

Satellite based survey of Encroachment positions

**-In compliance of Hon'ble SCI orders in the case WP (civil) 109/2008
(Wildlife First and Ors Vs Ministry of Forest and Environment and Ors)**



Forest Survey of India, Dehradun

Orders of Hon'ble SCI

(Wildlife First and Ors Vs Ministry of Forest and Environment and Ors)

- Eviction of encroachments where claims were rejected under the FRA, 2006
- Directs State and UTs to pass orders of eviction and evict occupation in rejected claims

Hon'ble Supreme Court of India's order dated 13-02-2019

“Let Forest Survey of India (FSI) make a satellite survey and place on record the encroachment position and also state the position after the eviction as far as possible”

Hon'ble Supreme Court of India's order dated 28-02-2019

“In the meantime, the Forest Survey of India has to make a satellite survey and place on record the encroachment positions as far as possible in this Court before the next date of hearing as directed in order dated 13.02.2019”.

Remote sensing techniques for Satellite Survey of Encroachment Positions

- Rejected claims are considered as encroachment (as is apparent from the Hon'ble Supreme court's order).
- Rejections can also be due to non-eligibility of claimant and /or due to non-fulfilment of conditions specified in the Act for different types of Forest Rights.
- Satellite survey provides evidence just on the parameter related to vegetation cover/ change in land use of the area under forest rights claimed w.r.to Section 3(1)(a) of the Act.
- The specific activities that can be recognized as Forest Right as mentioned under Section 3(1)(a) are 'Habitation' and 'self-cultivation'.
- The signatures of 'Habitation' and 'Cultivation' may be visible on the Satellite imagery of appropriate resolution.

Status of rejected polygons received from States /UT's, analysed by FSI

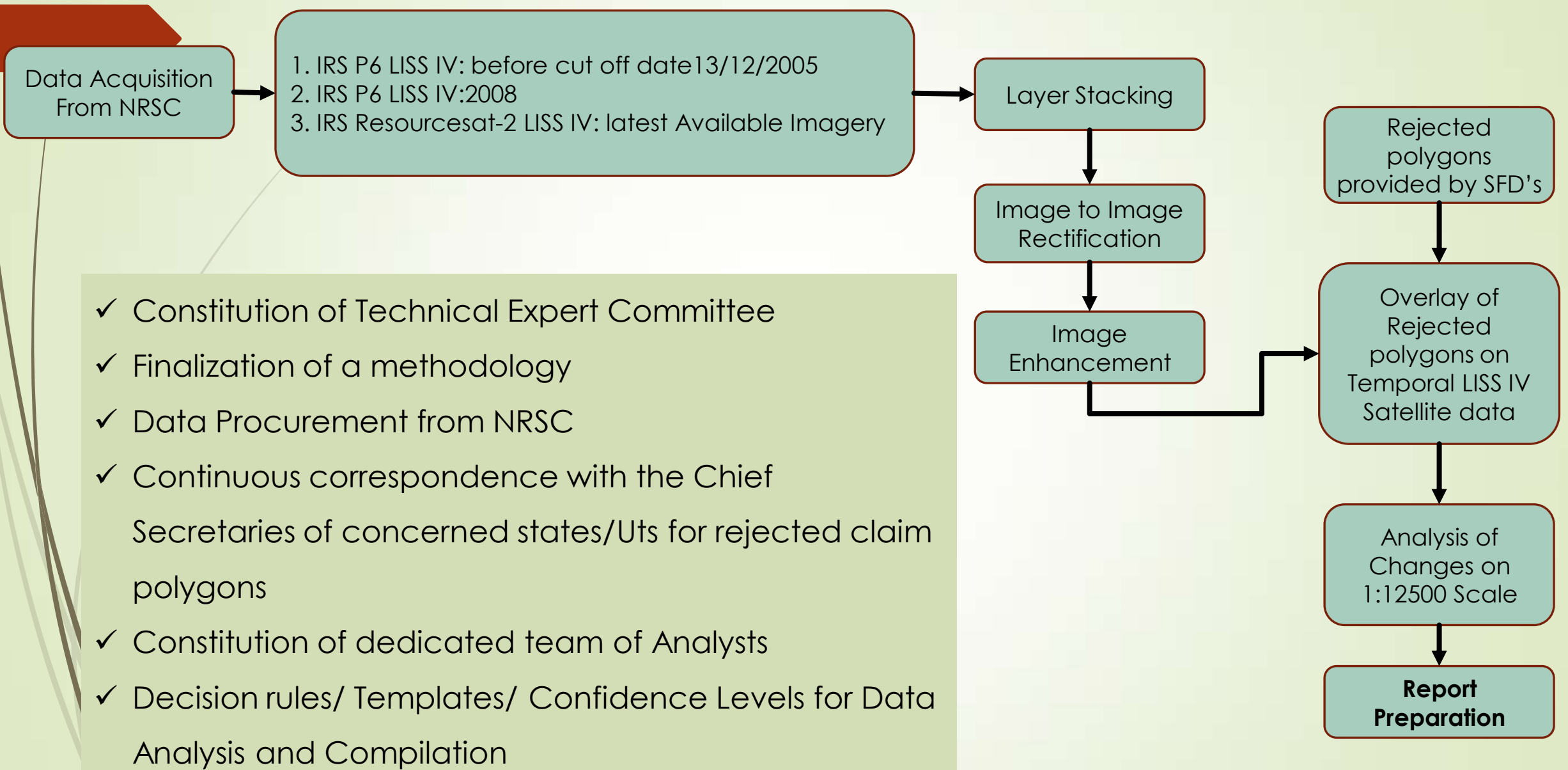
Sl. No	States/UTs	Total No of Rejected Claims as per order dated 13.02.2019	Total number of polygons received from States/UTs	Total Number of polygons found in usable form by FSI	Total Number of polygons analysed by FSI	Remarks
1	Andhra Pradesh	66,351	11,170	10,007	10,007	-
2	Assam	27,534	466	179	179	-
3	Bihar	4,354	2,276	64	64	-
4	Chhattisgarh	20,095	4996	4987	4481	Remaining 506 polygons analysis is in progress.
5	Himachal Pradesh	Number of rejected claims not mentioned in the Hon'bleSCI order dated 13-02-2019	104	104	104	-
6	Jharkhand	28,107	2,405	2,336	2,336	-
7	Karnataka	1,76,540	63,589	0	0	-
8	Maharashtra	22,509	740	250	250	-
9	Odisha	1,48,870	1,243	870	870	Odisha Nodal Agency has informed that they have only 822 rejected claims vide PCCF & HoFF Letter no. 16965 Dated 28 th September, 2020
10	Rajasthan	37,069	9,297	7,055	7,055	-
11	Uttar Pradesh	58,661	2,409	2,409	2,409	-
12	Uttarakhand	51	51	51	51	-
13	West Bengal	86,144	155	28	28	-

Status of rejected polygons received from States /UT's, analysed by FSI

Sl. No	States/UTs	Total No of Rejected Claims as per order dated 13.02.2019	Total number of polygons received from States/UTs	Total Number of polygons found in usable form by FSI	Total Number of polygons analysed by FSI	Remarks
14	Gujarat	Number of rejected claims not mentioned in the Hon'ble SCI order dated 13-02-2019	0	0	0	<ul style="list-style-type: none"> Gujarat has informed that the department does not have any shape files or polygons in respect of rejected claims under F.R.A. vide letter no. FRA/987/-990/2019.
15	Goa	Number of rejected claims not mentioned in the Hon'ble SCI order dated 13-02-2019	0	0	0	<ul style="list-style-type: none"> Goa has informed that the claims rejected in the State of Goa is nil at present vide letter no. 1-376-2019-20/FRA-FSI/DTW/1407.
16	Kerala	894	0	0	0	-
17	Madhya Pradesh	3,54,787	4,324	4,188	0	<ul style="list-style-type: none"> Satellite data rectified and polygon analysis is in progress. ST Development Department of Madhya Pradesh has informed that out of 3,54,787 claims they have verified 34006 polygons and out of which they have rejected 10766 polygons because of encroachment vide letter number 2398 dated 19/10/2020.
18	Tamil Nadu	9,029	4	4	4	-
19	Telangana	82,075	12909	12,715	0	Data scrutiny is in progress.
20	Tripura	68,257	4	4	4	-
	Total	11,91,327	1,16,142	45,251	27,842	

- FSI has received **1,16,142** polygons from states, Out of which 45,251 polygons were found to be in usable form, of which 27,842 rejected polygons are analyzed by FSI till 14/12/ 2020.
- So far FSI has submitted results of analysis of 14,259 (6,264 polygons in 1st affidavit +7,995 polygons in 2nd affidavit) rejected polygons out of total 11,91,327 rejected claims as reported in last filed affidavit in the Hon'ble Supreme Court of India Dated 05-12-2019.

Methodology



- ✓ Constitution of Technical Expert Committee
- ✓ Finalization of a methodology
- ✓ Data Procurement from NRSC
- ✓ Continuous correspondence with the Chief Secretaries of concerned states/Uts for rejected claim polygons
- ✓ Constitution of dedicated team of Analysts
- ✓ Decision rules/ Templates/ Confidence Levels for Data Analysis and Compilation

A. Steps for visual interpretation:

1. Overlay the shape file/polygon of area under claim on geo-rectified LISS-IV and Google earth imagery.
2. For ease of arriving at a conclusion, use of time series of satellite data is necessary to the extent it is possible.
 - The satellite imagery should be closest to the date 13-12-2005 (preferably just prior to this date).
 - In case of non-availability of the above data, select an imagery of a later date as close to 13-12-2005 as possible.
 - Simultaneous use of imageries of intermediate periods if possible may be useful in establishing the period of beginning of encroachment activity.
1. Look for the signatures of Land use change with respect to habitation/ cultivation only in areas with forest cover and without forest cover.
 - Habitation: Look for signature of huts/house/cluster of houses etc.
 - Cultivation: Look for signatures of bunds; boundary marks like hedges; generally geometrical shapes of areas with land use change; signatures of crops, planting, horticultural species and fallow land, etc.
 - Land use change in case of area with Forest cover: Looking for this is relatively simpler in case of change in Forest cover. One may see a complete/partial removal of Forest vegetation.
 - Land use change in case of Forest land that is Barren/open with few trees/ scrub forest/grasslands: Such cases need to be examined with much care. One can see signatures of habitation/cultivation on such areas by looking for generally regular shapes of areas with changed land use in contrast with the previous images showing non-disturbed landscapes, signatures of crops/bunds etc.
1. Save composed maps of the overlay of polygons on the satellite imageries and insert the same to the 'Standard Template' for each case.

Assessment about the status of encroachment in rejected claims under FRA 2006, based on interpretation of signature of land use (habitation/cultivation) in area with forest cover and area without forest cover (Forest Right as per section 3 (1)(a) of FRA 2006)

S. No	Land Use Land Cover	Before 13.12.2005	Current/Latest Period	Assessment about Rejected Cases *
(I)	Area with Forest Cover and Area without Forest Cover (Barren Land / Grass Land etc.)			
1	Land Use with respect to Habitation	No	Yes	Indications of encroachment seen
2		Yes	Yes	Indications of encroachment seen
3		Yes	No	No indication of encroachment seen
4		No	No	No indication of encroachment seen
5	Land Use with respect to Cultivation	No	Yes	Indications of encroachment seen
6		Yes	Yes	Indications of encroachment seen
7		Yes	No	No indication of encroachment seen
8		No	No	No indication of encroachment seen

* In some polygons rejection of claim may be due to reasons other than land use change.



Degree of Confidence of interpretation of signature of land use (habitation/cultivation) in area with forest cover and area without forest cover

High	Moderate	Low
Where the change on satellite image is very clearly discernible	Where change is not clearly discernible due to mixing of signatures	Where change is not clearly discernible due to poor quality of satellite data owing to cloud cover or poor tone and radiometric

SATELLITE SURVEY OF ENCROACHMENT POSITIONS PERTAINING TO REJECTED CLAIMS UNDER FRA 2006
 Related to Hon'ble Supreme Court order dated 13-02-2019 and 28-02-2019 in writ petition (Civil) no: 109/2008 wildlife first and other versus MoEF&CC and others

State: District: Rejected Claim Polygon ID: Area of Polygon:	Forest Division: Forest Range: Location of Polygon (centroid):
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Note: (i)The georeferenced polygon has been provided by: State Forest Department (Andhra Pradesh)
 (ii)The interpretation has been carried out in LISS IV image on scale: 1:12,500. Further, analysis with Google Earth images has been done on scale of 1:5000

Analysis of Rejected Claim polygons on Satellite Imageries

Date of available LISS IV image close to 13.12.2005: for example 15-11-2005	Date of available LISS IV image of intermediate period: for example 08-03-2008	Date of Latest available LISS IV image: for example 18-10-2018
Date of available Google Earth image close to 13.12.2005: For example 08-03-2008	Date of available Google Earth image of intermediate period: for example 08-03-2008	Date of Latest available Google Earth image: For example 08-03-2008

Status of polygon as per image prior to or close to 2005: 2005	Status of polygon as per image in intermediate year: 2008	Status of polygon as per latest image year: 2018	Assessment (Refer: Forest Right as per section 3 (1)(a) of FRA 2006)		
			Before 13.12.2005	Current/Latest Period	Assessment about the rejected case
					*Claim rejection may be due to reasons other than land use

Analysis of Rejected Polygon Based on Visual image Interpretation Technique

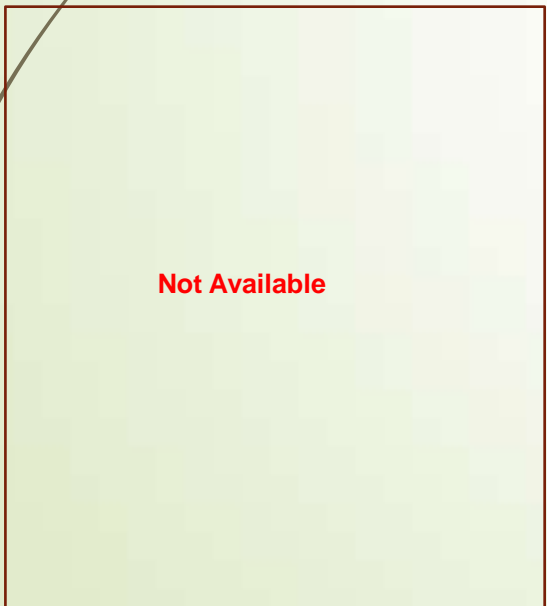
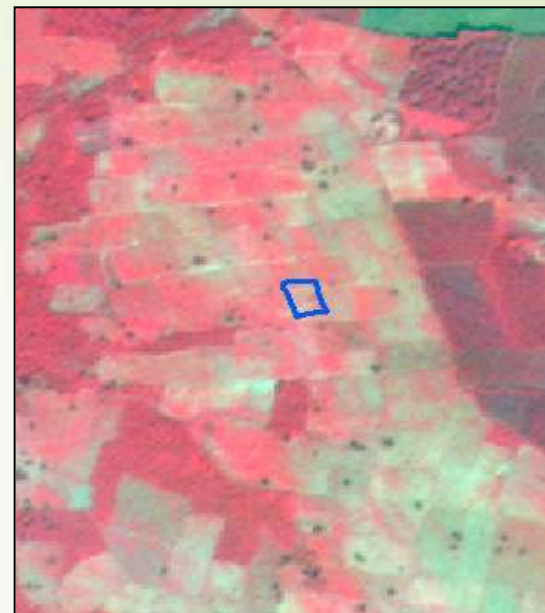
Date of Pass 27-12-2004 LISS IV



Date of Pass 03-03-2008 LISS IV



Date of Pass 11-11-2018 LISS IV



Google Earth Imagery 2-11-2009



Google Earth Imagery 28-11-2018



SATELLITE SURVEY OF ENCROACHMENT POSITIONS PERTAINING TO REJECTED CLAIMS UNDER FRA 2006
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State: Andhra Pradesh District: East Godavari Rejected Claim Polygon ID: AP_3404 Area of Polygon: 1.52 ha	Forest Division: Kakinada Forest Range: N/A Location of Polygon (centroid): 17° 29' 43.501" N/ 81° 55' 3.878" E
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Note: (i) The georeferenced polygon has been provided by: State Forest Department (Andhra Pradesh)
 (ii) The interpretation has been carried out in LISS IV image on scale: 1:12,500. Further, analysis with Google Earth images has been done on scale of 1:5000

Analysis of Rejected Claim polygons on Satellite Imageries

Date of available LISS IV image close to 13.12.2005: 19-11-2005	Date of available LISS IV image of intermediate period: 22-12-2007	Date of Latest available LISS IV image: 15-02-2019
Date of available Google Earth image close to 13.12.2005: 11-04-2006	Date of available Google Earth image of intermediate period: 16-12-2011	Date of Latest available Google Earth image: 01-03-2018

Status of polygon as per image prior to or close to 2005:	Status of polygon as per image in intermediate year: 2007	Status of polygon as per latest image year: 2019	Assessment (Refer: Forest Right as per section 3 (1)(a) of FRA 2006)		
			Before 13.12.2005	Current/Latest Period	Assessment about the rejected case
Discernible signature of cultivation observed in the polygon before cutoff date of FRA Act.2006 i.e. 13-12-2005 as seen from LISS IV Satellite imagery dated 19-11-2005	Discernible signature of cultivation observed in the polygon in intermediate period as seen from LISS IV Satellite imagery dated 22-12-2007	Discernible signature of cultivation observed in the polygon in latest period as seen from LISS IV Satellite imagery dated 15-02-2019	Yes	Yes	Indication of encroachment seen*
					*Claim rejection may be due to reasons other than land use

SATELLITE SURVEY OF ENCROACHMENT POSITIONS PERTAINING TO REJECTED CLAIMS UNDER FRA 2006
 Related to Hon'ble Supreme Court order dated 13-02-2019 and 28-02-2019 in writ petition (Civil) no: 109/2008 wildlife first and other versus MoEF&CC and others



State: Andhra Pradesh District: East Godavari Rejected Claim Polygon ID: AP_3400 Area of Polygon: 1.79 ha	Forest Division: Kakinada Forest Range: Not Available Location of Polygon (centroid): 17° 29' 38.776" N/ 81° 54' 6.898"E
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Note: (i) The georeferenced polygon has been provided by: State Forest Department (Andhra Pradesh)
 (ii) The interpretation has been carried out in LISS IV image on scale: 1:12,500. Further, analysis with Google Earth images has been done on scale of 1:5000

Analysis of Rejected Claim polygons on Satellite Imageries

Date of available LISS IV image close to 13.12.2005: 19-11-2005	Date of available LISS IV image of intermediate period: 22-12-2007	Date of Latest available LISS IV image: 15-02-2019
Date of available Google Earth image close to 13.12.2005: 11-04-2006	Date of available Google Earth image of intermediate period: 16-12-2011	Date of Latest available Google Earth image: 01-03-2018

Status of polygon as per image prior to or close to 2005: 2005	Status of polygon as per image in intermediate year: 2007	Status of polygon as per latest image year: 2019	Assessment (Refer: Forest Right as per section 3 (1)(a) of FRA 2006)		
No discernible signature of cultivation/habitation observed in the polygon before cutoff date of FRA Act.2006 i.e. 13-12-2005 as seen from LISS IV Satellite imagery dated 19-11-2005	No discernible signature of cultivation/habitation observed in the polygon in intermediate period as seen from LISS IV Satellite imagery dated 22-12-2007	No discernible signature of cultivation/habitation observed in the polygon in latest period as seen from LISS IV Satellite imagery dated 15-02-2019	Before 13.12.2005	Current/Latest Period	Assessment about the rejected case
			No	No	No indication of encroachment seen*

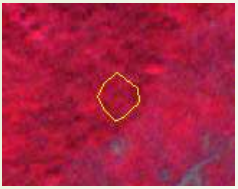
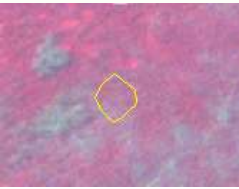



SATELLITE SURVEY OF ENCROACHMENT POSITIONS PERTAINING TO REJECTED CLAIMS UNDER FRA 2006

Related to Hon'ble Supreme Court order dated 13-02-2019 and 28-02-2019 in writ petition (Civil) no: 109/2008 wildlife first and other versus MoEF&CC and others

State: Andhra Pradesh District: East Godavari Rejected Claim Polygon ID: AP_3397 Area of Polygon: 0.49 ha	Forest Division: Kakinada Forest Range: Not Available Location of Polygon (centroid): 17° 29' 35.270" N/ 81° 57' 6.967"E
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Note: (i)The georeferenced polygon has been provided by: State Forest Department (Andhra Pradesh)
(ii)The interpretation has been carried out in LISS IV image on scale: 1:12,500. Further, analysis with Google Earth images has been done on scale of 1:5000

Analysis of Rejected Claim polygons on Satellite Imageries

Date of available LISS IV image close to 13.12.2005: 15-11-2005	Date of available LISS IV image of intermediate period: 08-03-2008	Date of Latest available LISS IV image: 18-10-2018
		
Date of available Google Earth image close to 13.12.2005: Not Available	Date of available Google Earth image of intermediate period: 16-12-2011	Date of Latest available Google Earth image: 01-03-2018
Google Earth Image not available		

Status of polygon as per image prior to or close to 2005:	Status of polygon as per image in intermediate year: 2007	Status of polygon as per latest image year: 2019	Assessment (Refer: Forest Right as per section 3 (1)(a) of FRA 2006)		
			Before 13.12.2005	Current/Latest Period	Assessment about the rejected case
2005	2007	2019	No	Yes	Indication of encroachment seen*
No discernible signature of cultivation/habitation observed in the polygon before cutoff date of FRA Act.2006 i.e. 13-12-2005 as seen from LISS IV Satellite imagery dated 15-11-2005	Discernible signature of cultivation observed in the polygon in intermediate period as seen from LISS IV Satellite imagery dated 08-03-2008	Discernible signature of cultivation observed in the polygon in latest period as seen from LISS IV Satellite imagery dated 18-10-2018			*Claim rejection may be due to reasons other than land use

Abstract of Results submitted to Hon'ble Supreme Court of India

State	No of Polygons				
	Total No of Polygons Received	Total No of Polygons analyzed	Encroachment seen	Encroachment not seen	Percentage of Encroachment
Andhra Pradesh	7035	6248	3572	2676	57.17%
Uttarakhand	44	16	15	1	93.75%

- ✓ forest area covered under the 6264 polygons analyzed by FSI is 7148.82 ha having an average size of 1.14 ha per polygon.
- ✓ The total area covered by 3587 polygons in which indications of encroachments were seen in the analysis carried out by FSI is 4204.54 ha.

Technical Limitations and Operational Constraints

➤ Limitations of Remote Sensing Data

- ❖ Since the **Resolution** of the LISS-IV sensor data is 5.8 m. the land cover having dimension less than the above are not captured.
- ❖ Young plantations and tree species with **less chlorophyll** or poor foliage are many a times not discernable on satellite images due to poor leaf area index and transmittance.
- ❖ Considerable ground details may sometimes be obscured due to **clouds and shadows**. Such areas are difficult to classify without the help of collateral data or ground truthing.

➤ Operational Constraints



Thanks...