Mapping and Assessment of Wasteland Changes Using Multi Temporal Satellite Data in Andhra Pradesh

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Outline & Wasteland Definition

- Objectives
- Satellite and Ancillary Data
- Wasteland classification scheme
- Methodology adopted for wasteland mapping
- Change analysis
- Conclusions

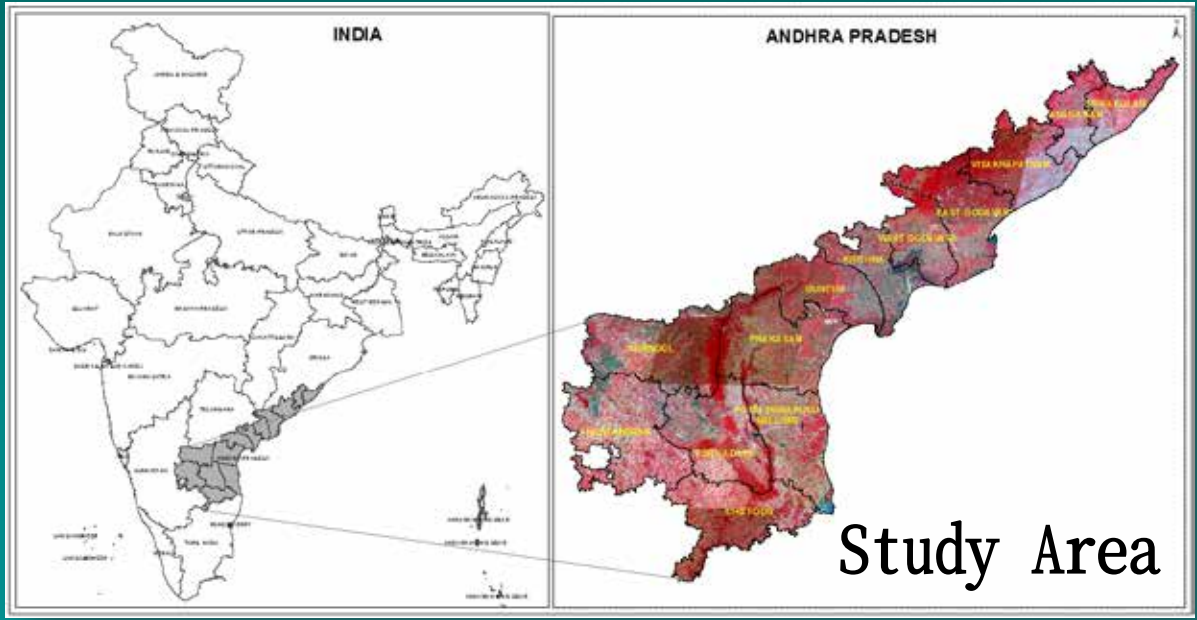
Wastelands refer to degraded lands that are currently underutilized, and are deteriorating for lack of appropriate soil & water management or on account of natural causes. Wastelands develop naturally or due to influence of environment, chemical and physical properties of the soil or management constraints.

Objectives

- To map the spatial extent and distribution of wastelands during 2015-16 of Andhra Pradesh State.
- To identify and depict the areas with major wastelands change between 2008-09 and 2015-16.
- To prepare category-wise spatial change statistics of wastelands.
- Creation of Digital database.

Data & Study Area

§ Satellite data: Orthorectified Resourcesat-2 LISS-3 of 2015-16
§ Seasons: Kharif, Rabi & Zaid
§ Ancillary data: Existing Wasteland Vector layer of 2008-09



§ The State lies between 12° 33' - 19° 09' of North latitude and 76° 38' - 84° 42' of East Longitude.

§ The geographical area of the State is 1,62,970 sq km.

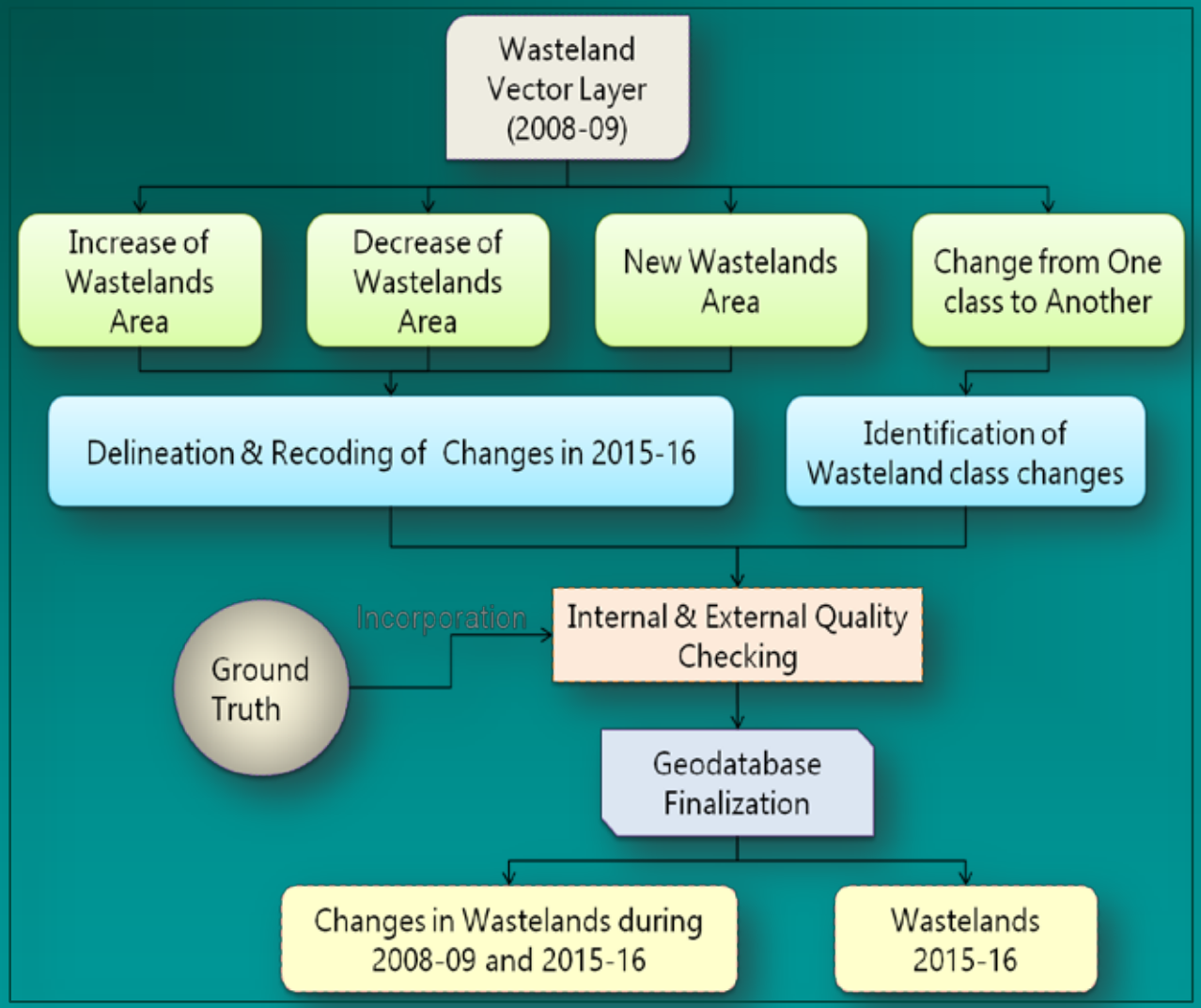
§ The state has the 2nd longest coastline in the country with a length of 974 km and 8th largest State in the country.

Wasteland classification scheme

S.No	Description	WL_0809	WL_1516
1	Gullied and/ or ravenous land (Medium)	1	1
2	Gullied and/ or ravenous land (Deep)	2	2
3	Land with Dense Scrub	3	3
4	Land with Open Scrub	4	4
5	Waterlogged and Marshy land (Permanent)	5	5
6	Waterlogged and Marshy land (Seasonal)	6	6
7	Land affected by salinity/alkalinity (Moderate)	7	7
8	Land affected by salinity/alkalinity (Strong)	8	8
9	Shifting Cultivation - Current Jhum	9	9
10	Shifting Cultivation - Abandoned Jhum	10	10
11	Under-utilized/degraded forest (Scrub dominated)	11	11
12	Under-utilized/degraded forest (Agriculture)	12	12
13	Degraded pastures/ grazing land	13	13
14	Degraded land under plantation crop	14	14
15	Sands - Riverine	15	15
16	Sands - Coastal	16	16
17	Sands - Desertic	17	17
18	Sands - Semi Stab. - Stab > 40 m	18	18
19	Sands - Semi Stab. - Stab 15 - 40 m	19	19
20	Mining Wastelands	20	20
21	Industrial Wastelands	21	21
22	Barren Rocky Area	22	22
23	Snow Covered / Glacial Area	23	23
24	Non Wasteland Area	999	999

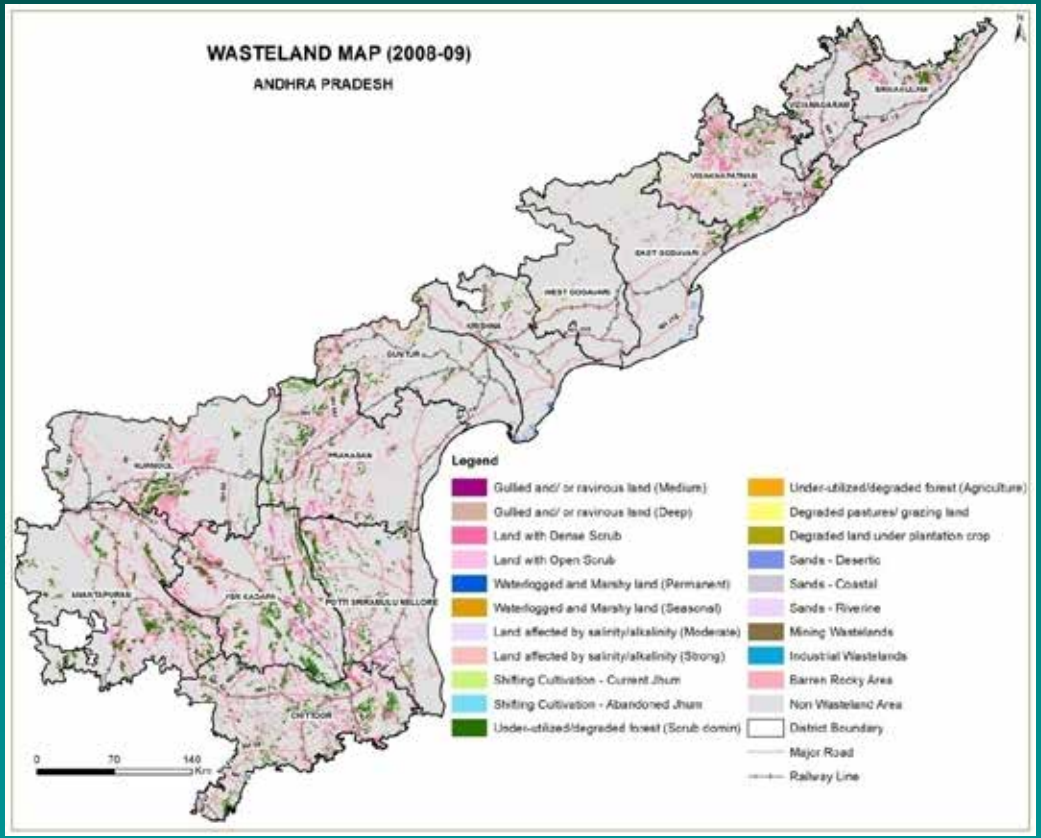
conversion of wastelands class to non-wastelands class		
25	Built - Up	24
26	Industrial Area	25
27	Cropland	26
28	Fallow Land	27
29	Plantation	28
30	Forest (Dense/ Open)	29
31	Forest Plantation	30
32	Grasslands	31
33	Water bodies	32

Methodology



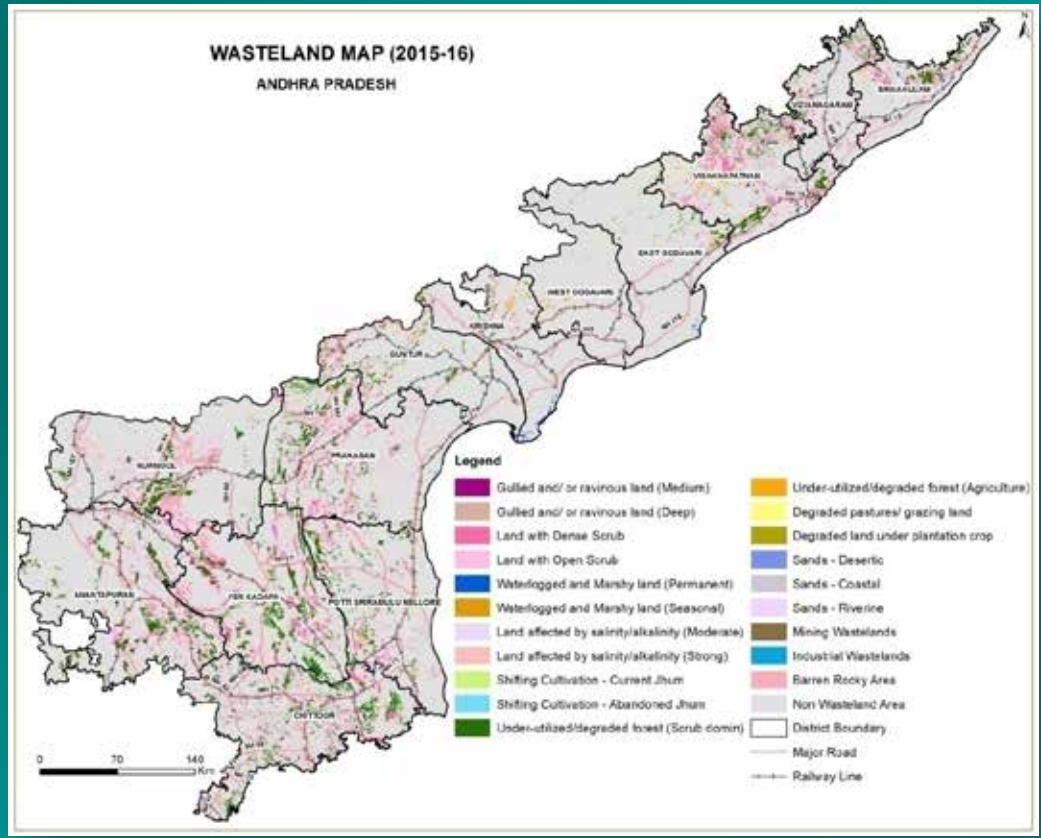
Wasteland Map [A] 2008-09 and [B] 2015-16

Total Wastelands Area in 2008-09 : 24790.10 sq. km



[A]

Total Wastelands Area in 2015-16 : 23945.66 sq. km

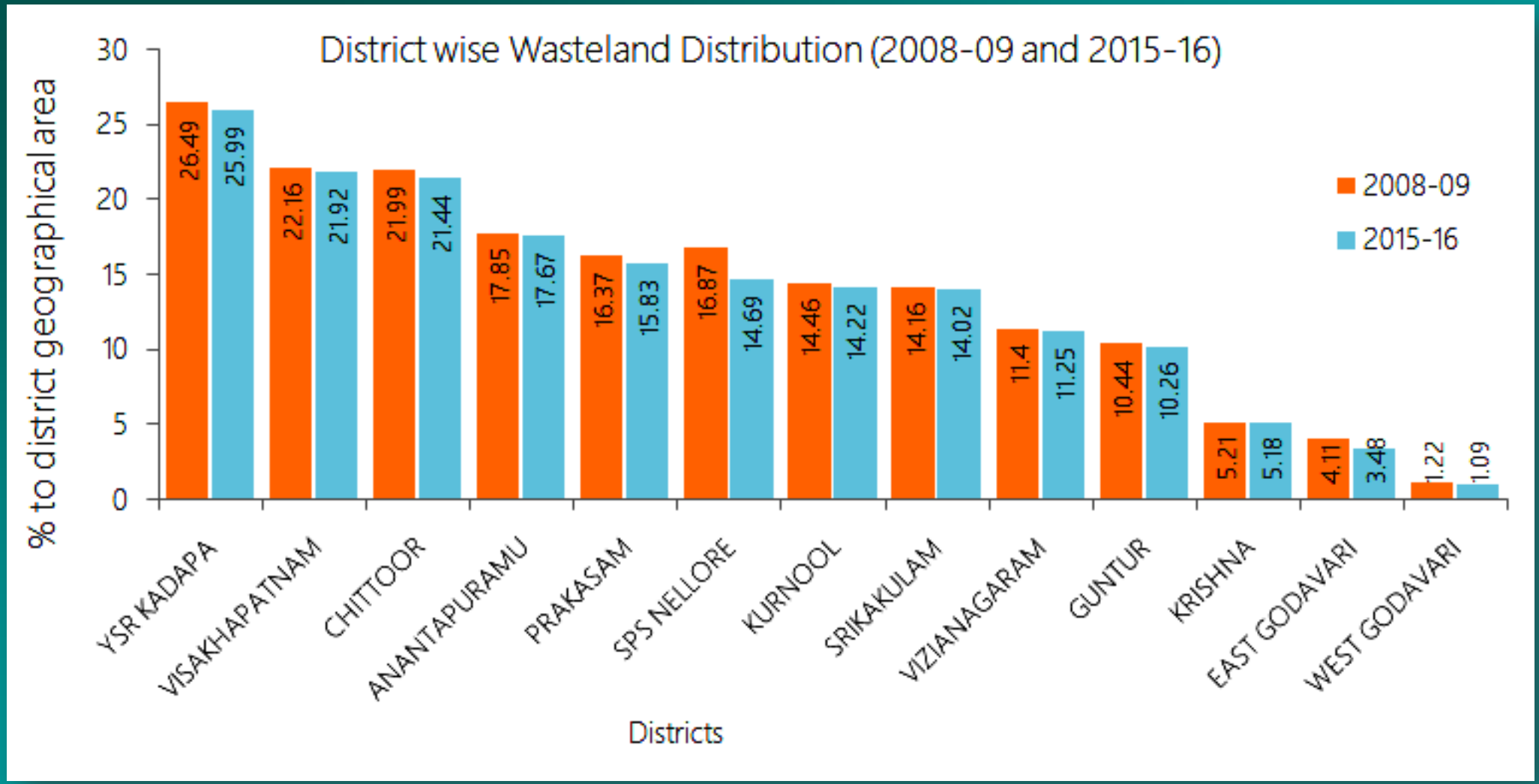


[B]

Category-wise wastelands distribution and changes during the period 2008-09 and 2015-16 (Area in sq. km)

S.No	Category	Year 2015-16	(%)	Year 2008-09	(%)	Change	% diff
1	Gullied and/ or ravinous land (Medium)	115.14	0.48	169.93	0.69	-54.79	-0.20
2	Gullied and/ or ravinous land (Deep)	1.90	0.01	3.00	0.01	-1.10	0.00
3	**Land with Dense Scrub**	**6368.78**	**26.60**	**6669.41**	**26.90**	**-300.63**	**-0.31**
4	**Land with Open Scrub**	**4604.91**	**19.23**	**4848.71**	**19.56**	**-243.80**	**-0.33**
5	Waterlogged and Marshy land (Permanent)	115.37	0.48	143.08	0.58	-27.71	-0.10
6	Waterlogged and Marshy land (Seasonal)	16.96	0.07	16.96	0.07	0.00	0.00
7	Land affected by salinity/alkalinity (Moderate)	800.67	3.34	885.64	3.57	-84.97	-0.23
8	Land affected by salinity/alkalinity (Strong)	349.66	1.46	376.86	1.52	-27.19	-0.06
9	Shifting Cultivation - Current Jhum	14.37	0.06	15.42	0.06	-1.05	0.00
10	Shifting Cultivation - Abandoned Jhum	2.34	0.01	1.29	0.01	1.05	0.00
11	**Under-utilised/degraded forest (Scrub dominated)**	**8204.20**	**34.26**	**8332.22**	**33.61**	**-128.02**	**0.65**
12	Under-utilised/degraded forest (Agriculture)	681.60	2.85	589.28	2.38	92.32	0.47
13	Degraded pastures/ grazing land	99.41	0.42	99.41	0.40	0.00	0.01
14	Degraded land under plantation crop	13.06	0.05	26.82	0.11	-13.76	-0.05
15	Sands – Riverine	15.75	0.07	22.94	0.09	-7.19	-0.03
16	Sands – Coastal	266.23	1.11	303.33	1.22	-37.10	-0.11
17	Sands – Desertic	1.94	0.01	3.80	0.02	-1.85	-0.01
18	Mining Wastelands	2.52	0.01	3.03	0.01	-0.51	0.00
19	Industrial Wastelands	3.22	0.01	3.28	0.01	-0.05	0.00
20	Barren Rocky Area	2267.62	9.47	2275.71	9.18	-8.09	0.29
Total		**23945.66**	**100**	**24790.10**	**100**	**-844.44**	**0.00**

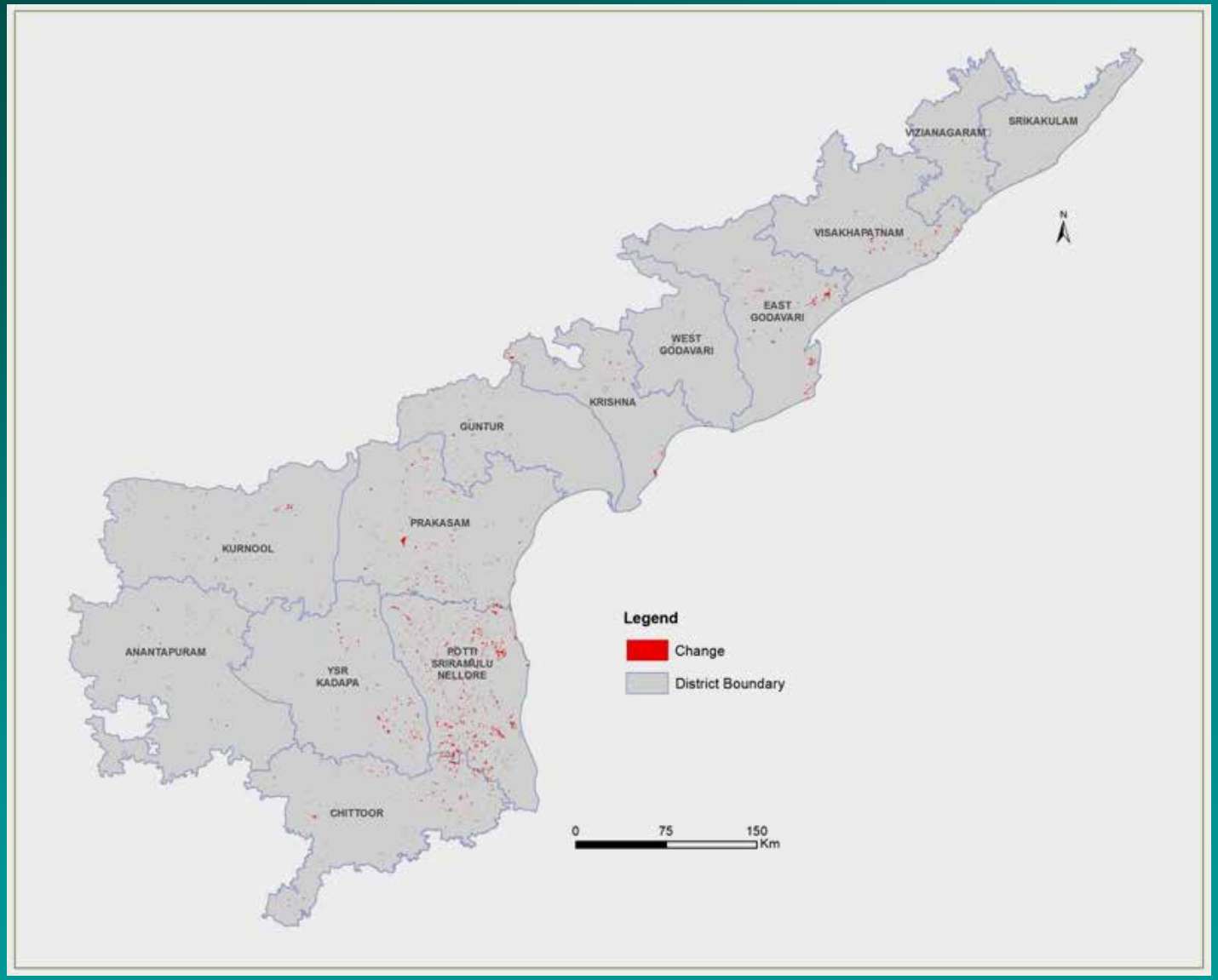
District-wise wastelands distribution in Andhra Pradesh
(% to total district geographical area)



District-wise wastelands distribution in Andhra Pradesh

District / Category - Code	ANANTAPURAMU	CHITTOOR	EAST GODAVARI	GUNTUR	KRISHNA	KURNOOL	SPS NELLORE	PRAKASAM	SRIKAKULAM	VISAKHAPATNAM	VIZIANAGARAM	WEST GODAVARI	YSR KADAPA	Area in Sq km Total
1	0.56	5.04	0.73			10.50	13.31	23.37	5.55	34.19	17.64	1.45	2.79	115.14
2										1.90				1.90
3	727.25	845.04	112.41	86.70	60.50	503.11	444.98	874.80	270.54	1073.58	291.94	27.82	1050.12	6368.78
4	720.94	726.78	22.28	184.77	45.04	278.38	289.91	553.71	171.40	371.15	80.61	6.35	1153.60	4604.91
5			13.19	9.10	85.37			4.84	1.91	0.44		0.51		115.37
6					5.58		3.46		7.70	0.22				16.96
7	217.67	47.63		7.43	0.95	198.23	189.20	122.16					17.39	800.67
8	78.91	9.51		15.09		91.80	42.69	106.82					4.84	349.66
9			14.17							0.08		0.13		14.37
10			2.19							0.14				2.34
11	1222.88	1324.09	146.84	334.83	134.89	665.94	709.24	901.08	299.06	677.58	306.90	2.69	1478.18	8204.20
12	11.99	31.82	58.93	61.05	64.31	34.05	58.78	52.06	30.82	202.50	21.24	44.03	10.03	681.60
13			38.54							54.52		6.35		99.41
14			3.89		4.17			0.42	4.14	0.44				13.06
15	4.76				0.23		9.40	0.06				0.07	1.22	15.75
16			30.82	9.86	20.78		130.31	30.57	19.54	19.18	2.07	3.09		266.23
17								1.94						1.94
20	0.27	1.81										0.17	0.27	2.52
21	0.15			1.56						1.19	0.31			3.22
22	394.43	252.12	4.44	457.97	0.93	727.43	7.55	117.32	6.12	9.40	15.88	0.28	273.76	2267.62
Total	3379.80	3243.83	448.42	1168.38	422.76	2509.45	1898.83	2789.16	816.78	2446.52	736.60	92.92	3992.19	23945.66
Dist. TGA	19130	15151	12805.25	11391	8727	17658	13076	17626	5837	11161	6539	8506.65	15359	162966.9
TGA %	17.67	21.41	3.50	10.26	4.84	14.21	14.52	15.82	13.99	21.92	11.26	1.09	25.99	14.69

Wasteland Change Map between 2008-09 and 2015-16



Change (+ve): 844.44 sq.km (3.41%)

Category Change: 203.22 sq.km (0.82%)

No Change: 23,742.44 sq.km (95.77%)

Wastelands change matrix (2008-09 to 2015-16)

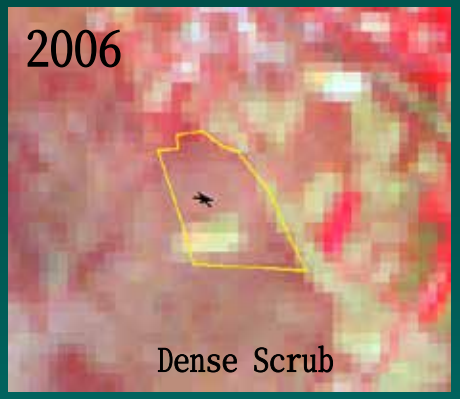
WL_2015-16 / WL_2008-09	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	20	21	22	24	25	26	27	28	29	30	32	999	Area in Sq Km
1	115.14			18.55																	3.75		18.45	3.10	10.14			0.79		169.93
2		1.90		0.79																			0.31							3.00
3			6364.64	33.18																	21.62	1.29	140.39	66.44	37.15			4.70		6669.41
4				4506.01																	29.29	1.67	244.35	41.24	23.40			2.75		4848.71
5					114.70																	0.49	0.60	0.06		27.23				143.08
6						16.96																								16.96
7			3.42	28.94			795.07	0.14											0.15		0.93		47.38	7.58	1.41			0.62		885.64
8			0.26	14.02			5.59	349.52													0.49		6.03	0.22	0.11			0.61		376.86
9									14.37	1.05																				15.42
10										1.29																				1.29
11											8204.20	92.58									4.34						29.00	2.10		8332.22
12												589.02									0.26									589.28
13													99.41																	99.41
14				1.46										13.06							1.87		2.22	0.74	7.47					26.82
15				0.94											15.75								6.25							22.94
16			0.45	0.69	0.67											266.23					0.05	0.20	20.41		13.02	1.61				303.33
17																	1.94						0.11	1.42	0.32					3.80
20				0.33														2.52			0.18									3.03
21																			3.07		0.20									3.28
22																				2267.62	8.09									2275.71
999																													138177	#######
Grand Total	115.14	1.90	6368.78	4604.91	115.37	16.96	800.67	349.66	14.37	2.34	8204.20	681.60	99.41	13.06	15.75	266.23	1.94	2.52	3.22	2267.62	71.09	3.64	486.50	120.79	93.02	28.84	29.00	11.56	138178	#######

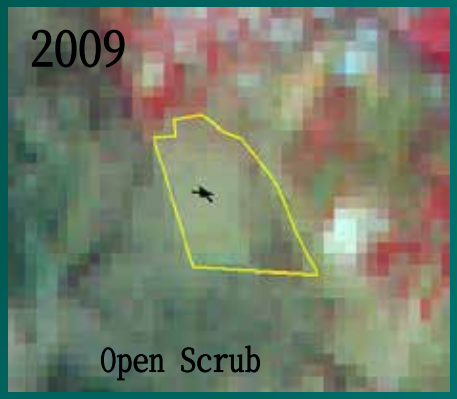
WL Code	Description	WL Code	Description	WL Code	Description	WL Code	Description
1	Gullied and/ or ravenous land (Medium)	9	Shifting Cultivation - Current Jhum	17	Sands - Desertic	24	Built - Up
2	Gullied and/ or ravenous land (Deep)	10	Shifting Cultivation - Abandoned Jhum	18	Sands - Semi Stab. - Stab > 40 m	25	Industrial Area
3	Land with Dense Scrub	11	Under-utilized/degraded forest (Scrub dominated)	19	Sands - Semi Stab. - Stab 15 - 40 m	26	Cropland
4	Land with Open Scrub	12	Under-utilized/degraded forest (Agriculture)	20	Mining Wastelands	27	Fallow Land
5	Waterlogged and Marshy land (Permanent)	13	Degraded pastures/ grazing land	21	Industrial Wastelands	28	Plantation
6	Waterlogged and Marshy land (Seasonal)	14	Degraded land under plantation crop	22	Barren Rocky Area	29	Forest (Dense/ Open)
7	Land affected by salinity/alkalinity (Moderate)	15	Sands - Riverine	23	Snow Covered / Glacial Area	30	Forest Plantation
8	Land affected by salinity/alkalinity (Strong)	16	Sands - Coastal			31	Grasslands
				999	Non Wasteland Area	32	Water bodies

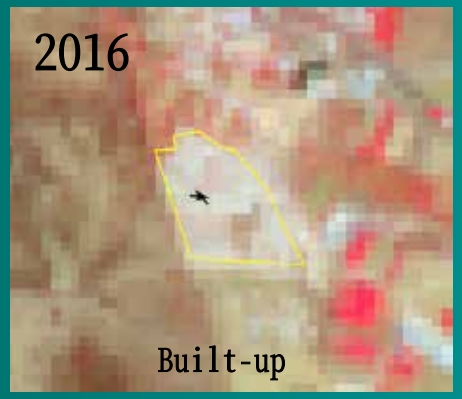
District-wise changes (2008-09 to 2015-16)

District Name	Built - Up	Industrial Area	Cropland	Fallow Land	Plantation	Forest (Dense/ Open)	Forest Plantation	Water bodies	Total
S.P.S. Nellore	5.10	1.88	184.53	66.44	25.93	0.00	21.80	1.97	307.66
Prakasam	0.84	0.00	64.02	12.61	12.74	0.00	1.23	6.19	97.63
Chittoor	17.71	0.30	36.21	25.35	6.01	0.00	1.94	1.75	89.29
East Godavari	3.55	0.04	30.25	2.67	22.39	18.74		0.55	78.19
Y.S.R. Kadapa	4.61	0.13	63.88	8.01	0.92			0.36	77.90
Kurnool	3.13		40.59	0.67	0.05			0.00	44.44
Anantapuramu	10.93	0.88	22.19	1.62	0.13			0.37	36.12
Krishna	6.57	0.14	9.42	0.00	4.12	10.01	2.36		32.62
Visakhapatnam	11.14	0.24	8.79	1.08	6.24				27.50
Guntur	2.61		17.17	1.18	0.19	0.08	0.00	0.00	21.23
Srikakulam	0.85	0.02	1.20	0.00	7.66		1.67		11.42
West Godavari	1.96	0.00	5.27	0.31	3.39	0.00		0.37	11.29
Vizianagaram	2.09	0.00	2.98	0.85	3.25				9.16
Total	**71.09**	**3.64**	**486.50**	**120.79**	**93.02**	**28.84**	**29.00**	**11.56**	**844.44**

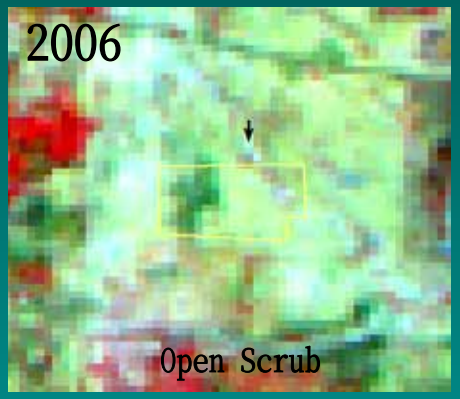
Changes

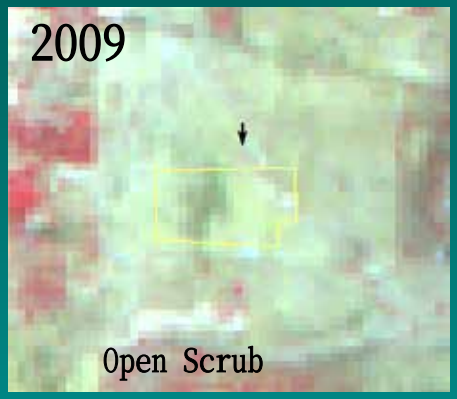

2006
Dense Scrub

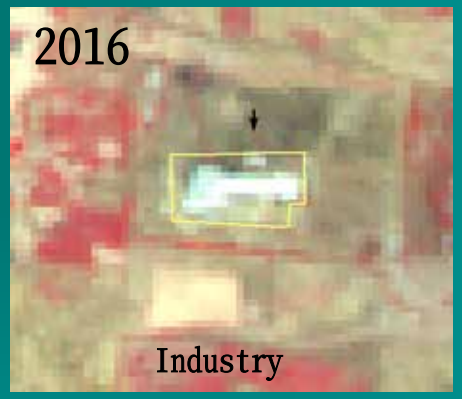

2009
Open Scrub


2016
Built-up

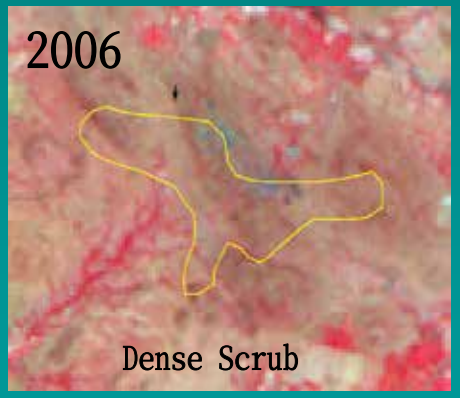

2018
80°0'54"E 16°27'23"N
Guntur District

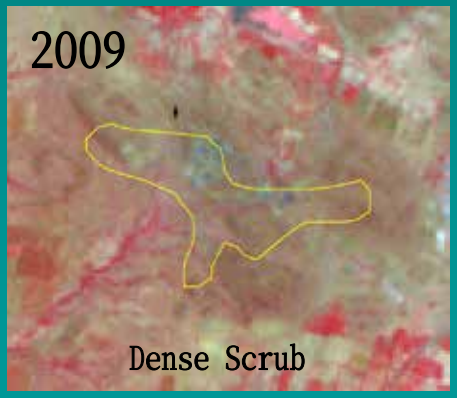

2006
Open Scrub

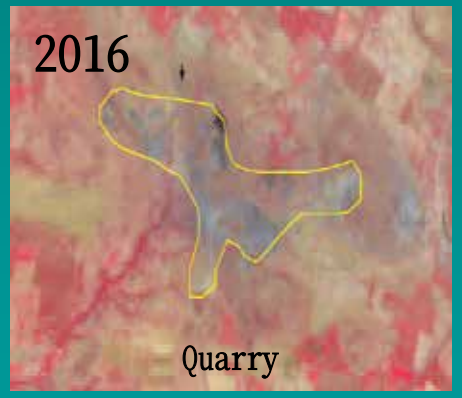

2009
Open Scrub


2016
Industry


2018
79°37'32"E 13°45'39"N
Chittoor District

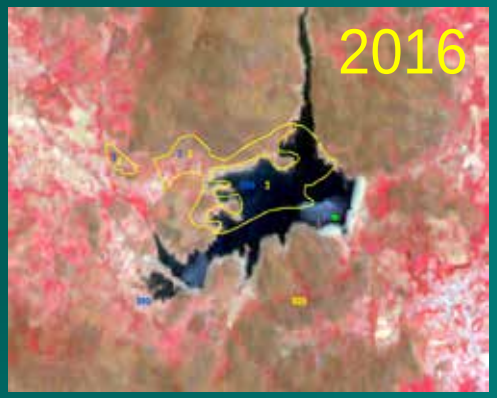

2006
Dense Scrub


2009
Dense Scrub


2016
Quarry

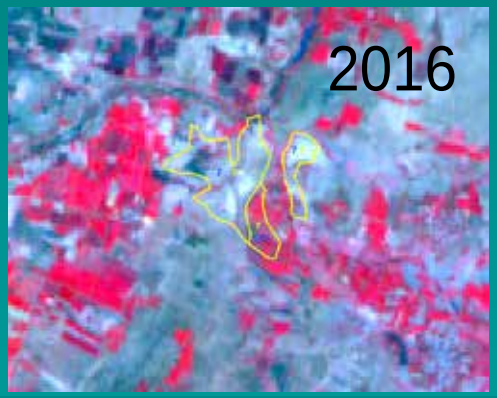

2018
79°44'37"E 14°03'41"N
SPS Nellore District

Changes



Change form Dense Scrub to Reservoir,
81°45'51.695"E 17°26'47.749"N
East Godavari District.

Change from Open Scrub to Crop Land,
79°15'7.268"E 15°29'55.304"N
Prakasam District.



Change from Salt affected to Crop land,
79°25'0.447"E 15°54'41.849"N
Prakasam District.

Conclusions

§ There is a decrease in the extent of wastelands during 2015-16 when compared with 2008-09.

§ This decrease is due to implementation of various developmental programmes by various departments in the State.

§ The study demonstrates the utilization of spatial information on wastelands for adopting various reclamation measures.

§ There is tremendous scope for frontier technologies to use the database for decision support system at gross root level.

§ The repetitive coverage of satellite data enables monitoring and evaluation of wasteland changes.

Thank you

Thank you