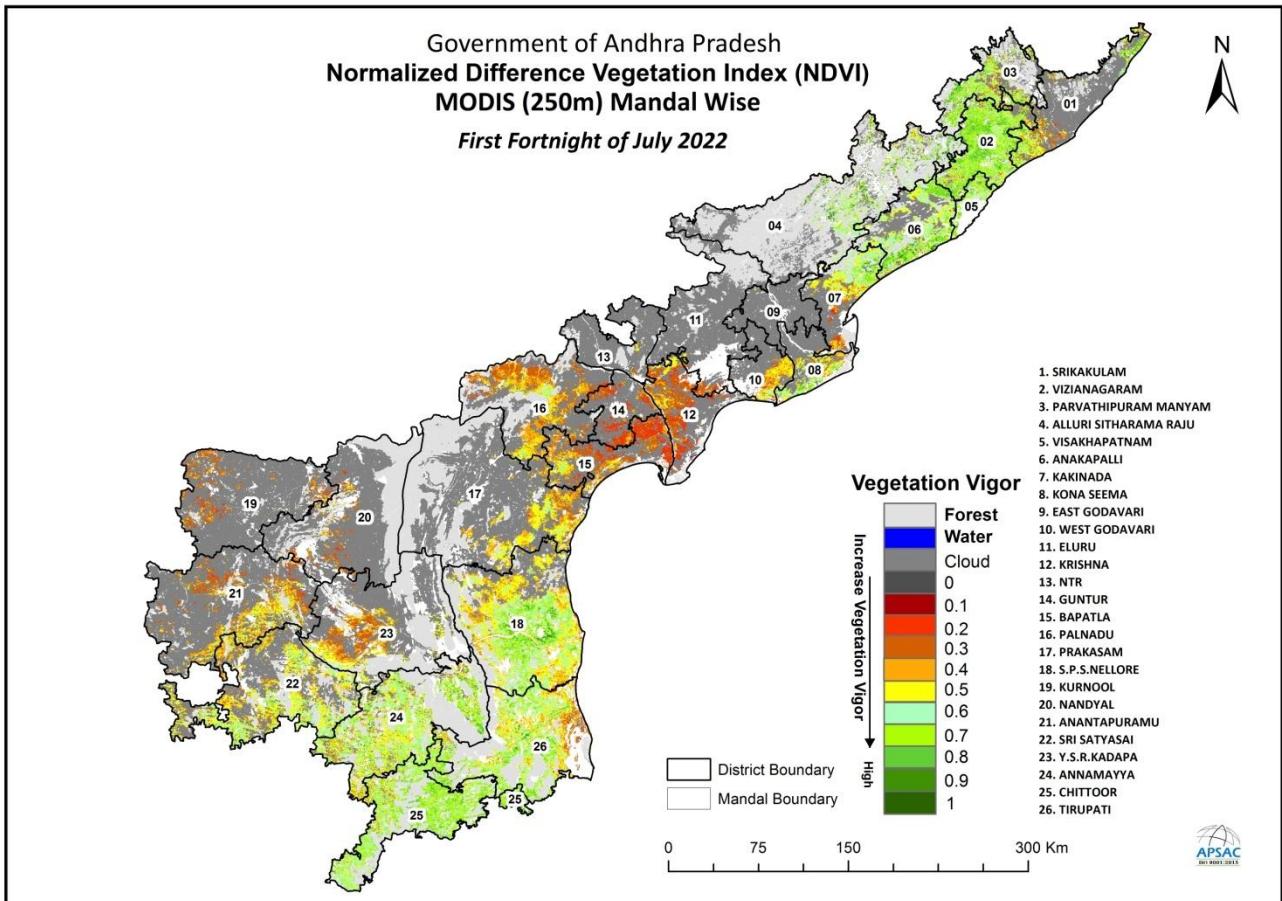




Technical Report: Drought Monitoring

Remote sensing Indicators (NDVI, NDWI and VCI) for Drought Declaration in Andhra Pradesh State *up to 1st FN July2022 (Kharif Season)*



Prepared by

Andhra Pradesh Space Applications Centre (APSAC)
Agriculture & Soils Division
ITE&C Department, Government of Andhra Pradesh
Vijayawada520010, web site : www.apsac.ap.gov.in

Prepared for

Andhra Pradesh State Disaster Management Authority (APSDMA)
Revenue (DM) Department
Genious, JR Towers, Kunchanapalli,
Guntur, Govt. of Andhra Pradesh



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8	Author(s)	Sri. Sudheer Tiwari, Smt. Pushpa, Sri. N. Venkaiya , Sri. G. Prasada Rao and Dr. B. Sundar		
9	Affiliation of authors	Andhra Pradesh Space Applications Centre, ITE & C Department, Govt. of Andhra Pradesh		
10	Scrutiny mechanism	Compiled by: Sri. Sudheer Tiwari, Scientist-SC (Associate Project manager)	Reviewed by: Sri. G. Prasada Rao, Scientist-SF (Project Manager)	Approved by : Dr. B. Sundar, IFS Vice-Chairman, APSAC
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Background

Advancements in satellite remote sensing technology has enabled regular monitoring of crop conditions/vigour over large regions. Among the various spectral vegetation indices commonly derived from remote sensing data, Normalized Difference Vegetation Index (NDVI) is most widely used for operational assessment of drought owing to the ease in calculation and interpretation and also its ability to partially compensate for the effects of atmosphere, illumination geometry etc. NDVI is derived using the formula $(\text{NIR} - \text{Red}) / (\text{NIR} + \text{Red})$, where NIR and Red are the reflectance in visible and near infrared channels. Water, clouds and snow have higher reflectance in the visible region and consequently NDVI assumes negative values for these features. Bare soil and rocks exhibit similar reflectance in both visible and near IR regions and the index values are near zero. The NDVI values for vegetation generally range from 0.2 to 0.6, the higher index values being associated with greater green leaf area and biomass. Shortwave Infrared (SWIR) band is sensitive to moisture available in soil as well as in crop canopy. In the beginning of the cropping season, soil background is dominant hence SWIR is sensitive to soil moisture in the top 12 cm. As the crop growth progresses, SWIR becomes sensitive to leaf moisture content. SWIR band provides only surface wetness information. Normalized Difference Wetness Index (NDWI), computed using SWIR data, can complement NDVI for drought assessment particularly in the beginning of the cropping season. NDWI is derived as follows: $\text{NDWI} = (\text{NIR}-\text{SWIR}) / (\text{NIR}+\text{SWIR})$ where, NIR and SWIR are the reflected radiation in Near Infrared and Shortwave Infrared channels. Higher values of NDWI signify more surface wetness. Satellite based crop condition anomalies which point towards agricultural drought can be generated by computing Vegetation Condition Index (VCI) of NDVI and VCI of NDWI. While combining VCI of NDVI and NDWI, the minimum of two values can be taken, i.e. if at least one is in Severe category, the category will be considered as Severe. If at least one is moderate then category will be taken as moderate (**As per the Drought manual:2016 and amendments**). Fortnightly (FN) NDVI, NDWI and VCI status is being generated and submitted to Andhra Pradesh State Disaster Management Authority and Revenue (DM) department for monitoring and Declaration of drought at mandal level in the state of Andhra Pradesh.

VCI Value (%)	Vegetation Condition	Description
60-100	Normal	Crop condition is Normal
40-60	Moderate	Crop condition is Moderate
0-40	Severe	Crop condition is Severe



The 26 districts of Andhra Pradesh have 679 mandals, out of 679 mandal 302 mandals are affected by cloud cover in July 2nd fortnight 2022 and remaining 177-Normal, 44-Moderate and 144 mandals are Severe. The 12 mandals are excluded from the vegetation condition assessment as these mandals under predominantly urban or forest cover. The status of indicators at district and mandal level are shown in Table-1 and Table-2 respectively.

Table 1: District wise number of Mandals under Normal, Moderate and Severe up to 1st FN July2022.

Sno.	District	No. of Mandals	VCI			Cloud Cover (Mandals)
			Normal	Moderate	Severe	
1	A. Sitharama Raju	22	3	6	4	9
2	Anakapalli	24	9	3	7	5
3	Anantapuramu	31	2	4	3	22
4	Annamayya	30	28	1	1	0
5	Bapatla	25	0	0	18	7
6	Chittoor	31	30	1	0	0
7	East Godavari	19	0	0	0	19
8	Eluru	28	0	0	2	26
9	Guntur	18	0	0	3	14
10	Kakinada	21	4	3	7	6
11	Kona Seema	22	1	1	11	9
12	Krishna	25	0	0	16	9
13	Kurnool	26	0	0	1	25
14	Manyam	15	2	0	12	1
15	Nandyal	29	0	0	0	28
16	NTR	20	0	0	0	16
17	Palnadu	28	1	4	8	15
18	Prakasam	38	0	2	9	27
19	S.P.S.Nellore	38	22	2	12	1
20	Sri Satyasai	32	12	4	6	10
21	Srikakulam	30	3	0	8	19
22	Tirupati	34	30	4	0	0
23	Visakhapatnam	11	6	1	0	0
24	Vizianagaram	27	23	1	3	0
25	West Godavari	19	0	0	7	12
26	Y.S.R.Kadapa	36	1	7	6	22
Grand Total		679	177	44	144	302

***Note:**

- Twelve urban mandals are excluded from the vegetation condition assessment.
- The excluded mandals are as follows: Visakhapatnam (Seethammadhara, Maharanipeta, Gopalapatnam, Mulagada), NTR (Vijayawada North, Vijayawada East, Vijayawada Central, Vijayawada West), Guntur (Guntur urban), Kurnool (Kurnool urban), Nandyal (Srisailam) and S.P.S Nellore (Nellore urban).

