871	12.04	167050	7.92	81854	3.88	86821	85196
Water Erosion	8119	0.39	8119	0.39	7444	0.35	0	675
Settlement	13837	0.66	12285	0.58	6575	0.31	1553	5710
Total Area under Desertification	**275827**	**13.08**	**187453**	**8.89**	**95873**	**4.55**	**88374**	**91580**
No Apparent Degradation	**1812845**	**85.99**	**1903762**	**90.31**	**1998679**	**94.81**	**-90917**	**-94917**
Total Geographical Area (ha)	**2108100**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	221926	10.53	144709	6.86	77217
2	Fv2	Forest, vegetation degradation, High	21409	1.02	11805	0.56	9604
3	Sv1	Land with scrub, vegetation degradation, Low	8148	0.39	8148	0.39	0
4	Sv2	Land with scrub, vegetation degradation, High	2387	0.11	2387	0.11	0
5	Iw1	Agriculture irrigated, water erosion, Low	8119	0.39	8119	0.39	0
6	S	Settlement	13837	0.66	12285	0.58	1553
Total Area Under Desertification/ Land Degradation			**275827**	**13.08**	**187453**	**8.89**	**88374**
7	W	Water body/ Drainage	19429	0.92	16885	0.80	2544
8	NAD	No Apparent Degradation	1812845	85.99	1903762	90.31	-90917
Total Geographical Area (ha)			**2108100**	**100**	**2108100**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	144709	6.86	69545	3.30	75163
2	Fv2	Forest, vegetation degradation, High	11805	0.56	2237	0.11	9568
3	Sv1	Land with scrub, vegetation degradation, Low	8148	0.39	7684	0.36	464
4	Sv2	Land with scrub, vegetation degradation, High	2387	0.11	2387	0.11	0
5	Iw1	Agriculture irrigated, water erosion, Low	8119	0.39	7444	0.35	675
6	S	Settlement	12285	0.58	6575	0.31	5710
Total Area Under Desertification/ Land Degradation			**187453**	**8.89**	**95873**	**4.55**	**91580**
7	W	Water body/ Drainage	16885	0.80	13548	0.64	3337
8	NAD	No Apparent Degradation	1903762	90.31	1998679	94.81	-94917
Total Geographical Area (ha)			**2108100**	**100**	**2108100**	**100**	



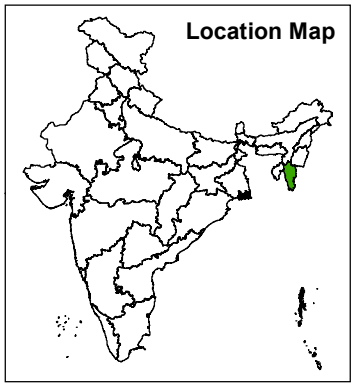
DESERTIFICATION / LAND DEGRADATION STATUS MAP MIZORAM (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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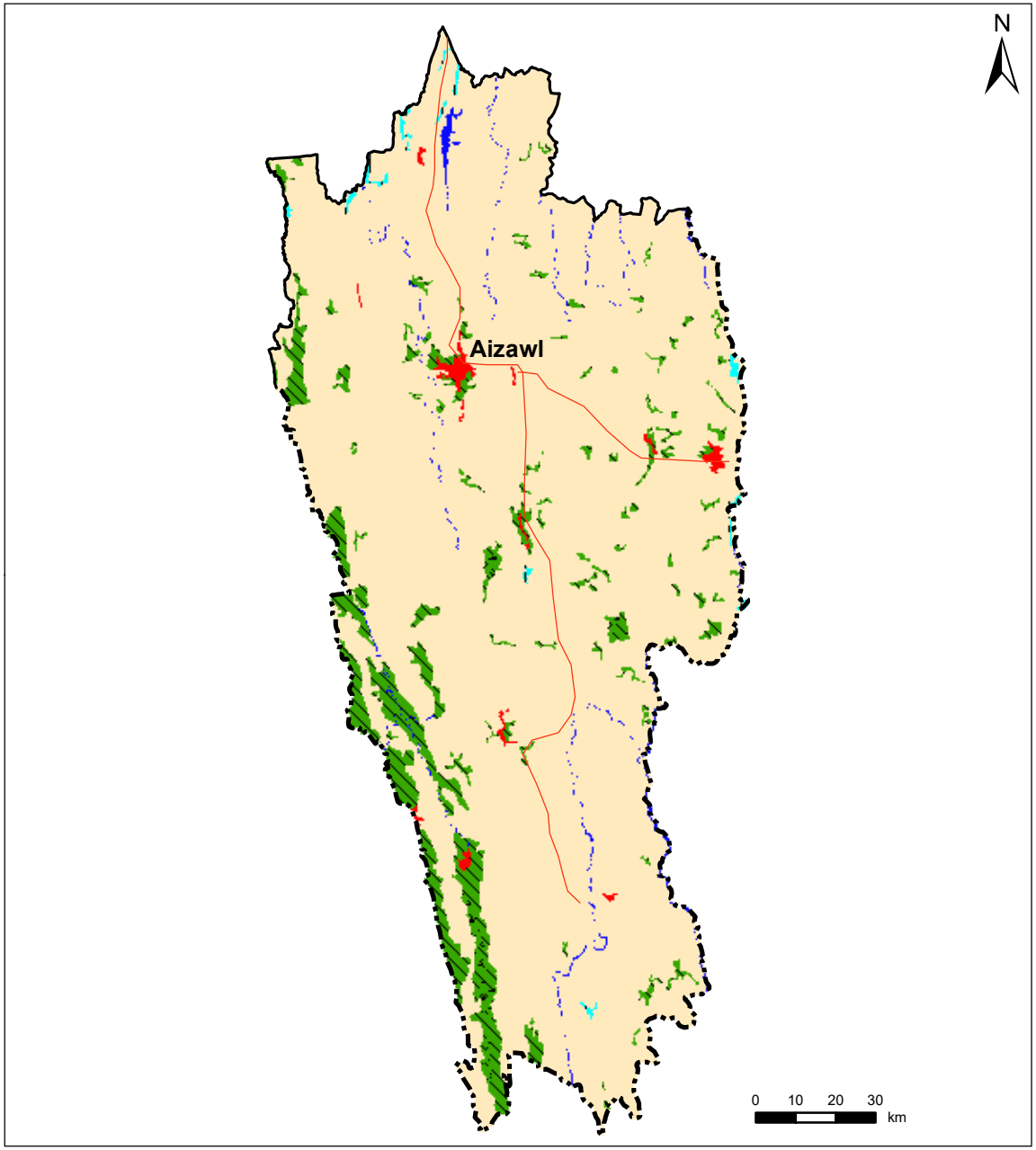
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP MIZORAM (2011-13)

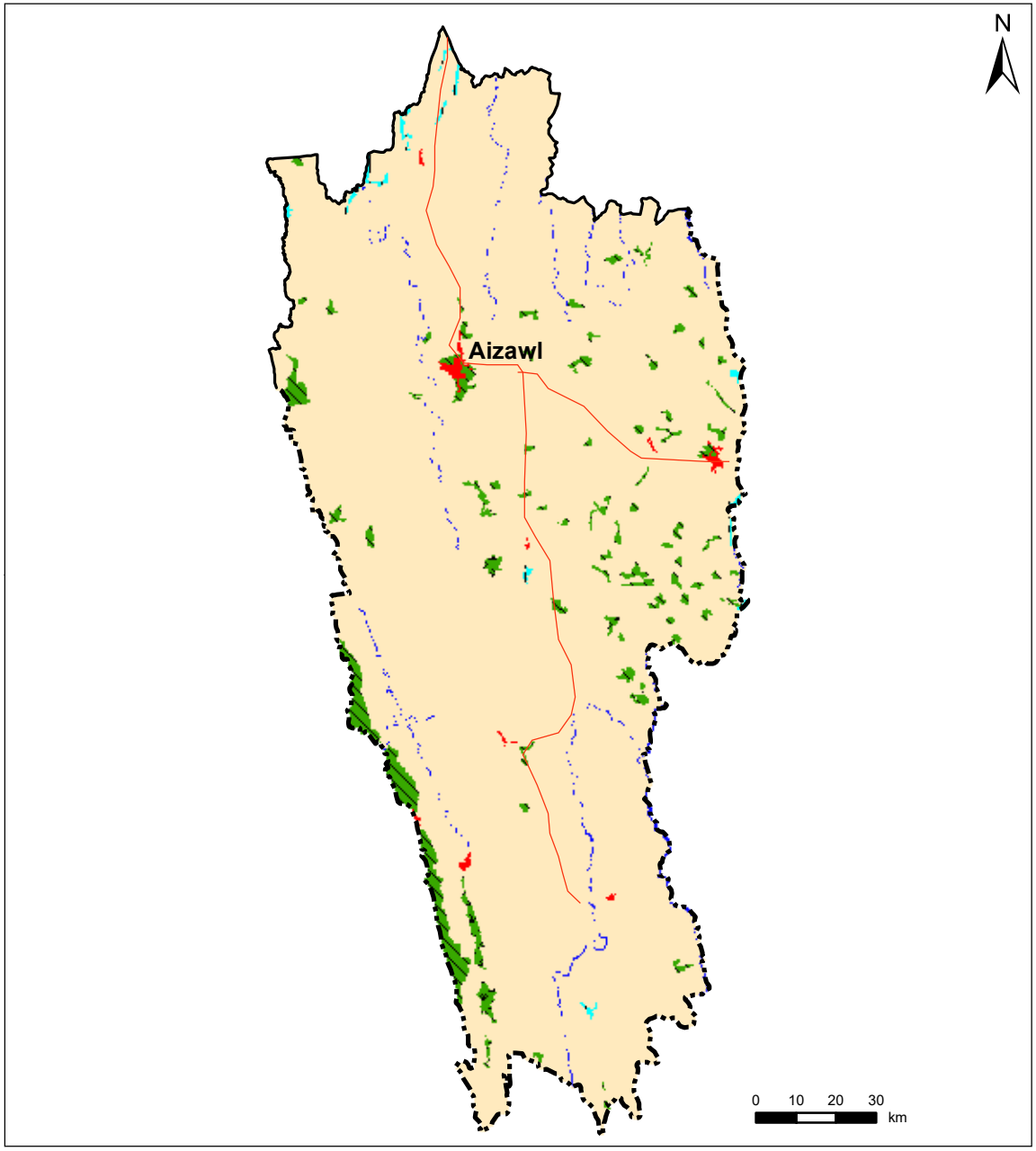
Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
Mizoram Remote Sensing Applications Centre, Aizawl
&
Space Applications Centre, ISRO, Ahmedabad



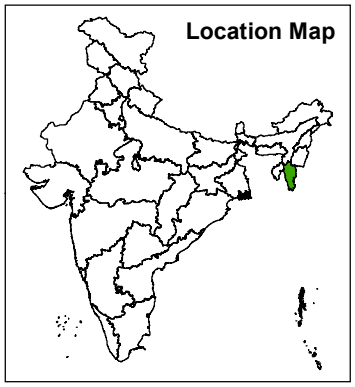
DESERTIFICATION / LAND DEGRADATION STATUS MAP MIZORAM (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

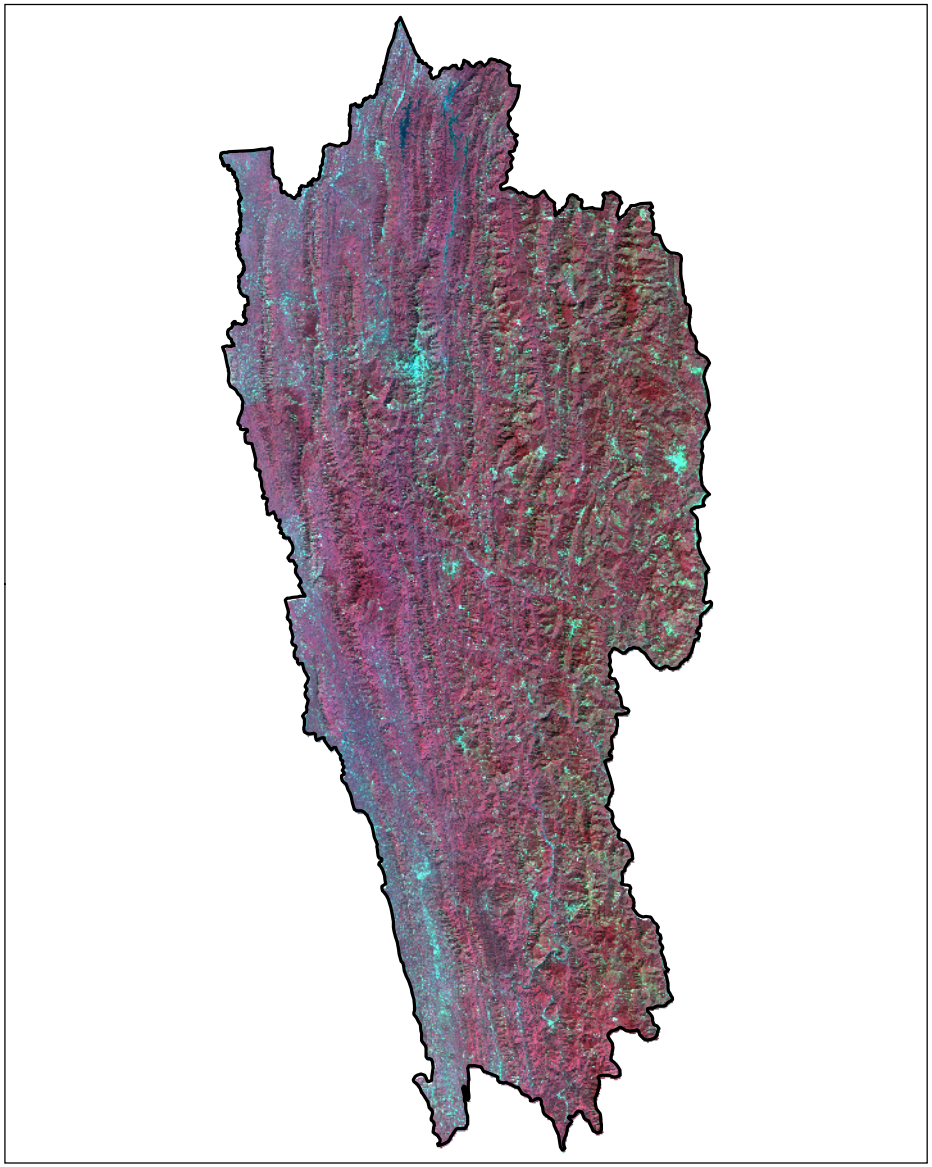
	International boundary
	State boundary
	Major roads
	Rail



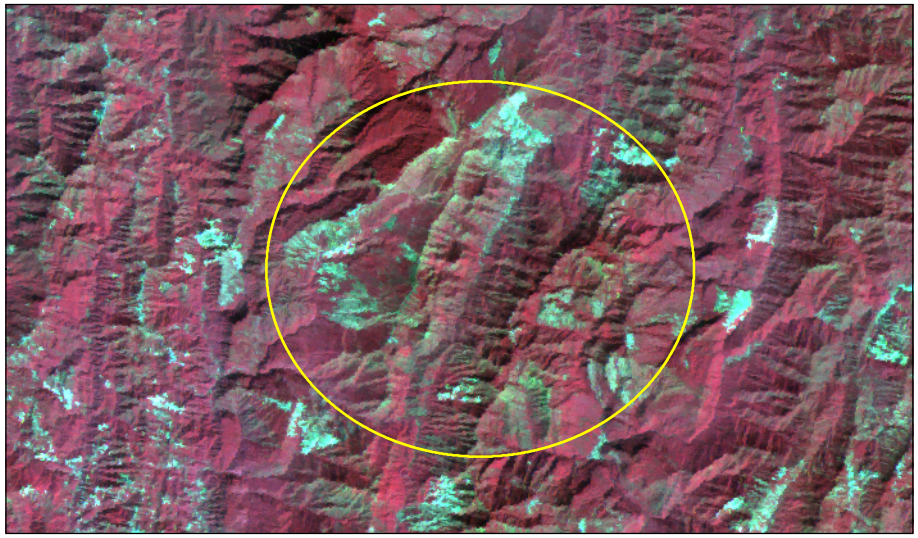
Prepared by:
Mizoram Remote Sensing Applications Centre, Aizawl
&
Space Applications Centre, ISRO, Ahmedabad

Mizoram - Illustrative representation of Land Degradation processes on IRS AWiFS data

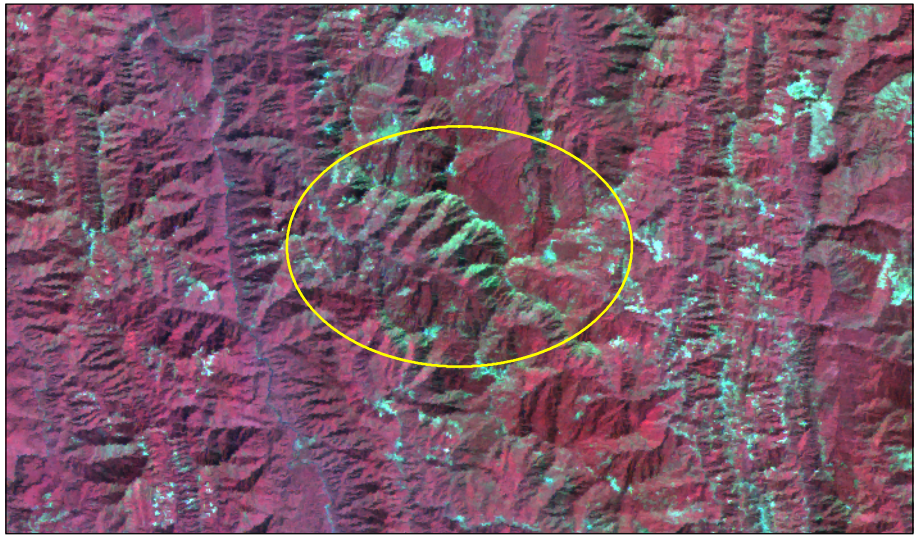
Mizoram as seen on IRS AWiFS (February 2019)



Forest area under vegetation degradation (February 2019)



Forest area under vegetation degradation (February 2019)



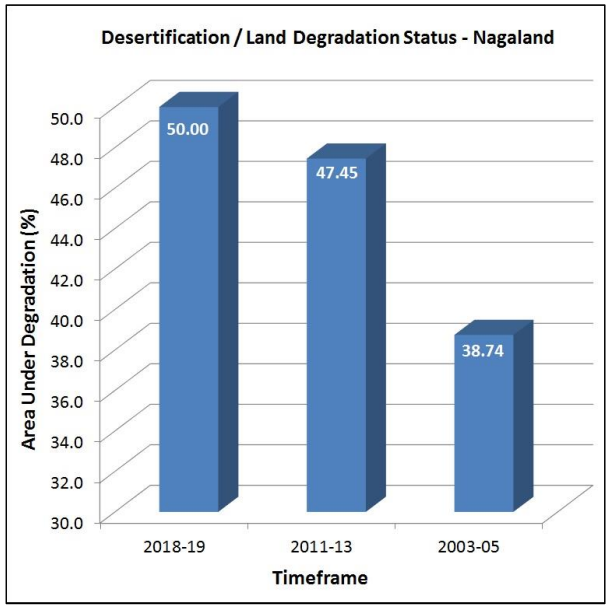
NAGALAND

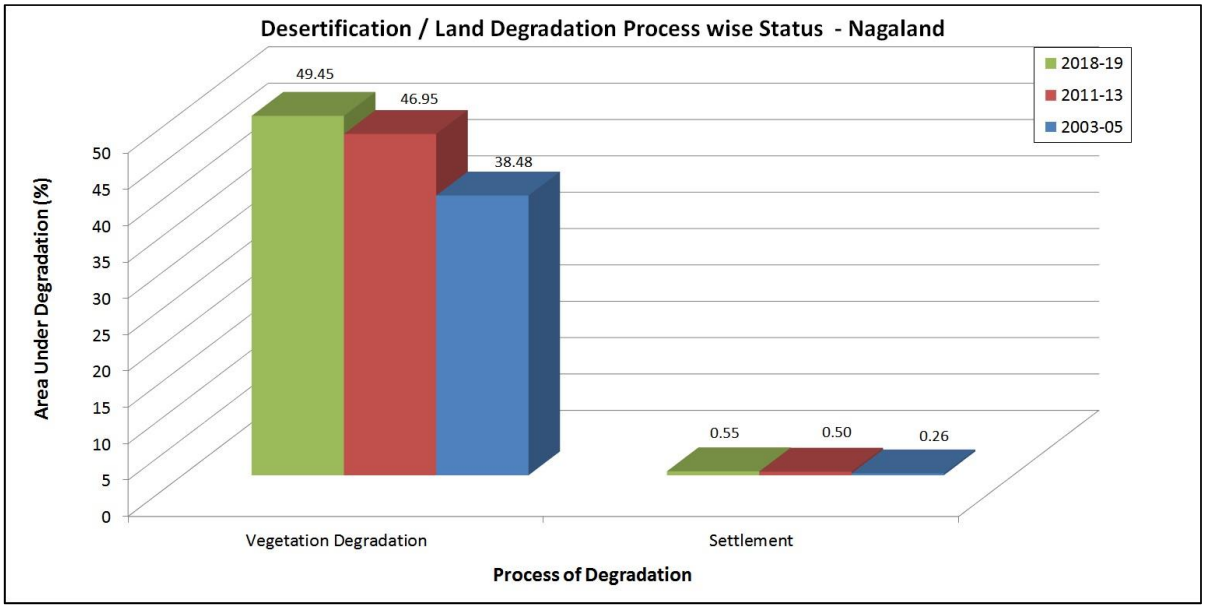
Nagaland is north eastern state of India, bordering Myanmar, with 16,579 sq km area. The state has population of 19,78,502; with 119 population density, 931 sex ratio and 79.55% literacy (Census 2011). Kohima is the capital of Nagaland. The state is mostly mountainous except those areas bordering Brahmaputra valley and mostly covered by dense woody forest. Mount Saramati is the highest peak in Nagaland with a height of 3,840 metres, and its range forms a natural barrier between Nagaland and Myanmar. Doyang, Diphu, Barak are the major rivers. Nagaland has a largely monsoon climate with high humidity levels. Annual rainfall averages around 1,800–2500 mm, concentrated in the months of May to September. Temperatures range from 4 °C to 40 °C. In winter, frost is common at high elevations.

The statistical summary and analysis of the Land Degradation of Nagaland state reveal that 50.00% (8,28,943 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 47.45% (7,86,678 ha) and 38.74% (6,42,304 ha) respectively. An increase of 2.55% (42,265 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 8.71% (1,44,374 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (49.45% in 2018-19, 46.95% in 2011-13 and 38.48% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation is observed. The same trend is observed between timeframe 2003-05 & 2011-13.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

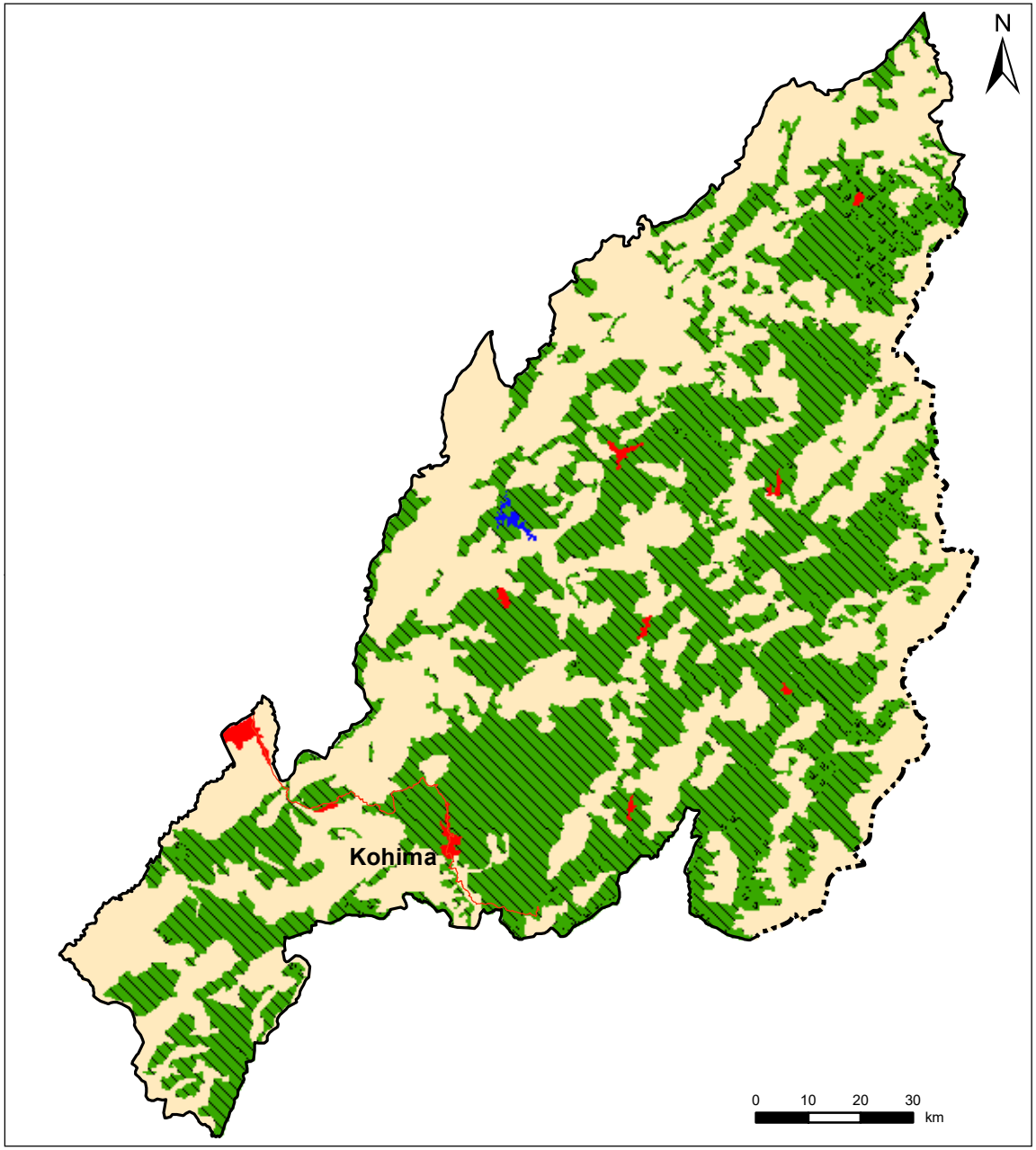




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	819753	49.45	778421	46.95	637957	38.48	41332	140464
Settlement	9190	0.55	8257	0.50	4347	0.26	933	3911
Total Area under Desertification	**828943**	**50.00**	**786678**	**47.45**	**642304**	**38.74**	**42265**	**144374**
No Apparent Degradation	**827297**	**49.90**	**869562**	**52.45**	**1013937**	**61.16**	**-42265**	**-144374**
Total Geographical Area (ha)	**1657900**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	634156	38.25	621356	37.48	12800
2	Fv2	Forest, vegetation degradation, High	115460	6.96	86615	5.22	28845
3	Gv2	Grassland / Grazing land, vegetation degradation, High	2459	0.15	2459	0.15	0
4	Sv1	Land with scrub, vegetation degradation, Low	54983	3.32	57047	3.44	-2064
5	Sv2	Land with scrub, vegetation degradation, High	12694	0.77	10943	0.66	1751
6	S	Settlement	9190	0.55	8257	0.50	933
Total Area Under Desertification/ Land Degradation			**828943**	**50.00**	**786678**	**47.45**	**42265**
7	W	Water body/ Drainage	1659	0.10	1659	0.10	0
8	NAD	No Apparent Degradation	827297	49.90	869562	52.45	-42265
Total Geographical Area (ha)			**1657900**	**100**	**1657900**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	621356	37.48	527757	31.83	93599
2	Fv2	Forest, vegetation degradation, High	86615	5.22	51178	3.09	35437
3	Gv2	Grassland / Grazing land, vegetation degradation, High	2459	0.15	2459	0.15	0
4	Sv1	Land with scrub, vegetation degradation, Low	57047	3.44	42503	2.56	14544
5	Sv2	Land with scrub, vegetation degradation, High	10943	0.66	14059	0.85	-3116
6	S	Settlement	8257	0.50	4347	0.26	3911
Total Area Under Desertification/ Land Degradation			**786678**	**47.45**	**642304**	**38.74**	**144374**
7	W	Water body/ Drainage	1659	0.10	1659	0.10	0
8	NAD	No Apparent Degradation	869562	52.45	1013937	61.16	-144374
Total Geographical Area (ha)			**1657900**	**100**	**1657900**	**100**	



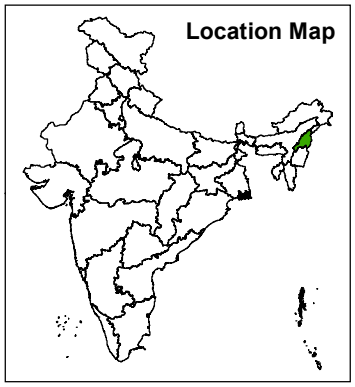
DESERTIFICATION / LAND DEGRADATION STATUS MAP NAGALAND (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Gv2	Grassland / Grazing land, vegetation degradation
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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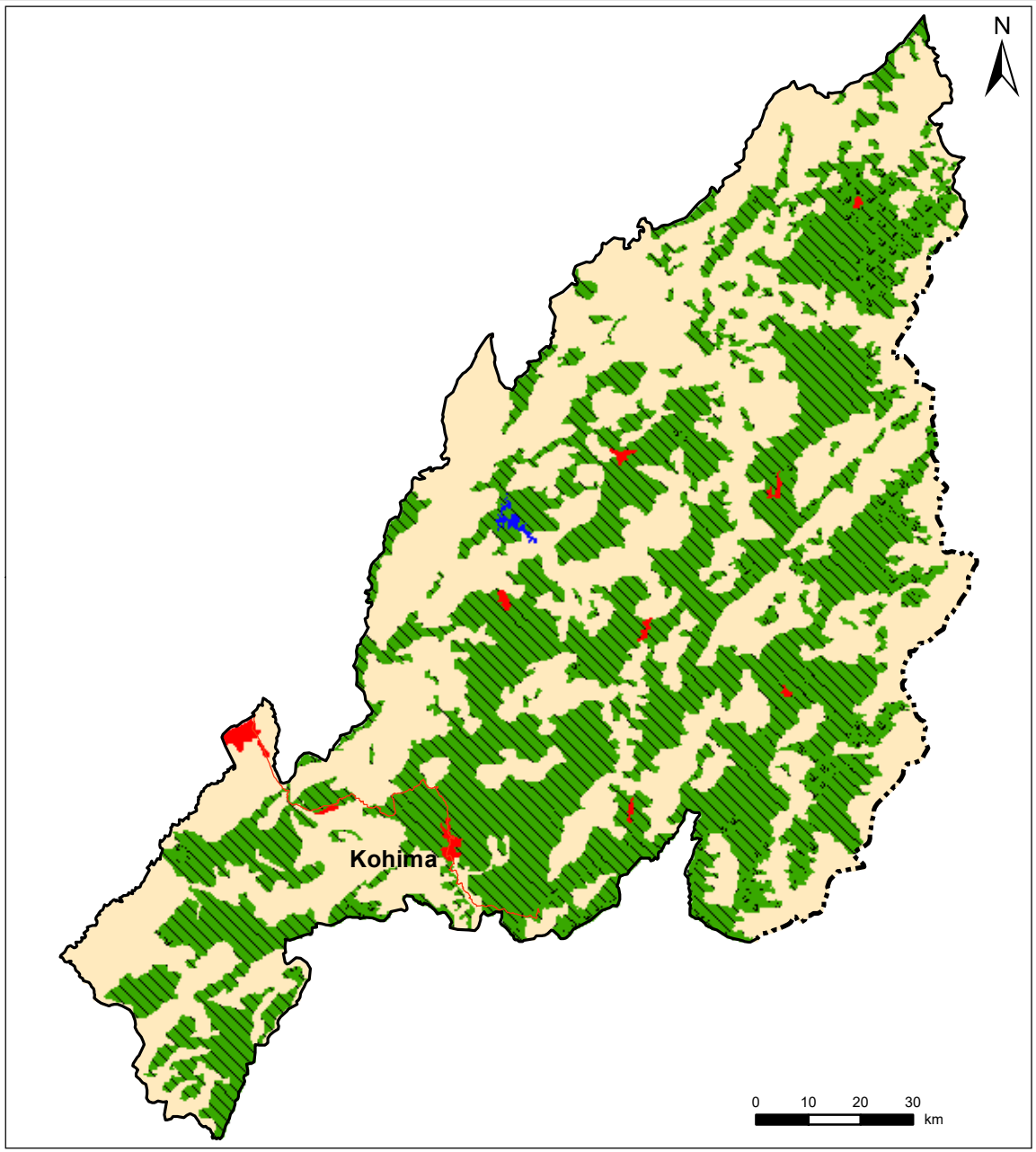
Space Applications Centre, ISRO, Ahmedabad



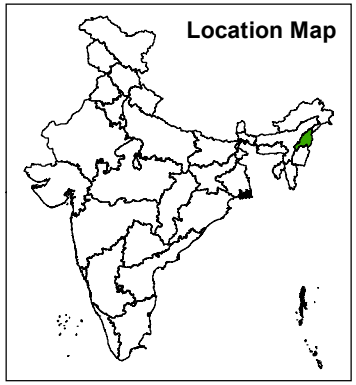
DESERTIFICATION / LAND DEGRADATION STATUS MAP NAGALAND (2011-13)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Gv2	Grassland / Grazing land, vegetation degradation
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

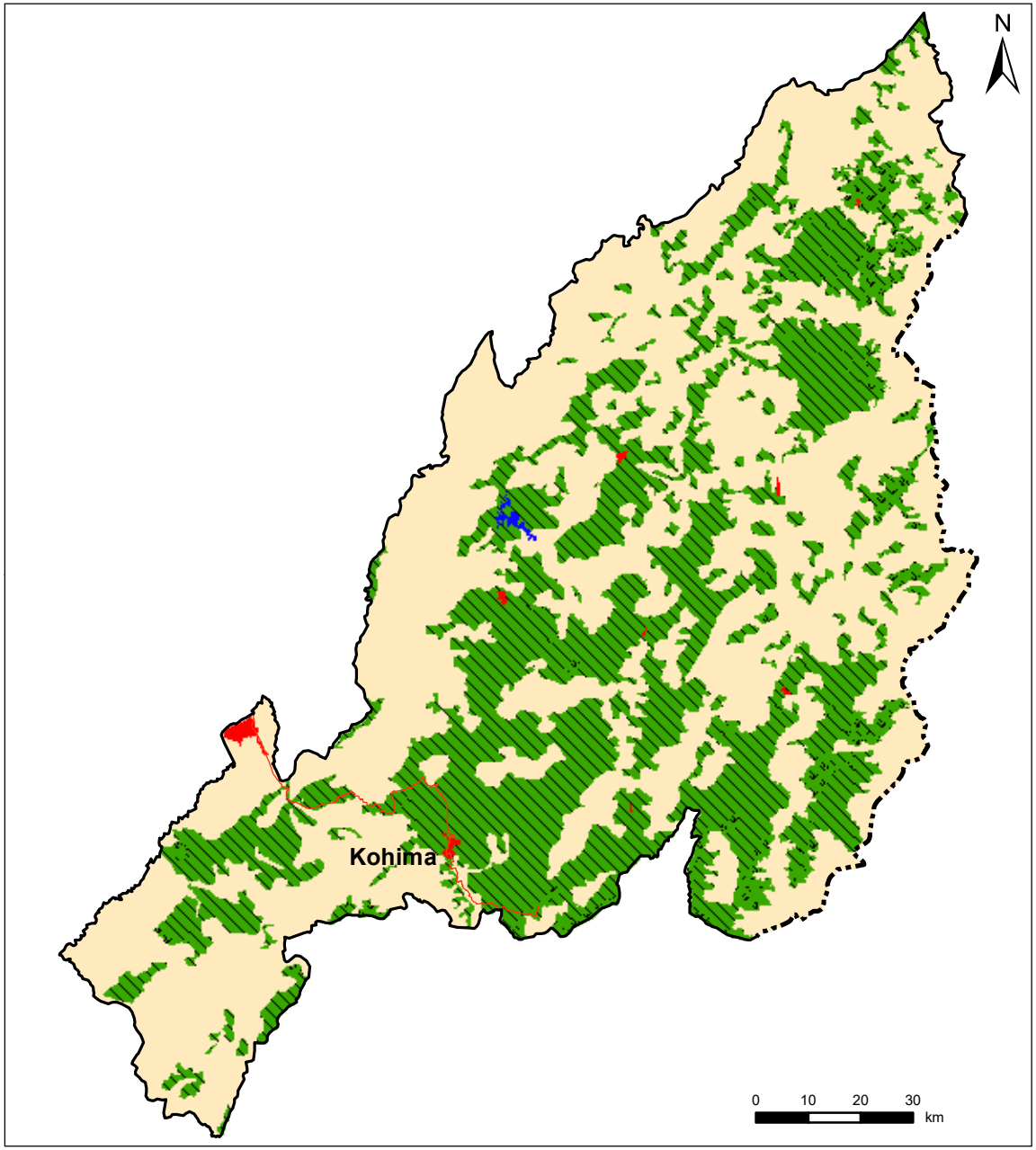
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Nagaland GIS & Remote Sensing Centre, Kohima
&
Space Applications Centre, ISRO, Ahmedabad



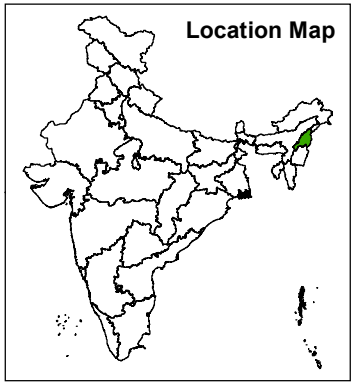
DESERTIFICATION / LAND DEGRADATION STATUS MAP NAGALAND (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Gv2	Grassland / Grazing land, vegetation degradation
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

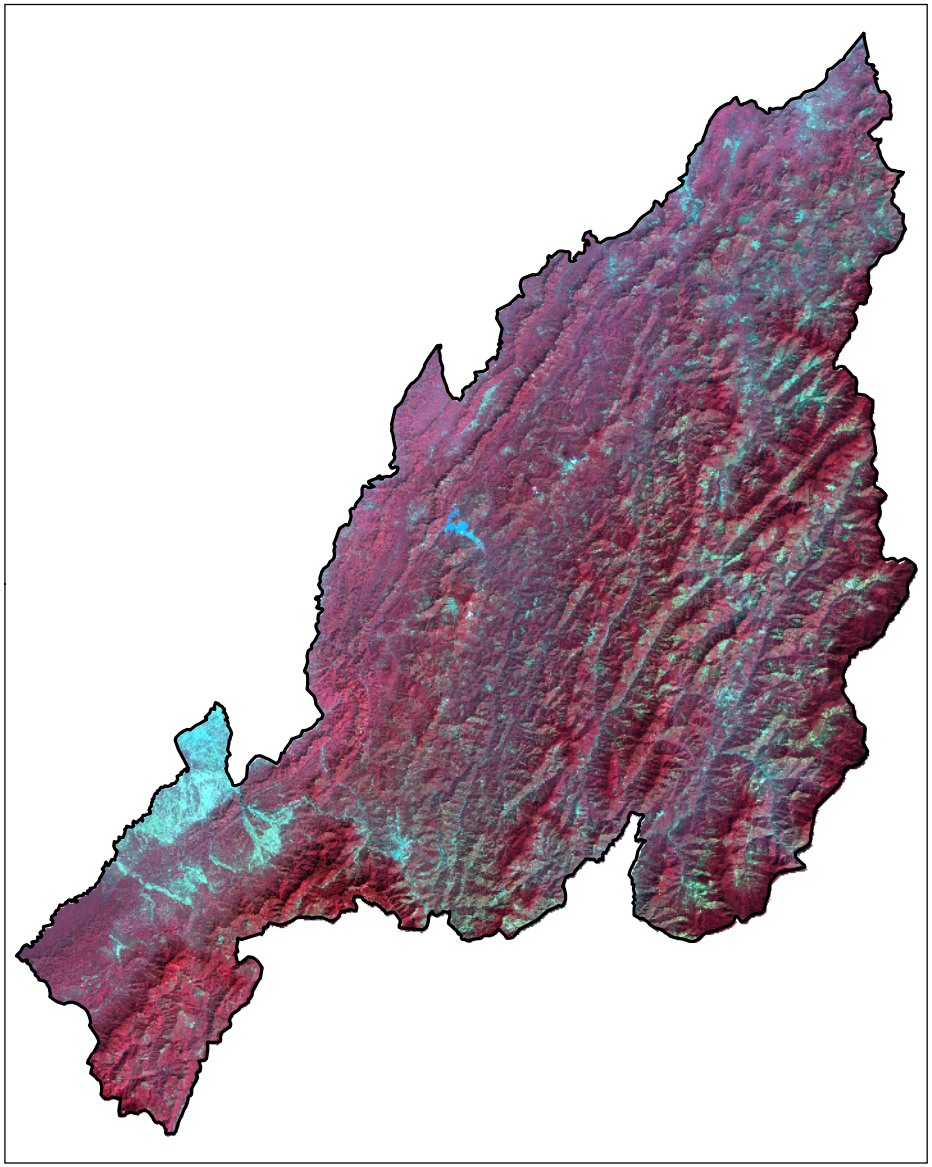
	International boundary
	State boundary
	Major roads
	Rail



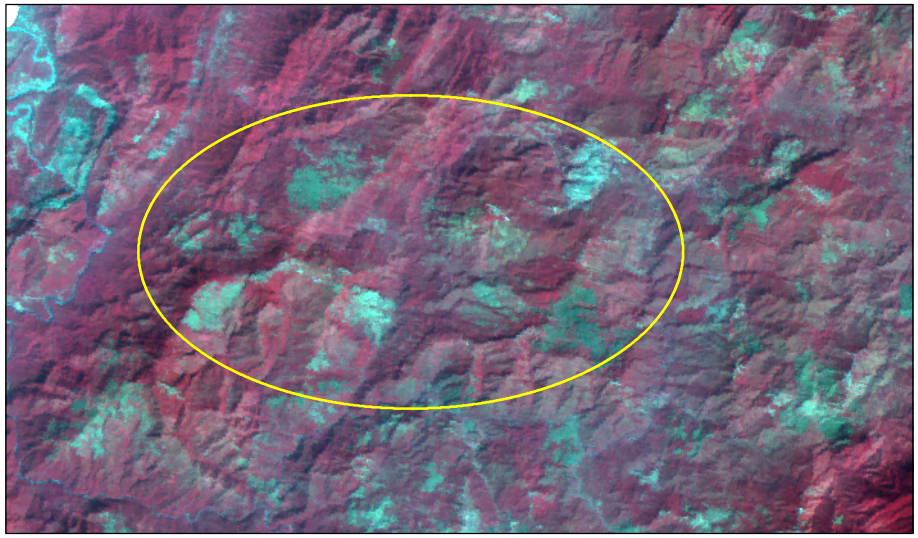
Prepared by:
Nagaland GIS & Remote Sensing Centre, Kohima
&
Space Applications Centre, ISRO, Ahmedabad

Nagaland - Illustrative representation of Land Degradation processes on IRS AWiFS data

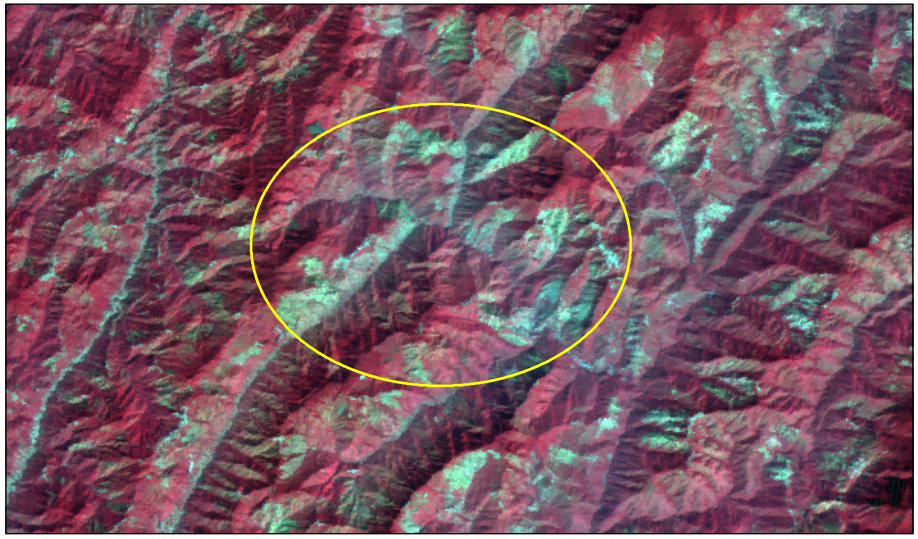
Nagaland as seen on IRS AWiFS (February 2019)



Forest area under vegetation degradation (February 2019)



Forest area under vegetation degradation (February 2019)



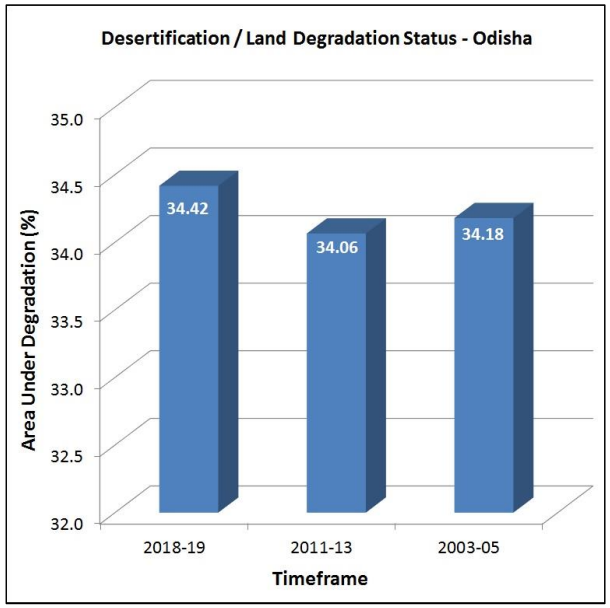
ODISHA

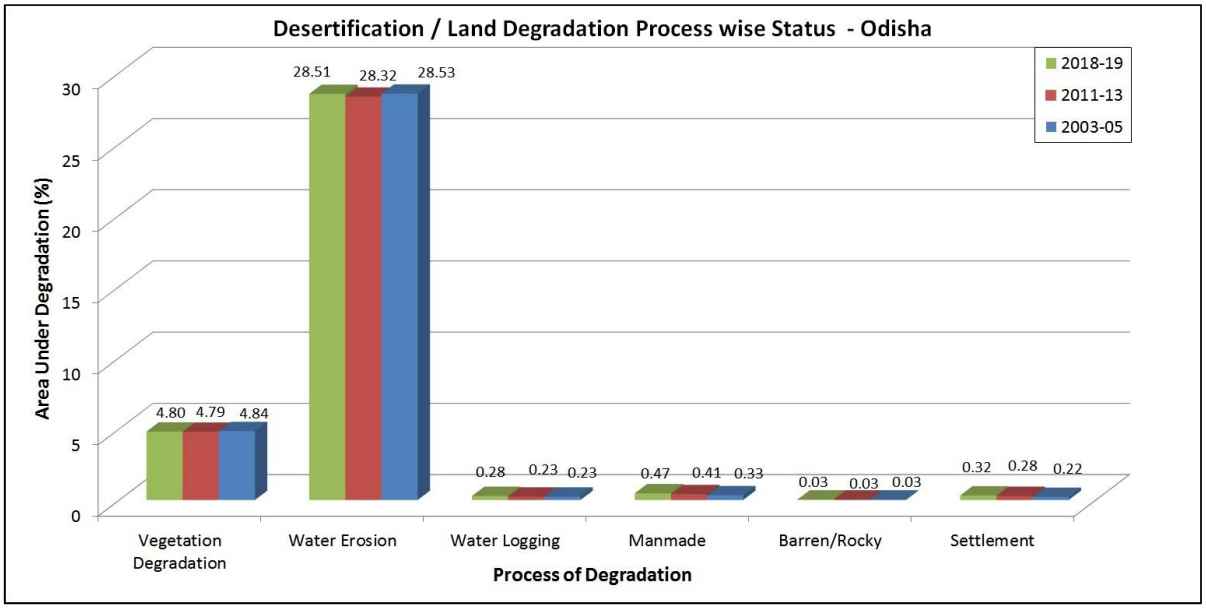
Odisha state is located on the eastern coast of India covering 1,55,707 sq km area. The state has population of 4,19,74,218; with 270 population density, 979 sex ratio and 72.87% literacy (Census 2011). Bhubaneshwar is the capital of Odisha. Physiographically, Odisha is divided into Coastal plains, Middle mountainous region and Plateaus and rolling up lands. Mahanadi, Rishikullya, Shubarnarekha, Baitarani etc. are major rivers. Odisha consists the largest lagoon of the country, Chilika. The state experiences tropical climate. The average annual temperature ranges between 15^{o}C to 42^{o}C.The average rainfall is 1500 mm.

The statistical summary and analysis of the Land Degradation of Odisha state reveal that 34.42% (5.35 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 34.06% (5.30 million ha) and 34.18% (5.32 million ha) respectively. An increase of 0.36% (54,900 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has decreased by 0.12% (17,789 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (28.51% in 2018-19, 28.32% in 2011-13 and 28.53% in 2003-05) followed by Vegetation Degradation (4.80% in 2018-19, 4.79% in 2011-13 and 4.84% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in agriculture area undergoing water erosion and area affected with manmade activities is observed. Whereas, from timeframe 2003-05 to 2011-13, decrease in agriculture area undergoing water erosion and increase in area affected with manmade activities is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

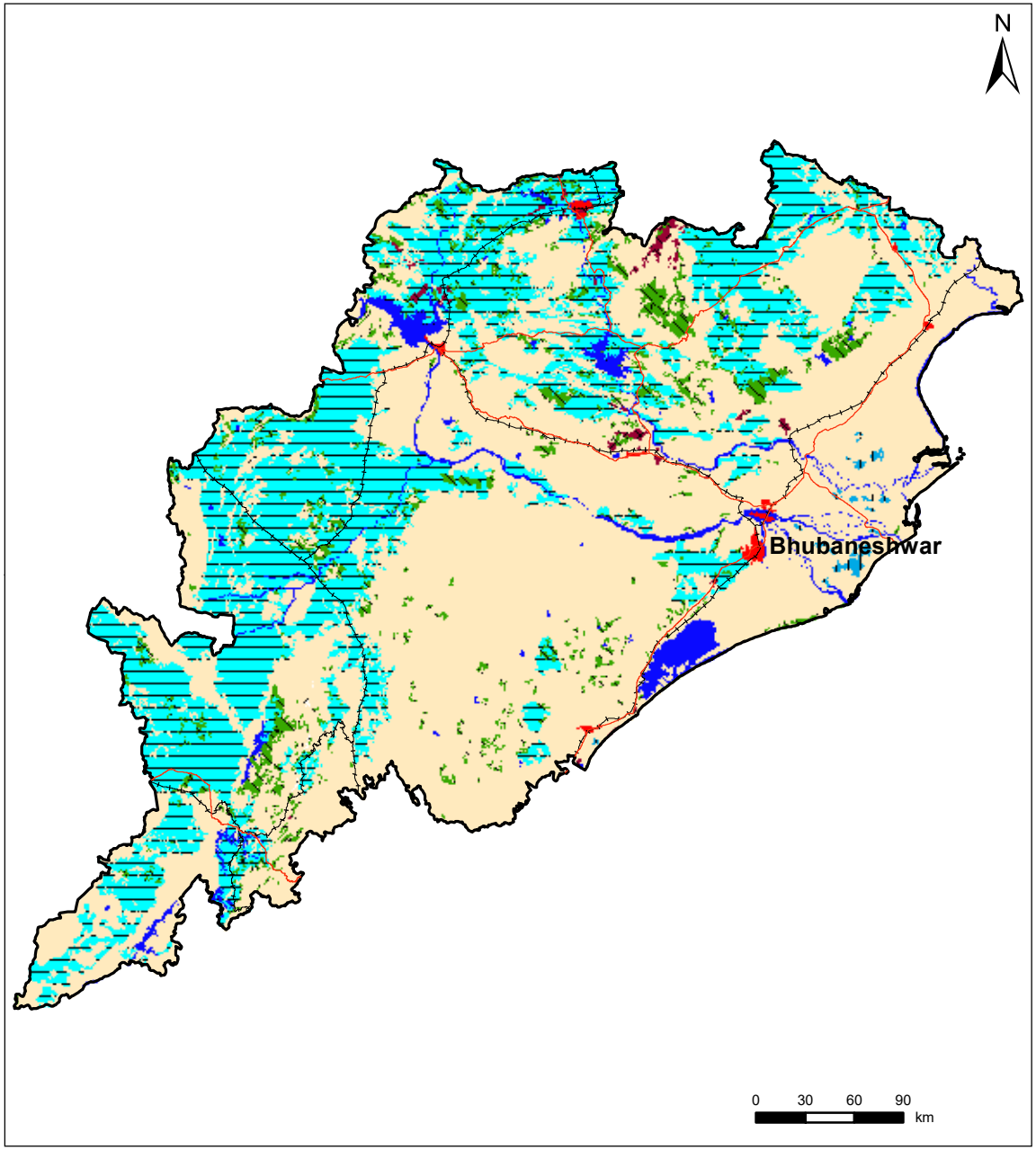




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	747574	4.80	745122	4.79	752929	4.84	2452	-7807
Water Erosion	4439799	28.51	4409413	28.32	4442556	28.53	30386	-33143
Water Logging	43992	0.28	36439	0.23	36439	0.23	7553	0
Manmade	72883	0.47	63851	0.41	51445	0.33	9032	12406
Barren/Rocky	5128	0.03	5128	0.03	5053	0.03	0	75
Settlement	49638	0.32	44161	0.28	33481	0.22	5477	10680
Total Area under Desertification	**5359014**	**34.42**	**5304114**	**34.06**	**5321903**	**34.18**	**54900**	**-17789**
No Apparent Degradation	**9715492**	**62.40**	**9758929**	**62.67**	**9741425**	**62.56**	**-43437**	**17504**
Total Geographical Area (ha)	**15570700**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	616048	3.96	613663	3.94	2385
2	Fv2	Forest, vegetation degradation, High	83839	0.54	83839	0.54	0
3	Sv1	Land with scrub, vegetation degradation, Low	43572	0.28	43572	0.28	0
4	Sv2	Land with scrub, vegetation degradation, High	4116	0.03	4048	0.03	67
5	Dw1	Agriculture unirrigated, water erosion, Low	4439799	28.51	4409413	28.32	30386
6	Il1	Agriculture irrigated, water logging, Low	43992	0.28	36439	0.23	7553
7	Fm1	Forest, man made, Low	12795	0.08	12051	0.08	744
8	Tm1	Others, man made, Low	53908	0.35	46018	0.30	7890
9	Tm2	Others, man made, High	6180	0.04	5783	0.04	397
10	B	Barren	5128	0.03	5128	0.03	0
11	S	Settlement	49638	0.32	44161	0.28	5477
Total Area Under Desertification/ Land Degradation			**5359014**	**34.42**	**5304114**	**34.06**	**54900**
12	W	Water body/ Drainage	496194	3.19	507657	3.26	-11463
13	NAD	No Apparent Degradation	9715492	62.40	9758929	62.67	-43437
Total Geographical Area (ha)			**15570700**	**100**	**15570700**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	613663	3.94	621446	3.99	-7783
2	Fv2	Forest, vegetation degradation, High	83839	0.54	83837	0.54	2
3	Sv1	Land with scrub, vegetation degradation, Low	43572	0.28	43598	0.28	-26
4	Sv2	Land with scrub, vegetation degradation, High	4048	0.03	4048	0.03	0
5	Dw1	Agriculture unirrigated, water erosion, Low	4409413	28.32	4442556	28.53	-33143
6	Il1	Agriculture irrigated, water logging, Low	36439	0.23	36439	0.23	0
7	Fm1	Forest, man made, Low	12051	0.08	11845	0.08	205
8	Tm1	Others, man made, Low	46018	0.30	36884	0.24	9134
9	Tm2	Others, man made, High	5783	0.04	2716	0.02	3067
10	B	Barren	5128	0.03	5053	0.03	75
11	S	Settlement	44161	0.28	33481	0.22	10680
Total Area Under Desertification/ Land Degradation			**5304114**	**34.06**	**5321903**	**34.18**	**-17789**
12	W	Water body/ Drainage	507657	3.26	507372	3.26	285
13	NAD	No Apparent Degradation	9758929	62.67	9741425	62.56	17504
Total Geographical Area (ha)			**15570700**	**100**	**15570700**	**100**	



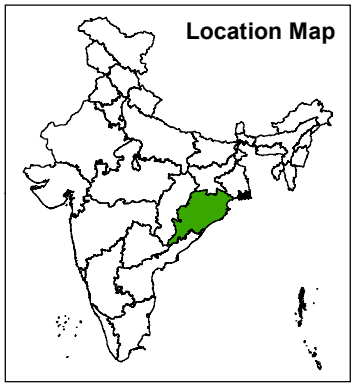
DESERTIFICATION / LAND DEGRADATION STATUS MAP ODISHA (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Fm1	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

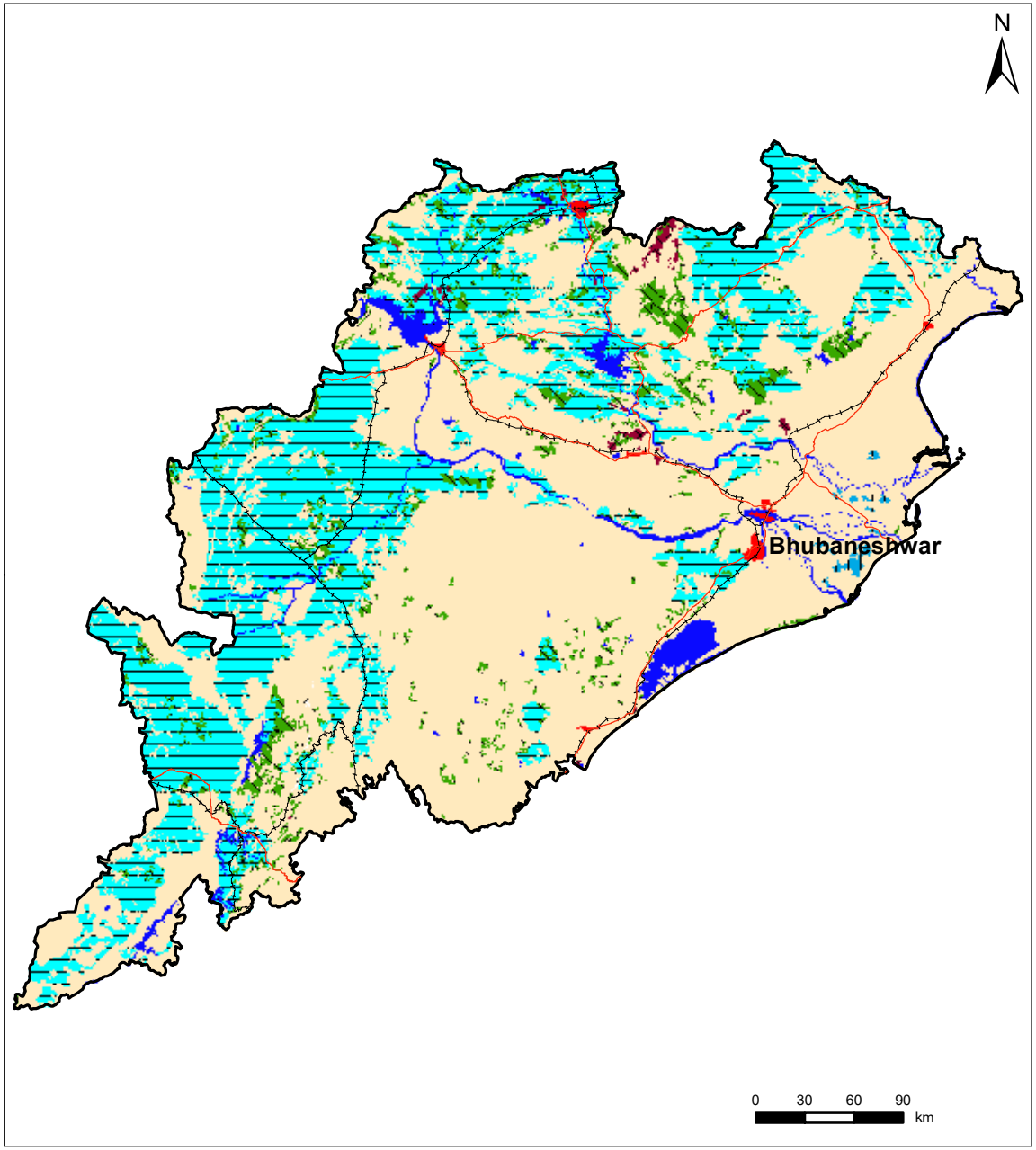
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Odisha Space Applications Centre, Bhubneshwar
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP ODISHA (2011-13)

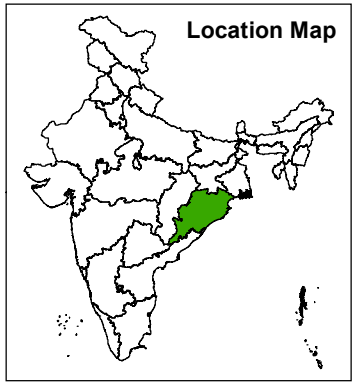
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Fm1	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

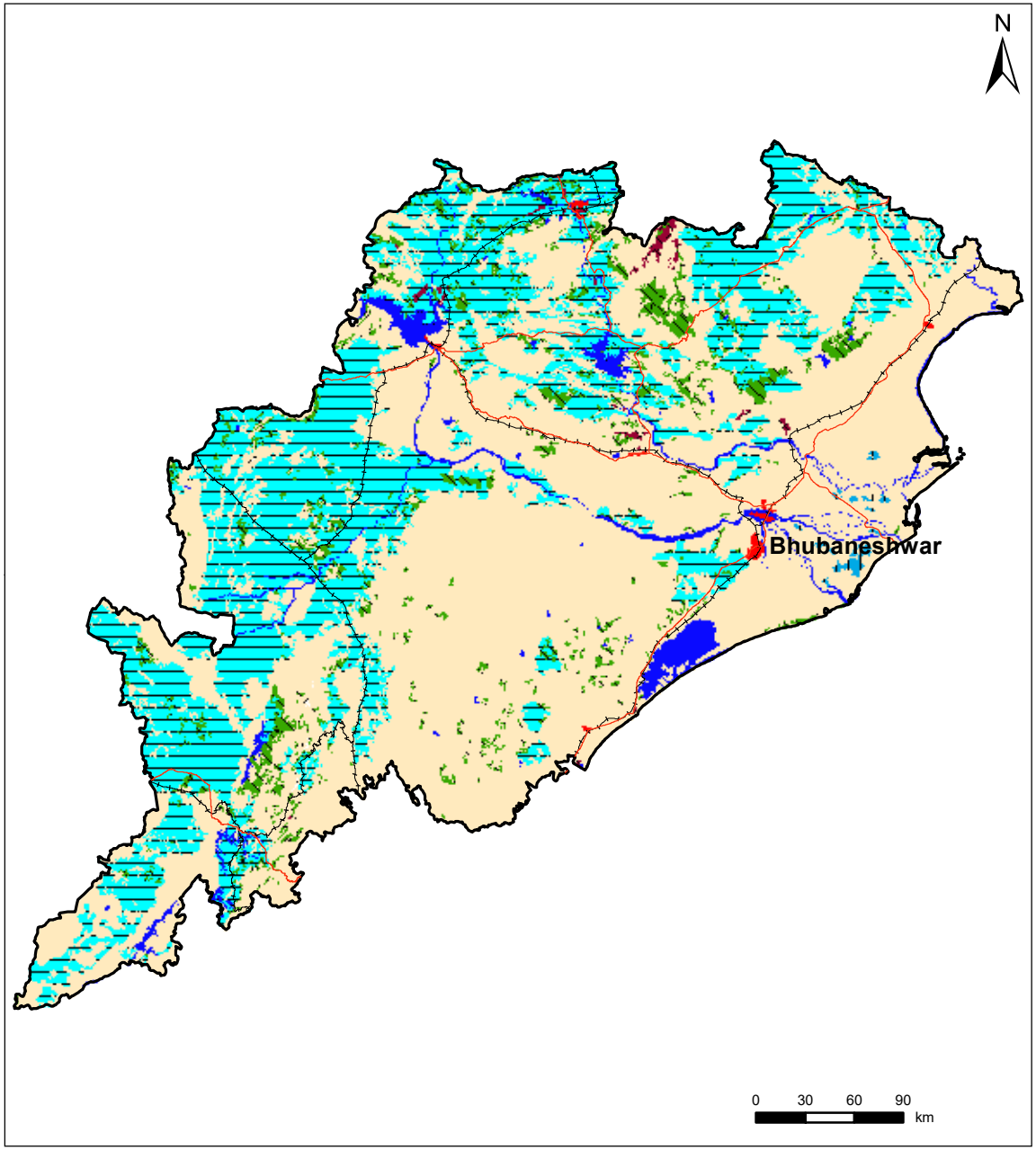
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Odisha Space Applications Centre, Bhubneshwar
&
Space Applications Centre, ISRO, Ahmedabad



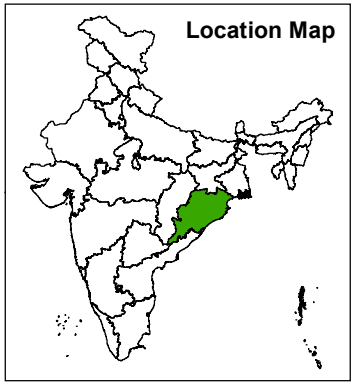
DESERTIFICATION / LAND DEGRADATION STATUS MAP ODISHA (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Fm1	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

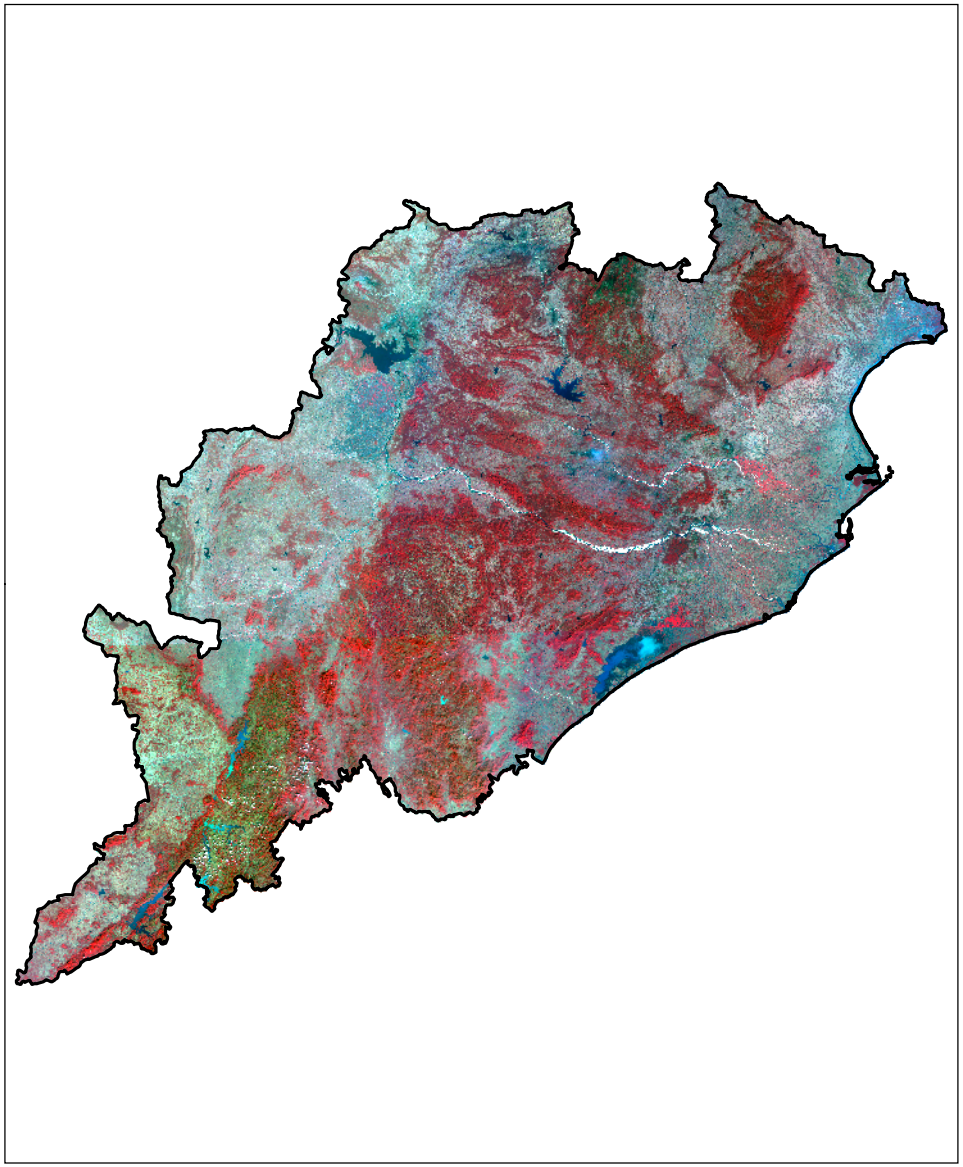
	International boundary
	State boundary
	Major roads
	Rail



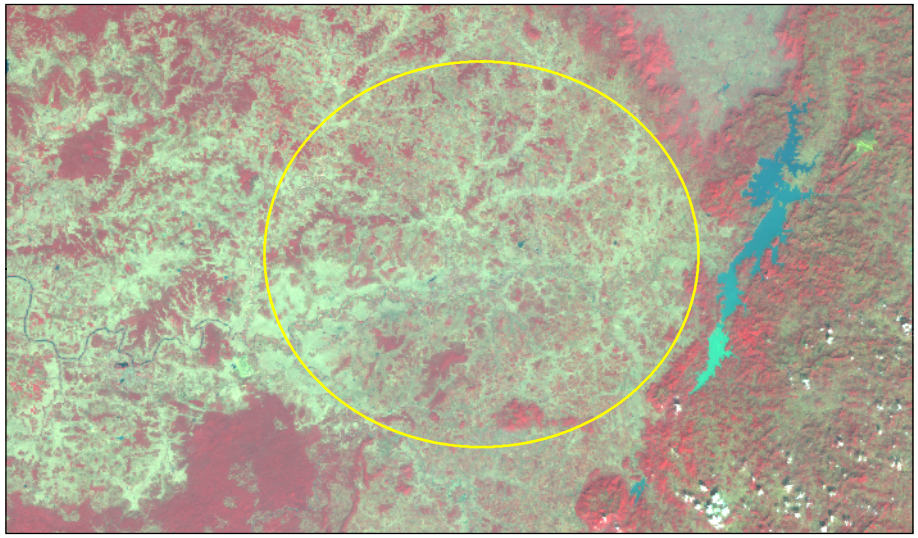
Prepared by:
Odisha Space Applications Centre, Bhubneshwar
&
Space Applications Centre, ISRO, Ahmedabad

Odisha - Illustrative representation of Land Degradation processes on IRS AWiFS data

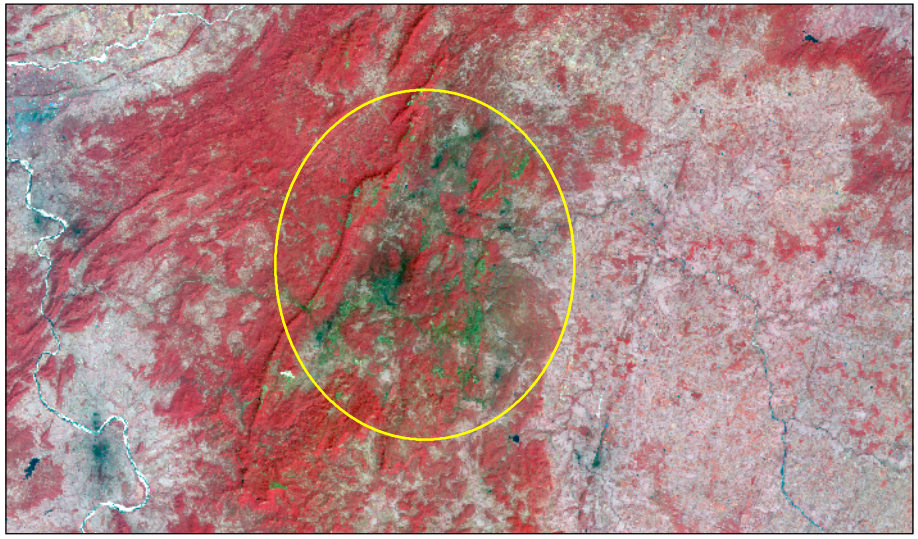
Odisha as seen on IRS AWiFS (February 2019)



Agriculture area affected with water erosion (February 2019)



Forest area affected with manmade (mining) activities (February 2018)



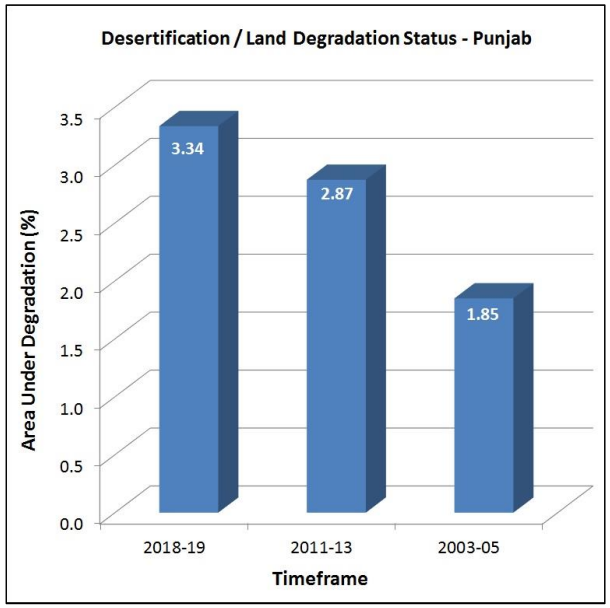
PUNJAB

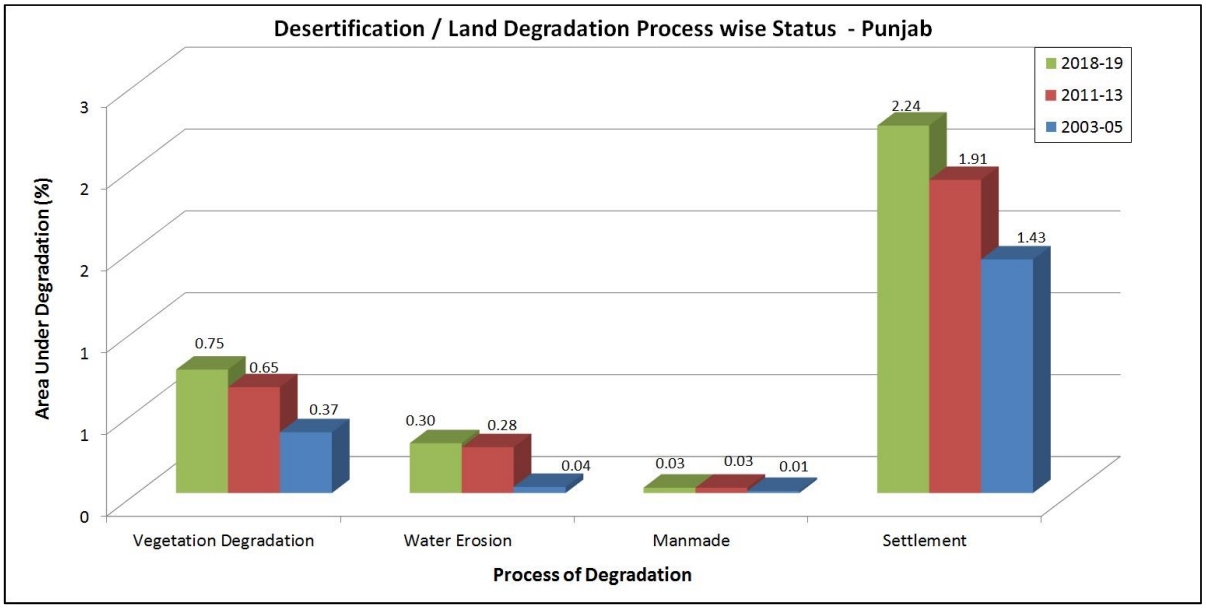
Punjab, the north-western border state of India, bordering Pakistan; and spread over 50,362 sq km area. The state has a population of 2,77,43,338; with 551 population density, 895 sex ratio and 75.84% literacy (Census 2011). Chandigarh is the capital of the state. The major geographic features of Punjab are Shivalik Hills in the north, alluvial plain almost in all over the state and semi-arid area in south-west gradually merging with Thar desert. The major rivers of Punjab are Beas and Sutlej. Agriculture is the largest industry of this state due to very fertile soil with variety of soil profile characteristics. Punjab's climate is characterised by extreme hot and extreme cold conditions with average annual rainfall about 450 to 950 mm.

The statistical summary and analysis of the Land Degradation of Punjab state reveal that 3.34% (1,67,989 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 2.87% (1,44,653 ha) and 1.85% (93,115 ha) respectively. An increase of 0.47% (23,336 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.02% (51,538 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (0.75% in 2018-19, 0.65% in 2011-13 and 0.37% in 2003-05). Between timeframe 2011-13 & 2018-19, slight increase in forest area undergoing vegetation degradation is observed. The same trend is observed between timeframe 2003-05 & 2011-13.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

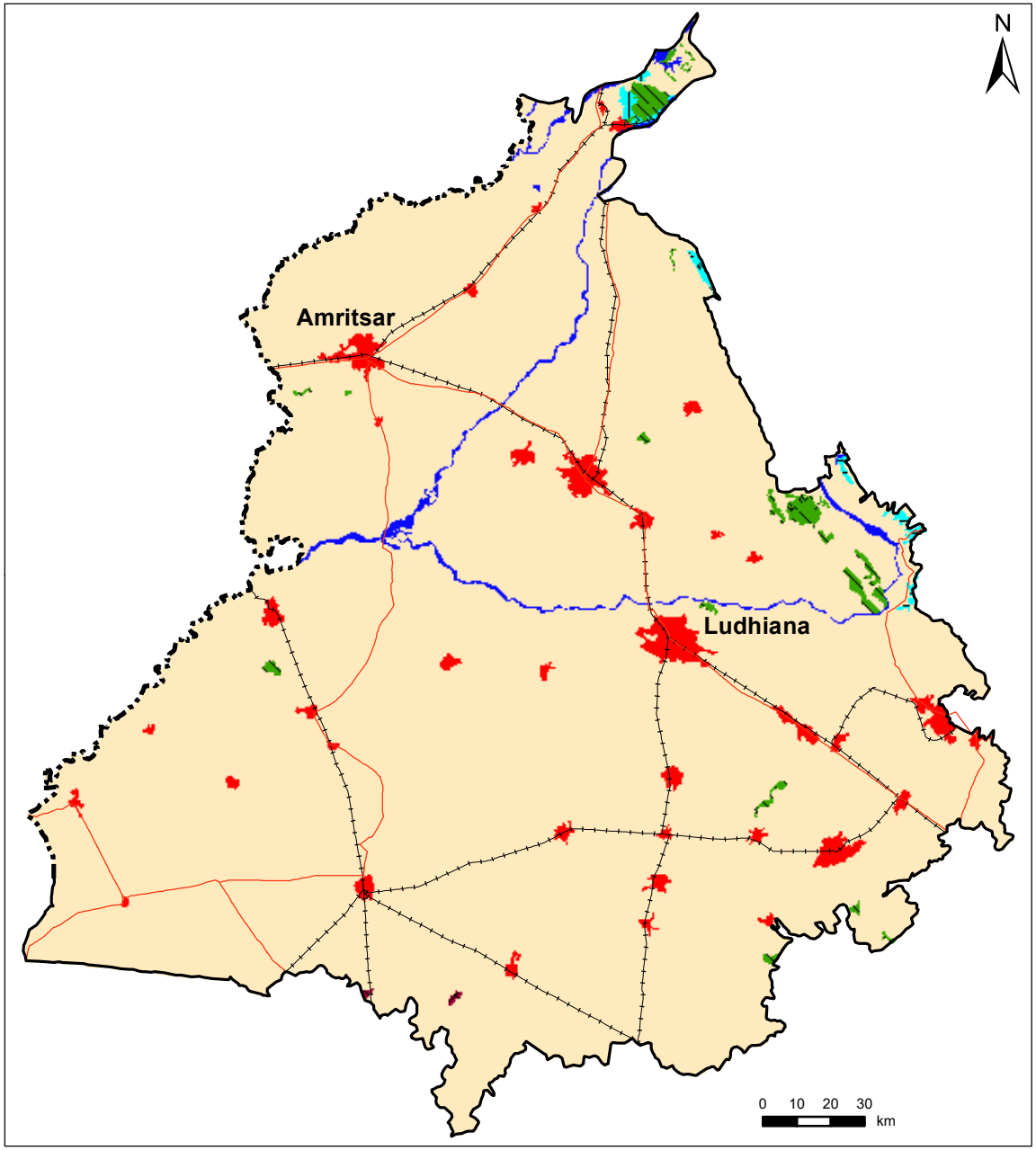




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	37972	0.75	32561	0.65	18705	0.37	5411	13856
Water Erosion	15344	0.30	14116	0.28	1897	0.04	1228	12219
Manmade	1641	0.03	1641	0.03	652	0.01	0	989
Settlement	113032	2.24	96335	1.91	71861	1.43	16696	24474
Total Area under Desertification	**167989**	**3.34**	**144653**	**2.87**	**93115**	**1.85**	**23336**	**51538**
No Apparent Degradation	**4824232**	**95.79**	**4849651**	**96.30**	**4901242**	**97.32**	**-25419**	**-51591**
Total Geographical Area (ha)	**5036200**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	27709	0.55	22298	0.44	5411
2	Fv2	Forest, vegetation degradation, High	3845	0.08	3845	0.08	0
3	Sv1	Land with scrub, vegetation degradation, Low	6418	0.13	6418	0.13	0
4	Iw1	Agriculture irrigated, water erosion, Low	3951	0.08	3951	0.08	3951
5	Dw1	Agriculture unirrigated, water erosion, Low	8277	0.16	7049	0.14	1228
6	Sw1	Land with scrub, water erosion, Low	3116	0.06	3116	0.06	3116
7	Tm1	Others, man made, Low	1641	0.03	1641	0.03	0
8	S	Settlement	113032	2.24	96335	1.91	16696
Total Area Under Desertification/ Land Degradation			**167989**	**3.34**	**144653**	**2.87**	**23336**
9	W	Water body/ Drainage	43979	0.87	41897	0.83	2083
10	NAD	No Apparent Degradation	4824232	95.79	4849651	96.30	-25419
Total Geographical Area (ha)			**5036200**	**100**	**5036200**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	22298	0.44	14717	0.29	7580
2	Fv2	Forest, vegetation degradation, High	3845	0.08	3398	0.07	447
3	Sv1	Land with scrub, vegetation degradation, Low	6418	0.13	590	0.01	5828
4	Iw1	Agriculture irrigated, water erosion, Low	3951	0.08	-	-	3951
5	Dw1	Agriculture unirrigated, water erosion, Low	7049	0.14	1897	0.04	5151
6	Sw1	Land with scrub, water erosion, Low	3116	0.06	-	-	3116
7	Tm1	Others, man made, Low	1641	0.03	652	0.01	989
8	S	Settlement	96335	1.91	71861	1.43	24474
Total Area Under Desertification/ Land Degradation			**144653**	**2.87**	**93115**	**1.85**	**51538**
9	W	Water body/ Drainage	41897	0.83	41843	0.83	53
10	NAD	No Apparent Degradation	4849651	96.30	4901242	97.32	-51591
Total Geographical Area (ha)			**5036200**	**100**	**5036200**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP PUNJAB (2018-19)

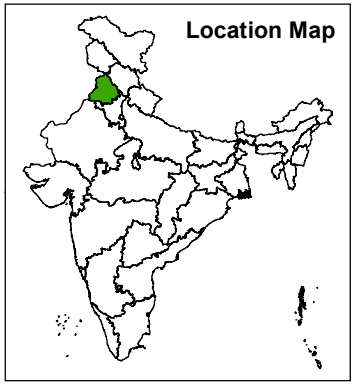
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Tm1	Others, man made
	S	Settlement
	W	Water body /Drainage
	NAD	No Apparent Degradation

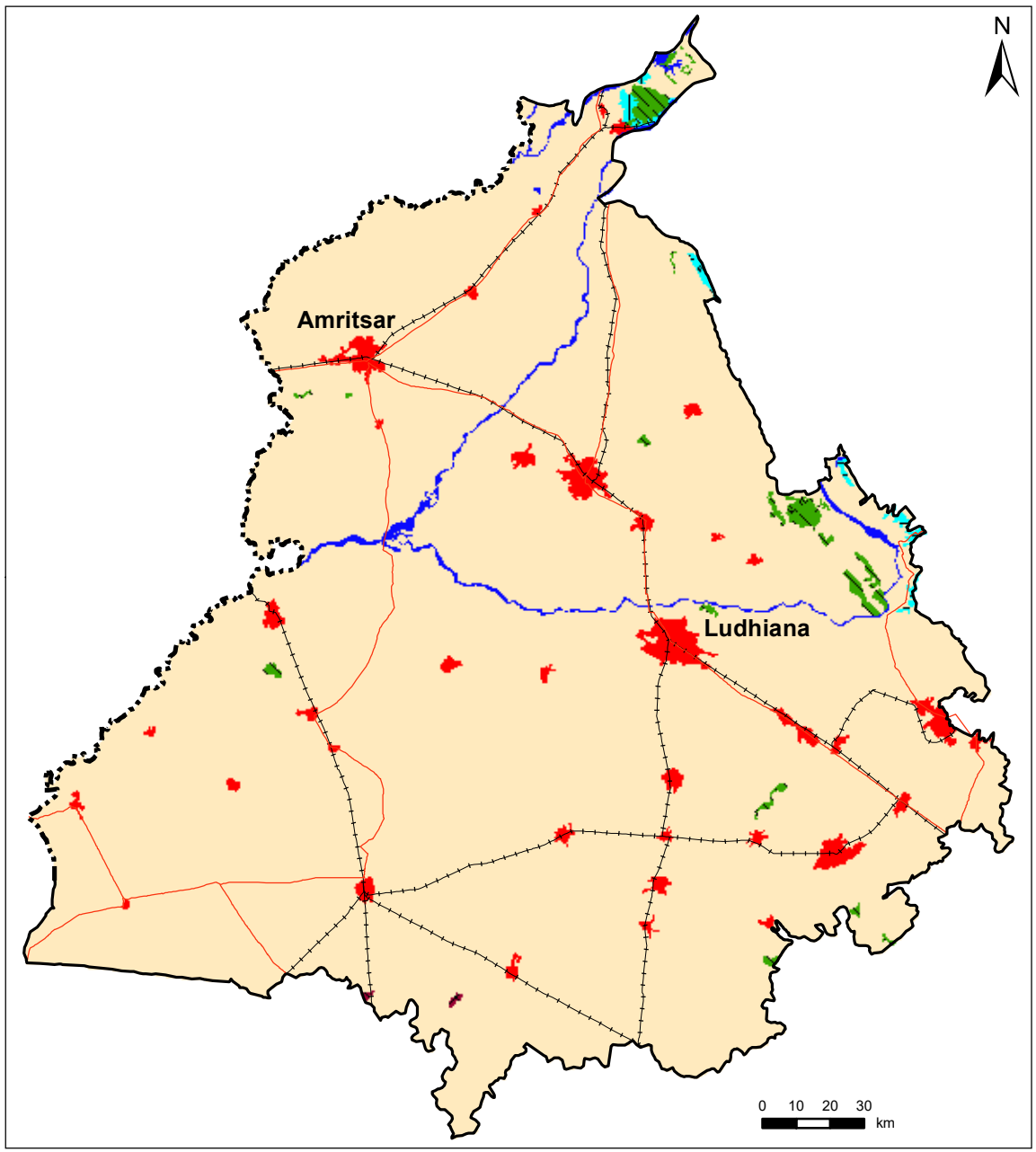
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Jawaharlal Nehru University, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP PUNJAB (2011-13)

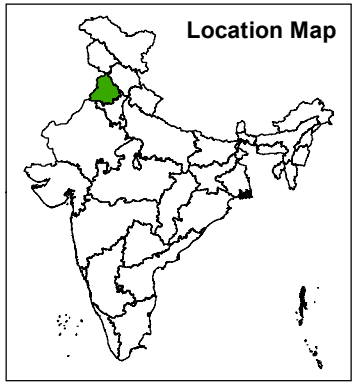
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Tm1	Others, man made
	S	Settlement
	W	Water body /Drainage
	NAD	No Apparent Degradation

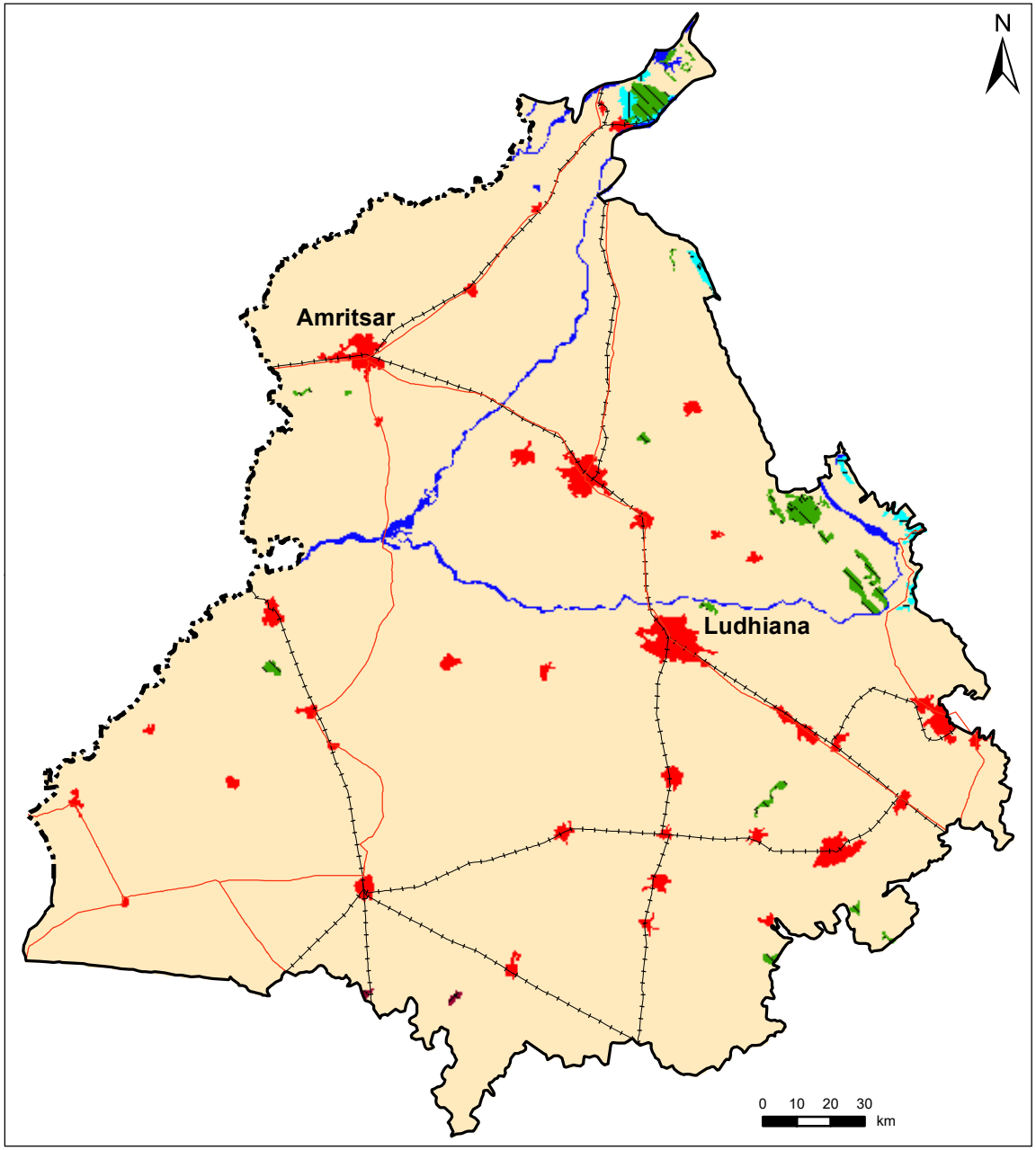
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Soil and Land Use Survey of India, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad



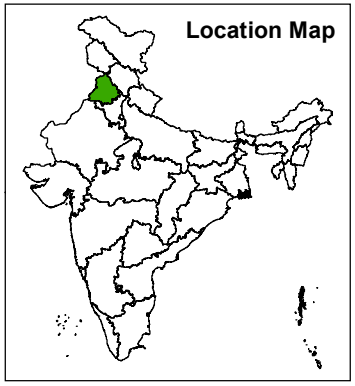
DESERTIFICATION / LAND DEGRADATION STATUS MAP PUNJAB (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Tm1	Others, man made
	S	Settlement
	W	Water body /Drainage
	NAD	No Apparent Degradation

Data Source:

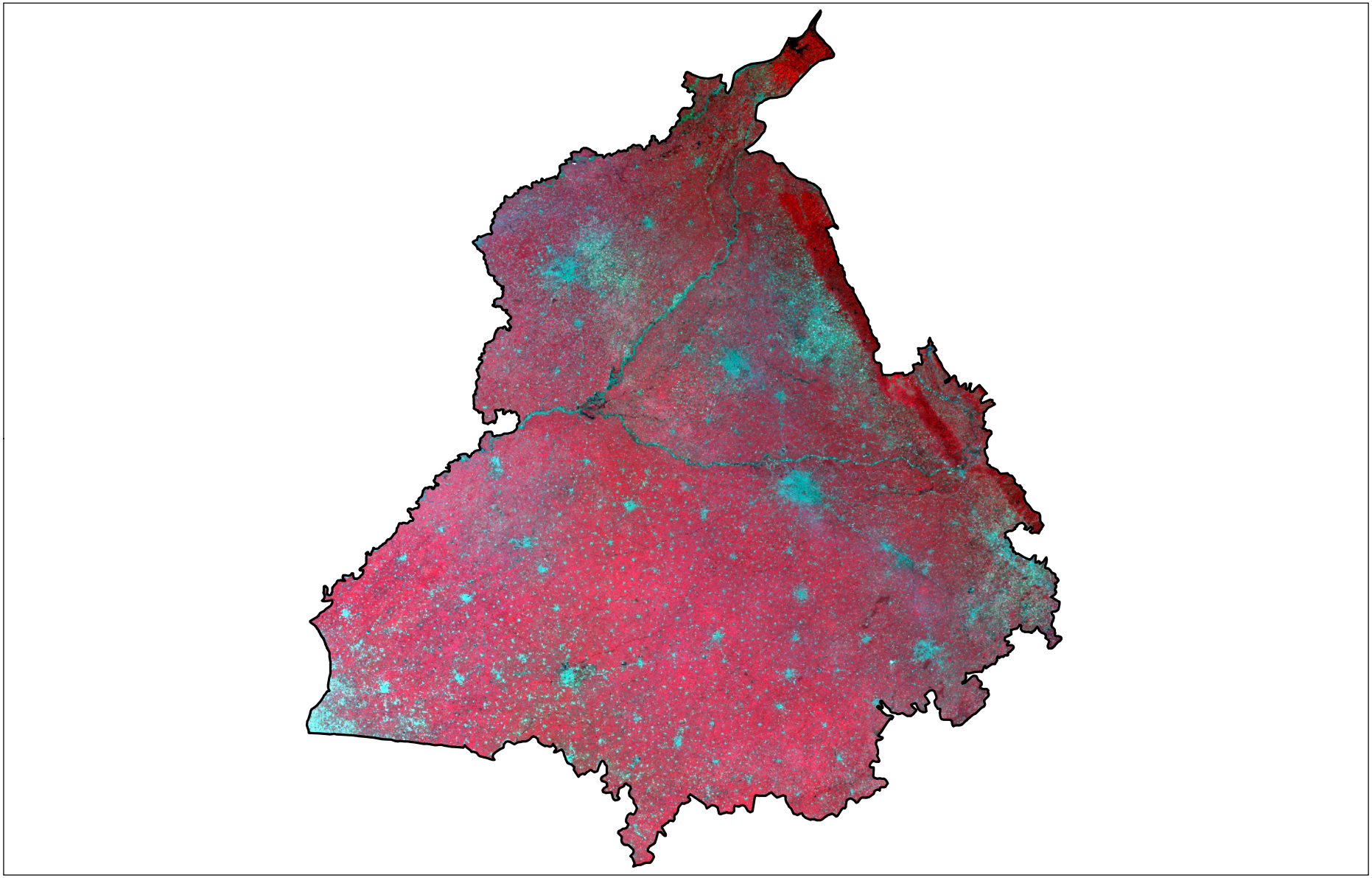
- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Soil and Land Use Survey of India, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad

Punjab - As seen on IRS AWiFS data (October 2018)



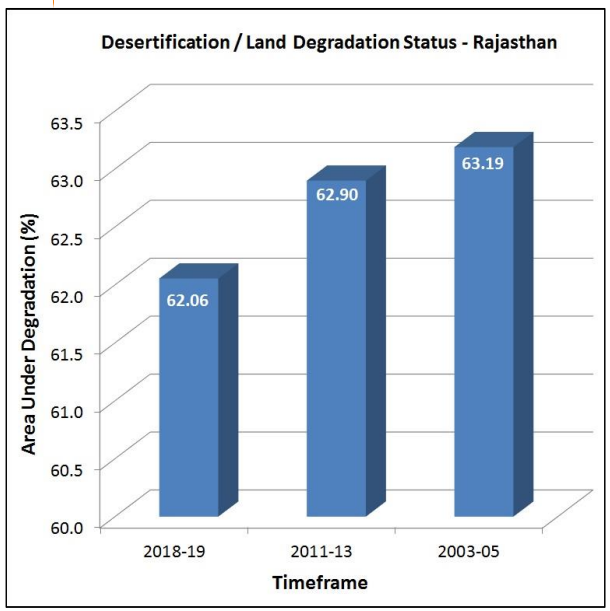
RAJASTHAN

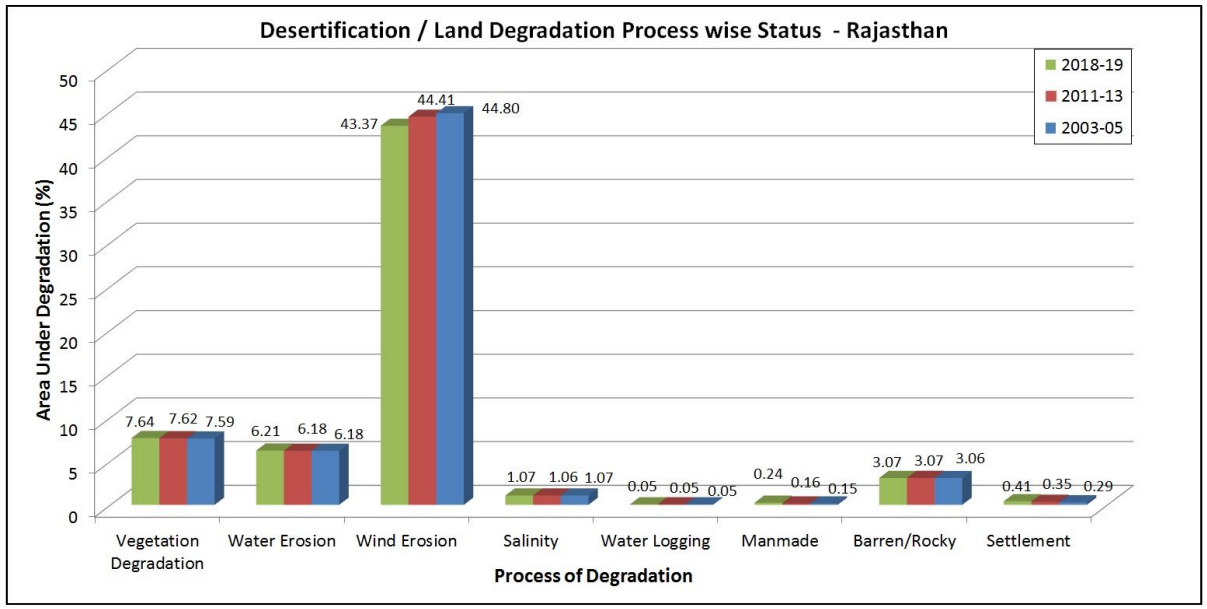
Rajasthan, located in north western part of India, bordering Pakistan, is the largest state of the country by area covering 3,42,239 sq km area. The state has population of 6,85,48,437; with 200 population density, 928 sex ratio and 66.11% literacy (Census 2011). Jaipur is the capital of Rajasthan. The major geographic features of Rajasthan are Thar desert, alluvial plain and Aravalli ranges. The main rivers of the state include Chambal, Luni, Banas, Ghaggar, Mahi, Sabarmati, etc. Rajasthan soils are mostly sandy, saline, alkaline and chalky (calcareous), Clay, loamy and black lava and so on. The state comprises characteristics of arid region in west and semi-arid region in eastern part. Rajasthan experiences extreme climate or weather and consists of four distinct seasons i.e., pre-monsoon, monsoon, post-monsoon and winter with very scanty rainfall.

The statistical summary and analysis of the Land Degradation of Rajasthan state reveal that 62.06% (21.23 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 62.90% (21.52 million ha) and 63.19% (21.62 million ha) respectively. A decrease of 0.84% (2,88,847 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has decreased by 0.29% (99,092 ha).

The most significant process of desertification/ land degradation in the state is Wind Erosion (43.37% in 2018-19, 44.41% in 2011-13 and 44.80% in 2003-05) followed by Vegetation Degradation (7.64% in 2018-19, 7.62% in 2011-13 and 7.59% in 2003-05) and Water Erosion (6.21% in 2018-19, 6.18% in both 2011-13 and 2003-05). Between timeframe 2011-13 & 2018-19, decrease in area affected with wind erosion/deposition and increase in area affected with manmade activities is observed. Whereas, from timeframe 2003-05 to 2011-13, decrease in area affected with wind erosion/deposition and increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

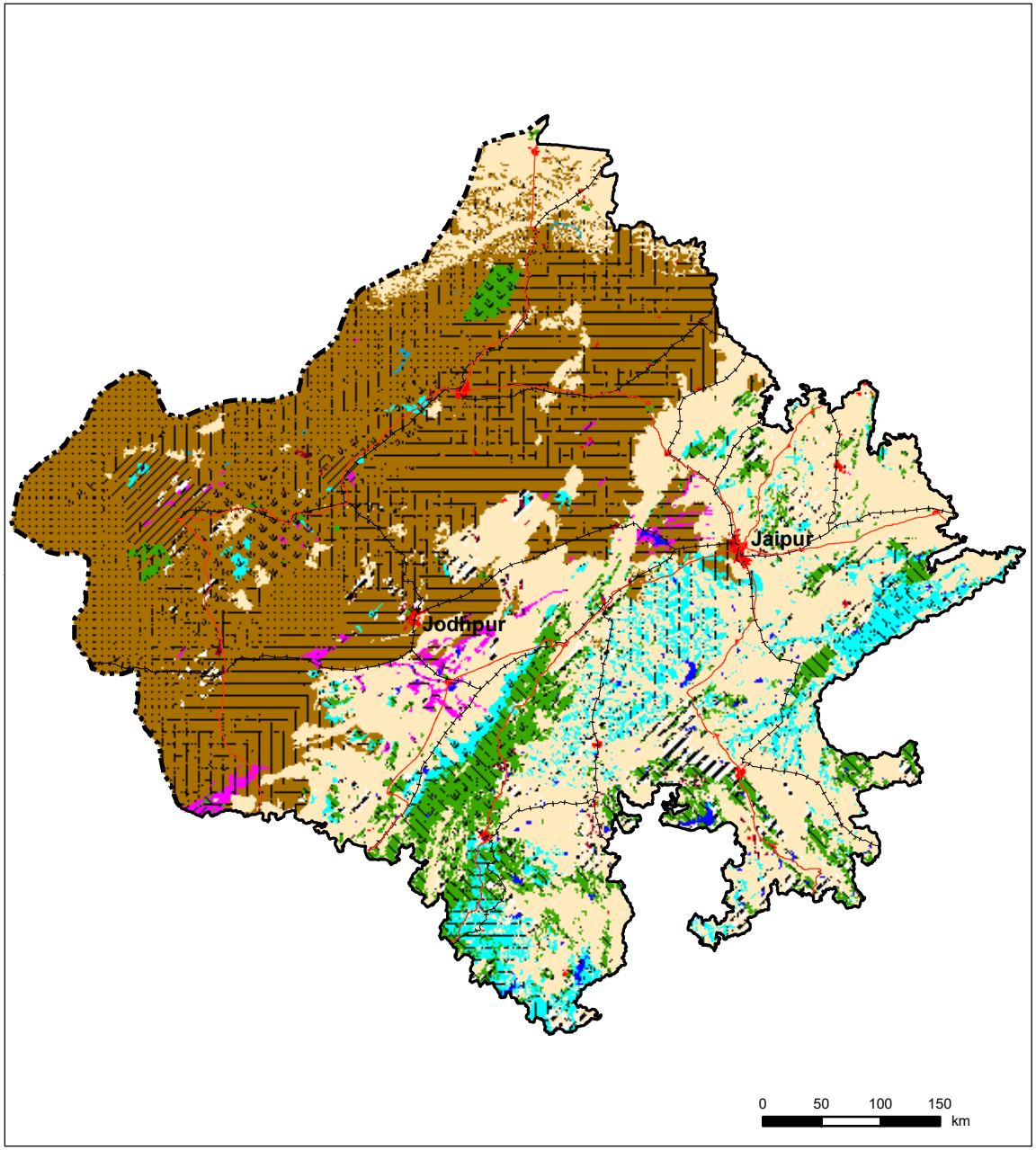




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	2614640	7.64	2606221	7.62	2596003	7.59	8418	10218
Water Erosion	2124456	6.21	2116314	6.18	2116082	6.18	8141	233
Wind Erosion	14843215	43.37	15197874	44.41	15332054	44.80	-354659	-134180
Salinity	365834	1.07	363768	1.06	365666	1.07	2066	-1898
Water Logging	18425	0.05	18421	0.05	18421	0.05	4	0
Manmade	81796	0.24	53058	0.16	50865	0.15	28738	2193
Barren/Rocky	1050236	3.07	1052374	3.07	1047818	3.06	-2138	4556
Settlement	139064	0.41	118482	0.35	98696	0.29	20582	19786
Total Area under Desertification	**21237665**	**62.06**	**21526512**	**62.90**	**21625604**	**63.19**	**-288847**	**-99092**
No Apparent Degradation	**12821672**	**37.46**	**12546925**	**36.66**	**12448140**	**36.37**	**274747**	**98785**
Total Geographical Area (ha)	**34223900**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	1481891	4.33	1479558	4.32	2334
2	Fv2	Forest, vegetation degradation, High	251514	0.73	252480	0.74	-966
3	Sv1	Land with scrub, vegetation degradation, Low	839464	2.45	832578	2.43	6886
4	Sv2	Land with scrub, vegetation degradation, High	41771	0.12	41606	0.12	165
5	Iw1	Agriculture irrigated, water erosion, Low	675326	1.97	673640	1.97	1686
6	Iw2	Agriculture irrigated, water erosion, High	4970	0.01	4970	0.01	0
7	Dw1	Agriculture unirrigated, water erosion, Low	333755	0.98	334003	0.98	-248
8	Fw1	Forest, water erosion, Low	80555	0.24	83173	0.24	-2618
9	Fw2	Forest, water erosion, High	133375	0.39	133375	0.39	0
10	Sw1	Land with scrub, water erosion, Low	664340	1.94	658589	1.92	5751
11	Sw2	Land with scrub, water erosion, High	188496	0.55	184926	0.54	3570
12	Bw1	Barren, water erosion, Low	15003	0.04	15003	0.04	0
13	Ew1	Dune / Sandy area, water erosion, Low	28636	0.08	28636	0.08	0
14	Ie1	Agriculture irrigated, wind erosion, Low	3326104	9.72	2885396	8.43	440708
15	Ie2	Agriculture irrigated, wind erosion, High	388177	1.13	89837	0.26	298340
16	De1	Agriculture unirrigated, wind erosion, Low	4883899	14.27	5340669	15.61	-456770
17	De2	Agriculture unirrigated, wind erosion, High	656590	1.92	808076	2.36	-151486
18	Se1	Land with scrub, wind erosion, Low	932201	2.72	1136345	3.32	-204144
19	Se2	Land with scrub, wind erosion, High	319	0.00	319	0.00	0
20	Be1	Barren, wind erosion, Low	535847	1.57	588937	1.72	-53090
21	Ee1	Dune / Sandy area, wind erosion, Low	2446234	7.15	2497673	7.30	-51439
22	Ee2	Dune / Sandy area, wind erosion, High	1673842	4.89	1850621	5.41	-176778
23	Is1	Agriculture irrigated, salinity / alkalinity, Low	70432	0.21	31610	0.09	38821
24	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	119913	0.35	154674	0.45	-34761
25	Ds2	Agriculture unirrigated, salinity / alkalinity, High	18245	0.05	19058	0.06	-813
26	Ss1	Land with scrub, salinity / alkalinity, Low	27488	0.08	27716	0.08	-228
27	Ss2	Land with scrub, salinity / alkalinity, High	31960	0.09	32360	0.09	-400
28	Bs1	Barren, salinity / alkalinity, Low	6151	0.02	5184	0.02	967
29	Bs2	Barren, salinity / alkalinity, High	91646	0.27	93166	0.27	-1520
30	Il1	Agriculture irrigated, water logging, Low	9036	0.03	9032	0.03	4
31	El1	Dune / Sandy area, water logging, Low	8801	0.03	8801	0.03	0
32	El2	Dune / Sandy area, water logging, High	588	0.00	588	0.00	0
33	Fm2	Forest, man made, High	422	0.00	422	0.00	0
34	Tm1	Others, man made, Low	30765	0.09	15748	0.05	15016
35	Tm2	Others, man made, High	50609	0.15	36887	0.11	13722
36	B	Barren	12755	0.04	9195	0.03	3560
37	R	Rocky	1037481	3.03	1043179	3.05	-5698
38	S	Settlement	139064	0.41	118482	0.35	20582
Total Area Under Desertification/ Land Degradation			**21237665**	**62.06**	**21526512**	**62.90**	**-288847**
39	W	Water body/ Drainage	164563	0.48	150463	0.44	14100
40	NAD	No Apparent Degradation	12821672	37.46	12546925	36.66	274747
Total Geographical Area (ha)			**34223900**	**100**	**34223900**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	1479558	4.32	1469518	4.29	10039
2	Fv2	Forest, vegetation degradation, High	252480	0.74	252480	0.74	0
3	Sv1	Land with scrub, vegetation degradation, Low	832578	2.43	832399	2.43	179
4	Sv2	Land with scrub, vegetation degradation, High	41606	0.12	41606	0.12	0
5	Iw1	Agriculture irrigated, water erosion, Low	673640	1.97	673640	1.97	0
6	Iw2	Agriculture irrigated, water erosion, High	4970	0.01	4970	0.01	0
7	Dw1	Agriculture unirrigated, water erosion, Low	334003	0.98	334003	0.98	0
8	Fw1	Forest, water erosion, Low	83173	0.24	83173	0.24	0
9	Fw2	Forest, water erosion, High	133375	0.39	133375	0.39	0
10	Sw1	Land with scrub, water erosion, Low	658589	1.92	658008	1.92	581
11	Sw2	Land with scrub, water erosion, High	184926	0.54	184926	0.54	0
12	Bw1	Barren, water erosion, Low	15003	0.04	15351	0.04	-349
13	Ew1	Dune / Sandy area, water erosion, Low	28636	0.08	28636	0.08	0
14	Ie1	Agriculture irrigated, wind erosion, Low	2885396	8.43	2908241	8.50	-22845
15	Ie2	Agriculture irrigated, wind erosion, High	89837	0.26	88382	0.26	1455
16	De1	Agriculture unirrigated, wind erosion, Low	5340669	15.61	5426579	15.86	-85909
17	De2	Agriculture unirrigated, wind erosion, High	808076	2.36	822834	2.40	-14758
18	Se1	Land with scrub, wind erosion, Low	1136345	3.32	1139509	3.33	-3164
19	Se2	Land with scrub, wind erosion, High	319	0.00	319	0.00	0
20	Be1	Barren, wind erosion, Low	588937	1.72	596828	1.74	-7891
21	Ee1	Dune / Sandy area, wind erosion, Low	2497673	7.30	2510506	7.34	-12833
22	Ee2	Dune / Sandy area, wind erosion, High	1850621	5.41	1838855	5.37	11765
23	Is1	Agriculture irrigated, salinity / alkalinity, Low	31610	0.09	31610	0.09	0
24	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	154674	0.45	155653	0.45	-979
25	Ds2	Agriculture unirrigated, salinity / alkalinity, High	19058	0.06	19058	0.06	0
26	Ss1	Land with scrub, salinity / alkalinity, Low	27716	0.08	27716	0.08	0
27	Ss2	Land with scrub, salinity / alkalinity, High	32360	0.09	32360	0.09	0
28	Bs1	Barren, salinity / alkalinity, Low	5184	0.02	6103	0.02	-919
29	Bs2	Barren, salinity / alkalinity, High	93166	0.27	93166	0.27	0
30	Il1	Agriculture irrigated, water logging, Low	9032	0.03	9032	0.03	0
31	El1	Dune / Sandy area, water logging, Low	8801	0.03	8801	0.03	0
32	El2	Dune / Sandy area, water logging, High	588	0.00	588	0.00	0
33	Fm2	Forest, man made, High	422	0.00	422	0.00	0
34	Tm1	Others, man made, Low	15748	0.05	13417	0.04	2332
35	Tm2	Others, man made, High	36887	0.11	37026	0.11	-139
36	B	Barren	9195	0.03	9195	0.03	0
37	R	Rocky	1043179	3.05	1038623	3.03	4556
38	S	Settlement	118482	0.35	98696	0.29	19786
Total Area Under Desertification/ Land Degradation			**21526512**	**62.90**	**21625604**	**63.19**	**-99092**
39	W	Water body/ Drainage	150463	0.44	150156	0.44	307
40	NAD	No Apparent Degradation	12546925	36.66	12448140	36.37	98785
Total Geographical Area (ha)			**34223900**	**100**	**34223900**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP RAJASTHAN (2018-19)

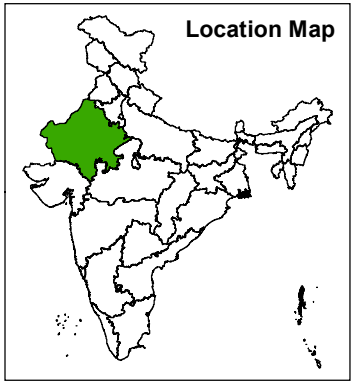
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ew1	Dune / Sandy area, water erosion
	Ie1,2	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Se1,2	Land with scrub, wind erosion
	Be1	Barren, wind erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Il1	Agriculture irrigated, water logging
	El1,2	Dune / Sandy area, water logging
	Fm2	Forest, manmade
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

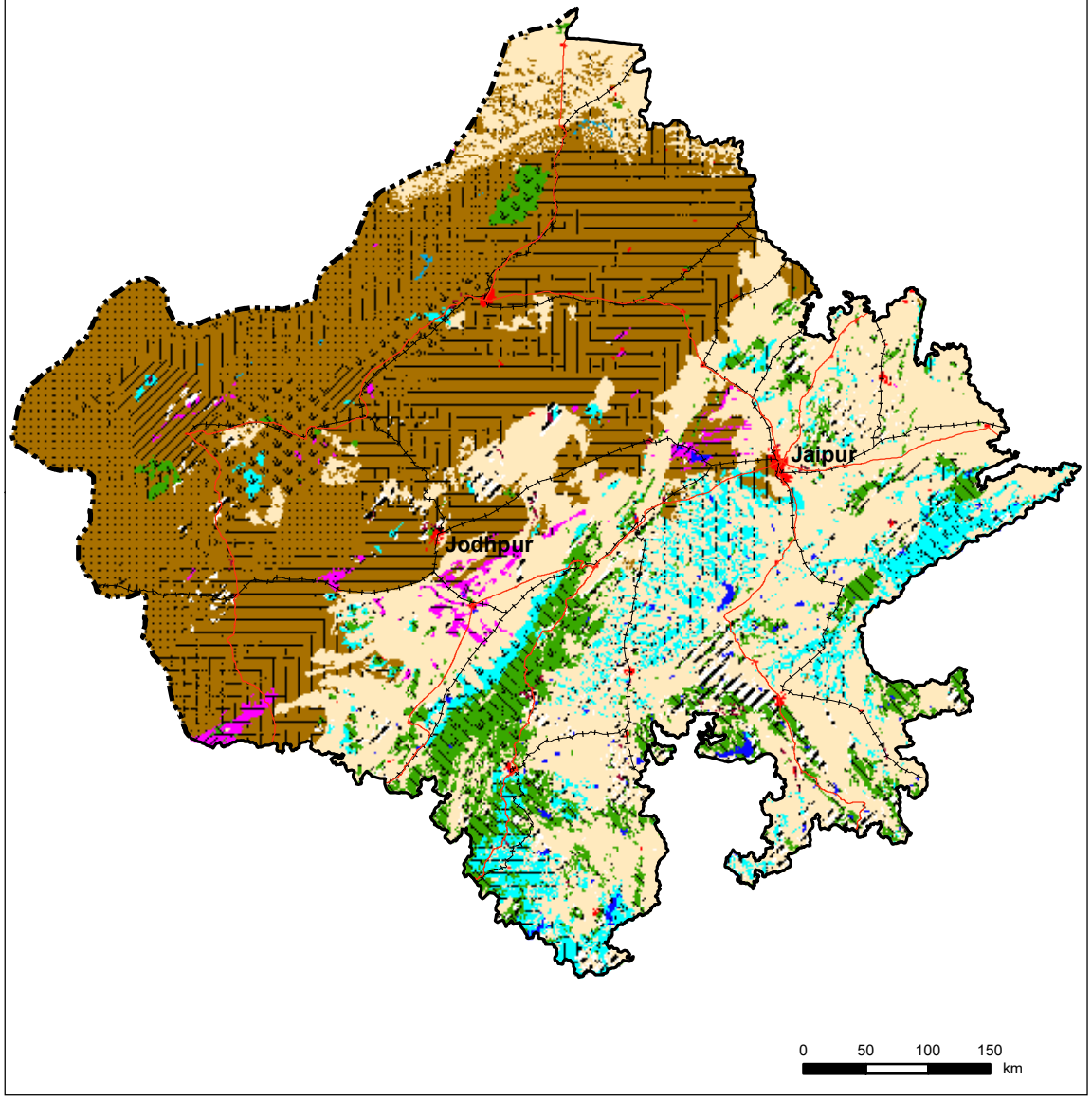
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Central Arid Zone Research Institute, Jodhpur
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP RAJASTHAN (2011-13)

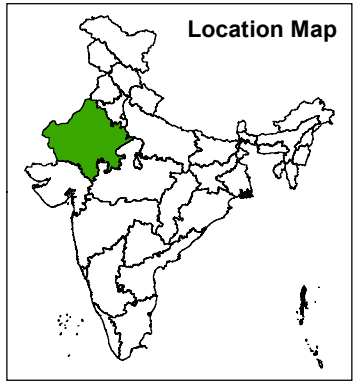
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ew1	Dune / Sandy area, water erosion
	Ie1,2	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Se1,2	Land with scrub, wind erosion
	Be1	Barren, wind erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Il1	Agriculture irrigated, water logging
	El1,2	Dune / Sandy area, water logging
	Fm2	Forest, manmade
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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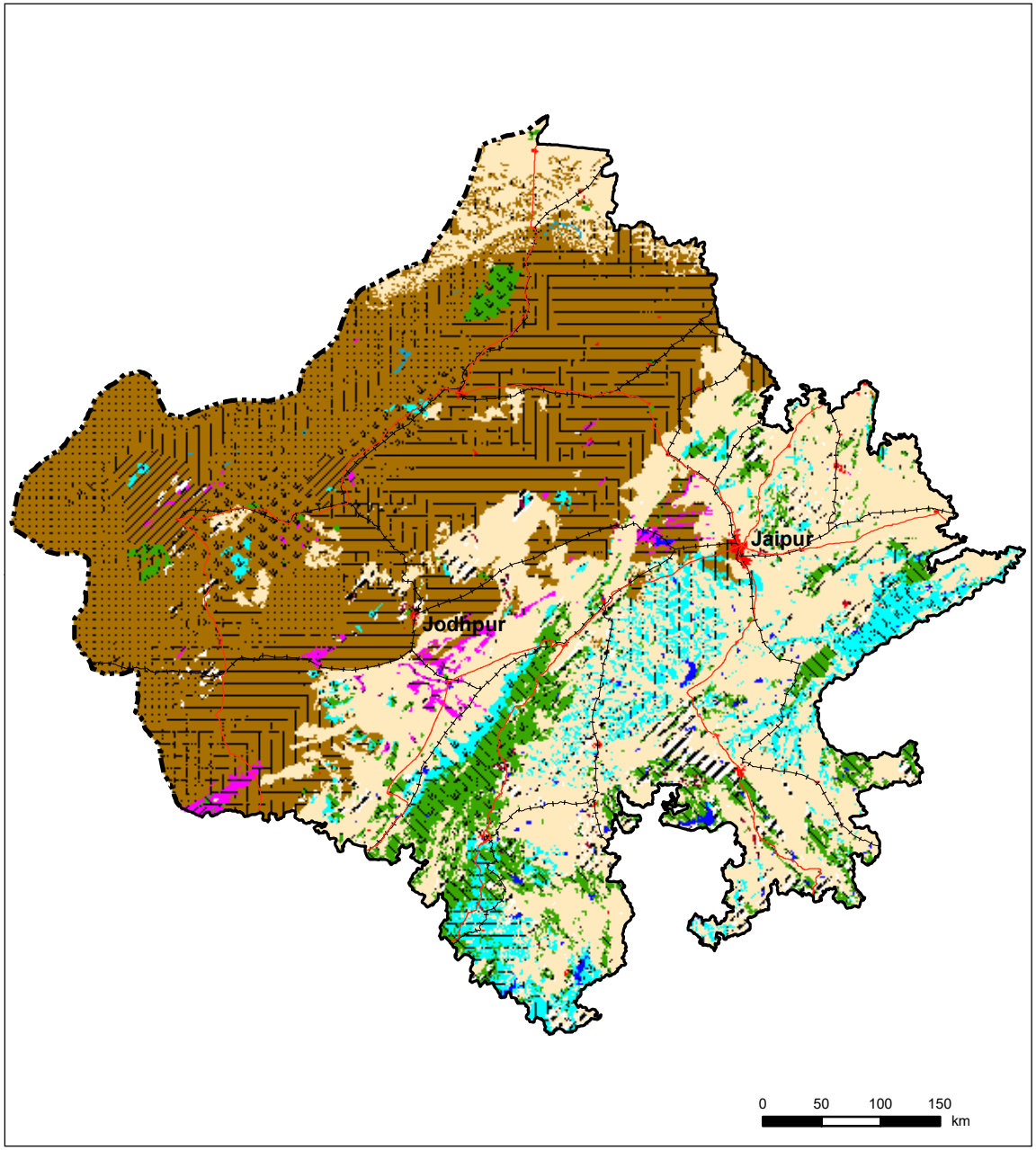


DESERTIFICATION / LAND DEGRADATION STATUS MAP RAJASTHAN (2003-05)

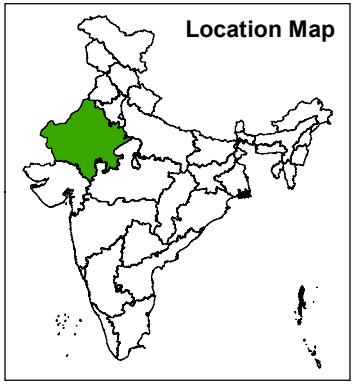
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ew1	Dune / Sandy area, water erosion
	Ie1,2	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Se1,2	Land with scrub, wind erosion
	Be1	Barren, wind erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Il1	Agriculture irrigated, water logging
	El1,2	Dune / Sandy area, water logging
	Fm2	Forest, manmade
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Central Arid Zone Research Institute, Jodhpur
&
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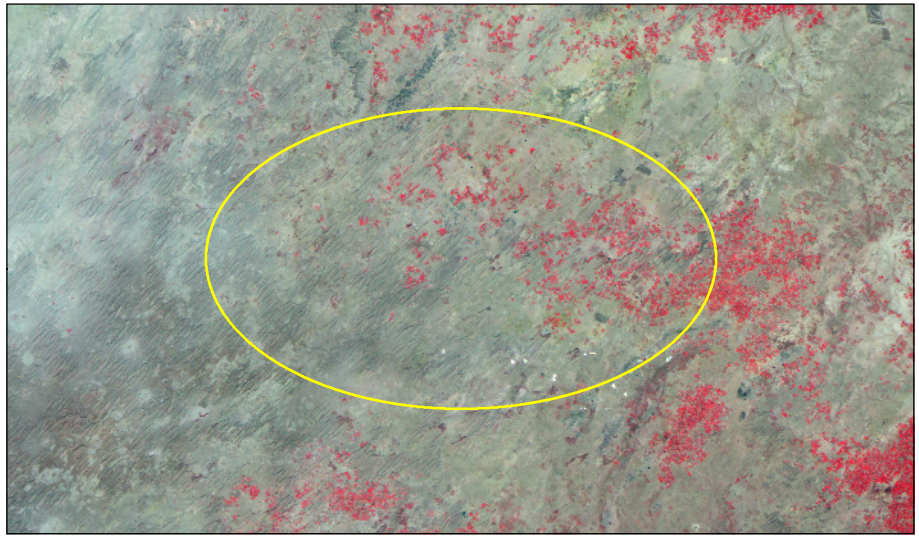
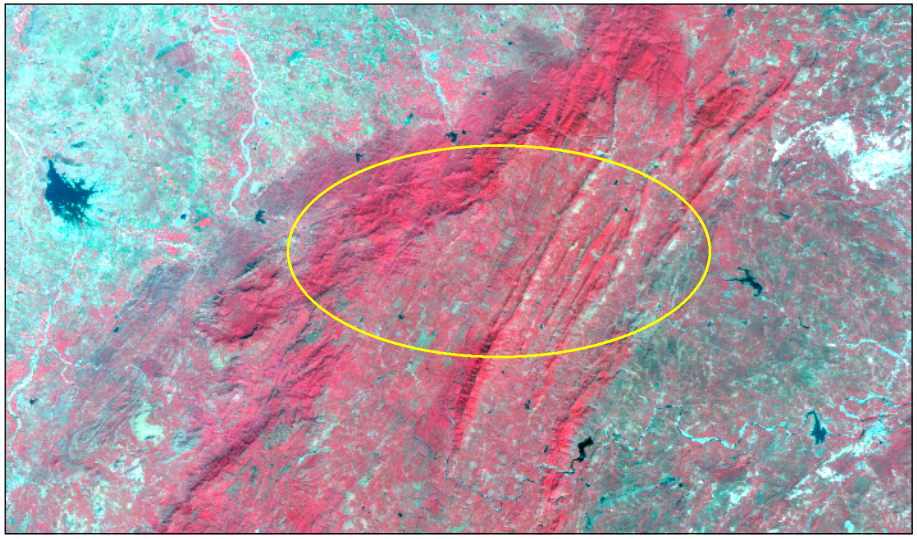
Rajasthan - Illustrative representation of Land Degradation processes / changes on IRS AWiFS data

Agriculture/sand dune area affected with wind erosion (February 2019)



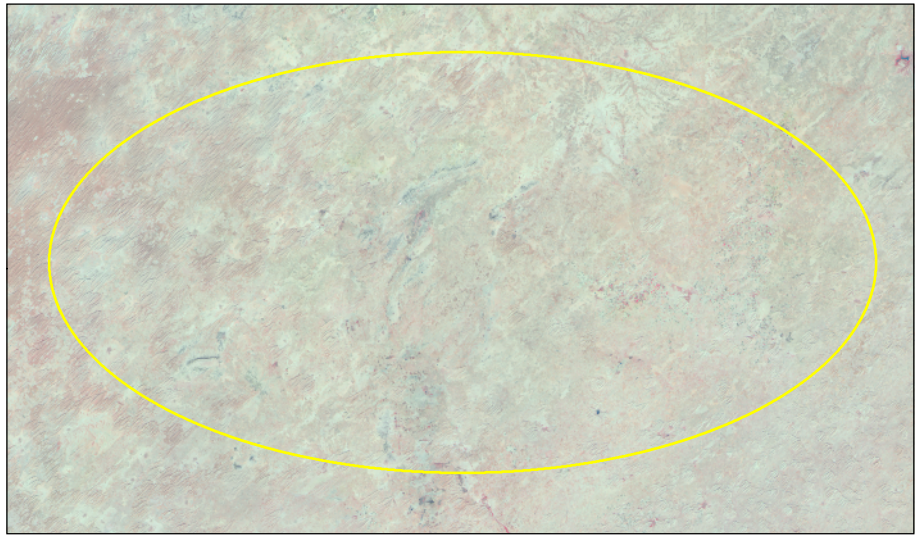
Forest area under vegetation degradation (October 2018)

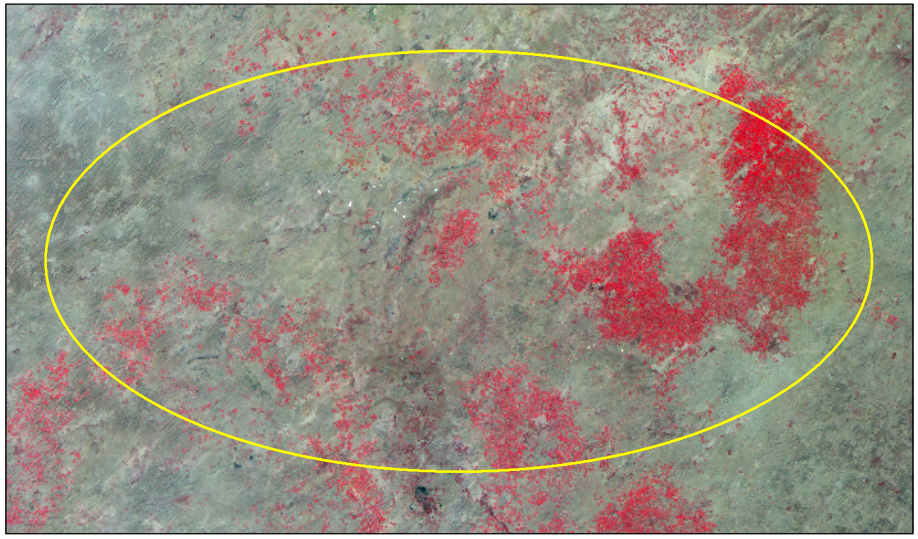


February 2004

Expansion of Agriculture area (coversion of sandy area into cropland)

February 2019





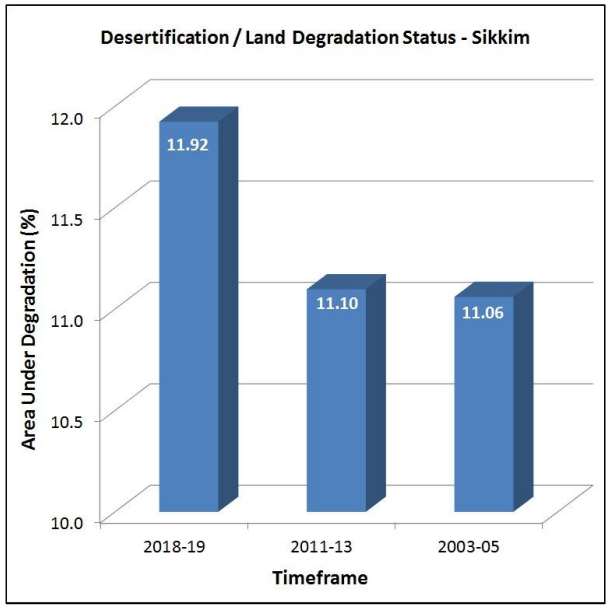
SIKKIM

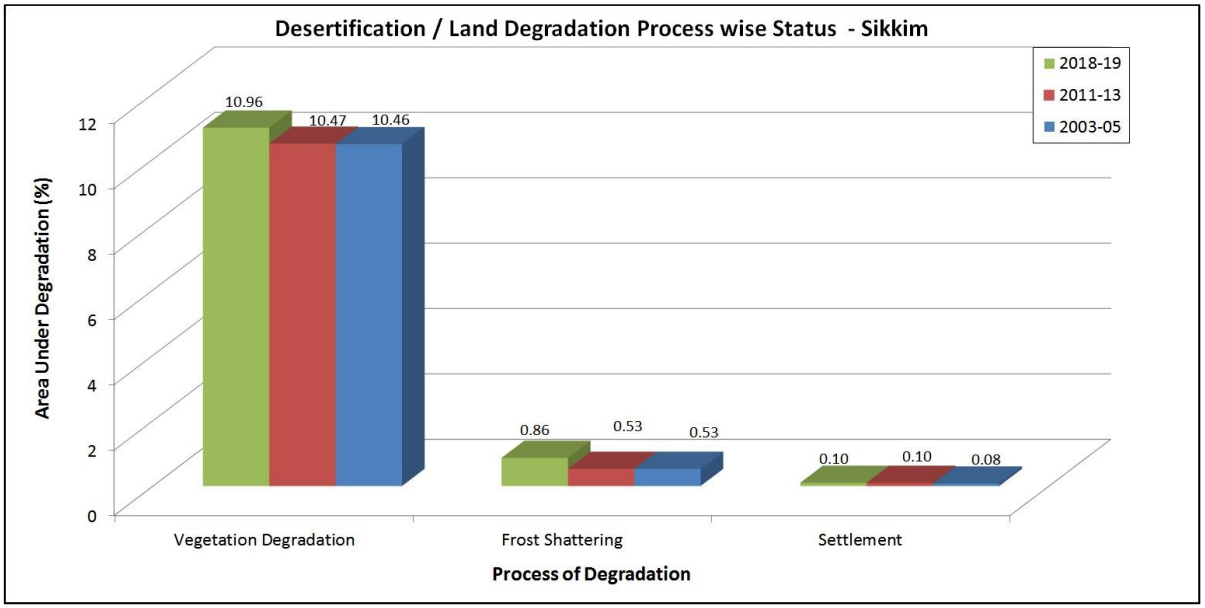
Sikkim state is located in northern part of India bordering Nepal, Bhutan and China with 7,096 sq km area. The state has population of 6,10,577; with 86 population density, 890 sex ratio and 81.42% literacy (Census 2011). Gangtok is the capital of Sikkim. Sikkim is a mountain state of eastern Himalaya having world's third largest peak Kanchanjunga, 28,162 feet height. Two principle mountain ranges are the Singilela and Chola, which start in the north and continue, following a more or less southerly direction. Between these ranges are the major rivers, Rangit and Teesta, forming the main channels of drainage. Sikkim experiences temperate Alpine climate with snowfall in winter season. The temperature ranges from below 0^{o}C in winter to 20^{o}C in summer.

The statistical summary and analysis of the Land Degradation of Sikkim state reveal that 11.92% (84,610 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 11.10% (78,749 ha) and 11.06% (78,482 ha) respectively. An increase of 0.82% (5,861 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.04% (267 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (10.96% in 2018-19, 10.47% in 2011-13 and 10.46% in 2003-05) followed by Frost Shattering (0.86% in 2018-19, 0.53% in both 2011-13 and 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation is observed. Also, from timeframe 2003-05 to 2011-13, a slight increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

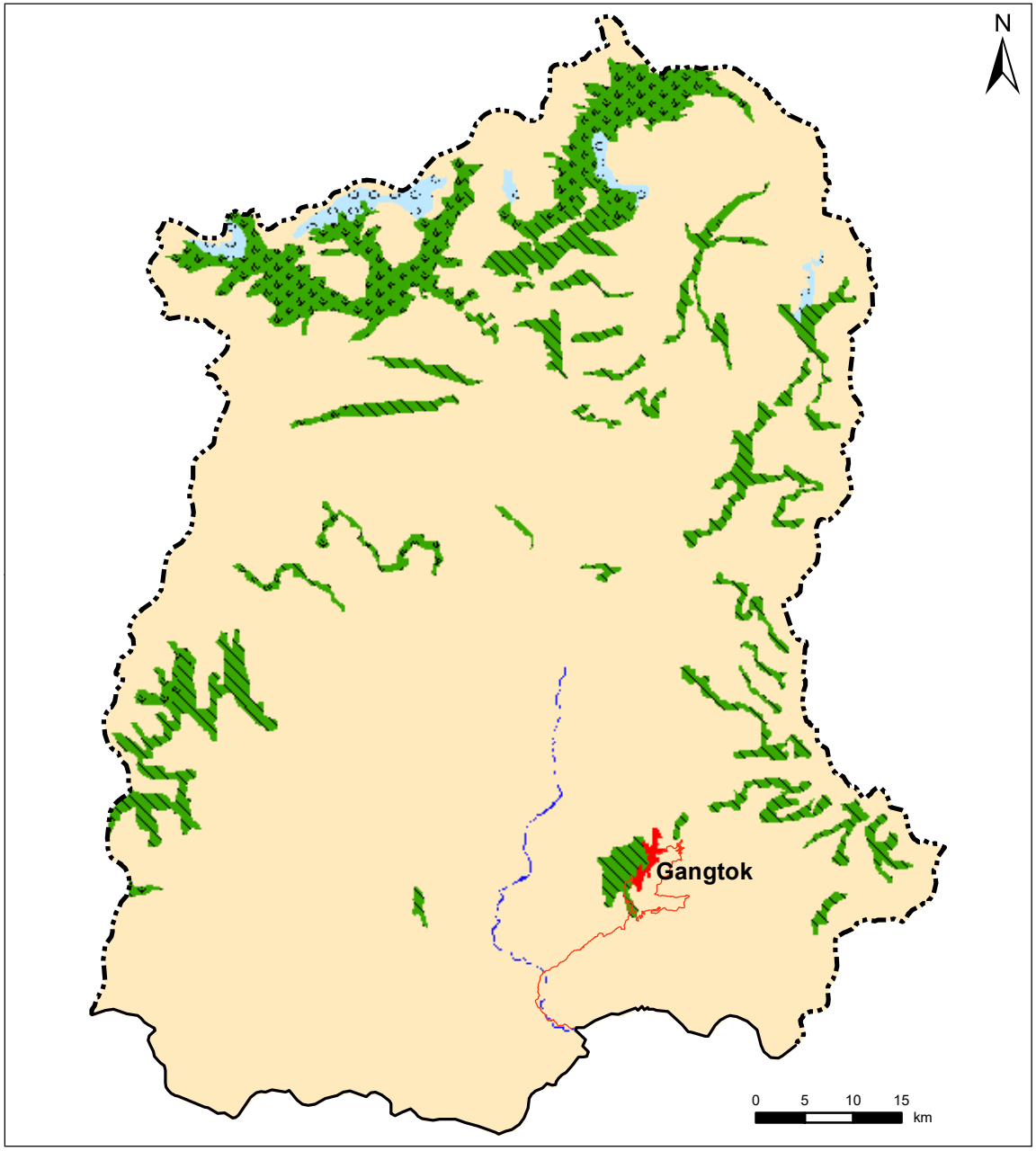




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	77794	10.96	74318	10.47	74205	10.46	3475	114
Frost Shattering	6116	0.86	3730	0.53	3730	0.53	2386	0
Settlement	700	0.10	700	0.10	546	0.08	0	153
Total Area under Desertification	**84610**	**11.92**	**78749**	**11.10**	**78482**	**11.06**	**5861**	**267**
No Apparent Degradation	**624372**	**87.99**	**630234**	**88.82**	**630500**	**88.85**	**-5861**	**-267**
Total Geographical Area (ha)	**709600**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	17686	2.49	14816	2.09	2870
2	Fv2	Forest, vegetation degradation, High	25842	3.64	25842	3.64	0
3	Sv1	Land with scrub, vegetation degradation, Low	19712	2.78	19409	2.74	303
4	Sv2	Land with scrub, vegetation degradation, High	14553	2.05	14251	2.01	302
5	Lf2	Periglacial, frost shattering, High	6116	0.86	3730	0.53	2386
6	S	Settlement	700	0.10	700	0.10	0
Total Area Under Desertification/ Land Degradation			**84610**	**11.92**	**78749**	**11.10**	**5861**
7	W	Water body/ Drainage	618	0.09	618	0.09	0
8	NAD	No Apparent Degradation	624372	87.99	630234	88.82	-5861
Total Geographical Area (ha)			**709600**	**100**	**709600**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	14816	2.09	14223	2.00	593
2	Fv2	Forest, vegetation degradation, High	25842	3.64	23473	3.31	2370
3	Sv1	Land with scrub, vegetation degradation, Low	19409	2.74	21915	3.09	-2506
4	Sv2	Land with scrub, vegetation degradation, High	14251	2.01	14594	2.06	-343
5	Lf2	Periglacial, frost shattering, High	3730	0.53	3730	0.53	0
6	S	Settlement	700	0.10	546	0.08	153
Total Area Under Desertification/ Land Degradation			**78749**	**11.10**	**78482**	**11.06**	**267**
7	W	Water body/ Drainage	618	0.09	618	0.09	0
8	NAD	No Apparent Degradation	630234	88.82	630500	88.85	-267
Total Geographical Area (ha)			**709600**	**100**	**709600**	**100**	



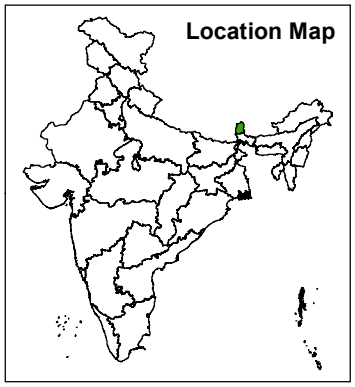
DESERTIFICATION / LAND DEGRADATION STATUS MAP SIKKIM (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Lf2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

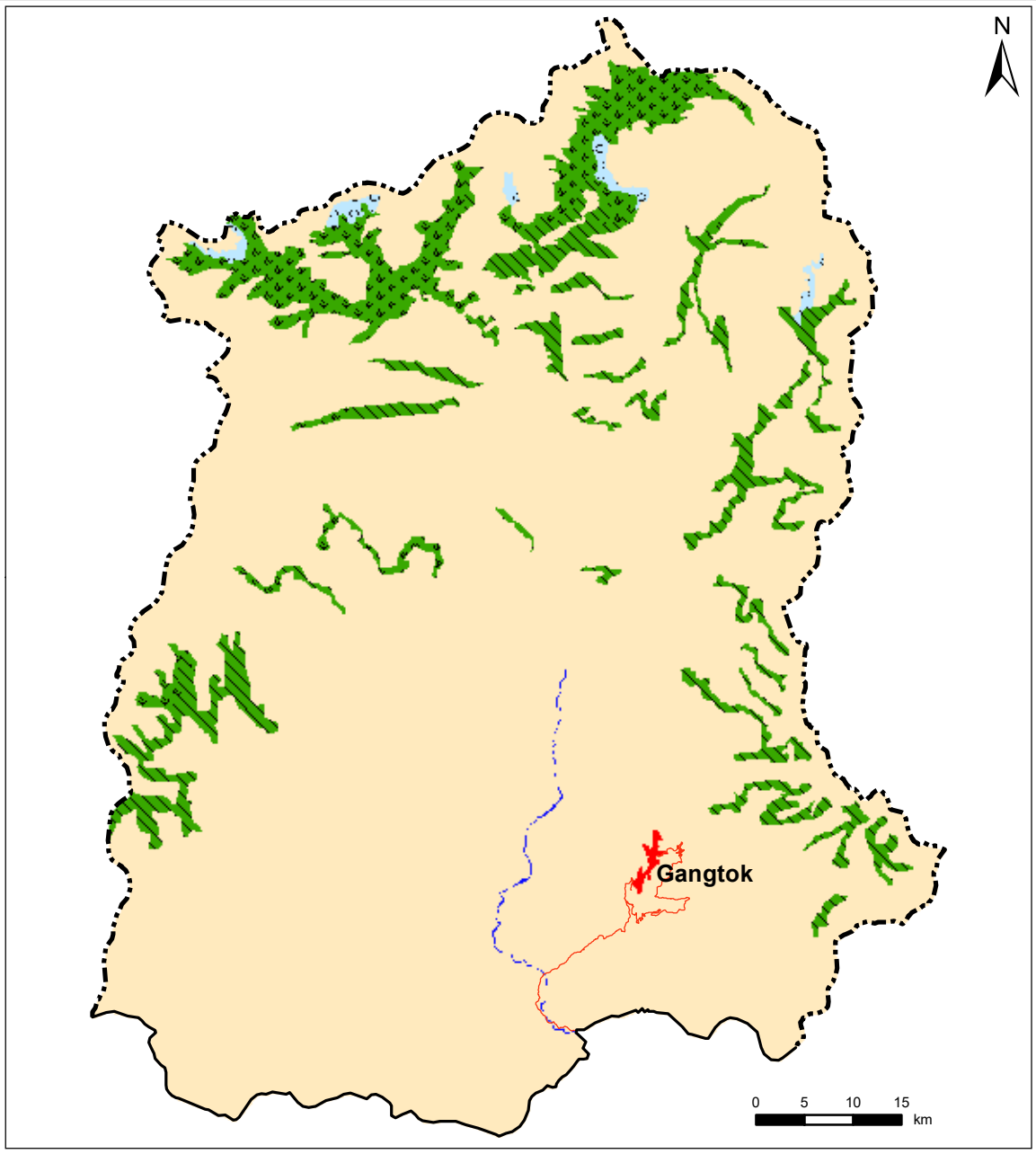
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
North Easrern Space Applications Centre, Meghalaya
&
Space Applications Centre, ISRO, Ahmedabad



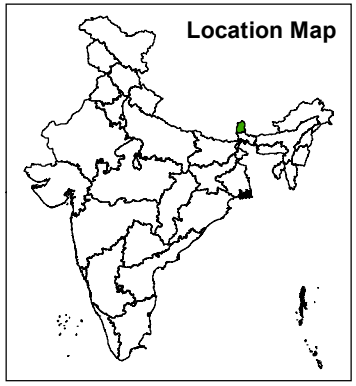
DESERTIFICATION / LAND DEGRADATION STATUS MAP SIKKIM (2011-13)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Lf2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

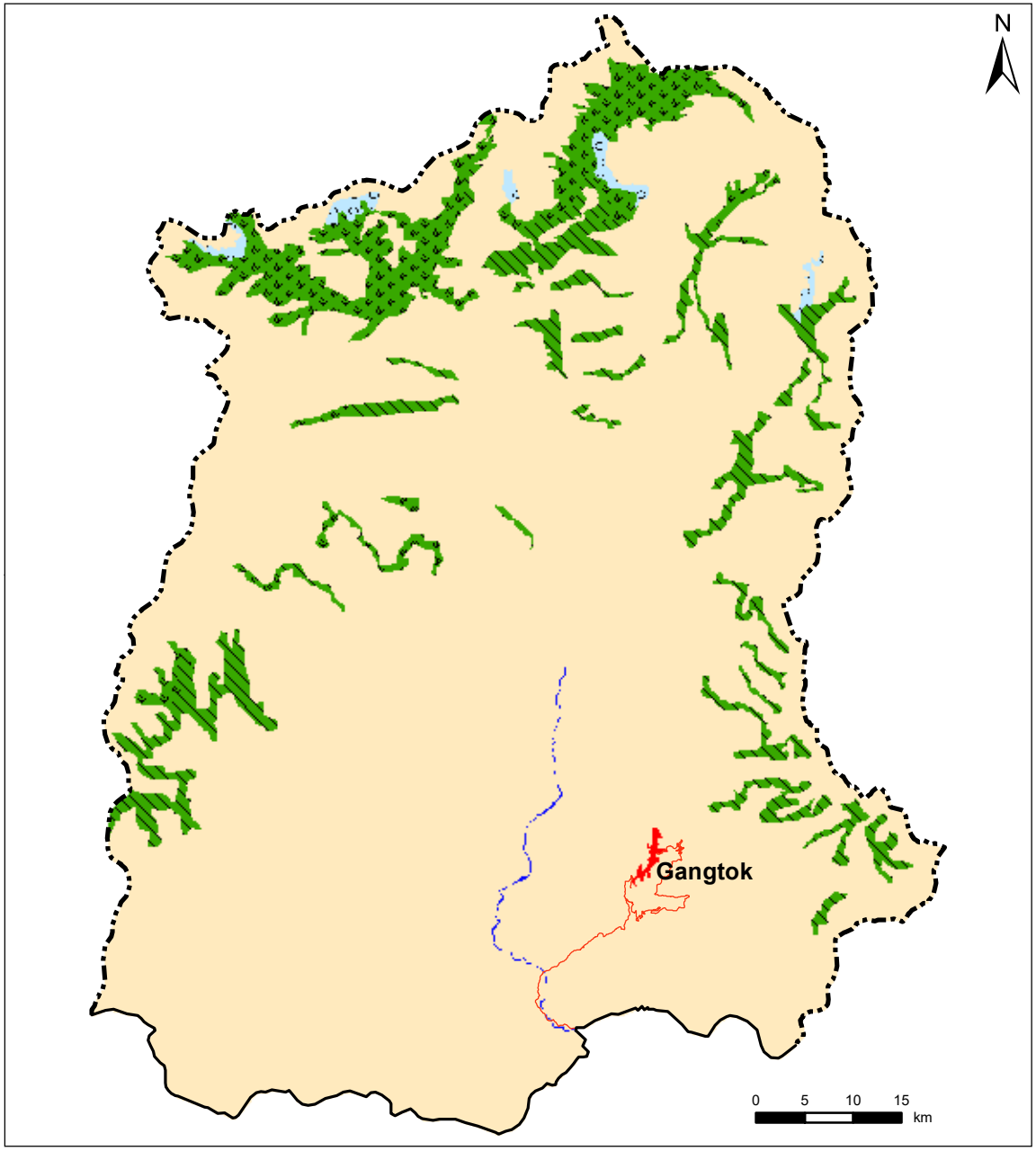
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
State Council of Science & Technology, Sikkim
&
Space Applications Centre, ISRO, Ahmedabad



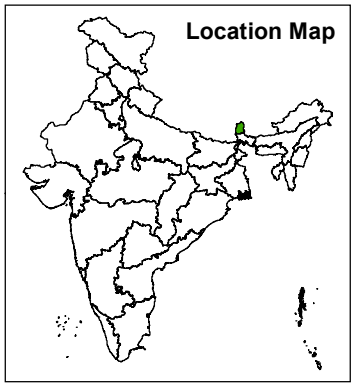
DESERTIFICATION / LAND DEGRADATION STATUS MAP SIKKIM (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Lf2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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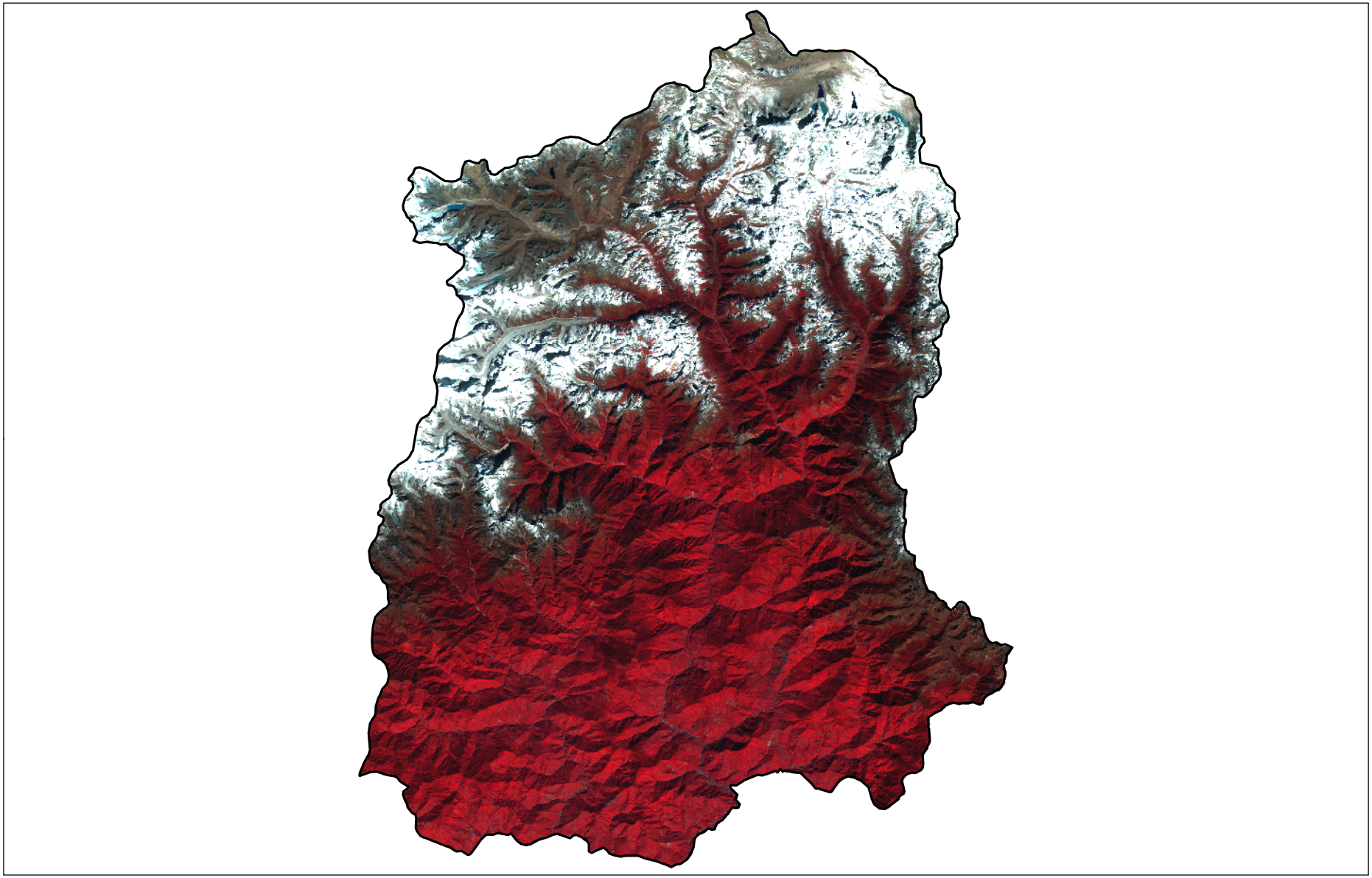
&
Space Applications Centre, ISRO, Ahmedabad

Punjab - As seen on IRS AWiFS data (October 2018)



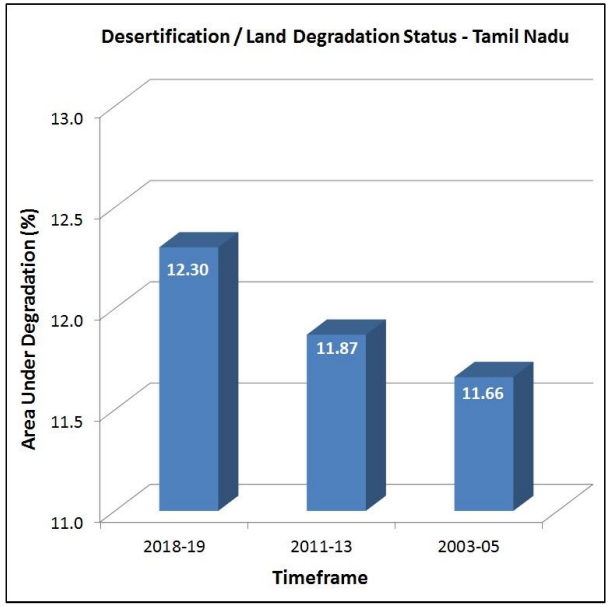
TAMIL NADU

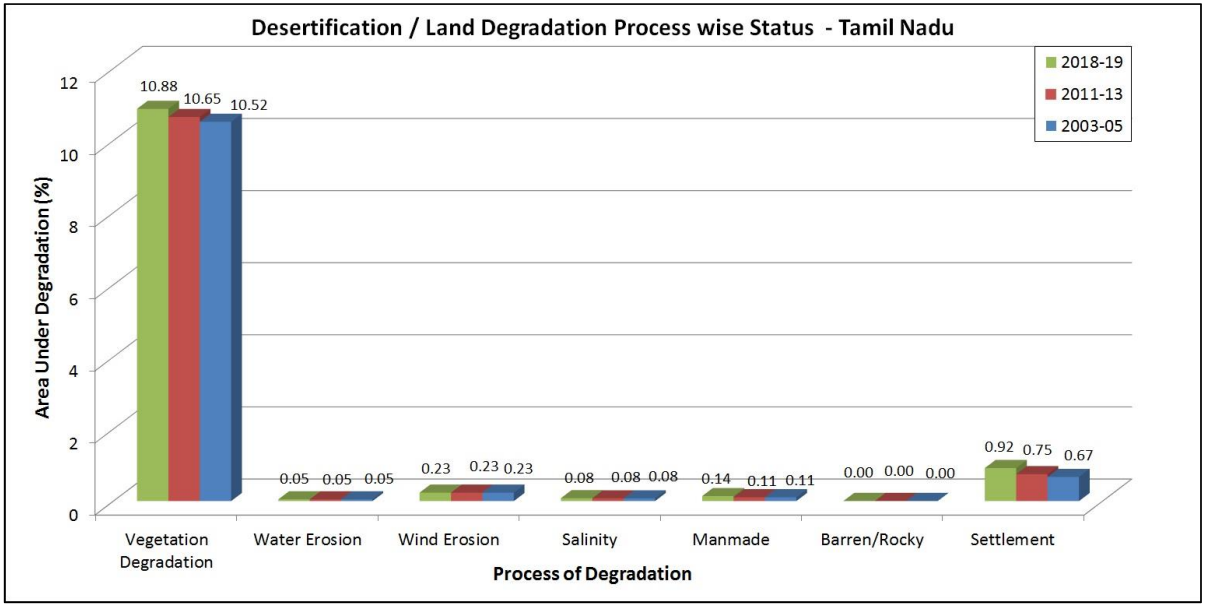
Tamil Nadu is situated on the south eastern side of the Indian peninsula with 1,30,060 sq km area. The state has population of 7,21,47,030; with 555 population density, 996 sex ratio and 80.09% literacy (Census 2011). Chennai is the capital of Tamil Nadu. Tamil Nadu is the only state in India having both Western Ghats and Eastern Ghats mountains, both meeting at the Nilgiri Hills in south. Kaveri, Bhavani, Manjalar, Palar etc. are the major rivers of the state. The climate of the state ranges from dry sub-humid to semi-arid. Tamil Nadu is highly dependent on monsoon and thereby is prone to droughts when the monsoons fail. The normal annual rainfall of the state is about 945 mm.

The statistical summary and analysis of the Land Degradation of Tamil Nadu state reveal that 12.30% (1.59 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 11.87% (1.54 million ha) and 11.66% (1.51 million ha) respectively. An increase of 0.43% (56,083 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.21% (27,238 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (10.88% in 2018-19, 10.65% in 2011-13 and 10.52% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation and area affected with manmade activities is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in forest area undergoing vegetation degradation is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

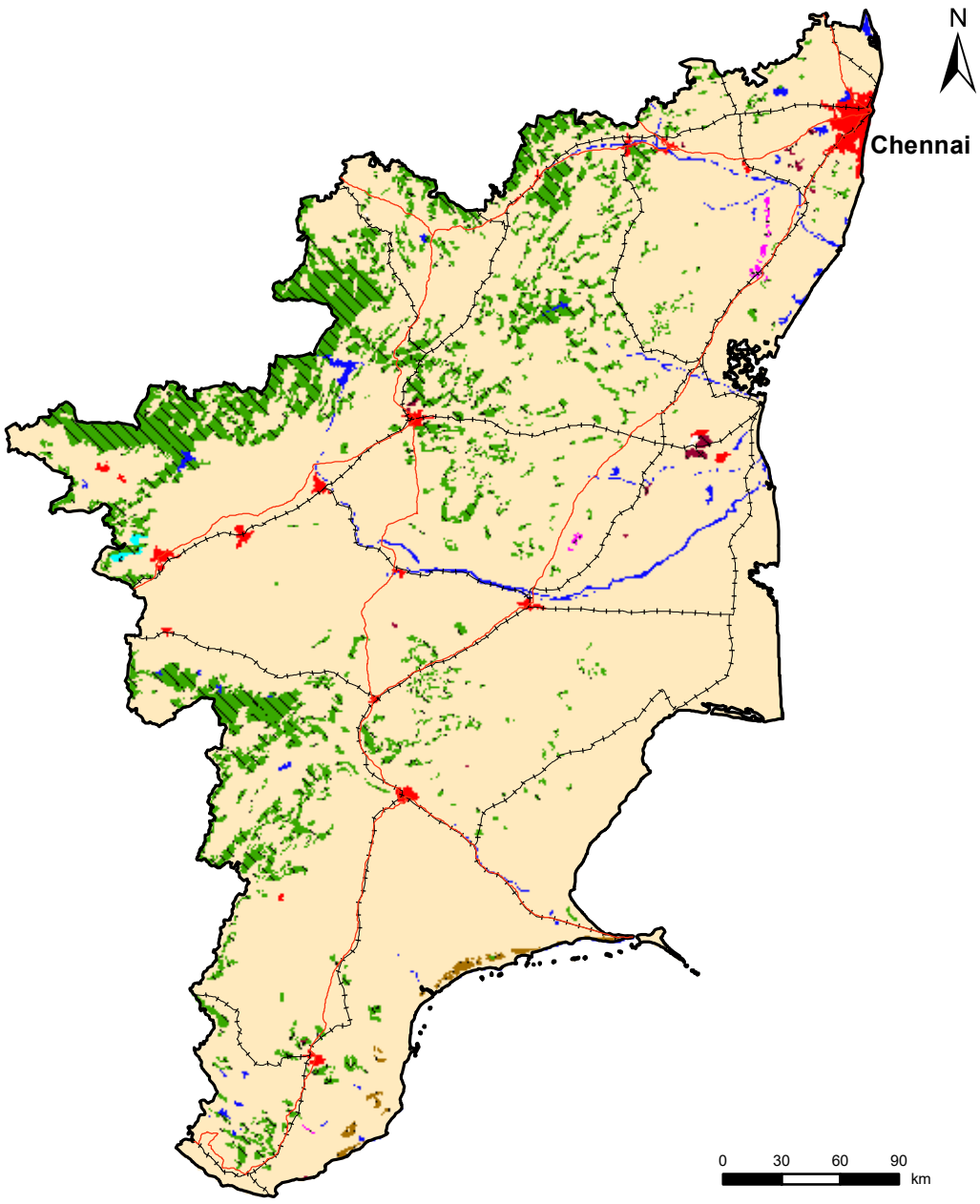




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	1414888	10.88	1385478	10.65	1368330	10.52	29410	17148
Water Erosion	6411	0.05	6411	0.05	6411	0.05	0	0
Wind Erosion	30429	0.23	30429	0.23	30429	0.23	0	0
Salinity	10500	0.08	9878	0.08	9878	0.08	622	0
Manmade	18036	0.14	13965	0.11	13965	0.11	4071	0
Barren/Rocky	515	0.00	515	0.00	515	0.00	0	0
Settlement	119203	0.92	97223	0.75	87133	0.67	21980	10090
Total Area under Desertification	**1599981**	**12.30**	**1543898**	**11.87**	**1516660**	**11.66**	**56083**	**27238**
No Apparent Degradation	**11287656**	**86.79**	**11344261**	**87.22**	**11371500**	**87.43**	**-56605**	**-27238**
Total Geographical Area (ha)	**13006000**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	954957	7.34	926953	7.13	28004
2	Fv2	Forest, vegetation degradation, High	326296	2.51	324576	2.50	1720
3	Sv1	Land with scrub, vegetation degradation, Low	72354	0.56	72354	0.56	0
4	Sv2	Land with scrub, vegetation degradation, High	61281	0.47	61594	0.47	-314
5	Iw2	Agriculture irrigated, water erosion, High	1069	0.01	1069	0.01	0
6	Sw1	Land with scrub, water erosion, Low	3931	0.03	3931	0.03	0
7	Sw2	Land with scrub, water erosion, High	1411	0.01	1411	0.01	0
8	Ie1	Agriculture irrigated, wind erosion, Low	1957	0.02	1957	0.02	0
9	Ee1	Dune / Sandy area, wind erosion, Low	28472	0.22	28472	0.22	0
10	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	5156	0.04	4534	0.03	622
11	Ss1	Land with scrub, salinity / alkalinity, Low	2869	0.02	2869	0.02	0
12	Bs1	Barren, salinity / alkalinity, Low	2475	0.02	2475	0.02	0
13	Tm2	Others, man made, High	18036	0.14	13965	0.11	4071
14	R	Rocky	515	0.00	515	0.00	0
15	S	Settlement	119203	0.92	97223	0.75	21980
Total Area Under Desertification/ Land Degradation			**1599981**	**12.30**	**1543898**	**11.87**	**56083**
16	W	Water body/ Drainage	117745	0.91	117841	0.91	-95
17	NAD	No Apparent Degradation	11287656	86.79	11344261	87.22	-56605
Total Geographical Area (ha)			**13005383**	**100**	**13006000**	**100**	

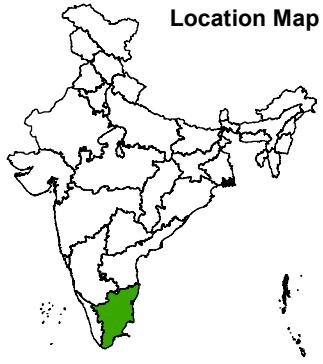
SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	926953	7.13	904211	6.95	22743
2	Fv2	Forest, vegetation degradation, High	324576	2.50	330360	2.54	-5783
3	Sv1	Land with scrub, vegetation degradation, Low	72354	0.56	69102	0.53	3252
4	Sv2	Land with scrub, vegetation degradation, High	61594	0.47	64658	0.50	-3063
5	Iw2	Agriculture irrigated, water erosion, High	1069	0.01	1069	0.01	0
6	Sw1	Land with scrub, water erosion, Low	3931	0.03	3931	0.03	0
7	Sw2	Land with scrub, water erosion, High	1411	0.01	1411	0.01	0
8	Ie1	Agriculture irrigated, wind erosion, Low	1957	0.02	1957	0.02	0
9	Ee1	Dune / Sandy area, wind erosion, Low	28472	0.22	28472	0.22	0
10	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	4534	0.03	4534	0.03	0
11	Ss1	Land with scrub, salinity / alkalinity, Low	2869	0.02	2869	0.02	0
12	Bs1	Barren, salinity / alkalinity, Low	2475	0.02	2475	0.02	0
13	Tm2	Others, man made, High	13965	0.11	13965	0.11	0
14	R	Rocky	515	0.00	515	0.00	0
15	S	Settlement	97223	0.75	87133	0.67	10090
Total Area Under Desertification/ Land Degradation			**1543898**	**11.87**	**1516660**	**11.66**	**27238**
16	W	Water body/ Drainage	117841	0.91	117841	0.91	0
17	NAD	No Apparent Degradation	11344261	87.22	11371500	87.43	-27238
Total Geographical Area (ha)			**13006000**	**100**	**13006000**	**100**	



DESERTIFICATION / LAND DEGRADATION STATUS MAP TAMIL NADU (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw2	Agriculture irrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ie1	Agriculture unirrigated, wind erosion
	Ee1	Dune / Sandy area, wind erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Ss1	Land with scrub, salinity / alkalinity
	Bs1	Barren, salinity / alkalinity
	Tm2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Location Map

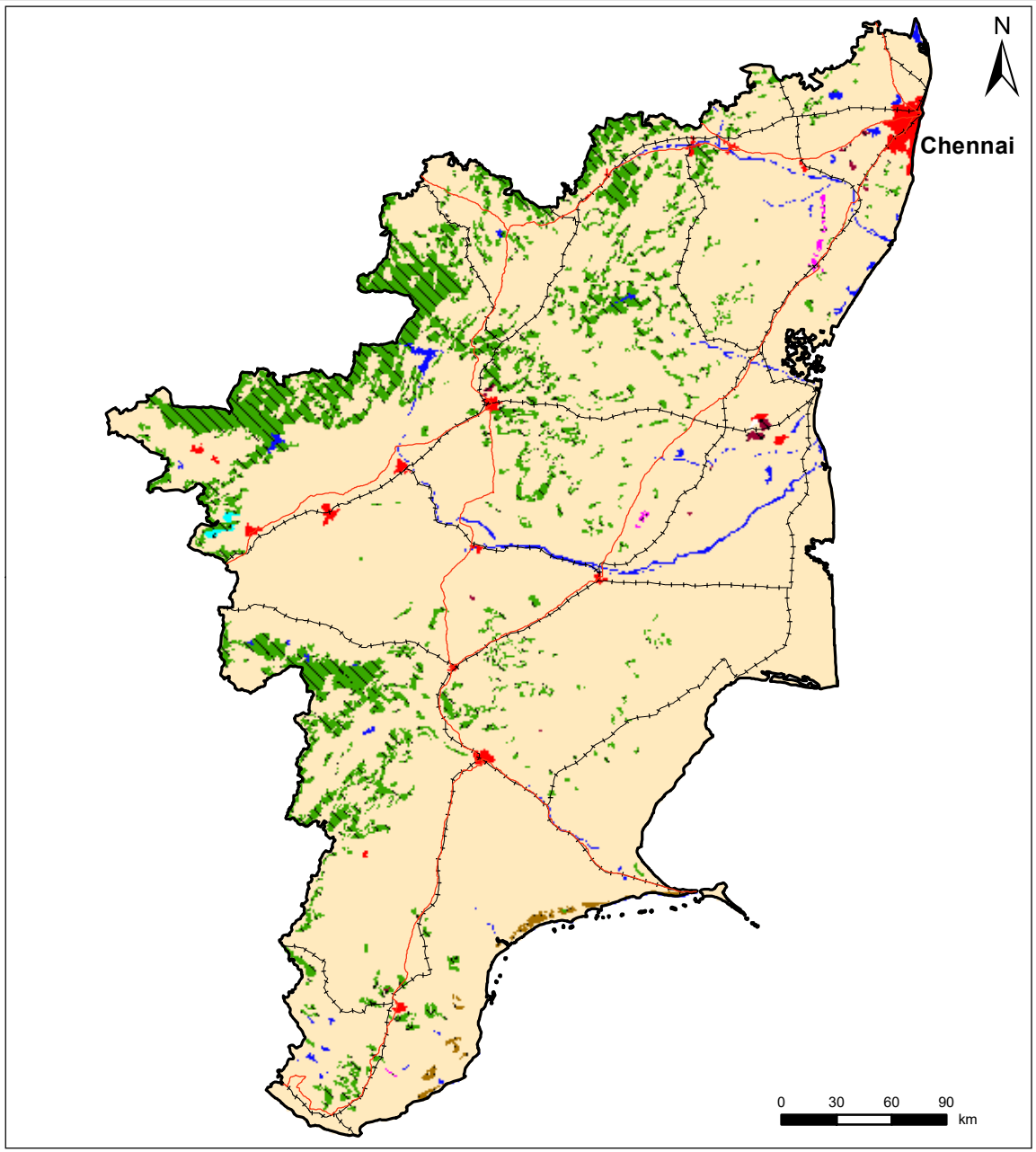


Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

Prepared by:
National Centre for Earth Science Studies, Thiruvananthapuram
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP TAMIL NADU (2011-13)

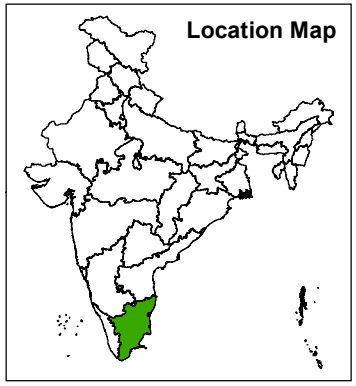
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw2	Agriculture irrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ie1	Agriculture unirrigated, wind erosion
	Ee1	Dune / Sandy area, wind erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Ss1	Land with scrub, salinity / alkalinity
	Bs1	Barren, salinity / alkalinity
	Tm2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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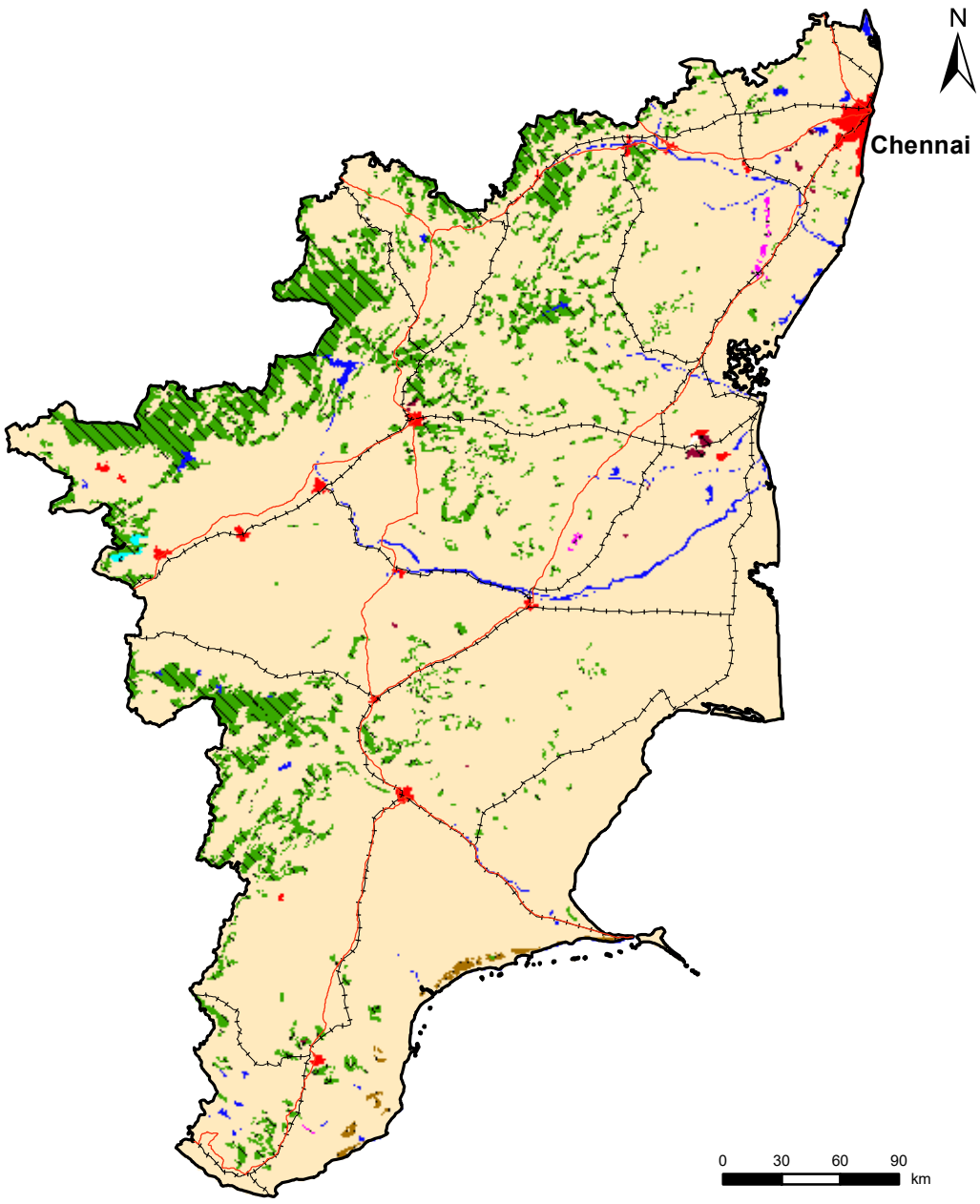
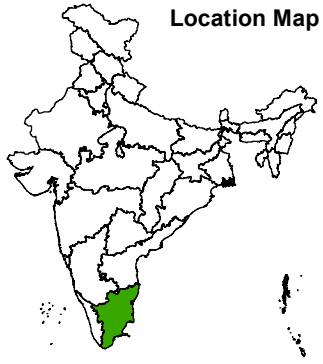


DESERTIFICATION / LAND DEGRADATION STATUS MAP TAMIL NADU (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw2	Agriculture irrigated, water erosion
	Sw1,2	Land with scrub, water erosion
	Ie1	Agriculture unirrigated, wind erosion
	Ee1	Dune / Sandy area, wind erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Ss1	Land with scrub, salinity / alkalinity
	Bs1	Barren, salinity / alkalinity
	Tm2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Location Map



Data Source:

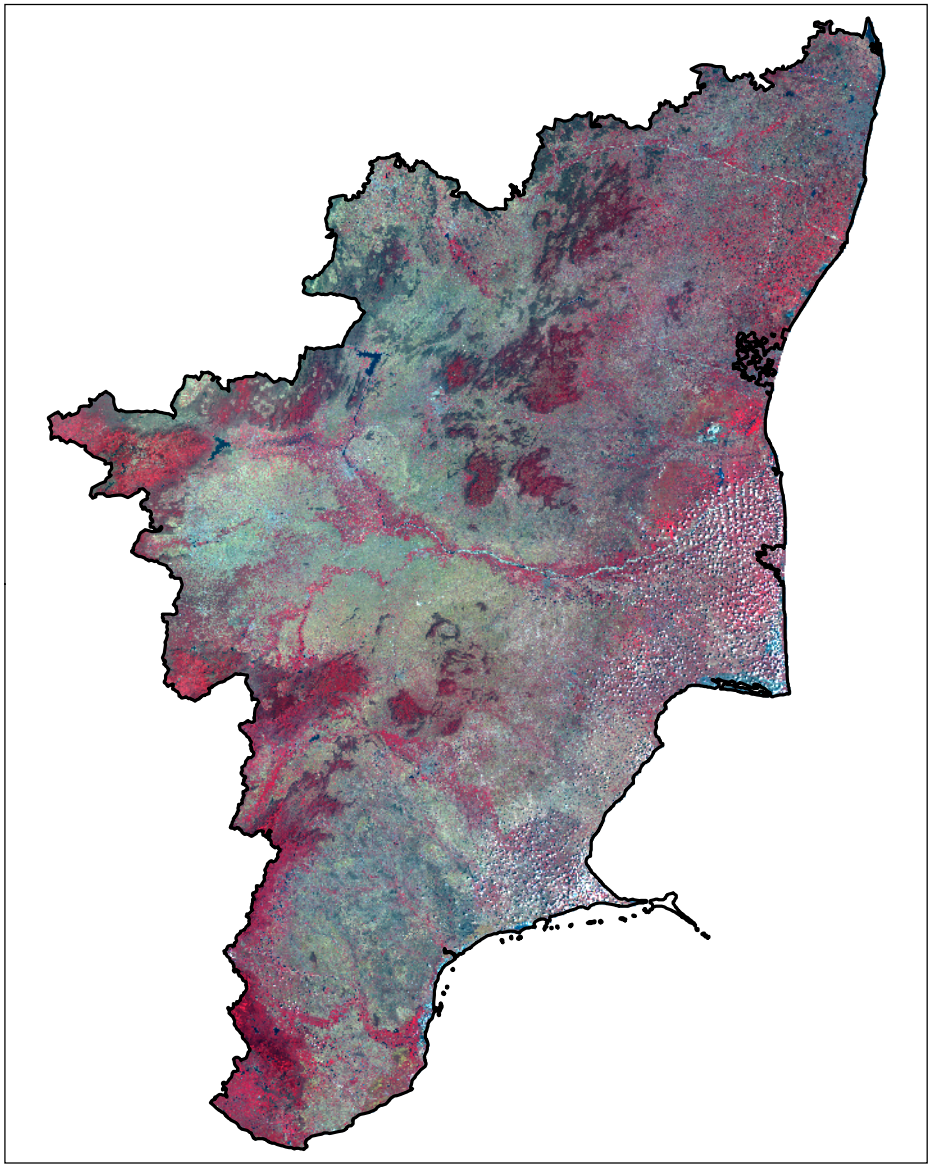
- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail

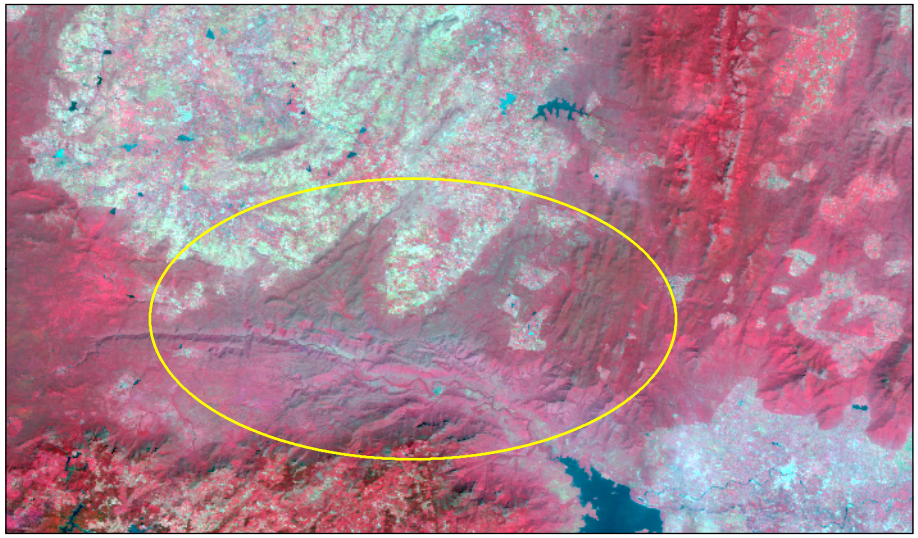
Prepared by:
Institute of Remote Sensing, Anna University, Chennai
&
Space Applications Centre, ISRO, Ahmedabad

Tamil Nadu - Illustrative representation of Land Degradation processes / changes on IRS AWiFS data

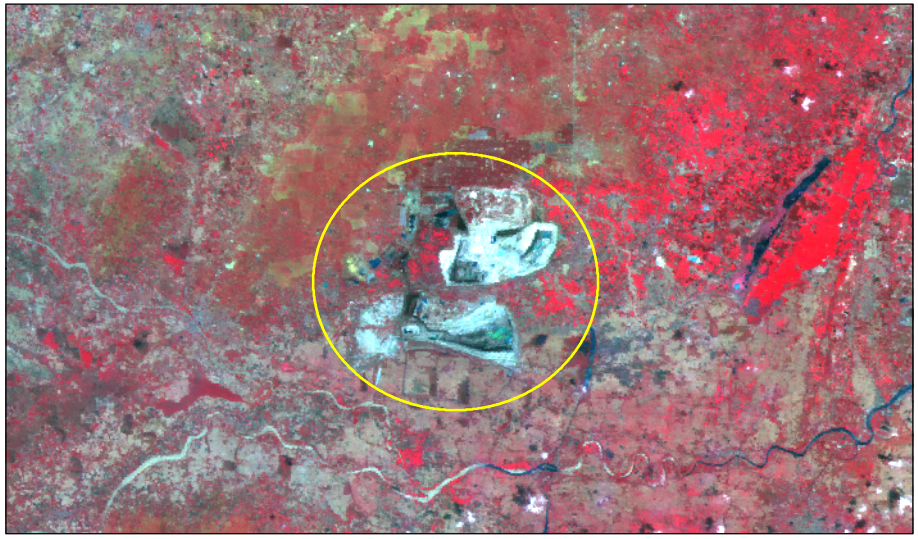
Tamil Nadu as seen on IRS AWiFS (February 2019)



Forest area under vegetation degradation (October 2018)



Area affected with manmade (mining) activities (February 2018)



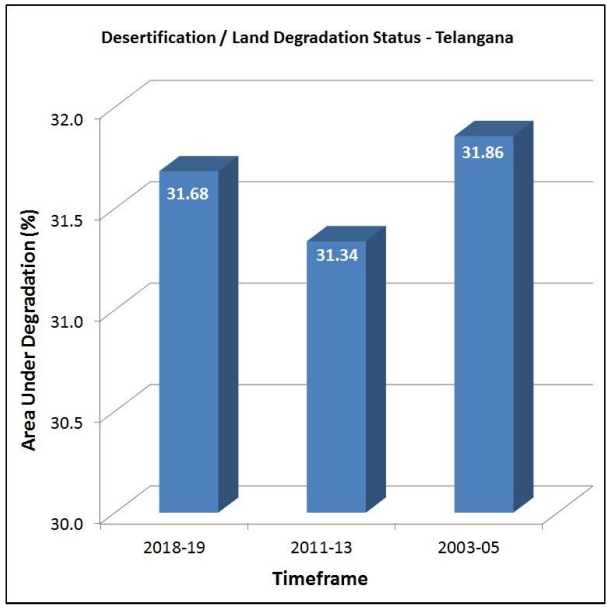
TELANGANA

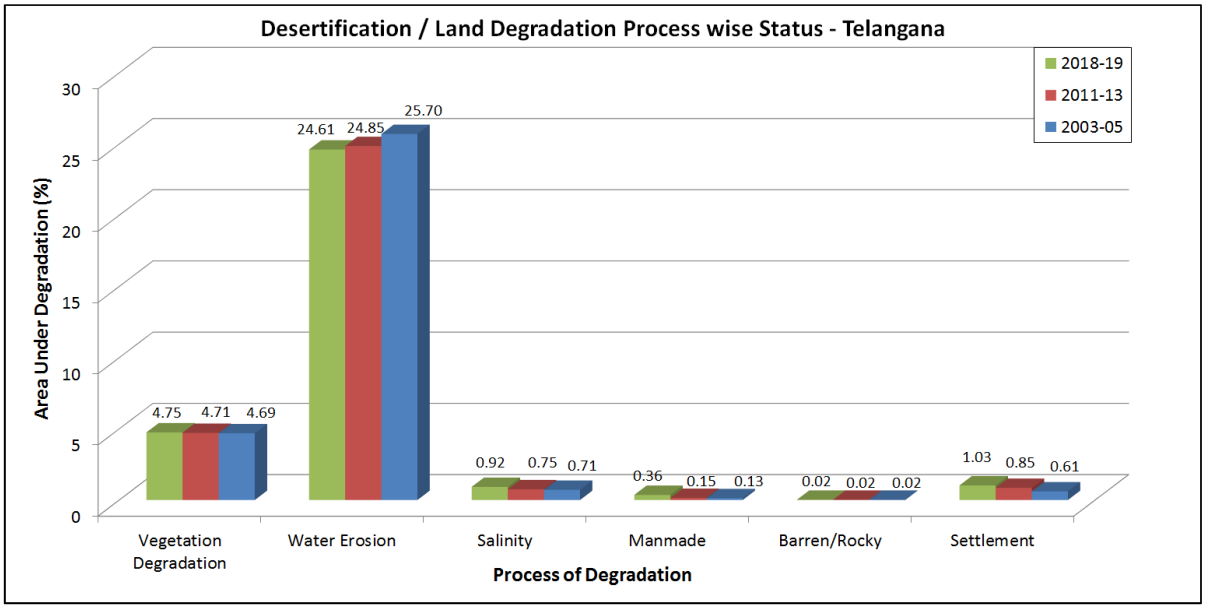
Telangana is the country's newest state formed on 2nd of June 2014. It is located in the south-central part of India spreading over 1,14,840 sq km area. The state has population of 3,51,93,978 with 306 population density, 988 sex ratio and 66.46% literacy (Census 2011). Hyderabad is the capital of Telangana. Telangana is situated in the central stretch of the eastern seaboard of the Indian Peninsula. The area is divided into Eastern Ghats and the plains. The topography is characterised by undulating uplands with small erosional hills and depressions. The Deccan plateau is drained by two major rivers, Godavari and Krishna, with other minor rivers such as Manair, Bhima, Dindi, Kinnerasani, Manjeera, Peddavagu etc. Telangana experiences dry tropical climate with 10^{o}C to 40^{o}C temperature and low rainfall.

The statistical summary and analysis of the Land Degradation of Telangana state reveal that 31.68% (3.6 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 31.34% (3.59 million ha) and 31.86% (3.65 million ha) respectively. An increase of 0.34% (39,652 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has decreased by 0.52% (59,626 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (24.61% in 2018-19, 24.85% in 2011-13 and 25.70% in 2003-05) followed by Vegetation Degradation (4.75% in 2018-19, 4.71% in 2011-13 and 4.69 in 2003-05). Between timeframe 2011-13 & 2018-19, decrease in agriculture area undergoing water erosion and increase in area affected with manmade activities & salinity is observed. Whereas, from timeframe 2003-05 to 2011-13, decrease in agriculture area undergoing water erosion and increase in agriculture area affected with salinity is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

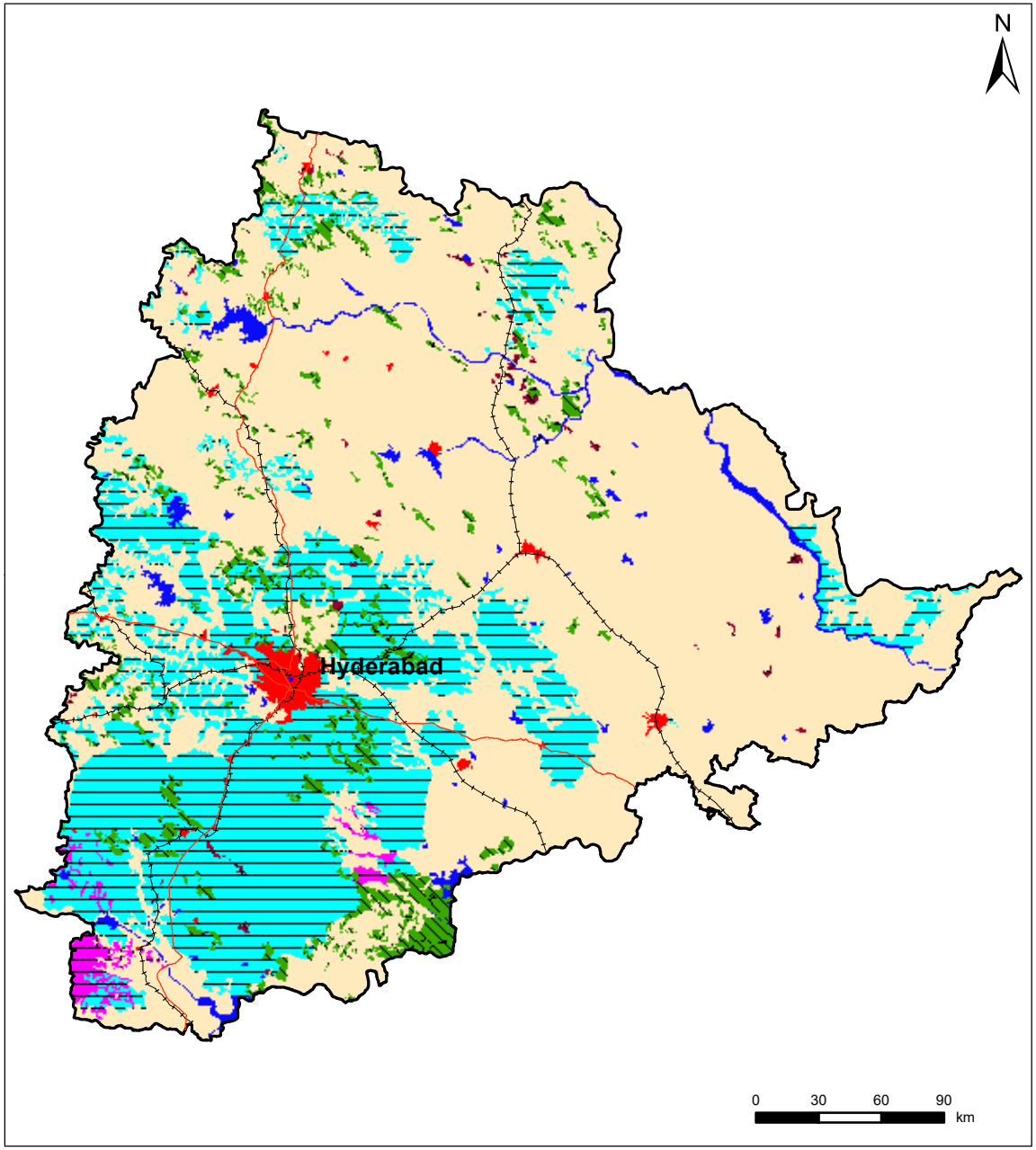




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	545477	4.75	541145	4.71	538533	4.69	4332	2612
Water Erosion	2826129	24.61	2854285	24.85	2951871	25.70	-28156	-97586
Salinity	105955	0.92	86514	0.75	81917	0.71	19441	4597
Manmade	41076	0.36	16982	0.15	14592	0.13	24095	2390
Barren/Rocky	1979	0.02	1979	0.02	1979	0.02	0	0
Settlement	117893	1.03	97951	0.85	69591	0.61	19942	28360
Total Area under Desertification	**3638508**	**31.68**	**3598856**	**31.34**	**3658482**	**31.86**	**39652**	**-59626**
No Apparent Degradation	**7633243**	**66.47**	**7689491**	**66.96**	**7631019**	**66.45**	**-56248**	**58472**
Total Geographical Area (ha)	**11484000**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	336792	2.93	334300	2.91	2492
2	Fv2	Forest, vegetation degradation, High	154037	1.34	151049	1.32	2988
3	Sv1	Land with scrub, vegetation degradation, Low	22942	0.20	21774	0.19	1168
4	Sv2	Land with scrub, vegetation degradation, High	31706	0.28	34022	0.30	-2316
5	Iw1	Agriculture irrigated, water erosion, Low	1775	0.02	1775	0.02	0
6	Dw1	Agriculture unirrigated, water erosion, Low	2810422	24.47	2838578	24.72	-28156
7	Sw1	Land with scrub, water erosion, Low	13932	0.12	13932	0.12	0
8	Is1	Agriculture irrigated, salinity / alkalinity, Low	8841	0.08	0	0.00	8841
9	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	97114	0.85	86514	0.75	10600
10	Fm2	Forest, man made, High	333	0.00	0	0.00	333
11	Tm1	Others, man made, Low	20311	0.18	5463	0.05	14848
12	Tm2	Others, man made, High	20432	0.18	11519	0.10	8914
13	R	Rocky	1979	0.02	1979	0.02	0
14	S	Settlement	117893	1.03	97951	0.85	19942
Total Area Under Desertification/ Land Degradation			**3638508**	**31.68**	**3598856**	**31.34**	**39652**
15	W	Water body/ Drainage	212249	1.85	195653	1.70	16596
16	NAD	No Apparent Degradation	7633243	66.47	7689491	66.96	-56248
Total Geographical Area (ha)			**11484000**	**100**	**11484000**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	334300	2.91	340728	2.97	-6428
2	Fv2	Forest, vegetation degradation, High	151049	1.32	142139	1.24	8909
3	Sv1	Land with scrub, vegetation degradation, Low	21774	0.19	20201	0.18	1573
4	Sv2	Land with scrub, vegetation degradation, High	34022	0.30	35464	0.31	-1442
5	Iw1	Agriculture irrigated, water erosion, Low	1775	0.02	1775	0.02	0
6	Dw1	Agriculture unirrigated, water erosion, Low	2838578	24.72	2936164	25.57	-97586
7	Sw1	Land with scrub, water erosion, Low	13932	0.12	13932	0.12	0
8	Is1	Agriculture irrigated, salinity / alkalinity, Low	0	0.00	0	0.00	0
9	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	86514	0.75	81917	0.71	4597
10	Fm2	Forest, man made, High	0	0.00	0	0.00	0
11	Tm1	Others, man made, Low	5463	0.05	5463	0.05	0
12	Tm2	Others, man made, High	11519	0.10	9129	0.08	2390
13	R	Rocky	1979	0.02	1979	0.02	0
14	S	Settlement	97951	0.85	69591	0.61	28360
Total Area Under Desertification/ Land Degradation			**3598856**	**31.34**	**3658482**	**31.86**	**-59626**
15	W	Water body/ Drainage	195653	1.70	194499	1.69	1154
16	NAD	No Apparent Degradation	7689491	66.96	7631019	66.45	58472
Total Geographical Area (ha)			**11484000**	**100**	**11484000**	**100**	



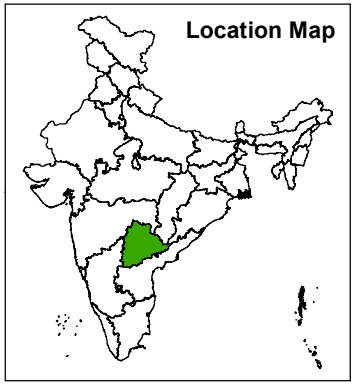
DESERTIFICATION / LAND DEGRADATION STATUS MAP TELANGANA (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Is1	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Fm2	Forest, man made
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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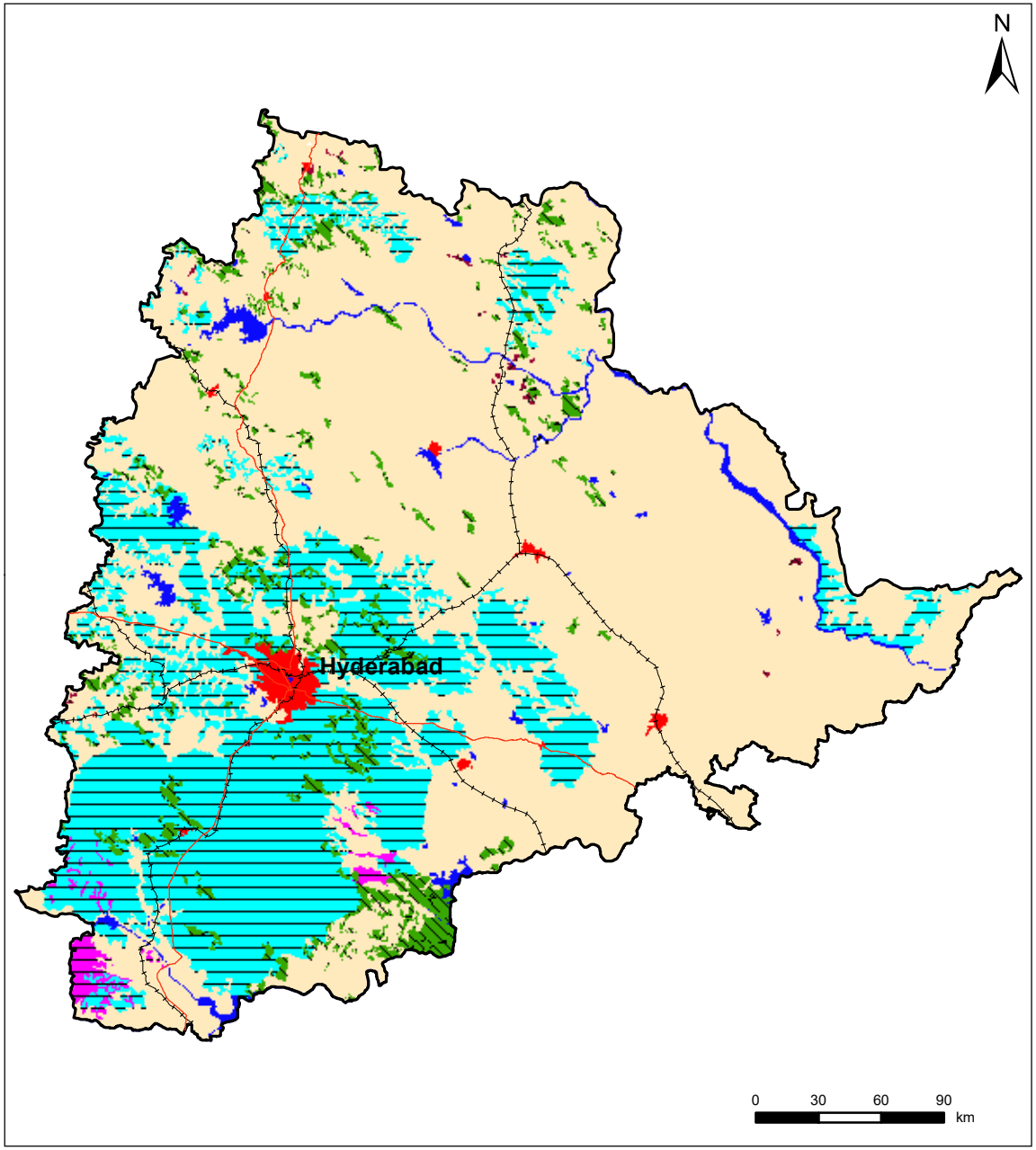
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP TELANGANA (2011-13)

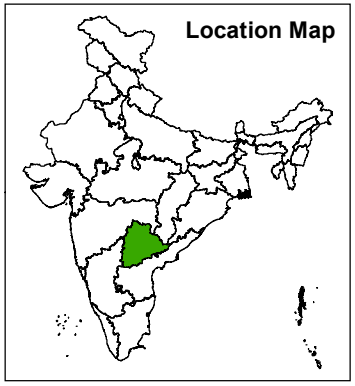
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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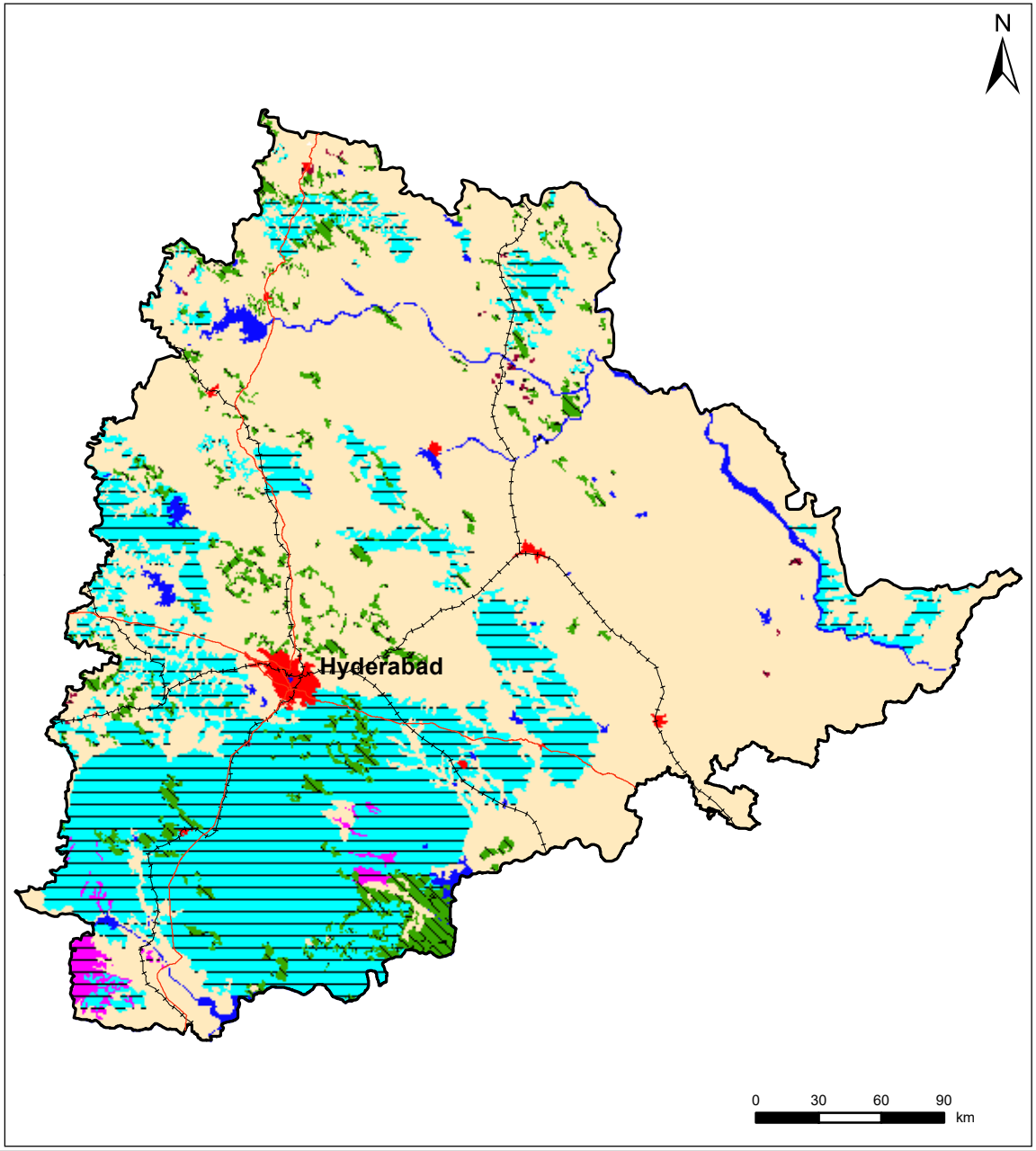


DESERTIFICATION / LAND DEGRADATION STATUS MAP TELANGANA (2003-05)

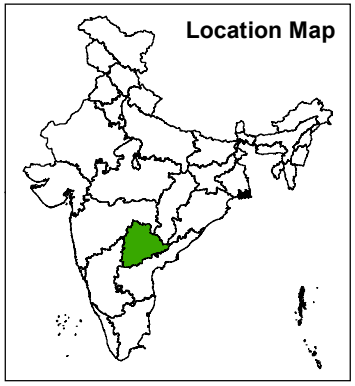
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Sw1	Land with scrub, water erosion
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Tm1,2	Others, man made
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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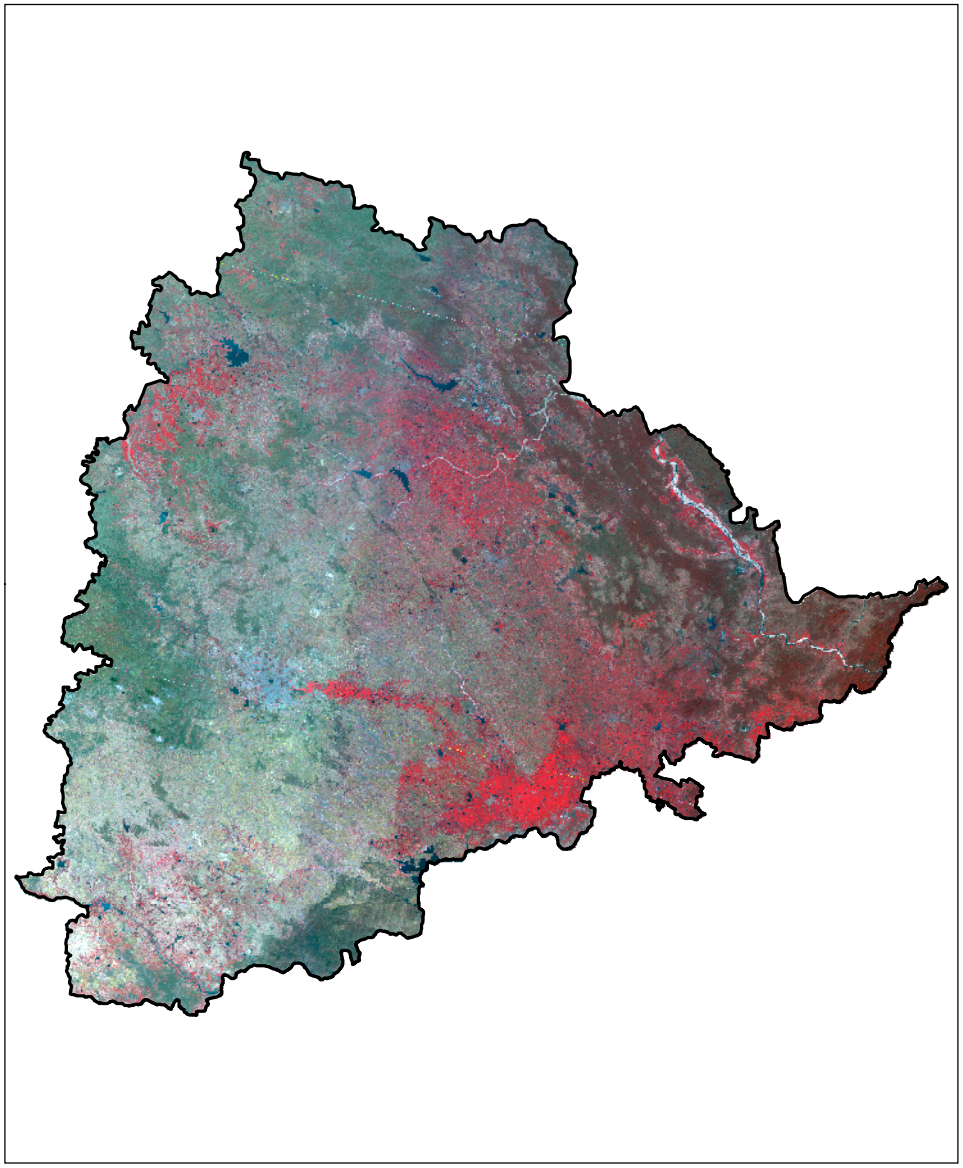
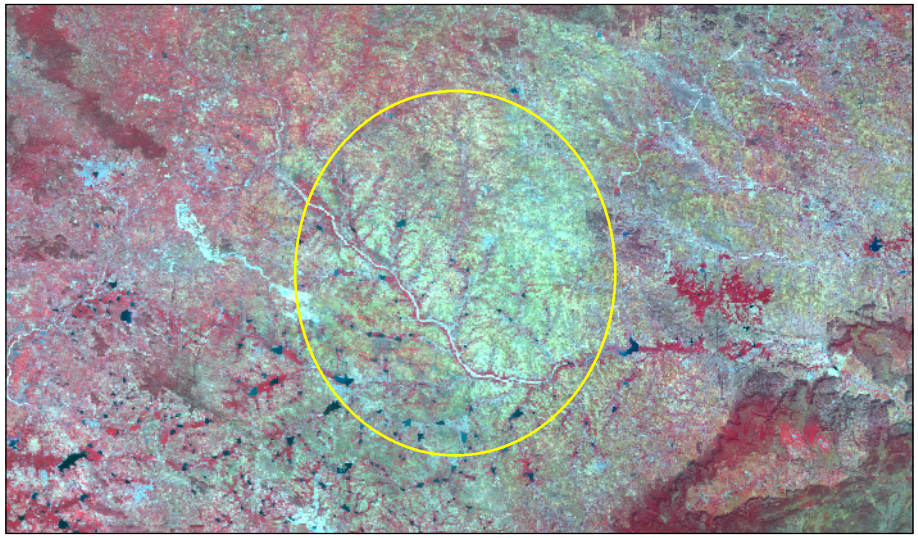
&
Space Applications Centre, ISRO, Ahmedabad

Telangana - Illustrative representation of Land Degradation processes on IRS AWiFS data

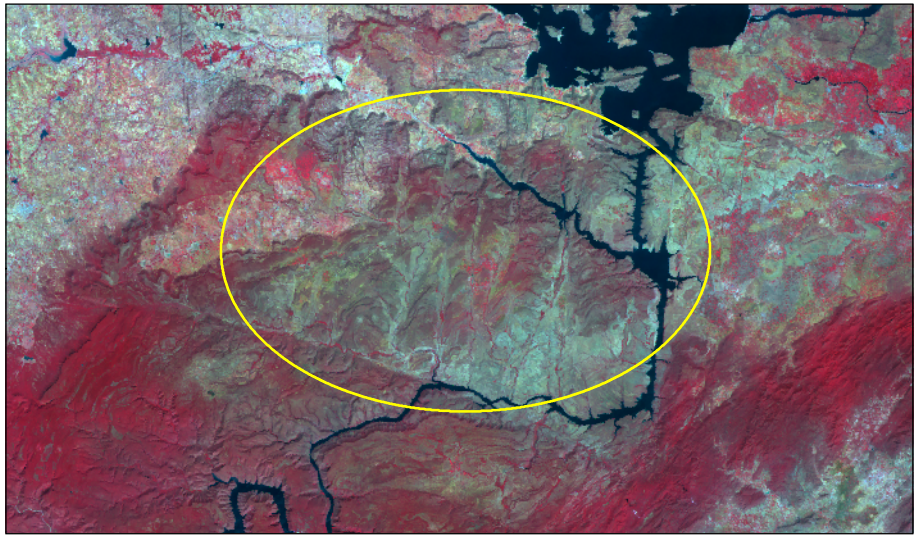
Telangana as seen on IRS AWiFS (February 2019)



Agriculture area affected with water erosion (October 2018)



Forest area under vegetation degradation (October 2018)



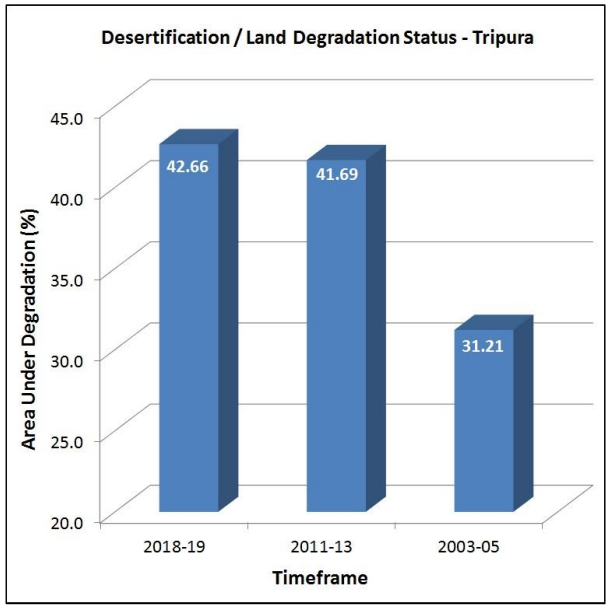
TRIPURA

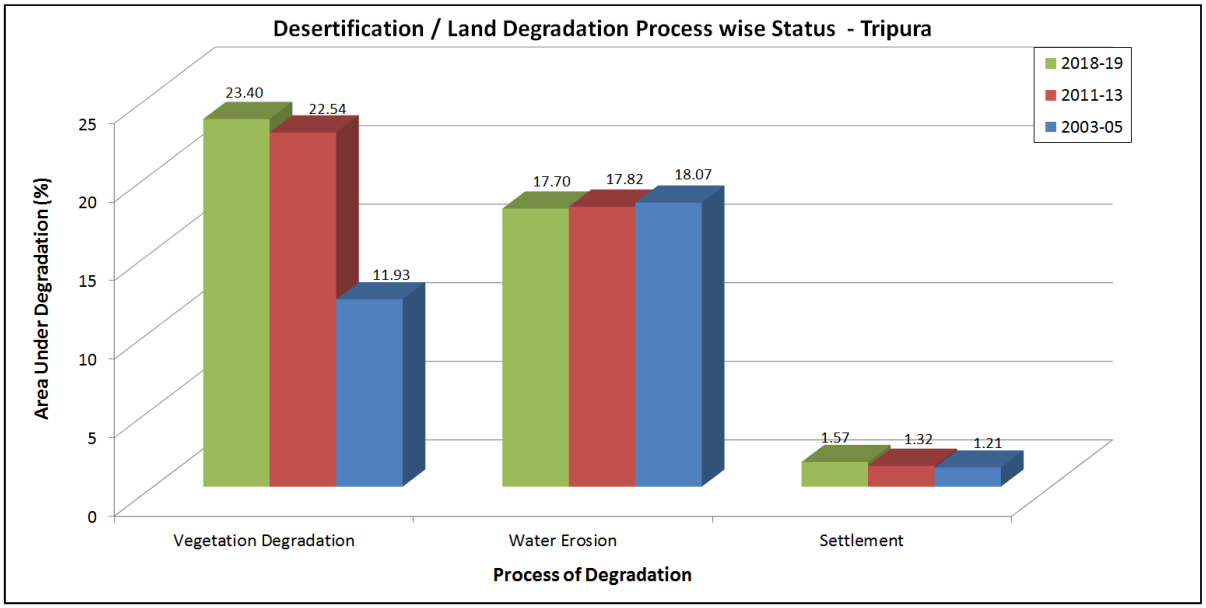
Tripura is one of the seven sisters' states of India bordering with Bangladesh and Myanmar; and covers 10,486 sq km area. The state has population of 36,73,917; with 350 population density, 960 sex ratio and 87.22% literacy (Census 2011). Agartala is the capital of Tripura. Tripura is marked by two distinct geographical features like mountain ranges and alluvial plain. Major ranges are Deotamura, South Baramura and Atharamura hills. Burima, Gomati, Khowai, Howrah, Longai, Dhalai, Muhuri etc. are major rivers. The state experiences tropical climate with five distinct seasons. The state is high rainfall zone with the incidence of very high concentration of rainfall (up to 450 mm per day) in the monsoon season, with average annual rainfall of 2025 mm. The average annual temperature ranges from 15^{o}C to 34^{o}C with occasional thunderstorms in summer.

The statistical summary and analysis of the Land Degradation of Tripura state reveal that 42.66% (4,47,378 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 41.69% (4,37,128 ha) and 31.21% (3,27,302 ha) respectively. An increase of 0.97% (10,250 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 10.48% (1,09,826 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (23.40% in 2018-19, 22.54% in 2011-13 and 11.93% in 2003-05) followed by Water Erosion (17.70% in 2018-19, 17.82% in 2011-13 and 18.07% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest area undergoing vegetation degradation and slight decrease in agriculture area undergoing water erosion is observed. Also, from timeframe 2003-05 to 2011-13, increase in forest area undergoing vegetation degradation and slight decrease in agriculture area undergoing water erosion is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

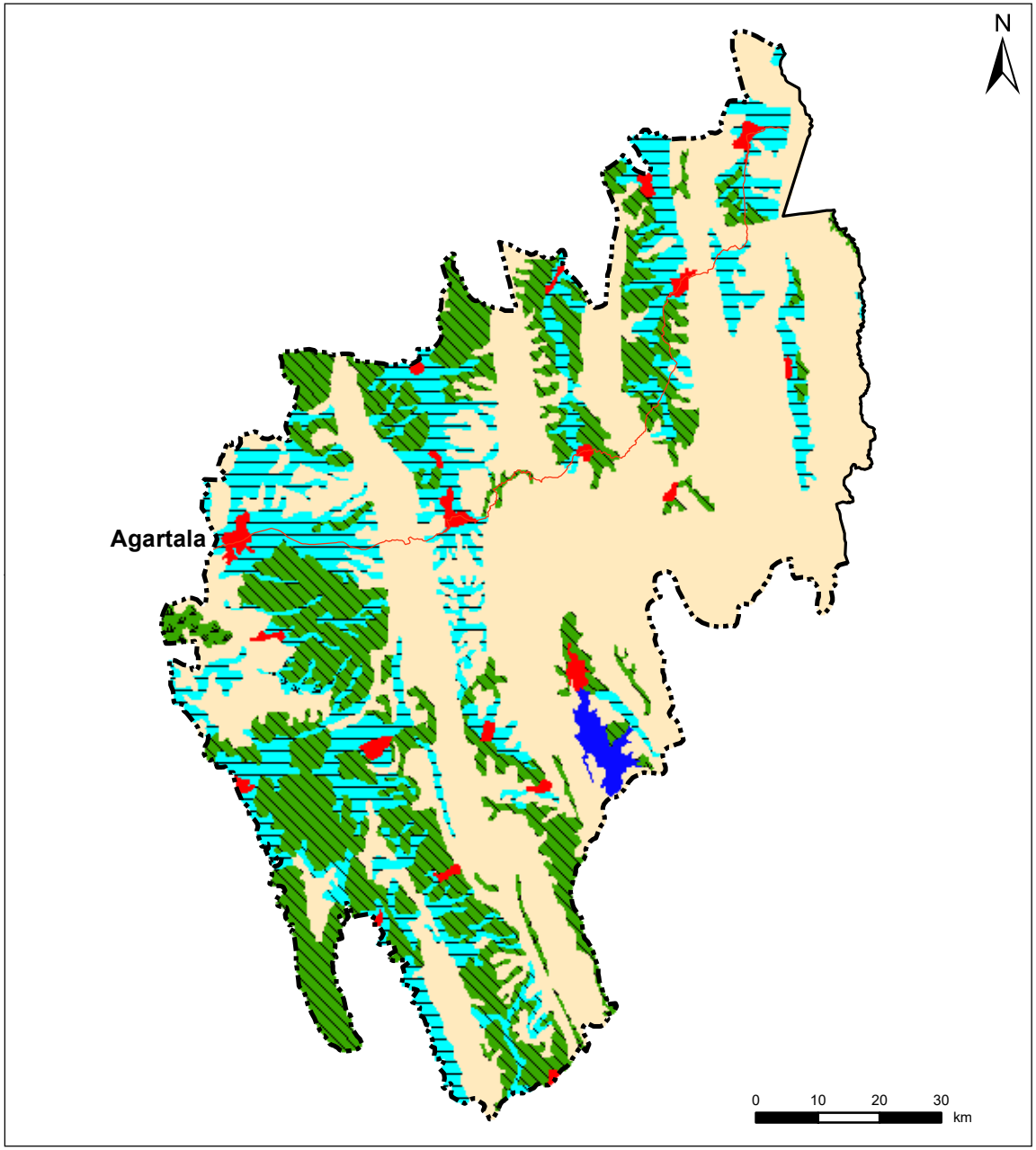




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	245366	23.40	236374	22.54	125058	11.93	8992	111317
Water Erosion	185575	17.70	186900	17.82	189533	18.07	-1325	-2633
Settlement	16437	1.57	13854	1.32	12711	1.21	2584	1143
Total Area under Desertification	**447378**	**42.66**	**437128**	**41.69**	**327302**	**31.21**	**10250**	**109826**
No Apparent Degradation	**593730**	**56.62**	**608776**	**58.06**	**716717**	**68.35**	**-15046**	**-107941**
Total Geographical Area (ha)	**1048600**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	238021	22.70	229444	21.88	8578
2	Sv1	Land with scrub, vegetation degradation, Low	7345	0.70	6931	0.66	414
3	Iw1	Agriculture irrigated, water erosion, Low	334	0.03	334	0.03	0
4	Dw1	Agriculture unirrigated, water erosion, Low	173935	16.59	175260	16.71	-1325
5	Fw1	Forest, water erosion, Low	8789	0.84	8789	0.84	0
6	Sw1	Land with scrub, water erosion, Low	2517	0.24	2517	0.24	0
7	S	Settlement	16437	1.57	13854	1.32	2584
Total Area Under Desertification/ Land Degradation			**447378**	**42.66**	**437128**	**41.69**	**10250**
8	W	Water body/ Drainage	7491	0.71	2696	0.26	4795
9	NAD	No Apparent Degradation	593730	56.62	608776	58.06	-15046
Total Geographical Area (ha)			**1048600**	**100**	**1048600**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	229444	21.88	122949	11.73	106495
2	Sv1	Land with scrub, vegetation degradation, Low	6931	0.66	2109	0.20	4822
3	Iw1	Agriculture irrigated, water erosion, Low	334	0.03	334	0.03	0
4	Dw1	Agriculture unirrigated, water erosion, Low	175260	16.71	177892	16.96	-2633
5	Fw1	Forest, water erosion, Low	8789	0.84	8789	0.84	0
6	Sw1	Land with scrub, water erosion, Low	2517	0.24	2517	0.24	0
7	S	Settlement	13854	1.32	12711	1.21	1143
Total Area Under Desertification/ Land Degradation			**437128**	**41.69**	**327302**	**31.21**	**109826**
8	W	Water body/ Drainage	2696	0.26	4581	0.44	-1885
9	NAD	No Apparent Degradation	608776	58.06	716717	68.35	-107941
Total Geographical Area (ha)			**1048600**	**100**	**1048600**	**100**	



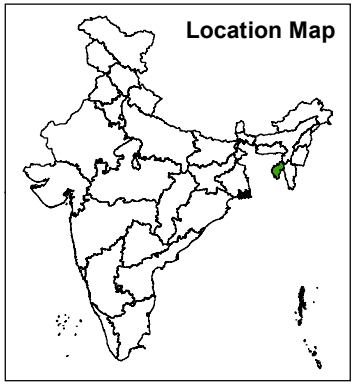
DESERTIFICATION / LAND DEGRADATION STATUS MAP TRIPURA (2018-19)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1	Land with scrub, water erosion
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

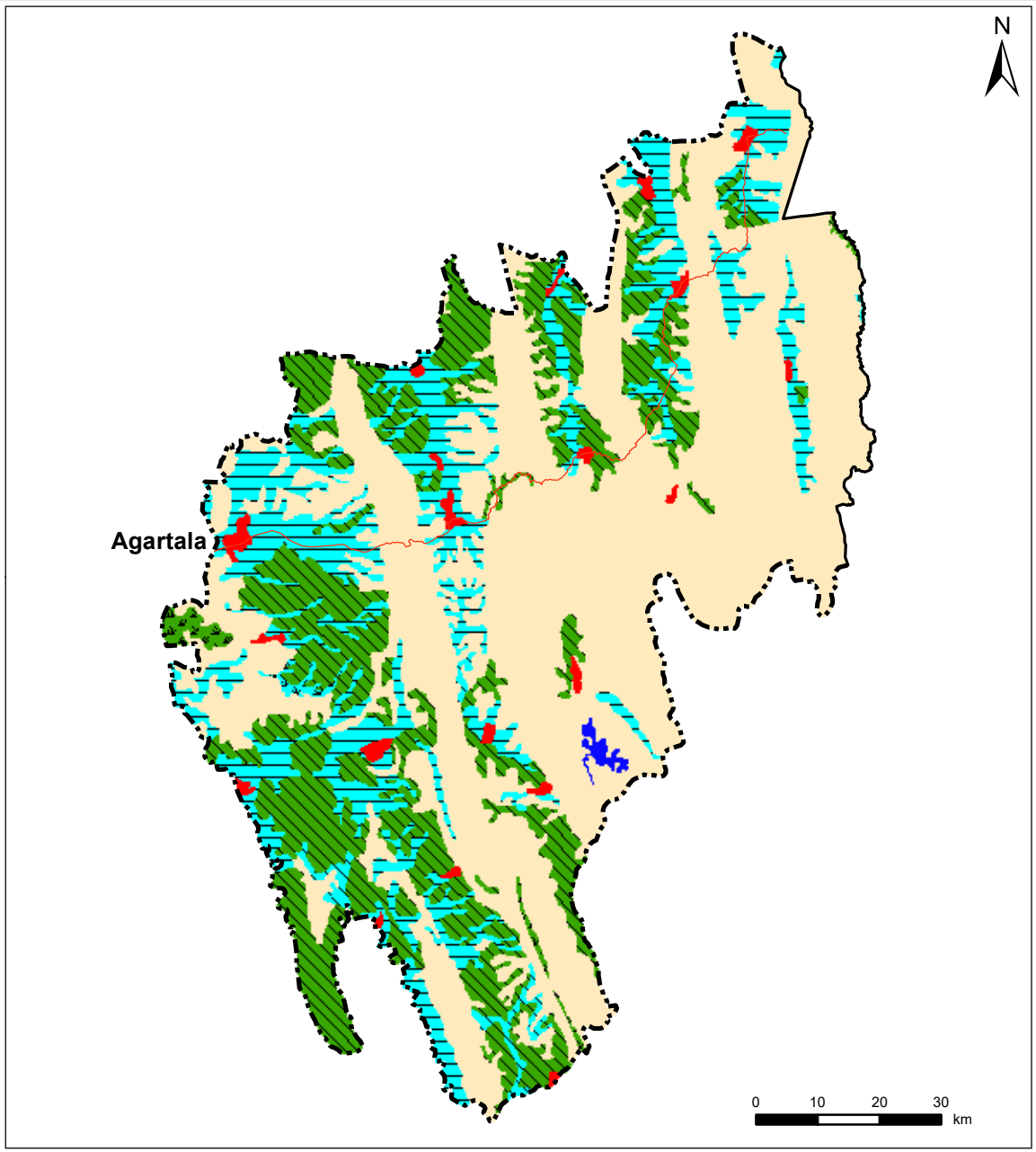
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
North Easrern Space Applications Centre, Meghalaya
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP TRIPURA (2011-13)

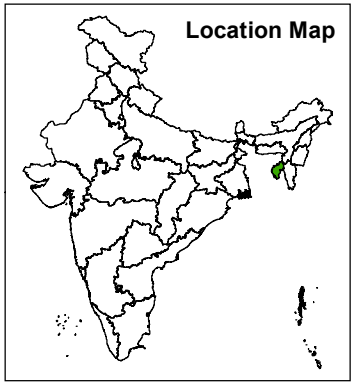
Legend

Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1	Land with scrub, water erosion
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

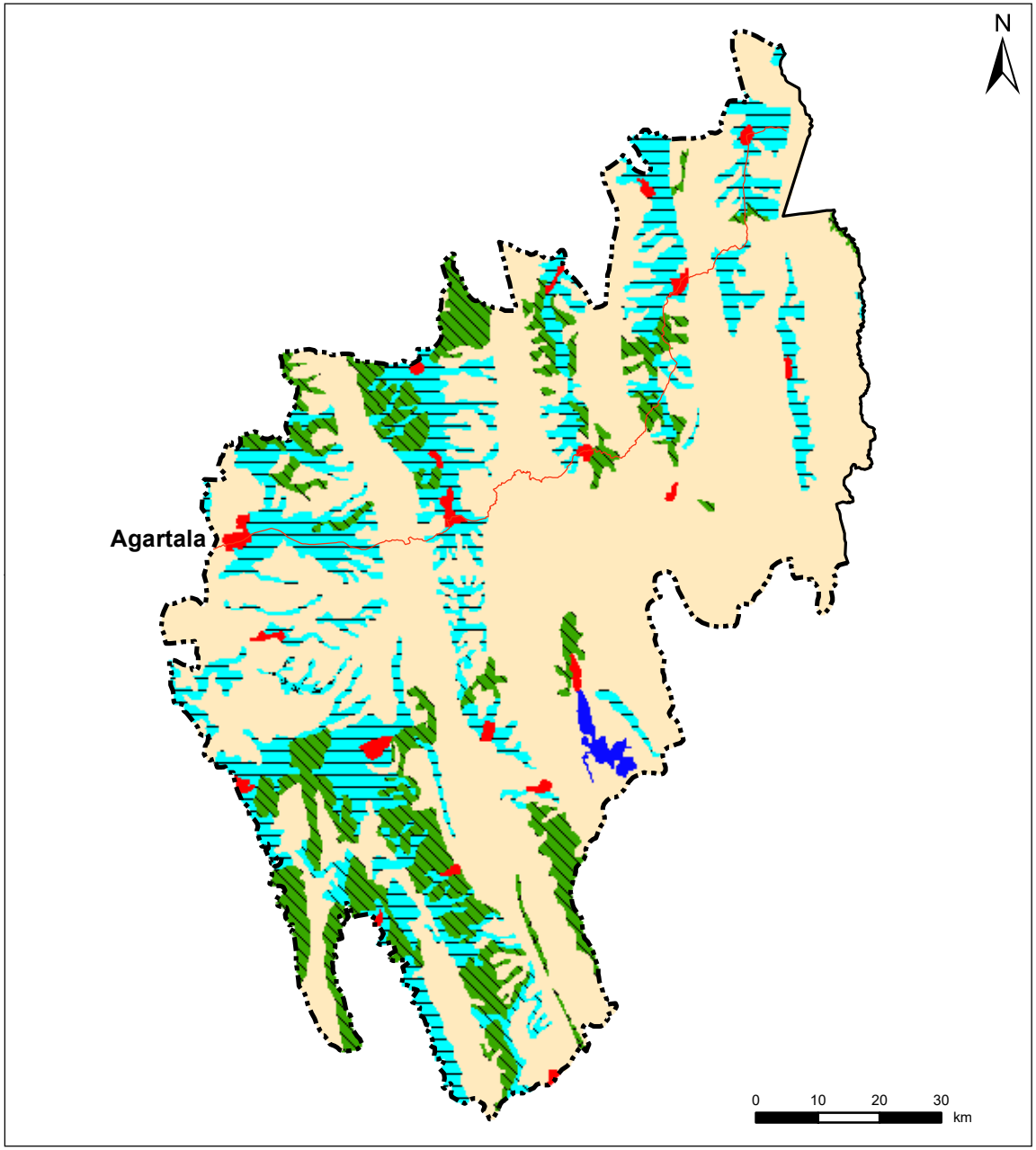
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Mizoram Remote Sensing Applications Centre, Aizawl
&
Space Applications Centre, ISRO, Ahmedabad



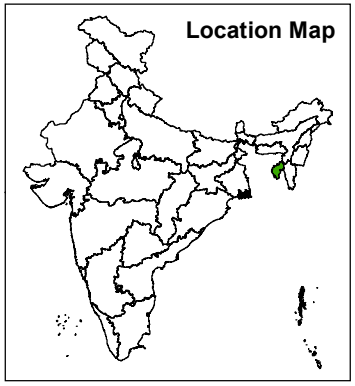
DESERTIFICATION / LAND DEGRADATION STATUS MAP TRIPURA (2003-05)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Fw1	Forest, water erosion
	Sw1	Land with scrub, water erosion
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

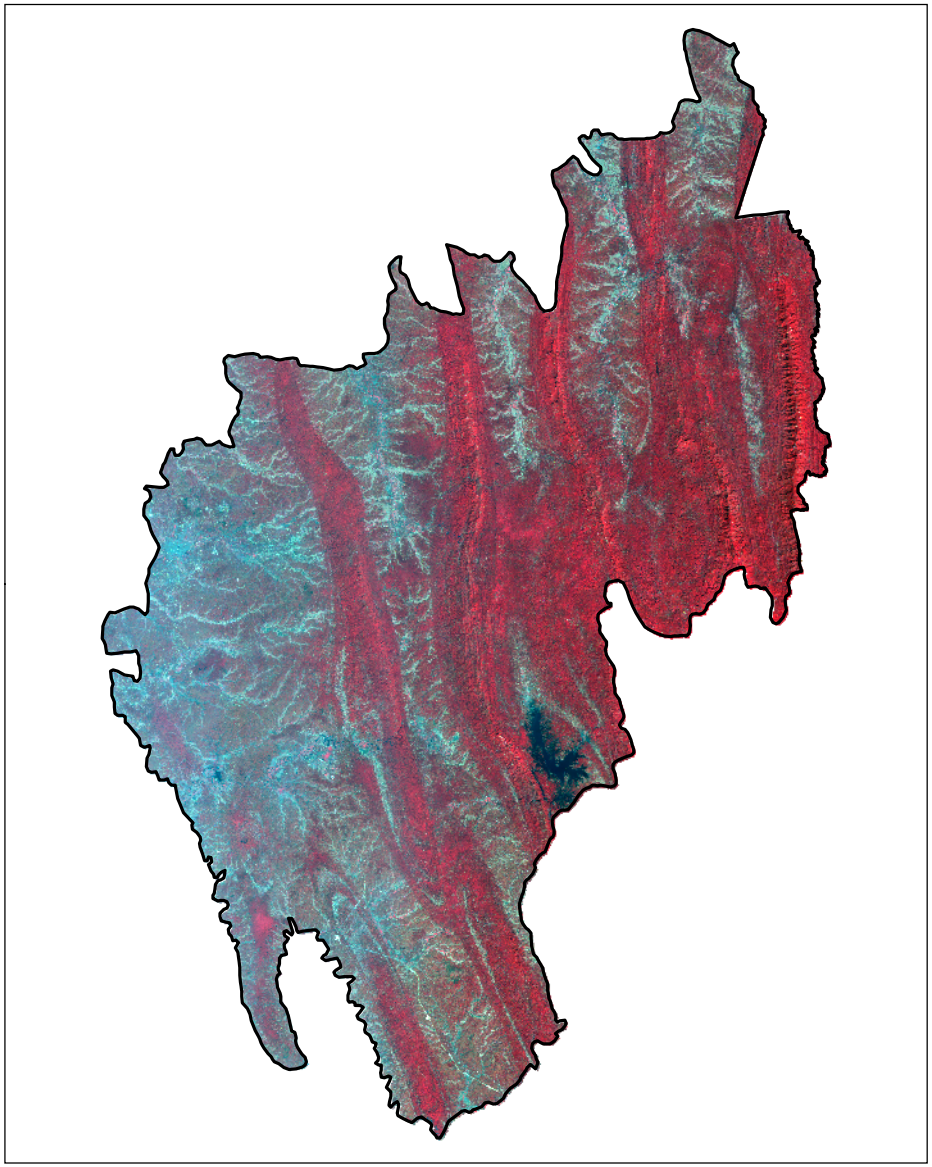
	International boundary
	State boundary
	Major roads
	Rail



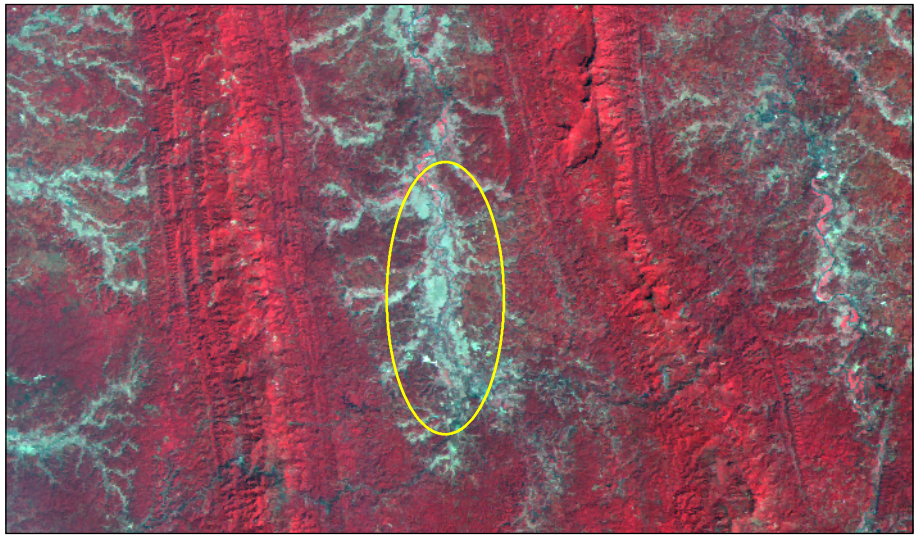
Prepared by:
Mizoram Remote Sensing Applications Centre, Aizawl
&
Space Applications Centre, ISRO, Ahmedabad

Tripura - Illustrative representation of Land Degradation processes on IRS AWiFS data

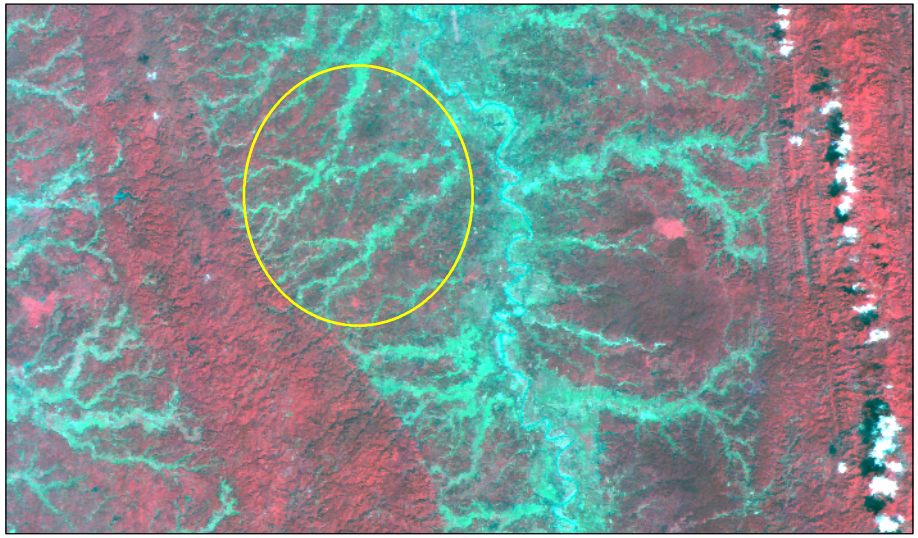
Tripura as seen on IRS AWiFS (February 2019)



Agriculture area affected with water erosion (February 2018)



Forest area under vegetation degradation (November 2018)



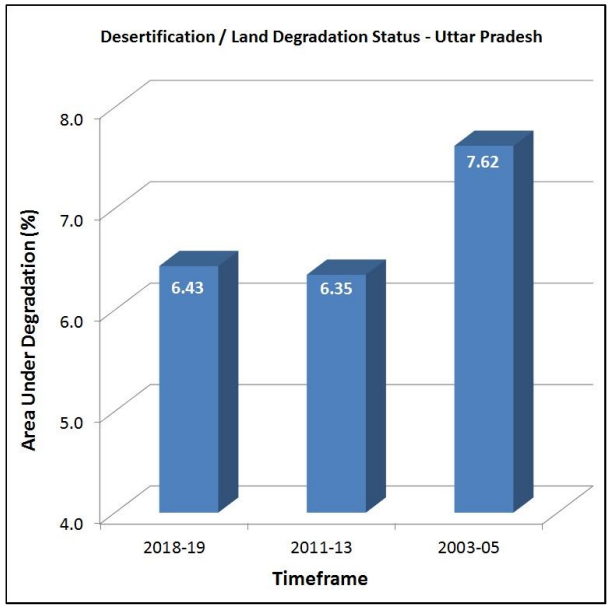
UTTAR PRADESH

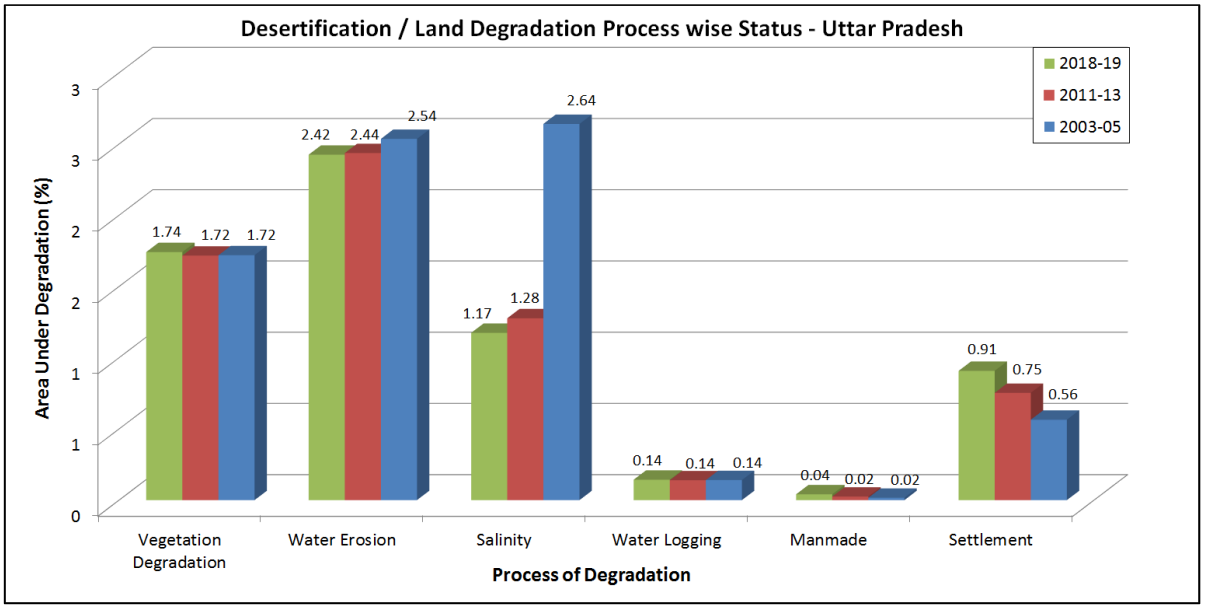
Uttar Pradesh is located in northern part of India bordering with Nepal; spreading over 2,40,928 sq km area and most populous state of the country with population of 19,98,12,341. The state has 829 population density, 912 sex ratio and 67.68% literacy (Census 2011). Lucknow is the capital of Uttar Pradesh. Geographically Uttar Pradesh is divided into Shivalik foothills, Terai, Gangetic plains and Vindhya hills and plateau. The main rivers are Ganges, Yamuna, Ghaghara, Gandak, Koshi, Gomati, Ramganga etc. Soils of the state are very fertile. In southern bank of Ganges, few places are effected by water logging and sodicity. The climate of Uttar Pradesh is characterised by hot and dry summer and cold winter with average annual rainfall of 990 mm in monsoon.

The statistical summary and analysis of the Land Degradation of Uttar Pradesh state reveal that 6.43% (1.54 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 6.35% (1.52 million ha) and 7.62% (1.83 million ha) respectively. A slight increase of 0.08% (20,612 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19, which is mainly contributed by urbanisation. From timeframe 2003-05 to 2011-13, the area undergoing DLD has decreased by 1.27% (3,06,266 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (2.42% in 2018-19, 2.44% in 2011-13 and 2.54% in 2003-05) followed by Vegetation Degradation (1.74% in 2018-19, 1.72% in both 2011-13 and 2003-05) and Salinity (1.17% in 2018-19, 1.28% in 2011-13 and 2.64% in 2003-05). Between timeframe 2011-13 & 2018-19, decrease in agriculture area affected with salinity and slight increase in forest area undergoing vegetation degradation is observed. Whereas, from timeframe 2003-05 to 2011-13, decrease in agriculture area affected with salinity & water erosion and is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

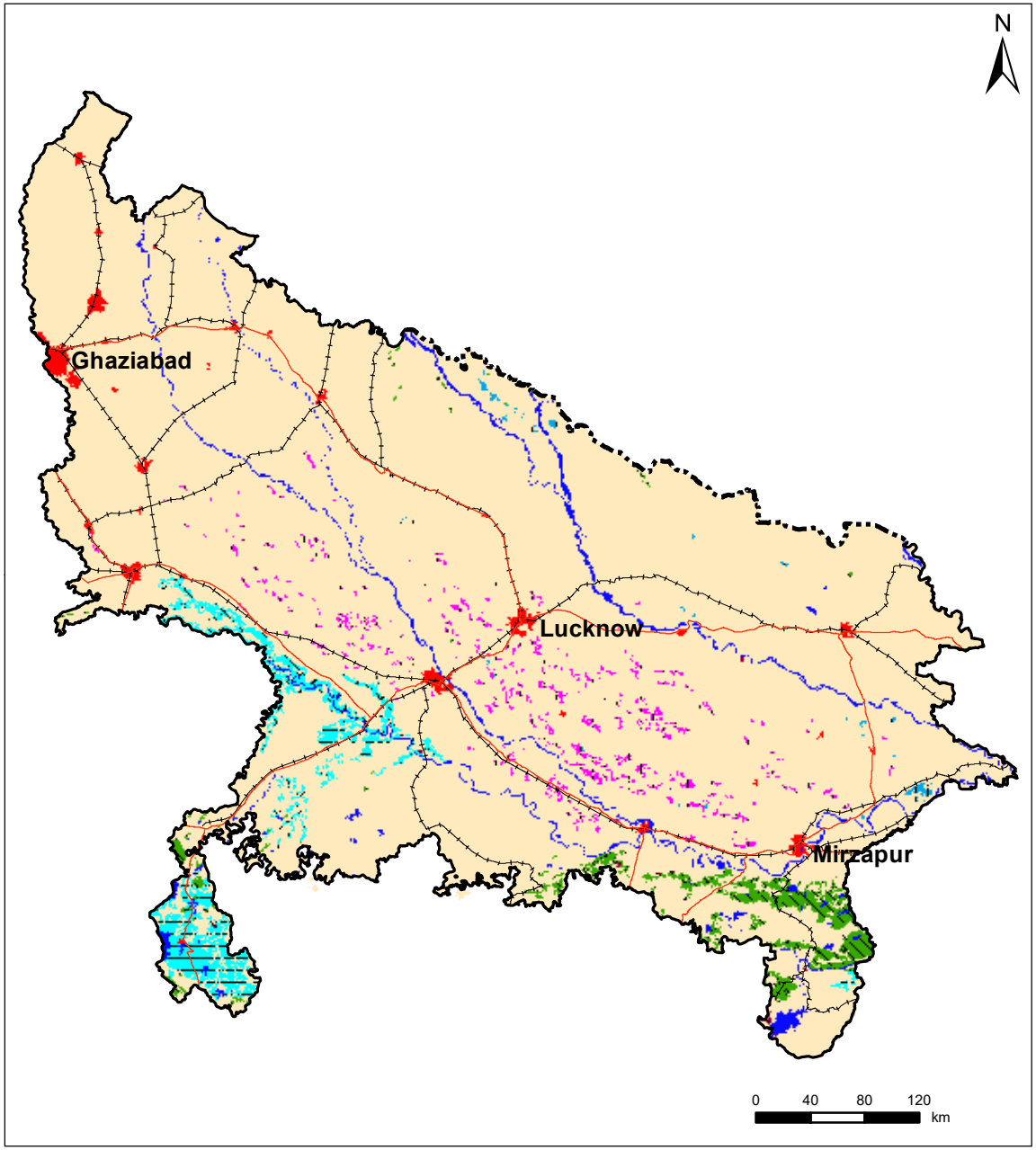




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	419538	1.74	413476	1.72	414176	1.72	6062	-700
Water Erosion	584188	2.42	586961	2.44	610989	2.54	-2774	-24027
Salinity	282913	1.17	307571	1.28	636202	2.64	-24658	-328631
Water Logging	34505	0.14	33620	0.14	33907	0.14	885	-287
Manmade	9836	0.04	5970	0.02	4028	0.02	3867	1941
Settlement	218628	0.91	181399	0.75	135962	0.56	37230	45437
Total Area under Desertification	**1549608**	**6.43**	**1528997**	**6.35**	**1835263**	**7.62**	**20612**	**-306266**
No Apparent Degradation	**22092515**	**91.70**	**22115961**	**91.79**	**21831845**	**90.62**	**-23446**	**284116**
Total Geographical Area (ha)	**24092800**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	199183	0.83	199183	0.83	0
2	Fv2	Forest, vegetation degradation, High	16367	0.07	16367	0.07	0
3	Sv1	Land with scrub, vegetation degradation, Low	135816	0.56	114276	0.47	21540
4	Sv2	Land with scrub, vegetation degradation, High	68172	0.28	83650	0.35	-15478
5	Dw1	Agriculture unirrigated, water erosion, Low	304029	1.26	304830	1.27	-801
6	Fw1	Forest, water erosion, Low	87976	0.37	88153	0.37	-177
7	Fw2	Forest, water erosion, High	11984	0.05	11984	0.05	0
8	Sw1	Land with scrub, water erosion, Low	177419	0.74	179392	0.74	-1973
9	Sw2	Land with scrub, water erosion, High	2780	0.01	2603	0.01	177
10	Is1	Agriculture irrigated, salinity / alkalinity, Low	264850	1.10	287470	1.19	-22620
11	Is2	Agriculture irrigated, salinity / alkalinity, High	16613	0.07	18650	0.08	-2037
12	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	1450	0.01	1450	0.01	0
13	Il1	Agriculture irrigated, water logging, Low	11225	0.05	11476	0.05	-251
14	Il2	Agriculture irrigated, water logging, High	16477	0.07	15342	0.06	1136
15	Fl1	Forest, water logging, Low	6802	0.03	6802	0.03	0
16	Tm1	Others, man made, Low	6018	0.02	3110	0.01	2907
17	Tm2	Others, man made, High	3818	0.02	2859	0.01	959
18	S	Settlement	218628	0.91	181399	0.75	37230
Total Area Under Desertification/ Land Degradation			**1549608**	**6.43**	**1528997**	**6.35**	**20612**
19	W	Water body/ Drainage	450676	1.87	447842	1.86	2834
20	NAD	No Apparent Degradation	22092515	91.70	22115961	91.79	-23446
Total Geographical Area (ha)			**24092800**	**100**	**24092800**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	199183	0.83	198521	0.82	662
2	Fv2	Forest, vegetation degradation, High	16367	0.07	15788	0.07	580
3	Sv1	Land with scrub, vegetation degradation, Low	114276	0.47	114276	0.47	0
4	Sv2	Land with scrub, vegetation degradation, High	83650	0.35	85592	0.36	-1941
5	Dw1	Agriculture unirrigated, water erosion, Low	304830	1.27	336178	1.40	-31348
6	Fw1	Forest, water erosion, Low	88153	0.37	80753	0.34	7400
7	Fw2	Forest, water erosion, High	11984	0.05	11984	0.05	0
8	Sw1	Land with scrub, water erosion, Low	179392	0.74	179471	0.74	-79
9	Sw2	Land with scrub, water erosion, High	2603	0.01	2603	0.01	0
10	Is1	Agriculture irrigated, salinity / alkalinity, Low	287470	1.19	529570	2.20	-242099
11	Is2	Agriculture irrigated, salinity / alkalinity, High	18650	0.08	105182	0.44	-86532
12	Ds1	Agriculture unirrigated, salinity / alkalinity, Low	1450	0.01	1450	0.01	0
13	Il1	Agriculture irrigated, water logging, Low	11476	0.05	12158	0.05	-682
14	Il2	Agriculture irrigated, water logging, High	15342	0.06	14947	0.06	395
15	Fl1	Forest, water logging, Low	6802	0.03	6802	0.03	0
16	Tm1	Others, man made, Low	3110	0.01	1781	0.01	1330
17	Tm2	Others, man made, High	2859	0.01	2248	0.01	611
18	S	Settlement	181399	0.75	135962	0.56	45437
Total Area Under Desertification/ Land Degradation			**1528997**	**6.35**	**1835263**	**7.62**	**-306266**
19	W	Water body/ Drainage	447842	1.86	425692	1.77	22150
20	NAD	No Apparent Degradation	22115961	91.79	21831845	90.62	284116
Total Geographical Area (ha)			**24092800**	**100**	**24092800**	**100**	



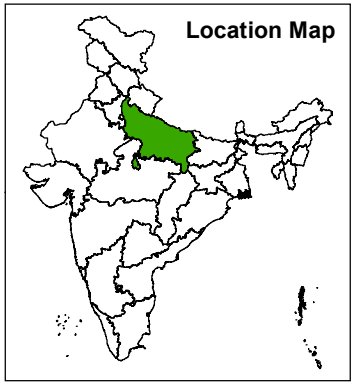
DESERTIFICATION / LAND DEGRADATION STATUS MAP UTTAR PRADESH (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Is1,2	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Il1,2	Agriculture irrigated, water logging
	Fl1	Forest, water logging
	Tm1,2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

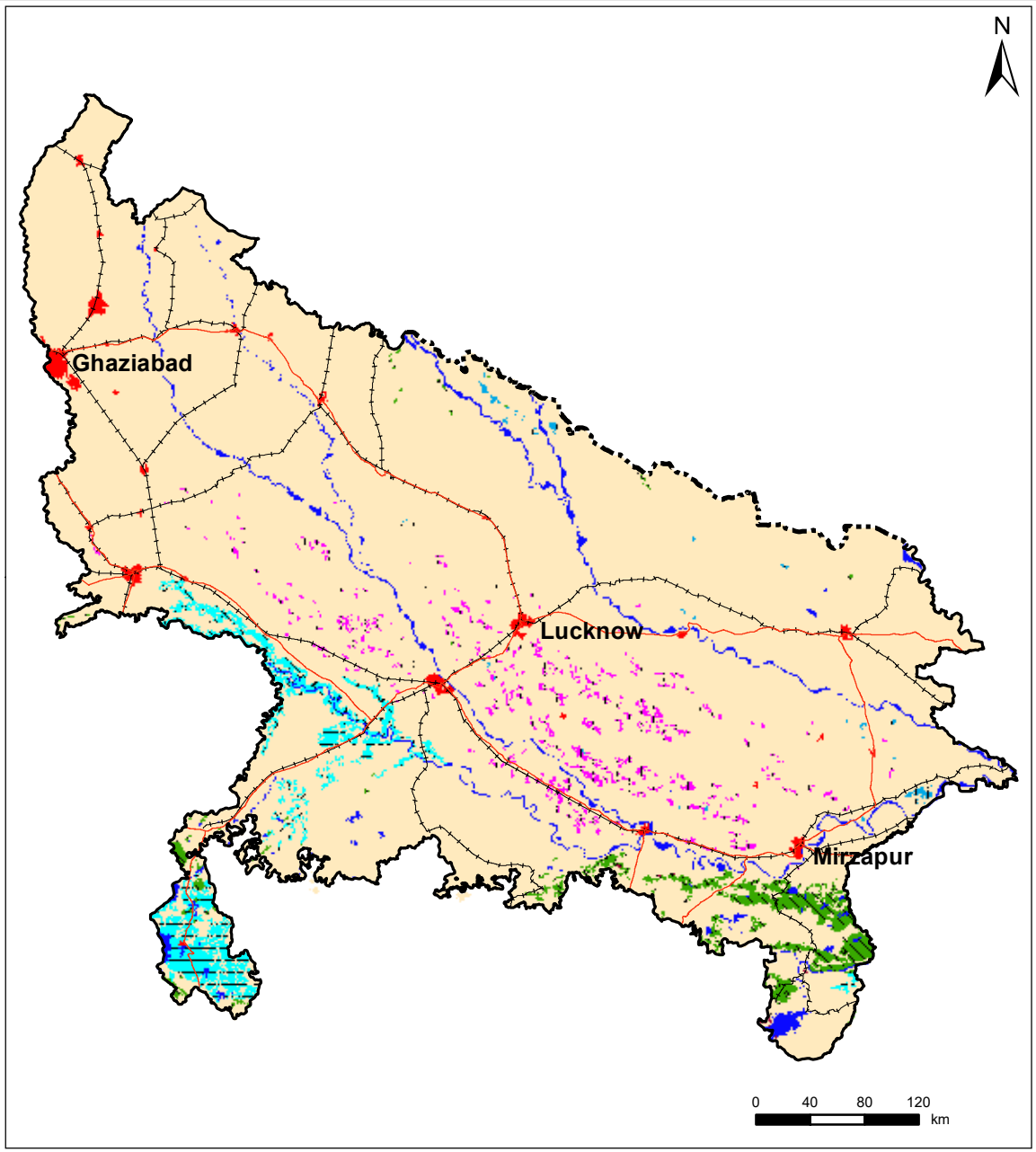
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
UP Remote Sensing Applications Centre, Lucknow
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP
UTTAR PRADESH (2011-13)

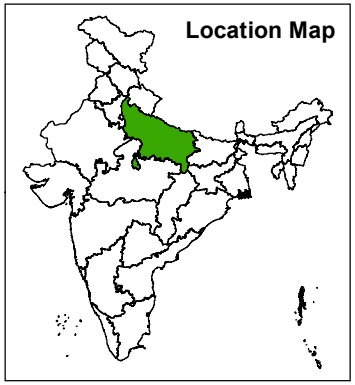
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Is1,2	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Il1,2	Agriculture irrigated, water logging
	Fl1	Forest, water logging
	Tm1,2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

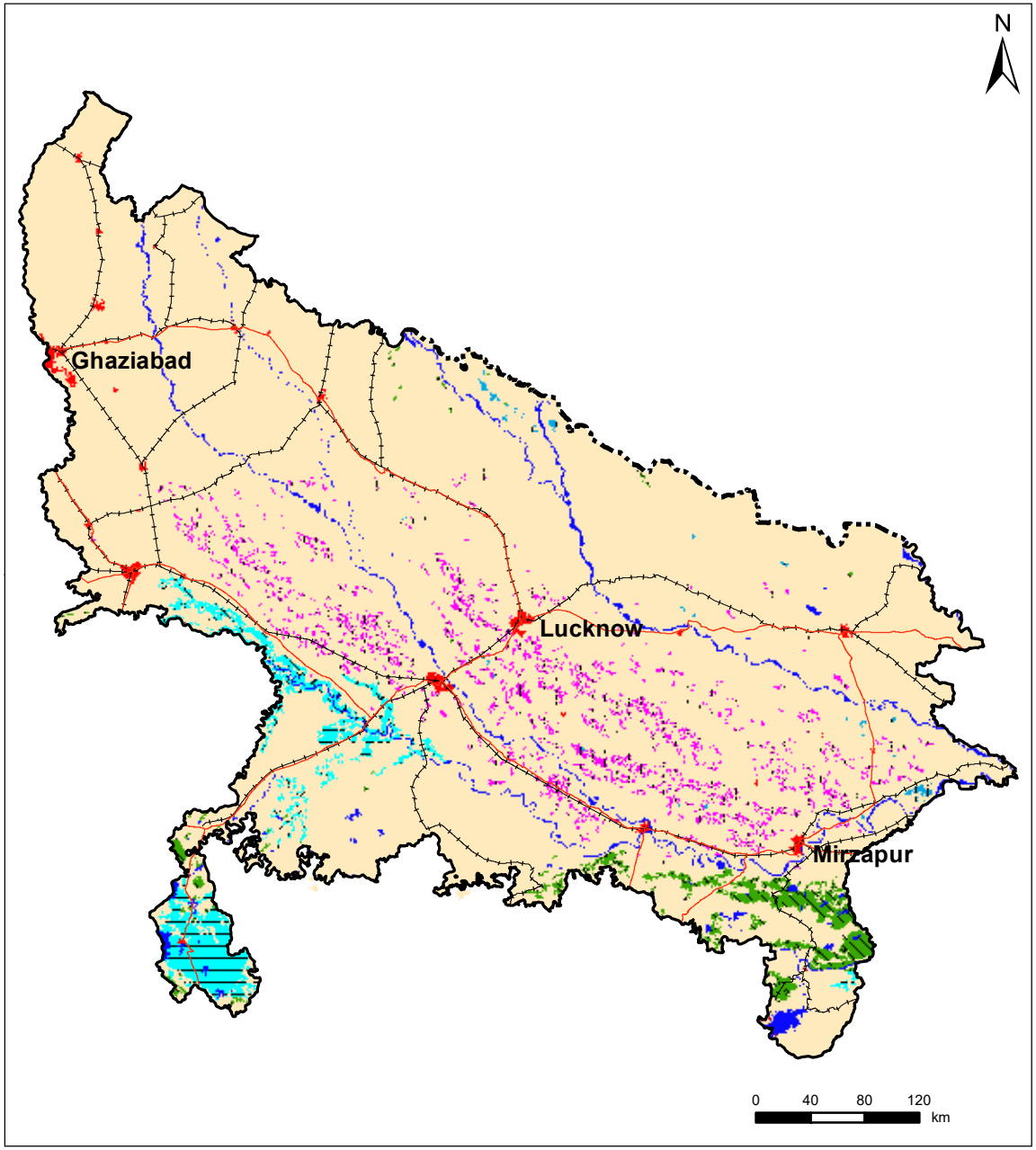
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
UP Remote Sensing Applications Centre, Lucknow
&
Space Applications Centre, ISRO, Ahmedabad



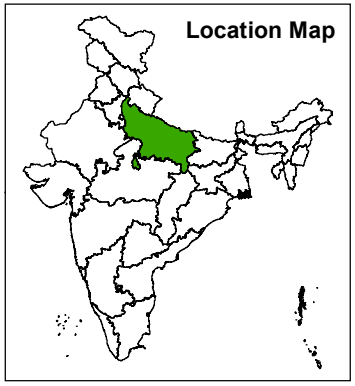
DESERTIFICATION / LAND DEGRADATION STATUS MAP
UTTAR PRADESH (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Is1,2	Agriculture irrigated, salinity / alkalinity
	Ds1	Agriculture unirrigated, salinity / alkalinity
	Il1,2	Agriculture irrigated, water logging
	Fl1	Forest, water logging
	Tm1,2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

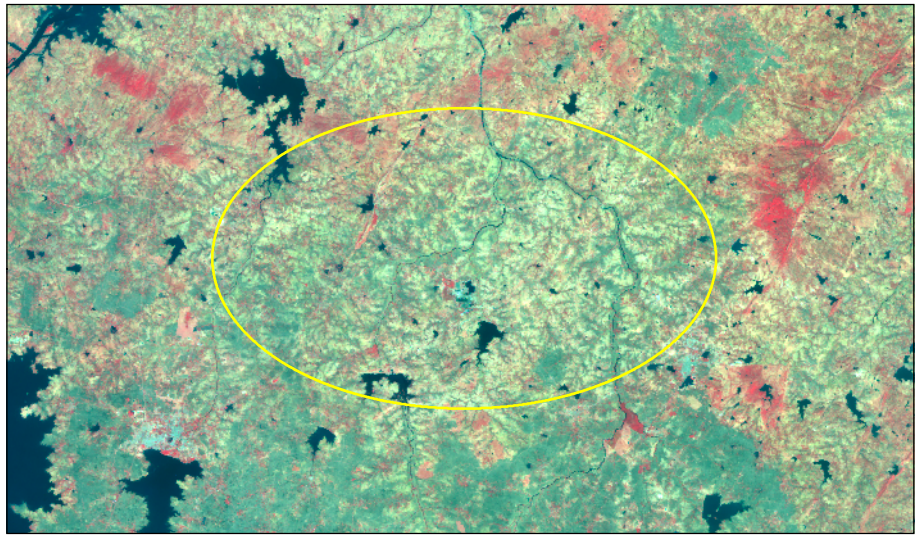
	International boundary
	State boundary
	Major roads
	Rail



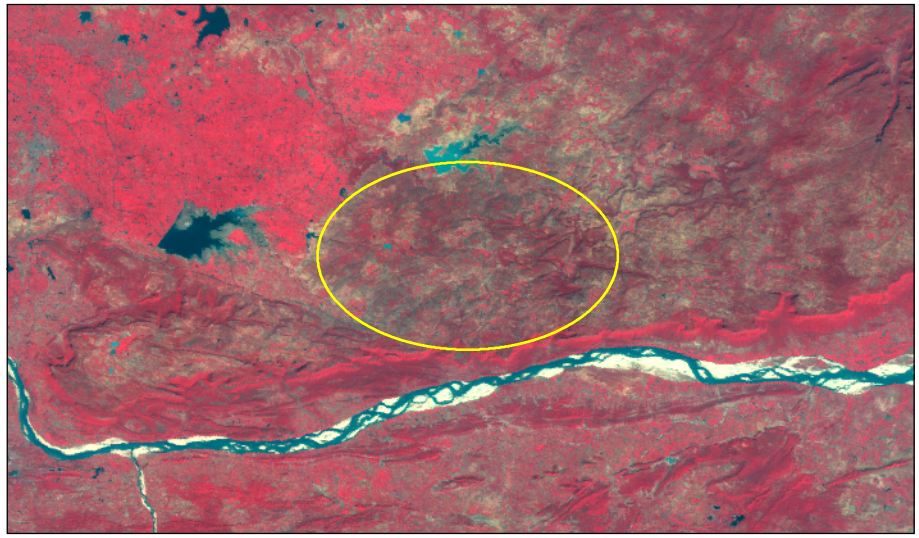
Prepared by:
UP Remote Sensing Applications Centre, Lucknow
&
Space Applications Centre, ISRO, Ahmedabad

Uttar Pradesh - Illustrative representation of Land Degradation processes / changes on IRS AWiFS data

Agriculture area affected with water erosion (October 2019)



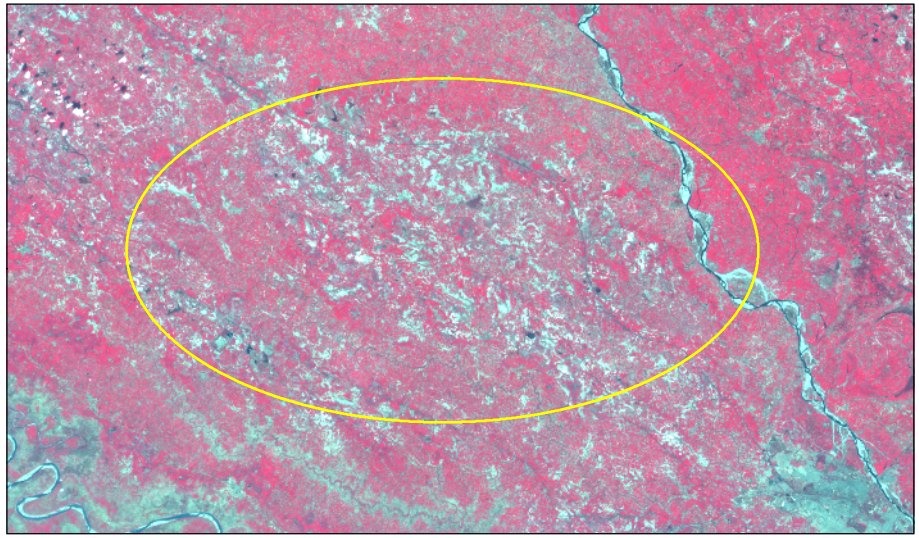
Forest area under vegetation degradation (October 2018)

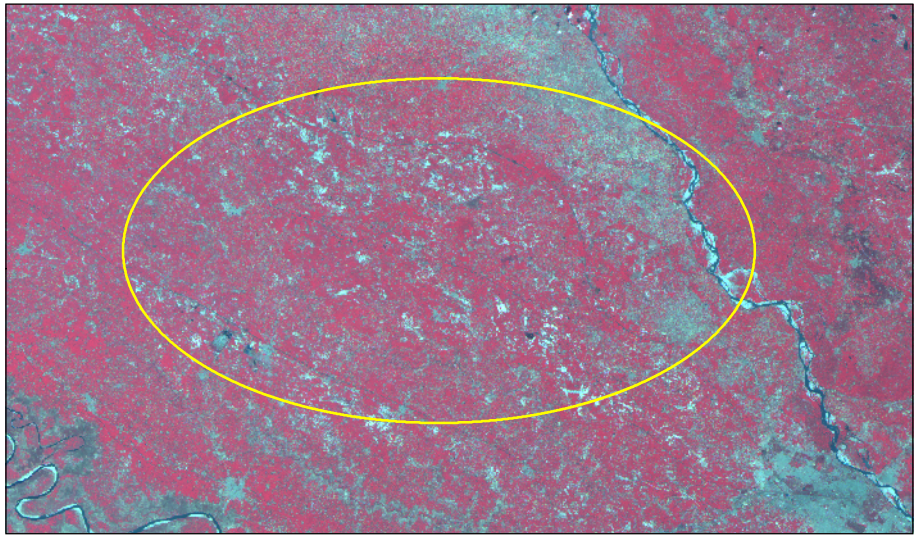


February 2005

Reclamation of agriculture area affected with salinity

February 2019





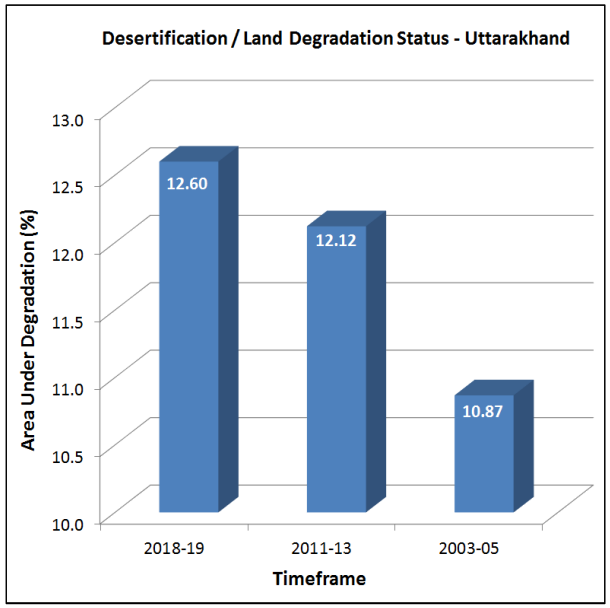
UTTARAKHAND

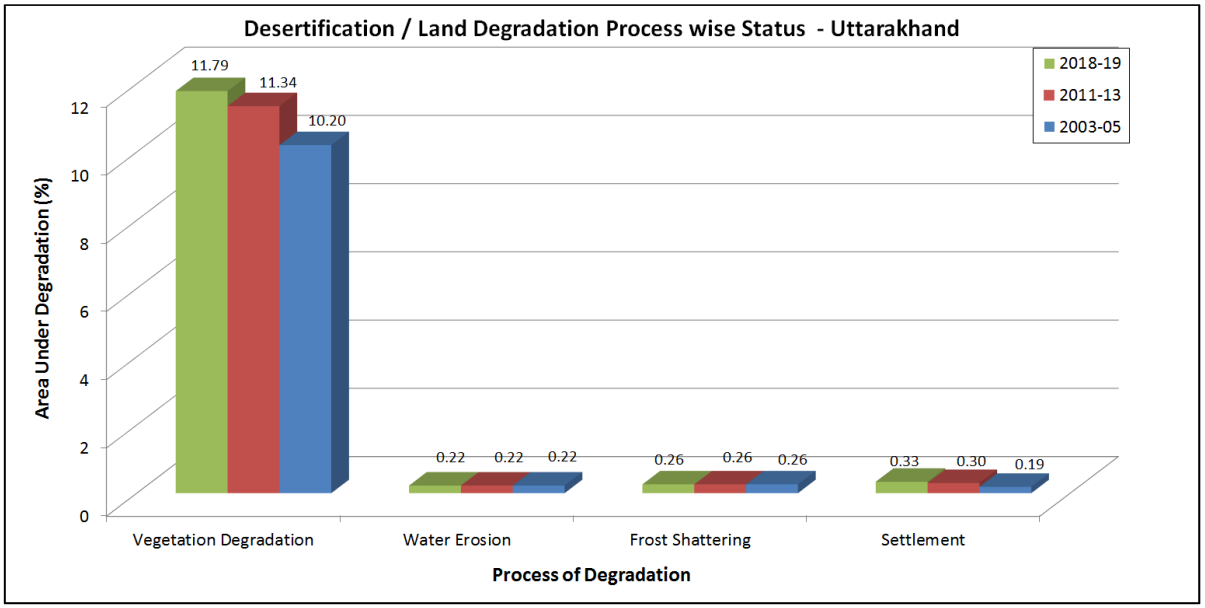
Uttarakhand is located in northern part of India bordering with China and Nepal, with 53,483 sq km area. The state has a population of 1,00,86,292; with 189 population density, 963 sex ratio and 78.82% literacy (Census 2011). Dehradun is the capital of Uttarakhand. Most of the northern parts of the state are part of Greater Himalaya ranges with Nanda Devi (7816 m) as the highest peak, covered by the high Himalayan peaks and glaciers, while the lower foothills are densely forested. Two of India's mightiest rivers, the Ganges and the Yamuna originates from the glaciers of Uttarakhand, namely Gangotri and Yamunotri respectively. The climate of Uttarakhand is of humid sub-tropical type with cool summer and very cold winter. The northern part of the state experiences heavy snowfall in winter season.

The statistical summary and analysis of the Land Degradation of Uttarakhand state reveal that 12.60% (6,73,894 ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 12.12% (6,48,253 ha) and 10.87% (5,81,241 ha) respectively. An increase of 0.48% (25,642 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 1.25% (67,011 ha).

The most significant process of desertification/ land degradation in the state is Vegetation Degradation (11.79% in 2018-19, 11.34% in 2011-13 and 10.20% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in forest and scrub land undergoing vegetation degradation is observed. The same trend is observed between timeframe 2003-05 & 2011-13.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

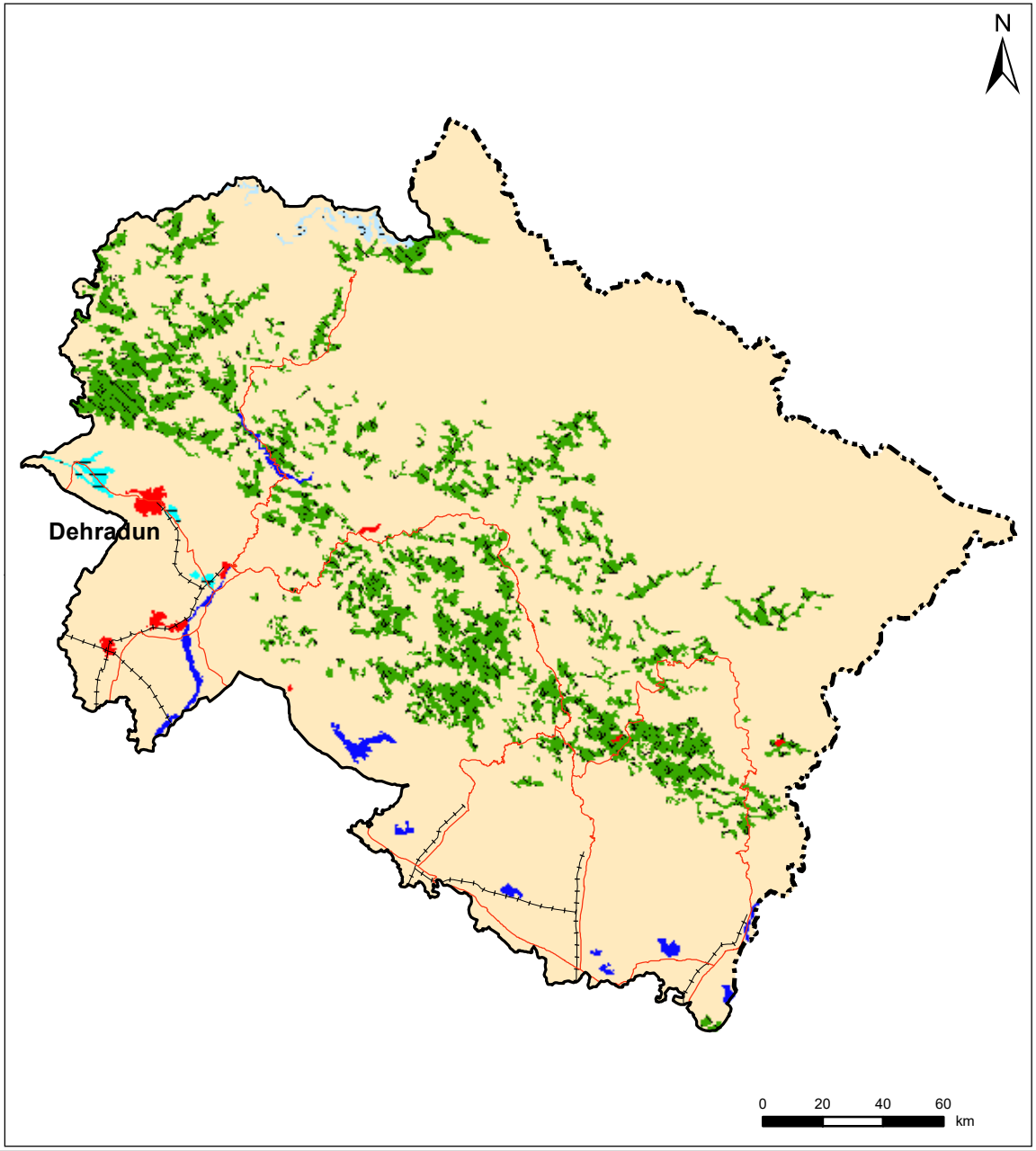




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	630308	11.79	606616	11.34	545610	10.20	23691	61007
Water Erosion	11943	0.22	11943	0.22	11943	0.22	0	0
Frost Shattering	13786	0.26	13786	0.26	13786	0.26	0	0
Settlement	17858	0.33	15908	0.30	9903	0.19	1950	6004
Total Area under Desertification	**673894**	**12.60**	**648253**	**12.12**	**581241**	**10.87**	**25642**	**67011**
No Apparent Degradation	**4642109**	**86.80**	**4667750**	**87.28**	**4738936**	**88.61**	**-25642**	**-71185**
Total Geographical Area (ha)	**5348300**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	156234	2.92	145903	2.73	10331
2	Sv1	Land with scrub, vegetation degradation, Low	441015	8.25	432038	8.08	8977
3	Sv2	Land with scrub, vegetation degradation, High	33059	0.62	28675	0.54	4384
4	Dw1	Agriculture unirrigated, water erosion, Low	11943	0.22	11943	0.22	0
5	Lf2	Periglacial, frost shattering, High	13786	0.26	13786	0.26	0
6	S	Settlement	17858	0.33	15908	0.30	1950
Total Area Under Desertification/ Land Degradation			**673894**	**12.60**	**648253**	**12.12**	**25642**
7	W	Water body/ Drainage	32297	0.60	32297	0.60	0
8	NAD	No Apparent Degradation	4642109	86.80	4667750	87.28	-25642
Total Geographical Area (ha)			**5348300**	**100**	**5348300**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	145903	2.73	138613	2.59	7290
2	Sv1	Land with scrub, vegetation degradation, Low	432038	8.08	392530	7.34	39508
3	Sv2	Land with scrub, vegetation degradation, High	28675	0.54	14467	0.27	14208
4	Dw1	Agriculture unirrigated, water erosion, Low	11943	0.22	11943	0.22	0
5	Lf2	Periglacial, frost shattering, High	13786	0.26	13786	0.26	0
6	S	Settlement	15908	0.30	9903	0.19	6004
Total Area Under Desertification/ Land Degradation			**648253**	**12.12**	**581241**	**10.87**	**67011**
7	W	Water body/ Drainage	32297	0.60	28123	0.53	4174
8	NAD	No Apparent Degradation	4667750	87.28	4738936	88.61	-71185
Total Geographical Area (ha)			**5348300**	**100**	**5348300**	**100**	



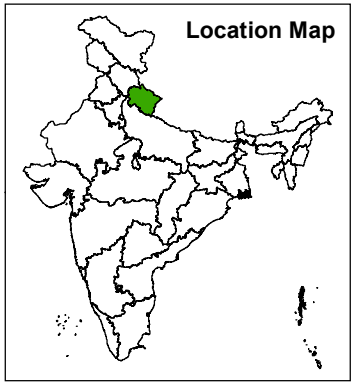
DESERTIFICATION / LAND DEGRADATION STATUS MAP UTTARAKHAND (2018-19)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Lf2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

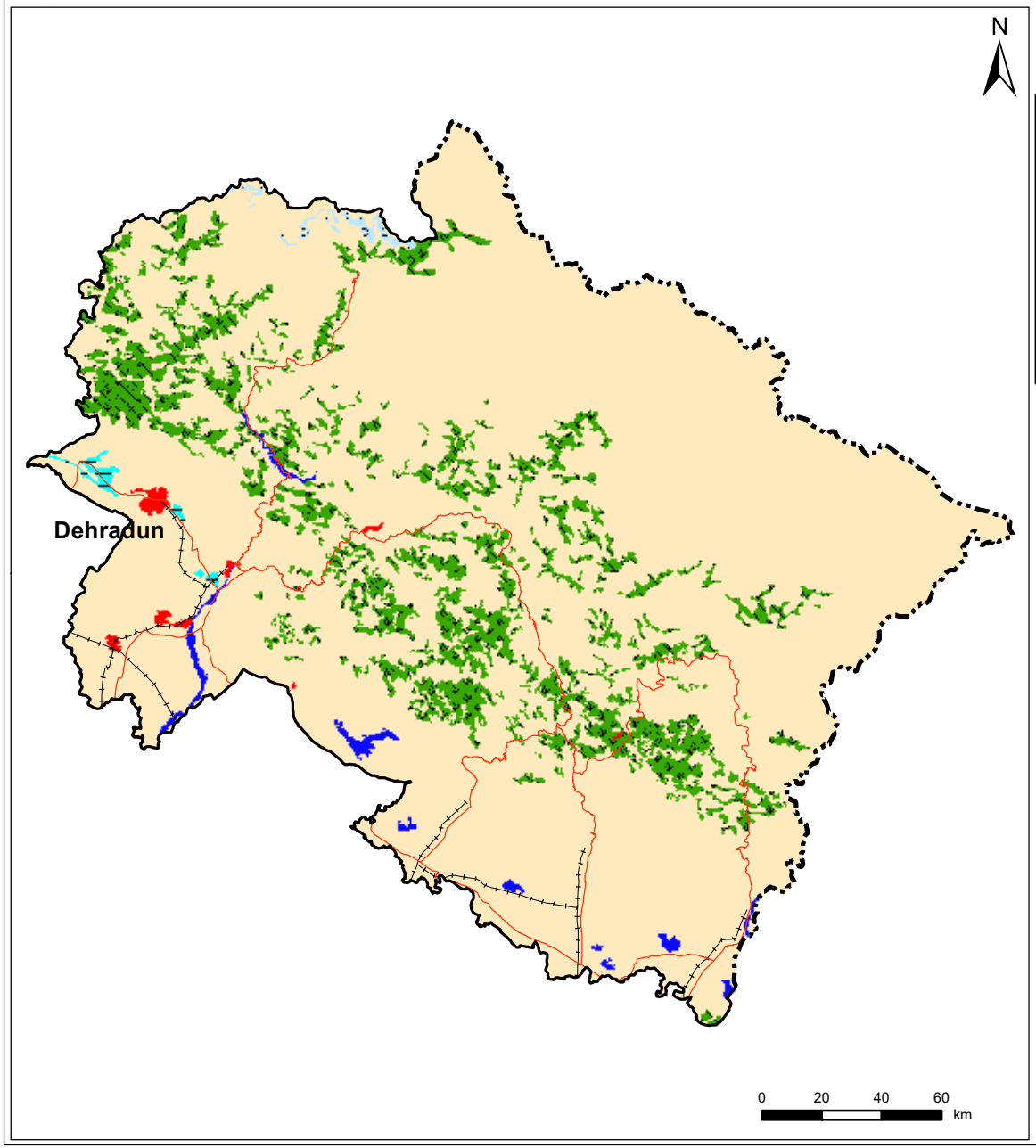
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Jawaharlal Nehru University, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad



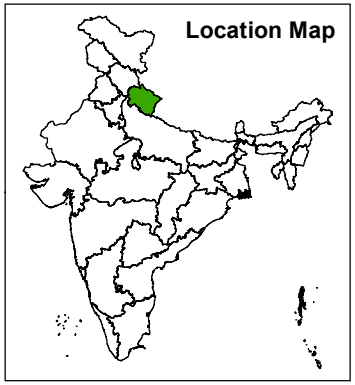
DESERTIFICATION / LAND DEGRADATION STATUS MAP UTTARAKHAND (2011-13)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Lf2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

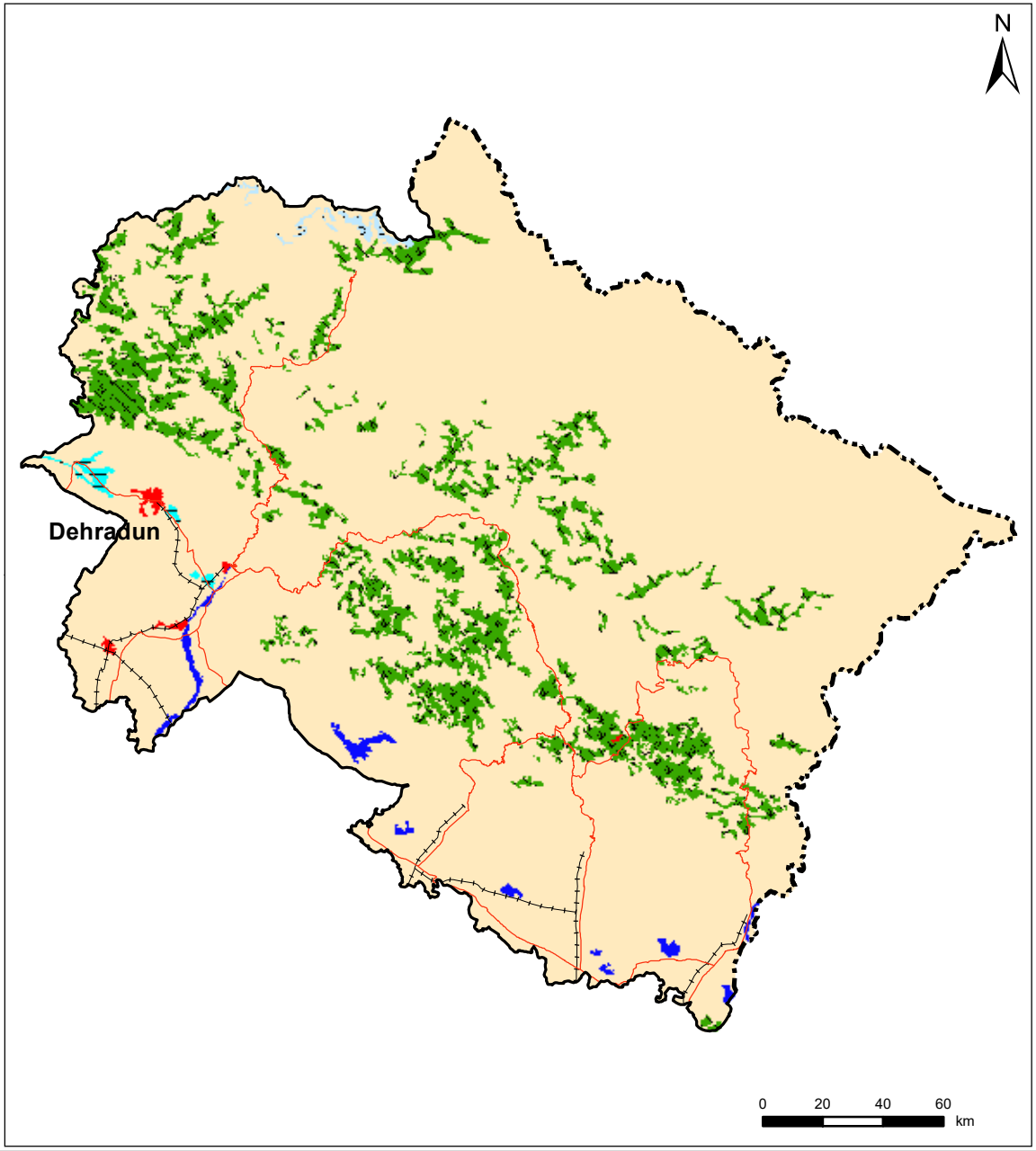
Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
Soil and Land Use Survey of India, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad



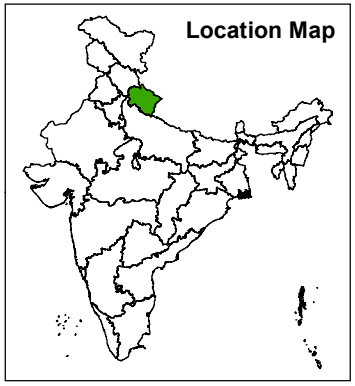
DESERTIFICATION / LAND DEGRADATION STATUS MAP UTTARAKHAND (2003-05)

Legend		
Symbol	Code	Description
	Fv1	Forest, vegetation degradation
	Sv1,2	Land with scrub, vegetation degradation
	Dw1	Agriculture unirrigated, water erosion
	Lf2	Periglacial, frost shattering
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

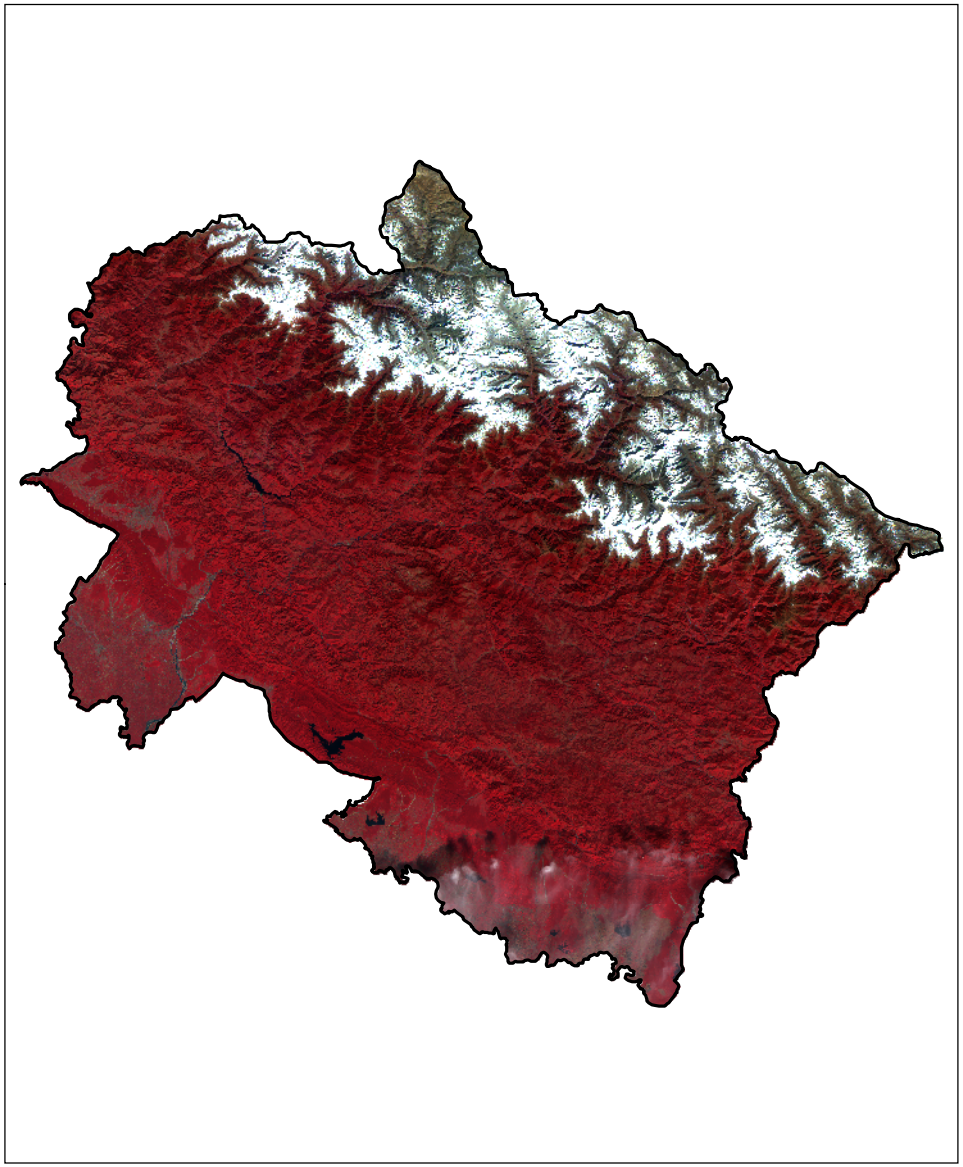
	International boundary
	State boundary
	Major roads
	Rail



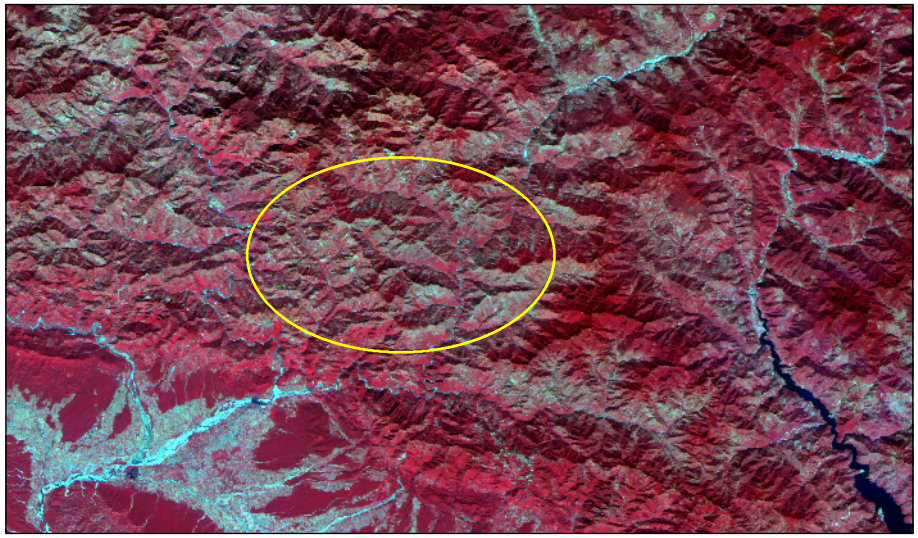
Prepared by:
Soil and Land Use Survey of India, New Delhi
&
Space Applications Centre, ISRO, Ahmedabad

Uttarakhand - Illustrative representation of Land Degradation processes on IRS AWiFS data

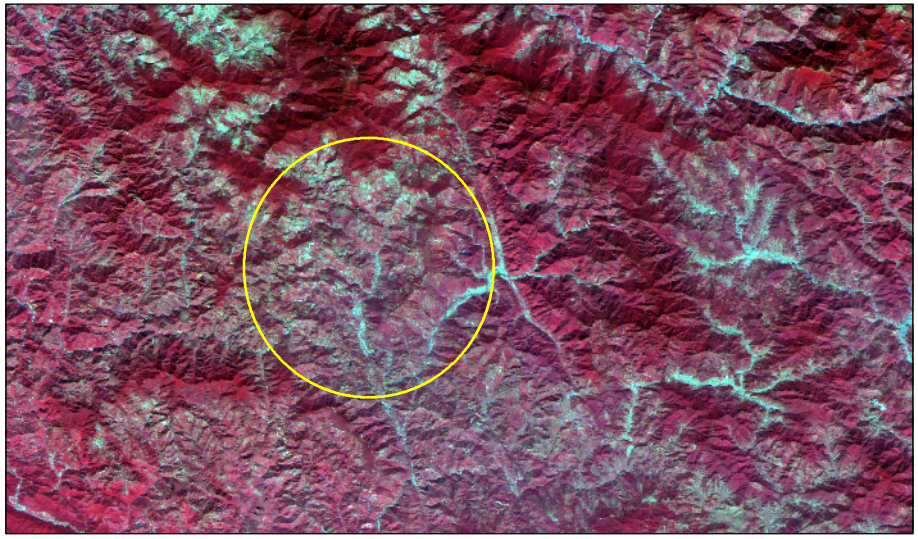
Uttarakhand as seen on IRS AWiFS (October 2018)



Forest area under vegetation degradation (October 2018)



Forest/ scrub land area under vegetation degradation (October 2018)



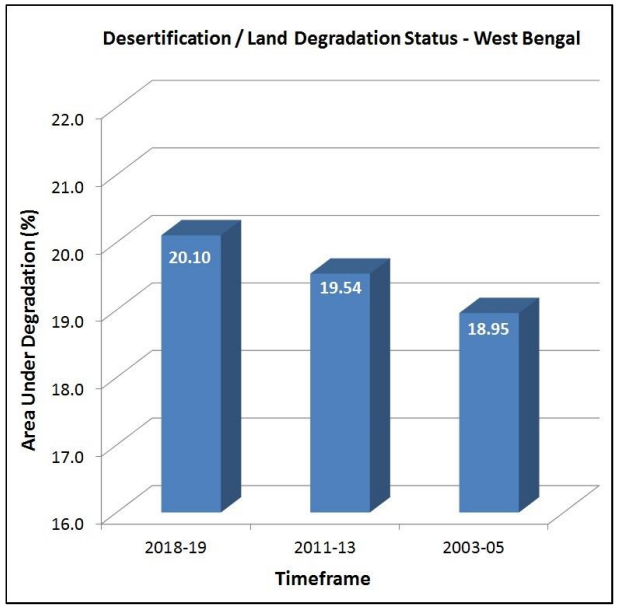
WEST BENGAL

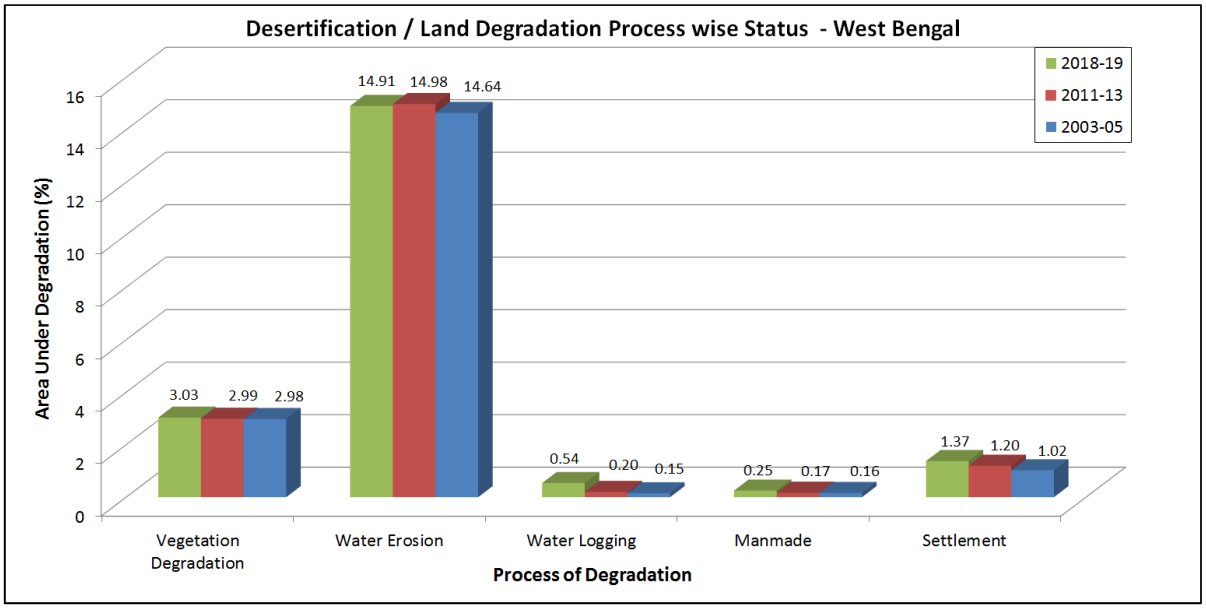
West Bengal is situated in eastern part of India with 88,752 sq km area. The state has population of 9,12,76,115; with 1028 population density, 950 sex ratio and 76.26% literacy (Census 2011). Kolkata is the capital of West Bengal. The geography of West Bengal includes the Darjeeling Himalayan hill region, Terai, undulating plateau, fertile alluvial plain and Sundarbans delta. Ganges, Damodar, Kangsabati and Bhagirathi-Hooghly are the major rivers. The Gangetic plain is rich in alluvial soil and thus is very fertile and suitable for agriculture. The state experiences a tropical-monsoon climate, exhibiting six diverse seasons distinctly. The temperature varies between 15°C - 45°C with rainfall of about 1000 mm and sudden western disturbances in hot summer.

The statistical summary and analysis of the Land Degradation of West Bengal state reveal that 20.10% (1.78 million ha) of the total geographical area is undergoing Desertification/Land Degradation (DLD) during timeframe 2018-19. The area undergoing DLD during timeframe 2011-13 and 2003-05 is observed at 19.54% (1.73 million ha) and 18.95% (1.68 million ha) respectively. An increase of 0.56% (50,414 ha) in the area undergoing DLD is observed from timeframe 2011-13 to 2018-19. Whereas, from timeframe 2003-05 to 2011-13, the area undergoing DLD has increased by 0.59% (51,749 ha).

The most significant process of desertification/ land degradation in the state is Water Erosion (14.91% in 2018-19, 14.98% in 2011-13 and 14.64% in 2003-05) followed by Vegetation Degradation (3.03% in 2018-19, 2.99% in 2011-13 and 2.98% in 2003-05). Between timeframe 2011-13 & 2018-19, increase in agriculture area affected with water logging and decrease in agriculture area undergoing water erosion is observed. Whereas, from timeframe 2003-05 to 2011-13, increase in agriculture area affected with water erosion and water logging is observed.

Detailed analysis and statistical summary are given in the form of graphs, tables and map compositions in subsequent pages.

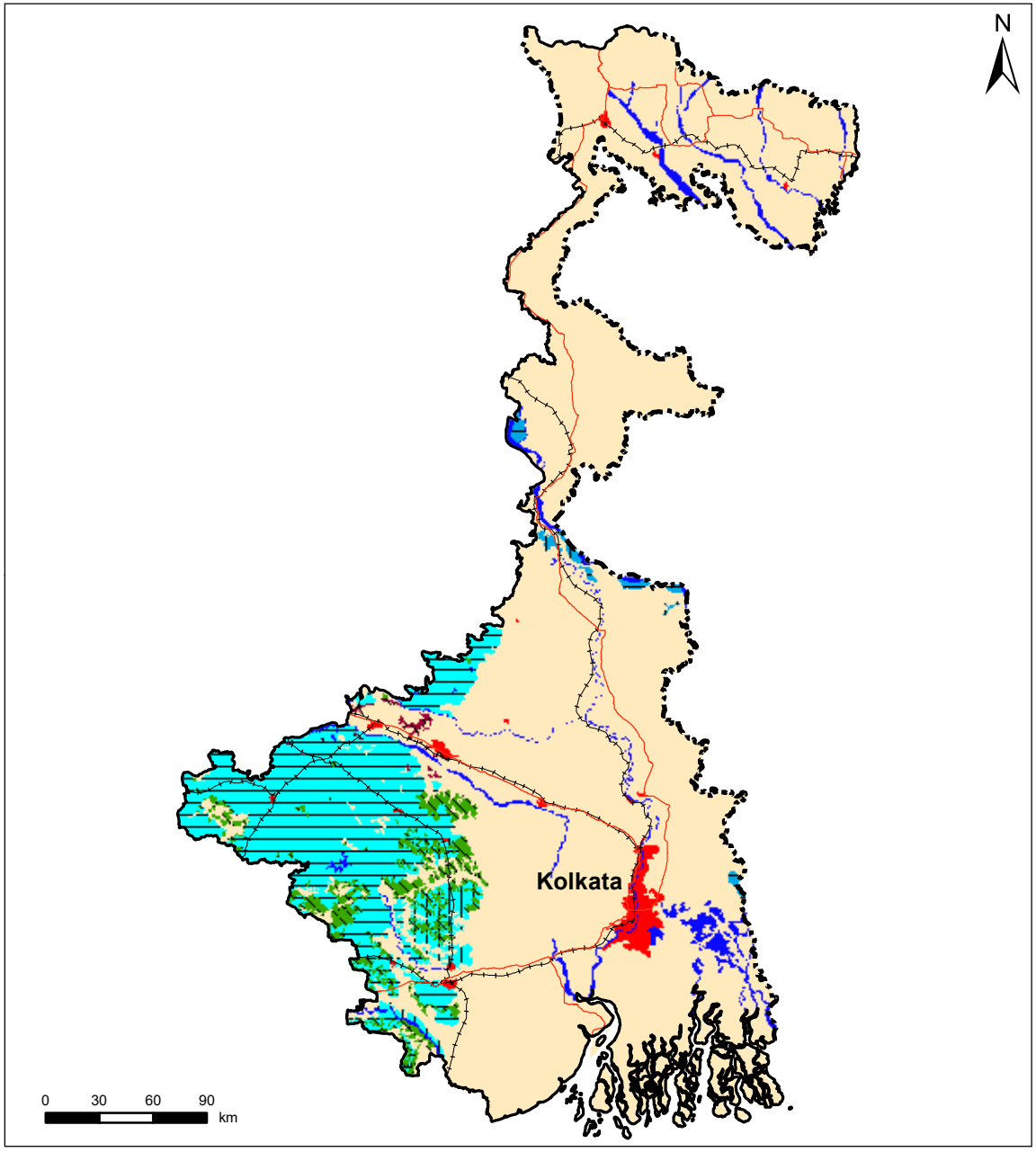




Process of Desertification / Land Degradation	2018-19		2011-13		2003-05		Change (ha)	
	Area(ha)	Area(%)	Area(ha)	Area(%)	Area(ha)	Area(%)	(2018-19) - (2011-13)	(2011-13) - (2003-05)
Vegetation Degradation	269089	3.03	265277	2.99	264325	2.98	3812	951
Water Erosion	1323275	14.91	1329539	14.98	1299542	14.64	-6264	29997
Water Logging	47759	0.54	17627	0.20	13261	0.15	30132	4366
Manmade	22206	0.25	15102	0.17	14112	0.16	7104	991
Settlement	122016	1.37	106386	1.20	90941	1.02	15630	15444
Total Area under Desertification	**1784345**	**20.10**	**1733931**	**19.54**	**1682181**	**18.95**	**50414**	**51749**
No Apparent Degradation	**6827084**	**76.92**	**6884910**	**77.57**	**6926022**	**78.04**	**-57826**	**-41112**
Total Geographical Area (ha)	**8875200**							

SN	Desertification / Land degradation Classes		2018-19		2011-13		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2018-19) - (2011-13)
1	Fv1	Forest, vegetation degradation, Low	250279	2.82	247422	2.79	2857
2	Fv2	Forest, vegetation degradation, High	1867	0.02	1466	0.02	401
3	Sv1	Land with scrub, vegetation degradation, Low	16943	0.19	16389	0.18	554
4	Iw1	Agriculture irrigated, water erosion, Low	109606	1.23	109606	1.23	0
5	Dw1	Agriculture unirrigated, water erosion, Low	1213669	13.67	1219933	13.75	-6264
6	Il1	Agriculture irrigated, water logging, Low	16873	0.19	10203	0.11	6670
7	Dl1	Agriculture unirrigated, water logging, Low	30886	0.35	7425	0.08	23462
8	Tm1	Others, man made, Low	22206	0.25	15102	0.17	7104
9	S	Settlement	122016	1.37	106386	1.20	15630
Total Area Under Desertification/ Land Degradation			**1784345**	**20.10**	**1733931**	**19.54**	**50414**
10	W	Water body/ Drainage	263771	2.97	256359	2.89	7412
11	NAD	No Apparent Degradation	6827084	76.92	6884910	77.57	-57826
Total Geographical Area (ha)			**8875200**	**100**	**8875200**	**100**	

SN	Desertification / Land degradation Classes		2011-13		2003-05		Change (ha)
	Code	Description (Land Cover, Process, Severity)	Area (ha)	Area (%)	Area (ha)	Area (%)	(2011-13) - (2003-05)
1	Fv1	Forest, vegetation degradation, Low	247422	2.79	246470	2.78	951
2	Fv2	Forest, vegetation degradation, High	1466	0.02	1466	0.02	0
3	Sv1	Land with scrub, vegetation degradation, Low	16389	0.18	16389	0.18	0
4	Iw1	Agriculture irrigated, water erosion, Low	109606	1.23	109606	1.23	0
5	Dw1	Agriculture unirrigated, water erosion, Low	1219933	13.75	1189936	13.41	29997
6	Il1	Agriculture irrigated, water logging, Low	10203	0.11	10203	0.11	0
7	Dl1	Agriculture unirrigated, water logging, Low	7425	0.08	3058	0.03	4366
8	Tm1	Others, man made, Low	15102	0.17	14112	0.16	991
9	S	Settlement	106386	1.20	90941	1.02	15444
Total Area Under Desertification/ Land Degradation			**1733931**	**19.54**	**1682181**	**18.95**	**51749**
10	W	Water body/ Drainage	256359	2.89	266997	3.01	-10638
11	NAD	No Apparent Degradation	6884910	77.57	6926022	78.04	-41112
Total Geographical Area (ha)			**8875200**	**100**	**8875200**	**100**	



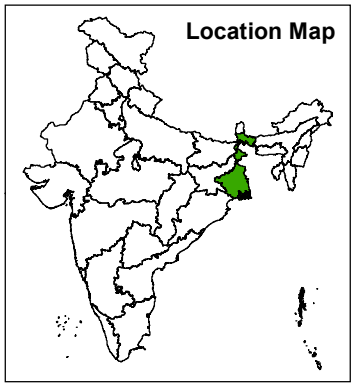
DESERTIFICATION / LAND DEGRADATION STATUS MAP WEST BENGAL (2018-19)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Tm1,2	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

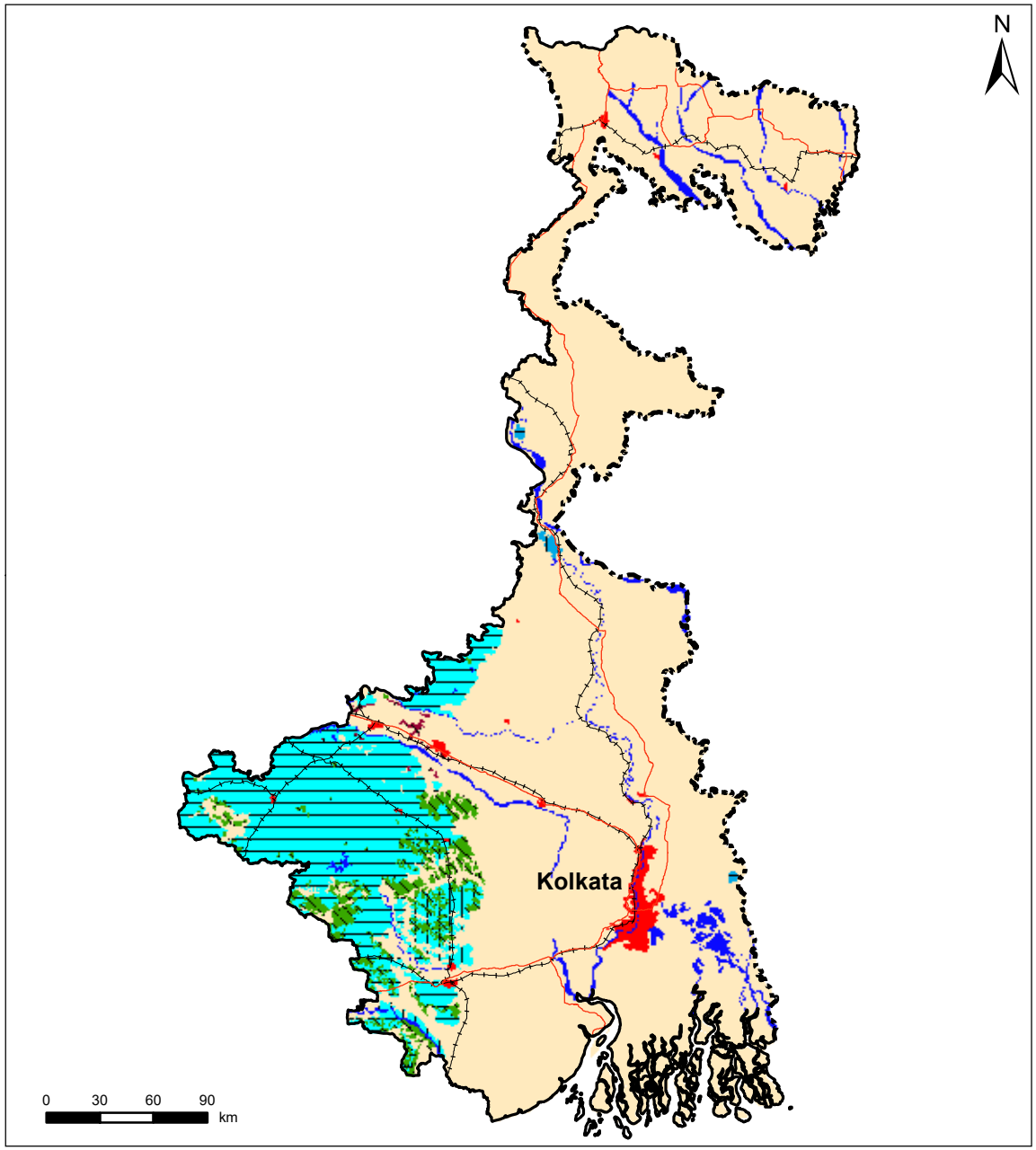
Data Source:

- IRS AWiFS (2018 - 2019)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
North Easrern Space Applications Centre, Meghalaya
&
Space Applications Centre, ISRO, Ahmedabad



DESERTIFICATION / LAND DEGRADATION STATUS MAP WEST BENGAL (2011-13)

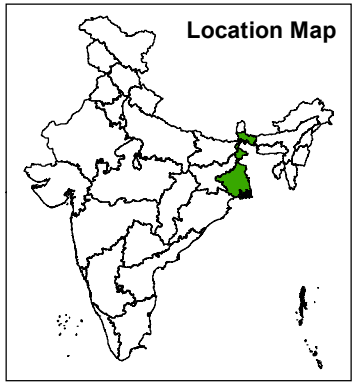
Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Tm1	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2011 - 2013)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



Prepared by:
University of Calcutta, Kolkata
&
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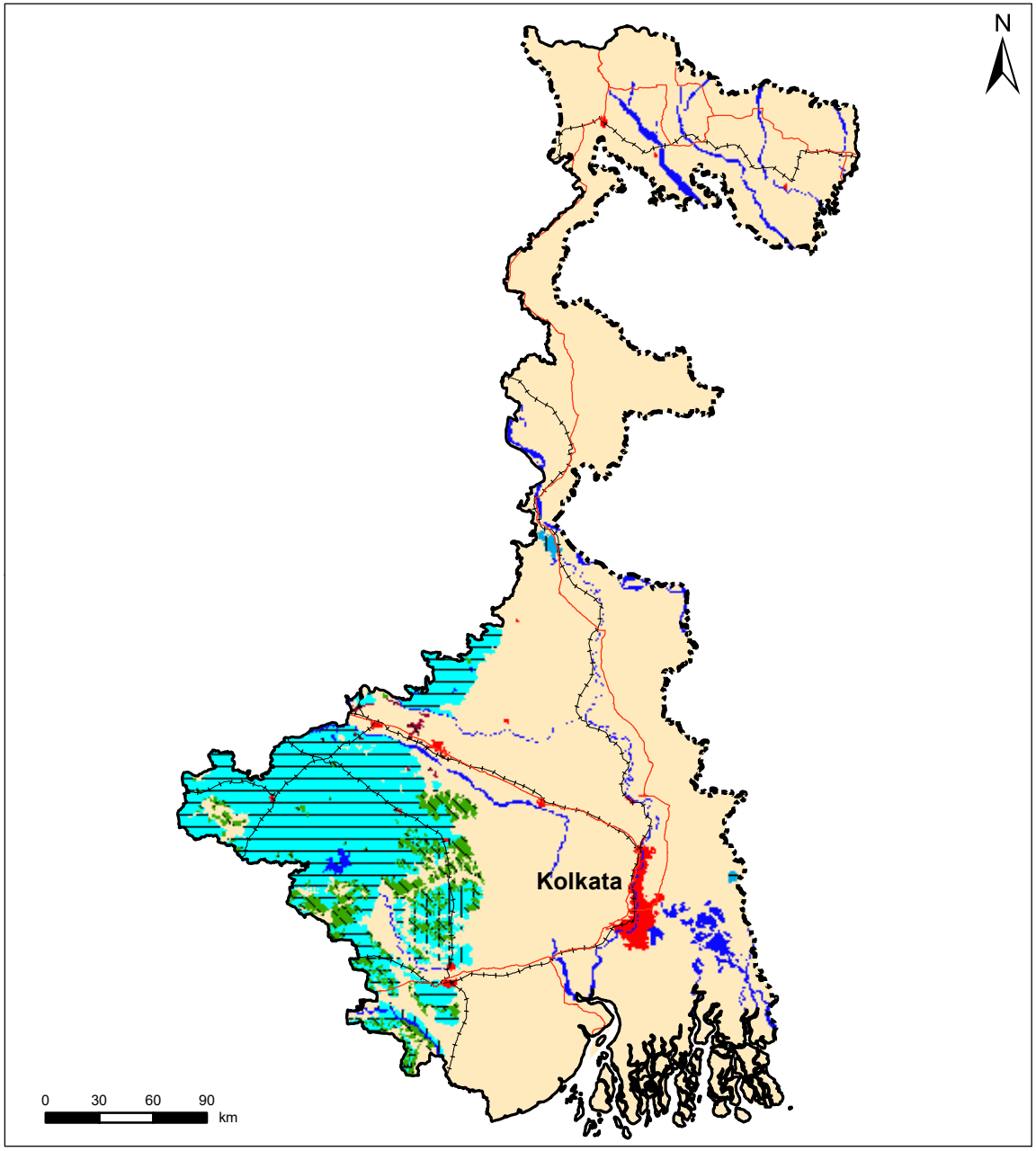


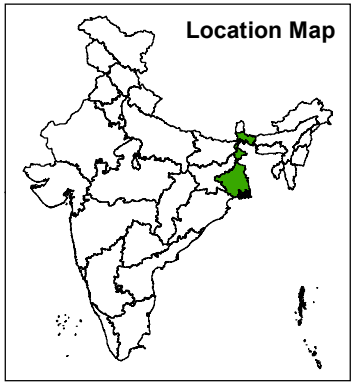
DESERTIFICATION / LAND DEGRADATION STATUS MAP
WEST BENGAL (2003-05)

Legend		
Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Sv1	Land with scrub, vegetation degradation
	Iw1	Agriculture irrigated, water erosion
	Dw1	Agriculture unirrigated, water erosion
	Il1	Agriculture irrigated, water logging
	Dl1	Agriculture unirrigated, water logging
	Tm1	Others, man made
	S	Settlement
	W	Water body / Drainage
	NAD	No Apparent Degradation

Data Source:

- IRS AWiFS (2003 - 2005)
- Ancillary Information

	International boundary
	State boundary
	Major roads
	Rail



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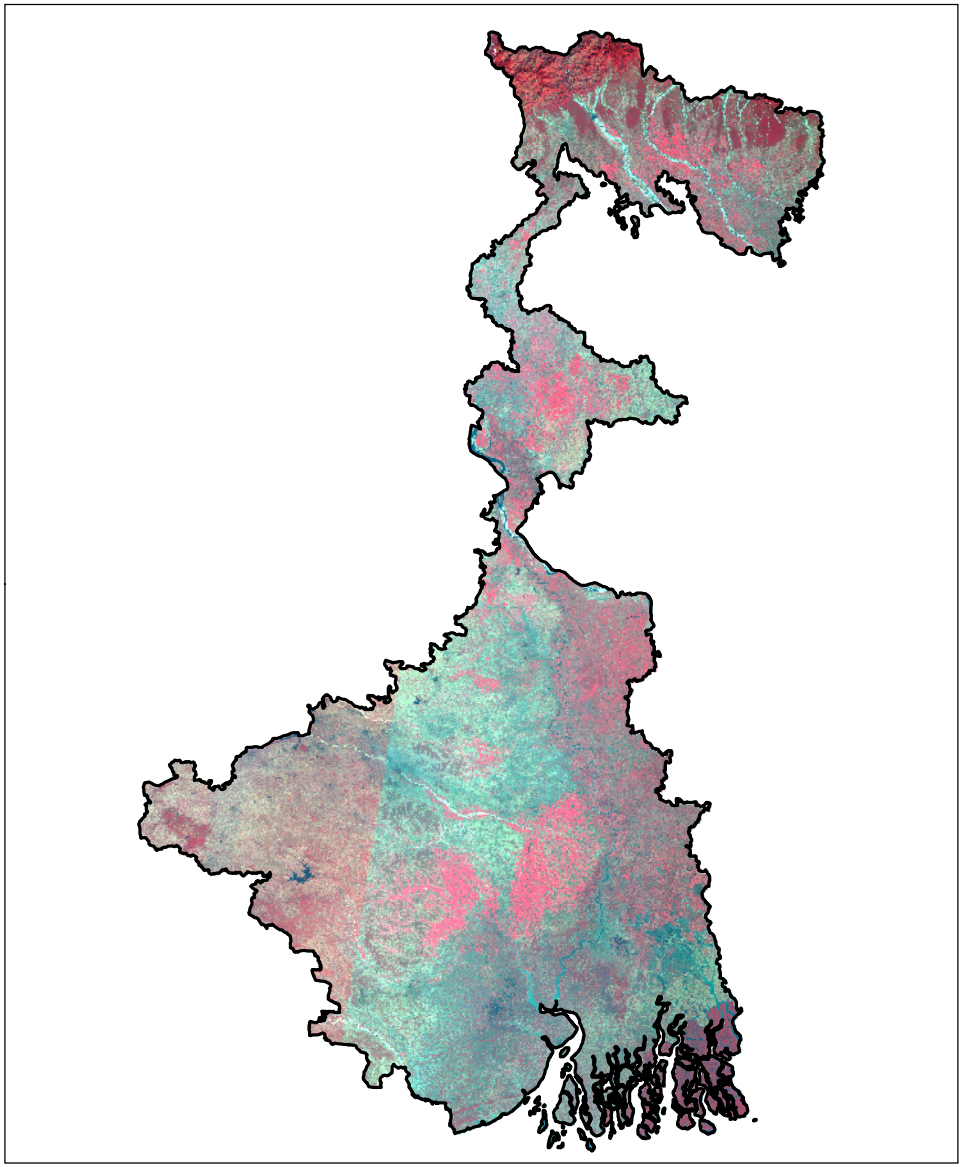
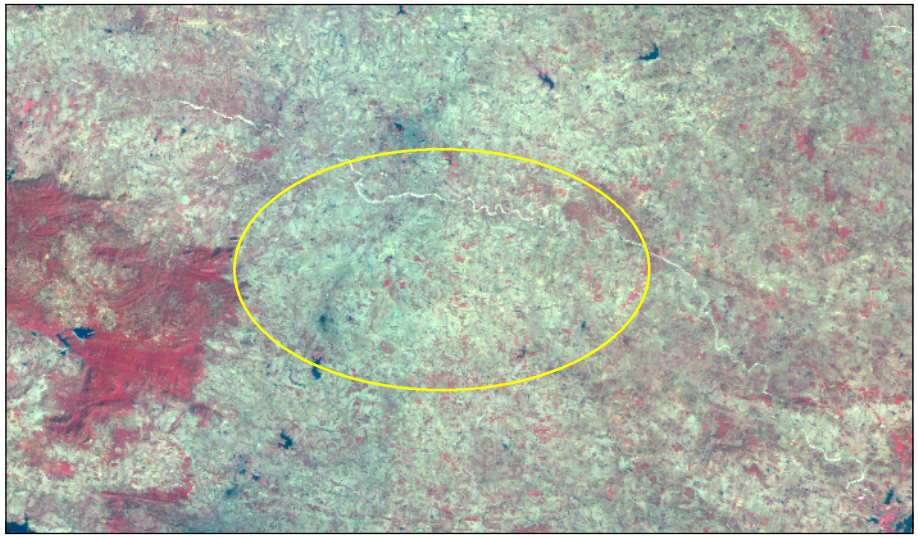
West Bengal - Illustrative representation of Land Degradation processes on IRS AWiFS data

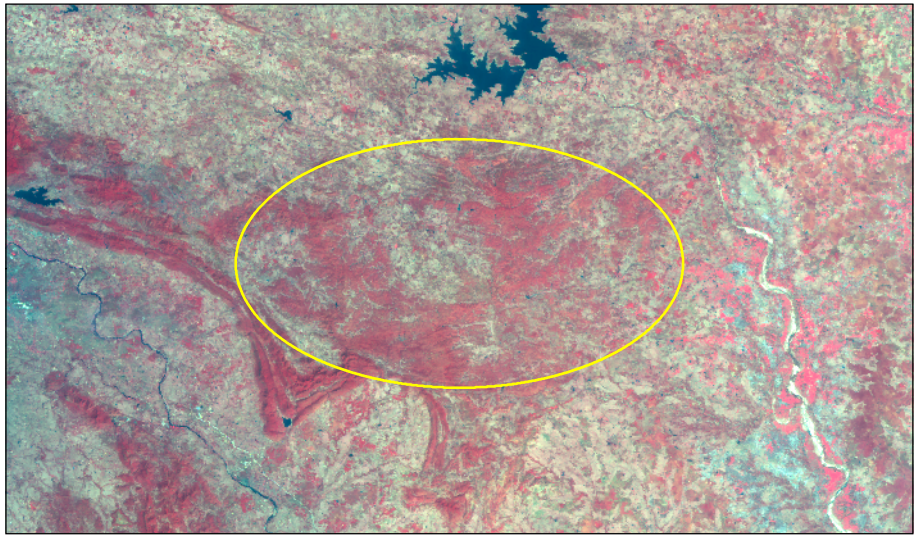
West Bengal as seen on IRS AWiFS (February 2018)



Agriculture area affected with water erosion (February 2018)



Forest area under vegetation degradation (October 2018)



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