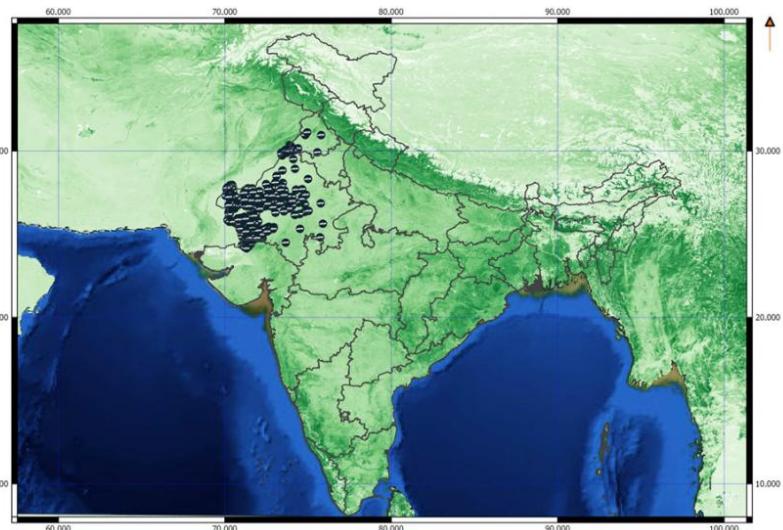


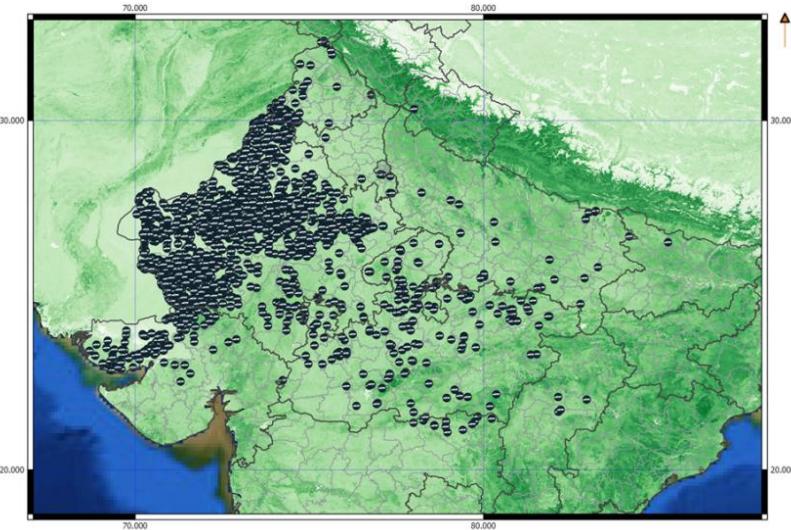
# Locust Surveillance Using Geospatial Technology

No. 7

10<sup>th</sup> July, 2020



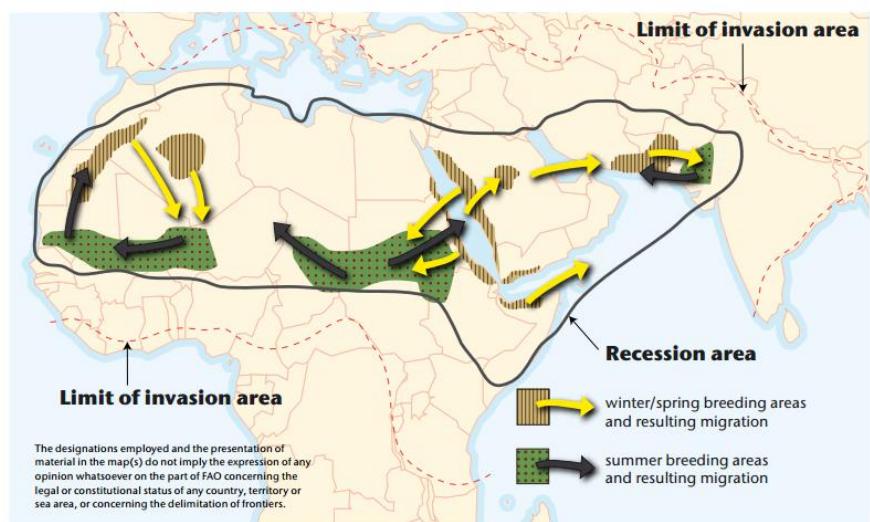
Progression of Locust in India (1<sup>st</sup> April - 15<sup>th</sup> May, 2020)



Progression of Locust in India (1<sup>st</sup> April - 30<sup>th</sup> June, 2020)



from National Geographic Magazine



## Contents

- General Situation of Desert Locust in India
- Probable Direction of Locust Migration
- Threat Map of Locust Infestation
- False Color Composite of India and Normalized Difference Vegetation Index
- Land Surface Temperature
- Leaf Area Index
- Wind Parameters
- Soil Moisture
- Root Zone Soil Moisture
- Accumulated Rainfall
- Fortnightly Progression of Locust Swarms in India
- Current and Cumulative Incidents of Locust Swarms in India
- Locust Breeding Points in Thar Desert Region overlaid on Soil Moisture, Soil Texture Map, NDVI and LST
- Locust Swarms Sightings Reported by NEWS Media
- Feedback and Suggestions

# General Situation of Desert Locust in India

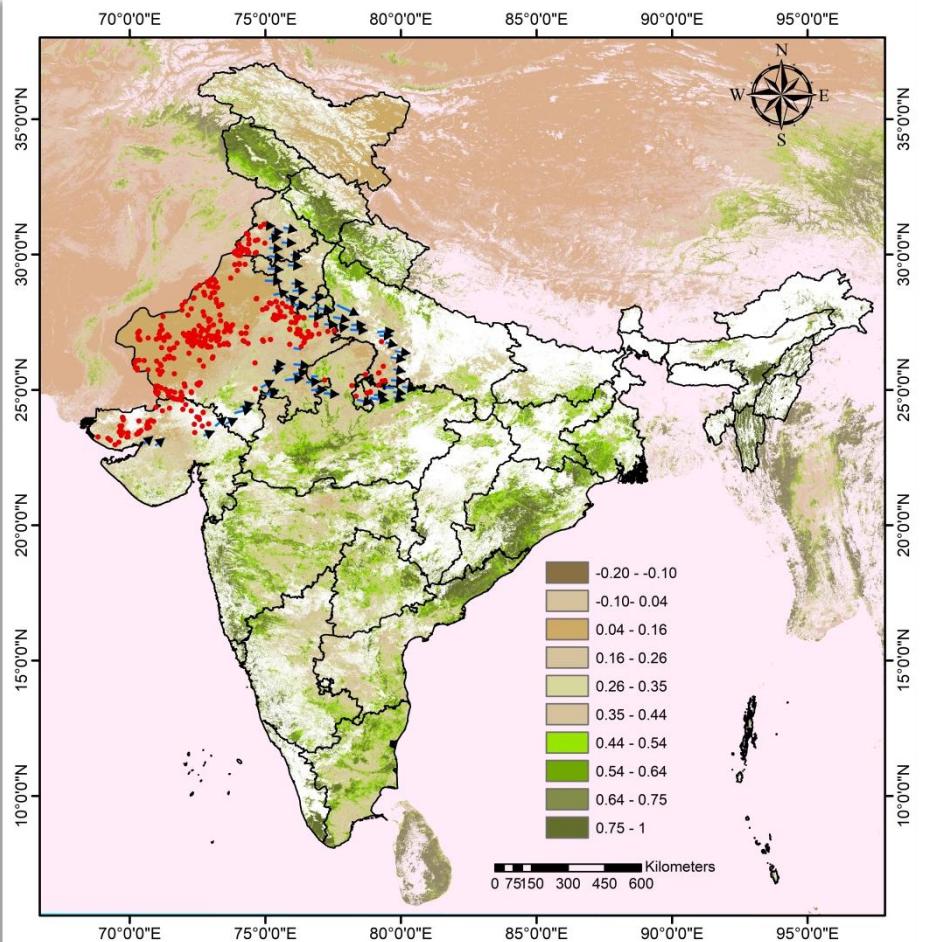
Spring-bred swarms shifting to summer breeding areas. The unprecedented Desert Locust threat to food security and livelihoods persists in the Horn of Africa and is increasing in southwest Asia. In southwest Asia, many of the spring-bred swarms migrated to the Indo-Pakistan border before the monsoon rains so some swarms continued east to northern states and a few groups reached Nepal. These swarms will return to Rajasthan with the start of the monsoon in early July to join other swarms still arriving from Iran and Pakistan, which is expected to be supplemented by swarms from the Horn of Africa in

about mid-July. Substantial hatching and band formation will occur along the During June, waves of immature swarms from spring breeding areas in Pakistan indo-Pakistan border that will cause the first-generation summer swarms to and Iran continued to arrive in Rajasthan. As conditioned were dry, some form in mid-August.

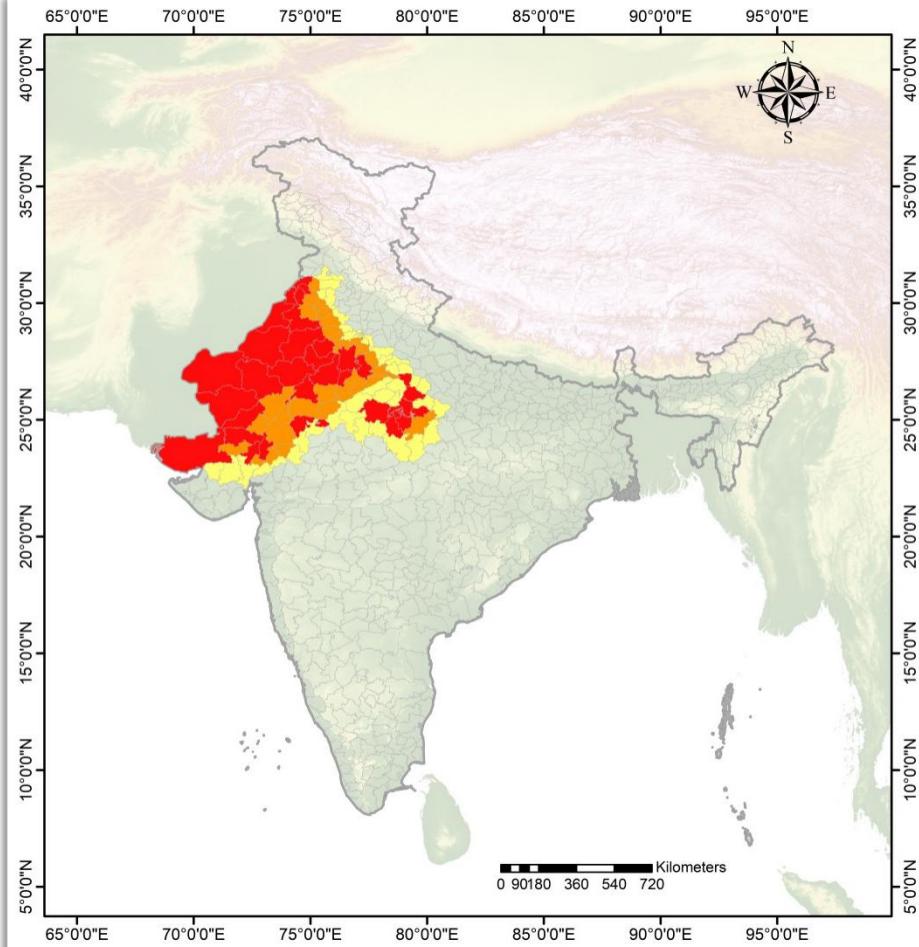
immature groups and swarms moved further east to Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Bihar. The locust generally oscillated in an east-west direction while a few small swarms surged northwards during strong southerly winds on the 26–27<sup>th</sup> in Uttar Pradesh north of Varanasi (25°19'N/83°00'E). A swarm also overflowed New Delhi on 27<sup>th</sup>. Nevertheless, a substantial number of swarms remained in Rajasthan and northern Gujarat where they were maturing. Early egg-laying occurred, and hatching started at

mid-month, giving rise to the first and second instar hopper groups south of The last remaining spring-bred swarms from the region will arrive in Rajasthan during July as well as any locusts that are in Haryana, Madhya Pradesh, Uttar Pradesh, and Chhattisgarh. This is expected to be supplemented by other swarms arriving from the Horn of Africa in about mid-July and thereafter. As the monsoon rains commence, adults will mature rapidly and lay eggs throughout Rajasthan and northern Gujarat, giving rise to an increasing number of hopper groups and bands that will start to fledge in late July.

## Probable Direction of Locust Migration



## Threat Map of Locust Infestation



**Table 1: Districts statistics with Locust Threat**

Threat Level	No. of Districts
Danger	35
Threat	31
Caution	49

**Red : Danger**

Significant threat to crops; intensive survey and control operations must be undertaken.

**Orange: Threat**

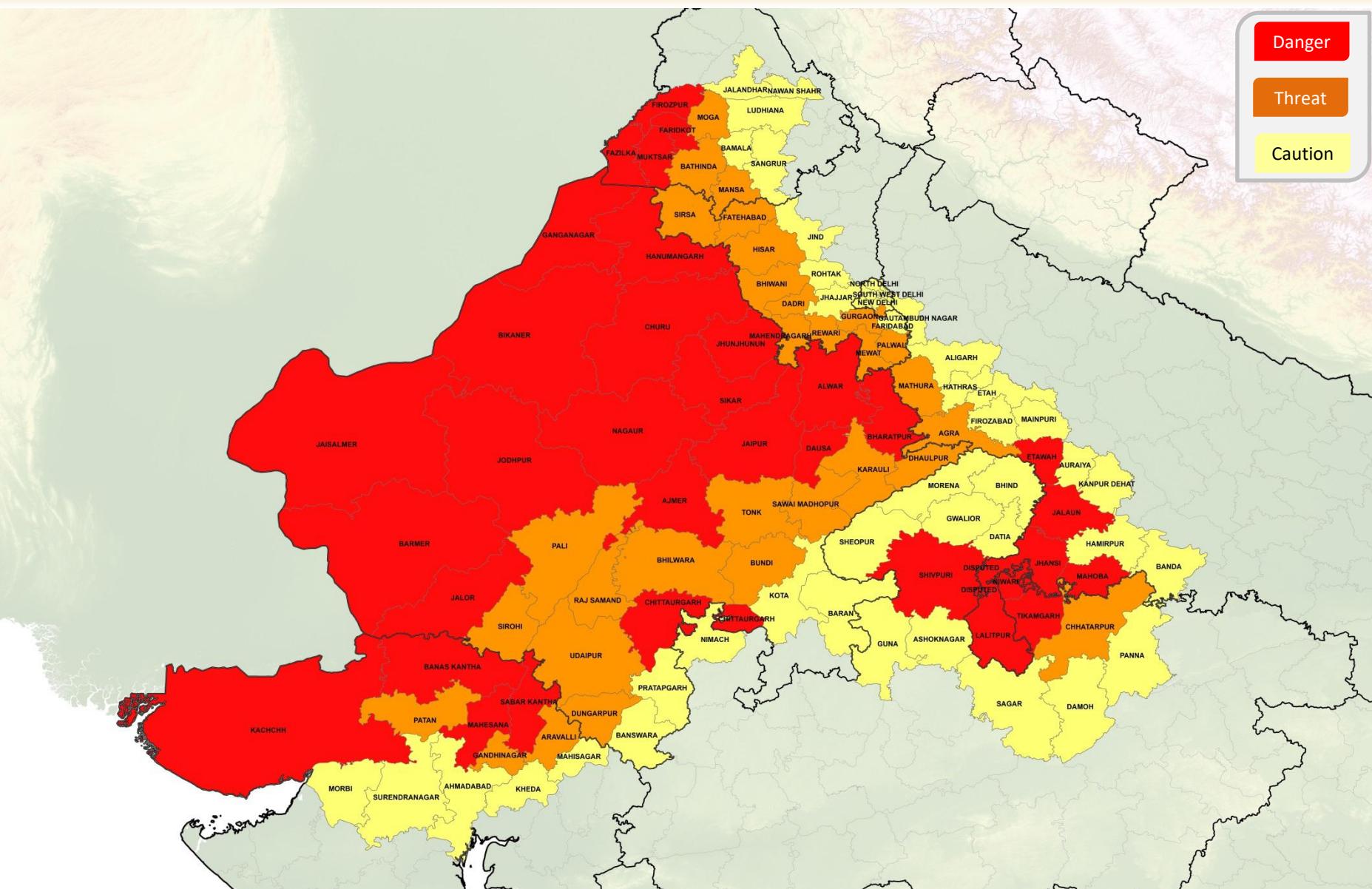
Threat to crops; survey and control operations must be undertaken

**Yellow : Caution**

Potential threat to crops; increased vigilance is required; control operations may be needed

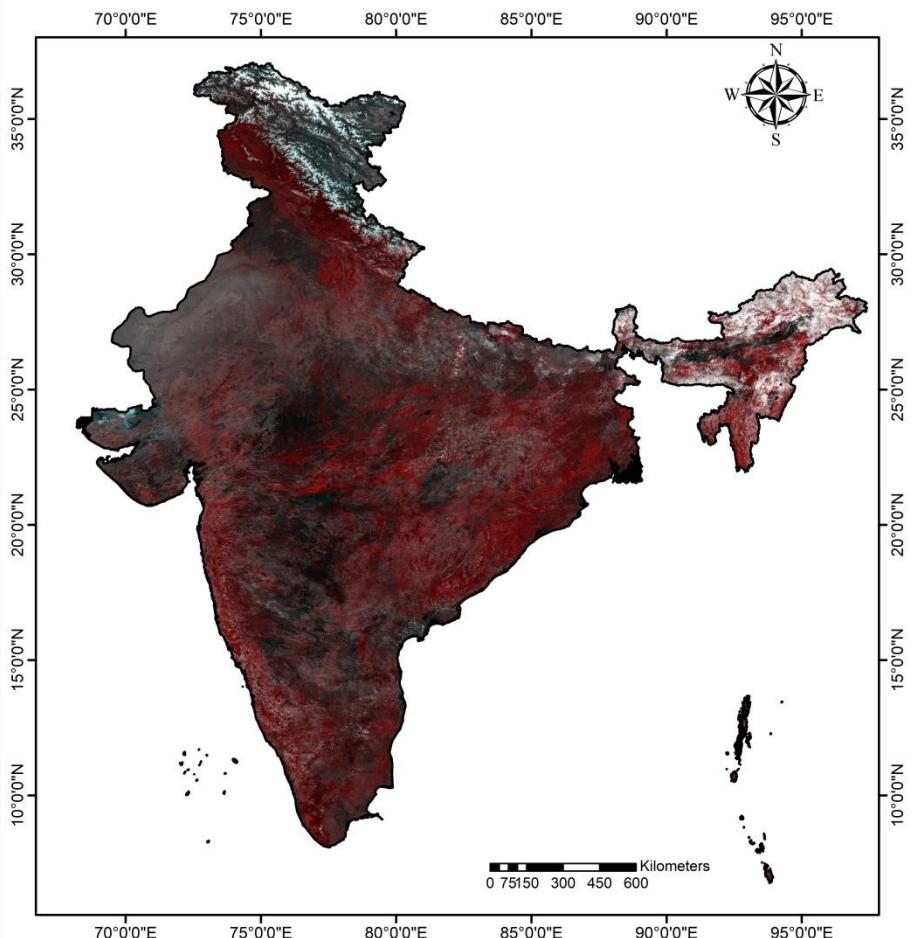
# Threat Map of Locust Infestation

Danger  
Threat  
Caution

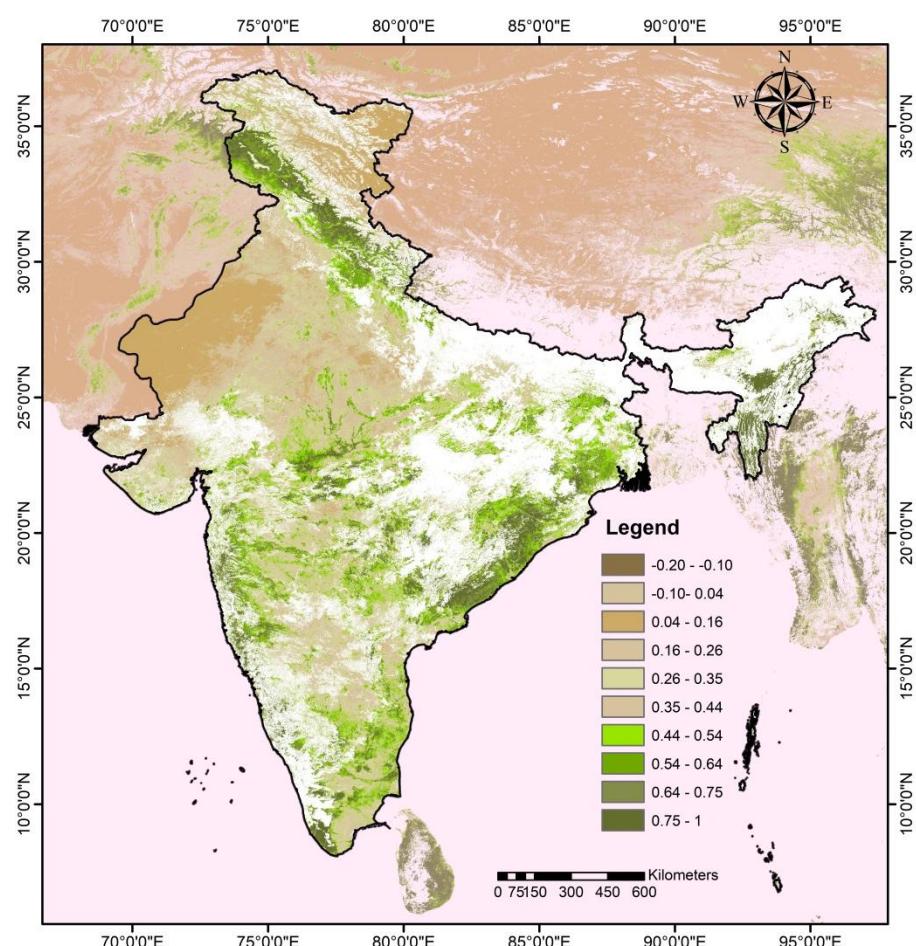


11<sup>th</sup> July 2020 ... 16<sup>th</sup> July, 2020

## False Color Composite of India



## Normalized Difference Vegetation Index

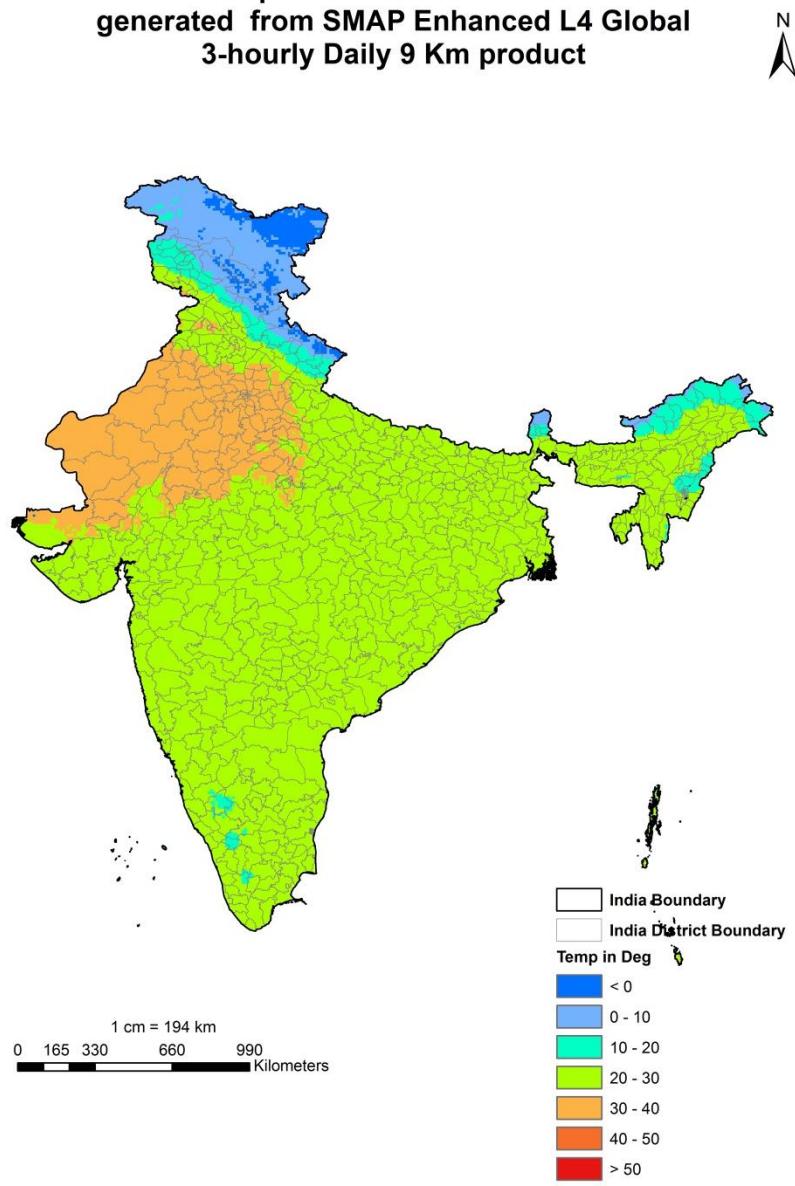


MODIS 8 day Composite Data (26<sup>th</sup> June - 3<sup>rd</sup> July, 2020)

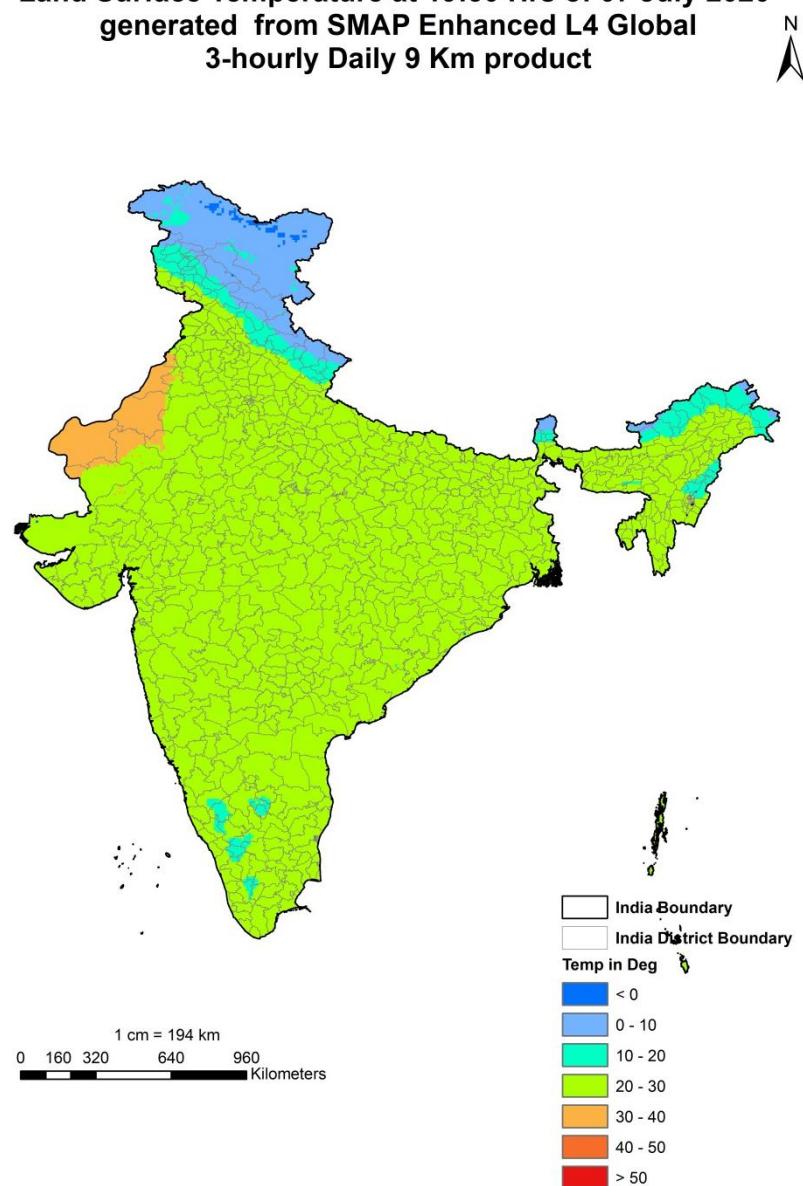
Proba V8 day Composite (26<sup>th</sup> June - 3<sup>rd</sup> July, 2020)

# Land Surface Temperature

Land Surface Temperature at 19:30 Hrs of 30 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product

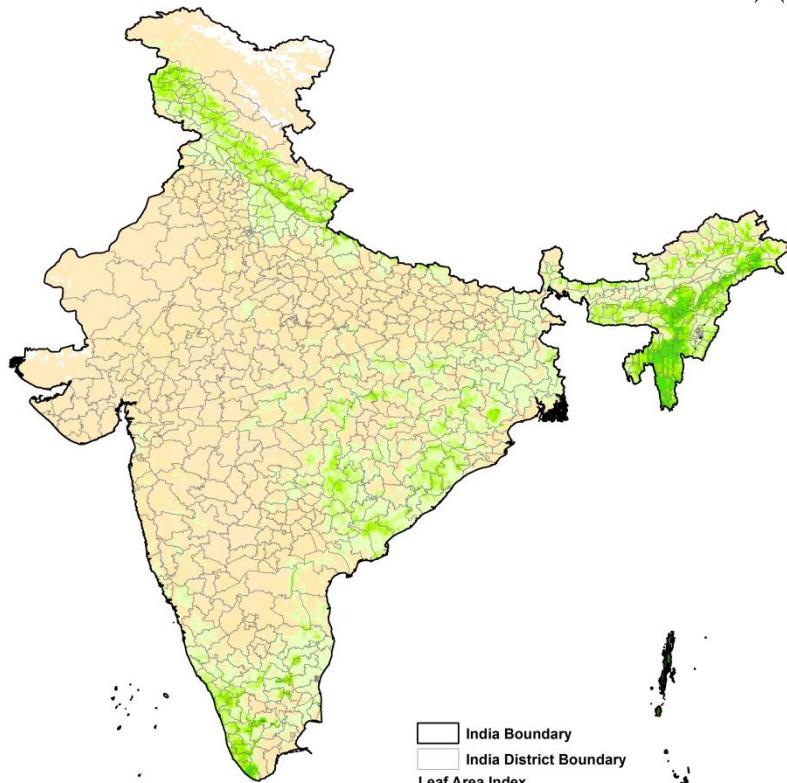


Land Surface Temperature at 19:30 Hrs of 07 July 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product



# Leaf Area Index

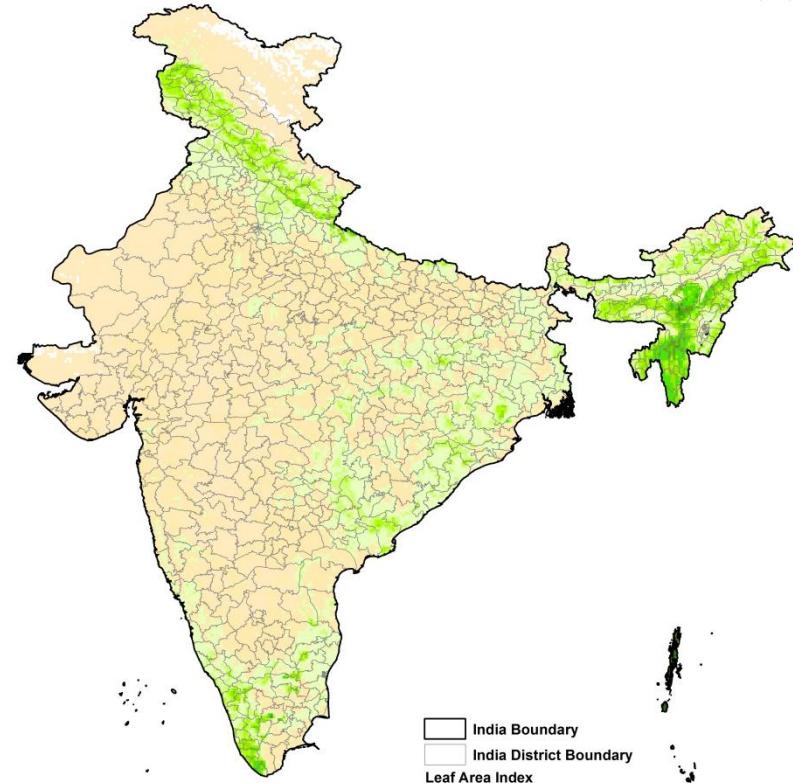
Leaf Area Index (LAI) at 19:30 Hrs of 30 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product



1 cm = 194 km  
0 165 330 660 990 Kilometers

	India Boundary
	India District Boundary
Leaf Area Index	
	0 - 0.01
	0.01 - 0.25
	0.25 - 0.5
	0.5 - 1
	1 - 1.5
	1.5 - 2
	2 - 2.5
	2.5 - 3
	3 - 3.5
	3.5 - 4
	4 - 4.5
	4.5 - 5
	> 5

Leaf Area Index (LAI) at 19:30 Hrs of 07 July 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product

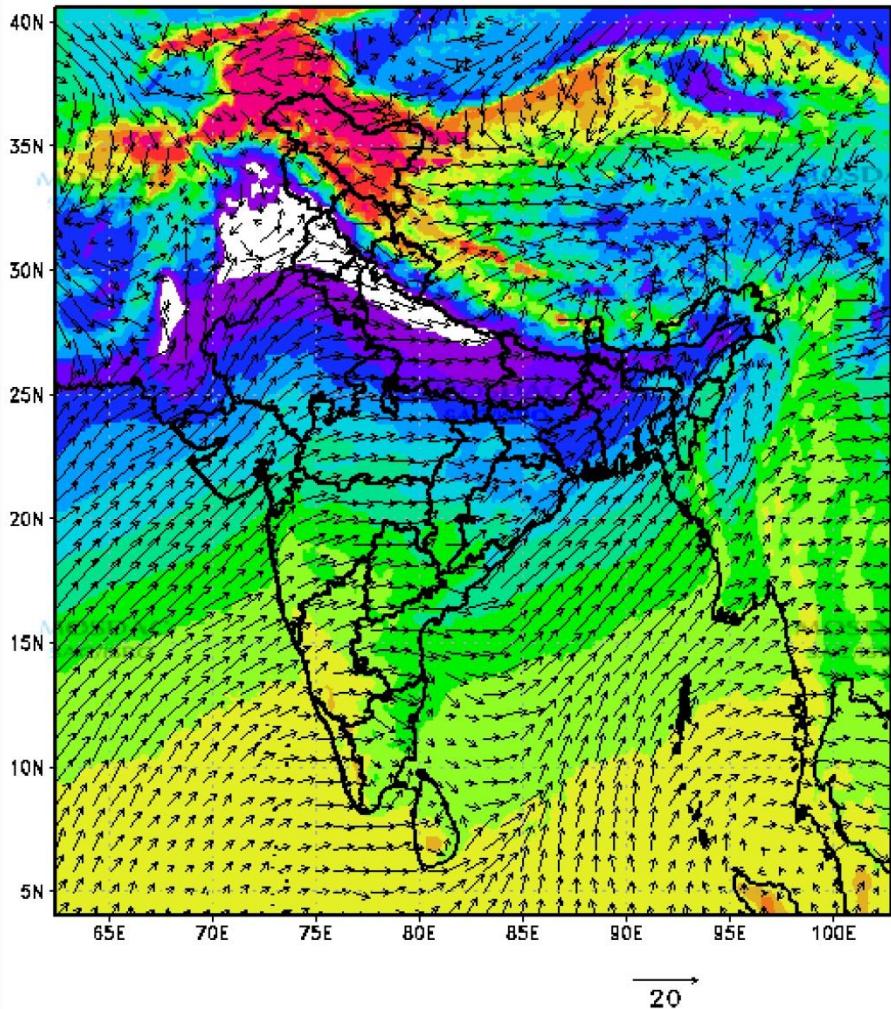


1 cm = 194 km  
0 165 330 660 990 Kilometers

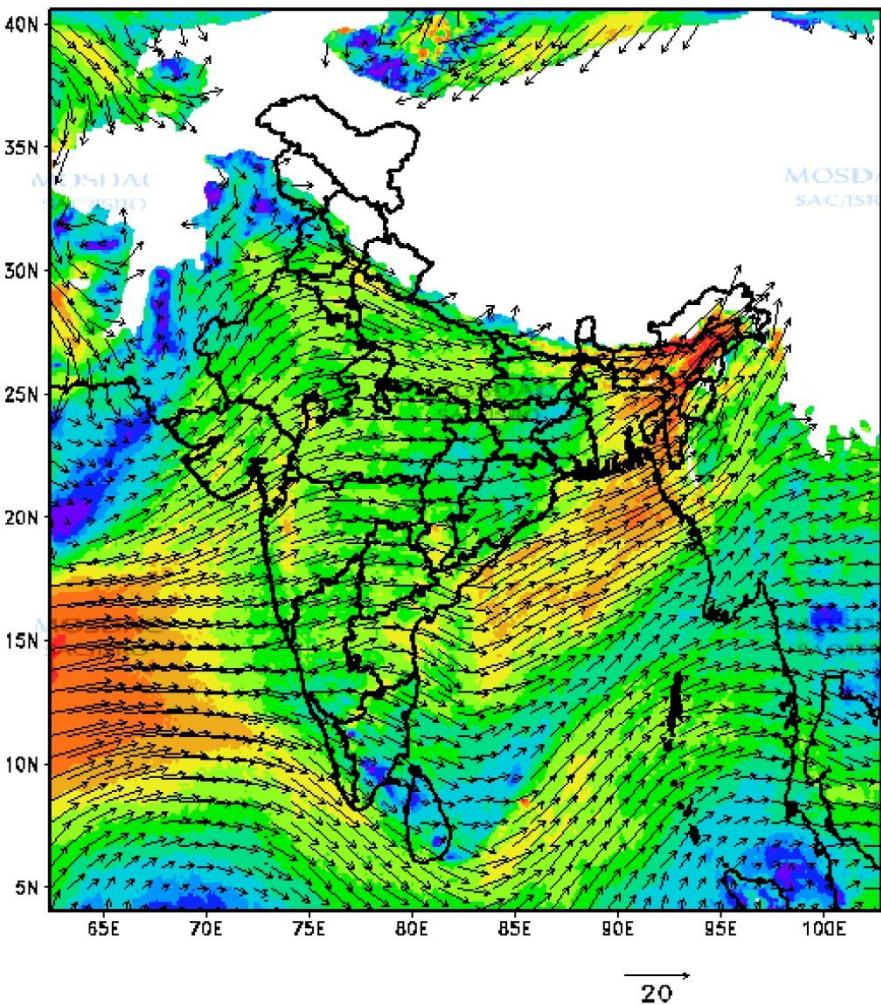
	India Boundary
	India District Boundary
Leaf Area Index	
	0 - 0.01
	0.01 - 0.25
	0.25 - 0.5
	0.5 - 1
	1 - 1.5
	1.5 - 2
	2 - 2.5
	2.5 - 3
	3 - 3.5
	3.5 - 4
	4 - 4.5
	4.5 - 5
	> 5

# Wind Parameters

30hr Forecast valid for 1130 IST 10JUL2020  
MSLP & 10m height Wind

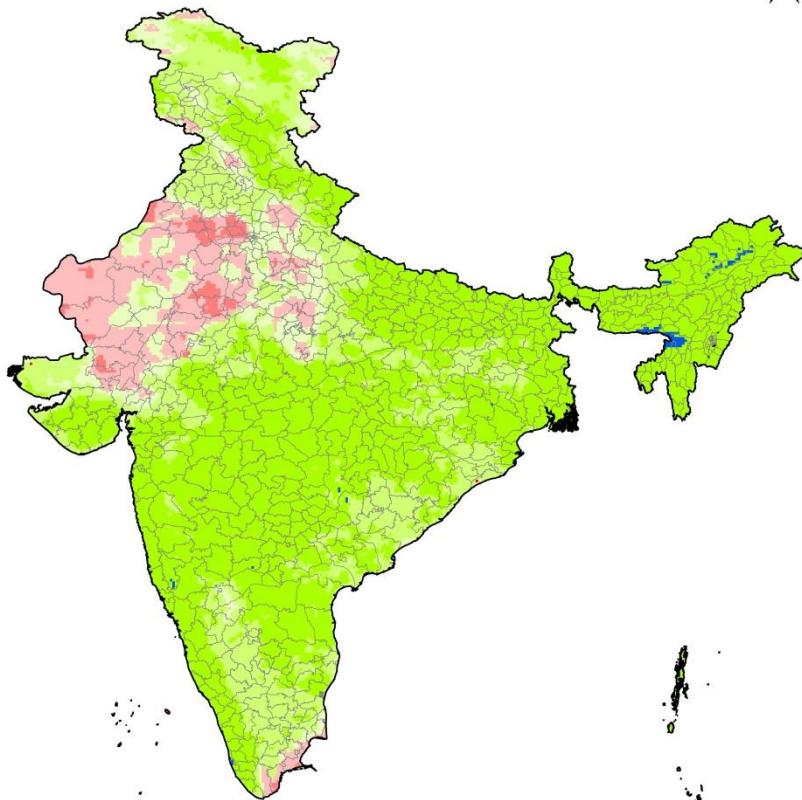


30hr Forecast valid for 1130 IST 10JUL2020  
850 hPa Wind



# Soil Moisture

Soil Moisture at 19:30 Hrs of 30 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product



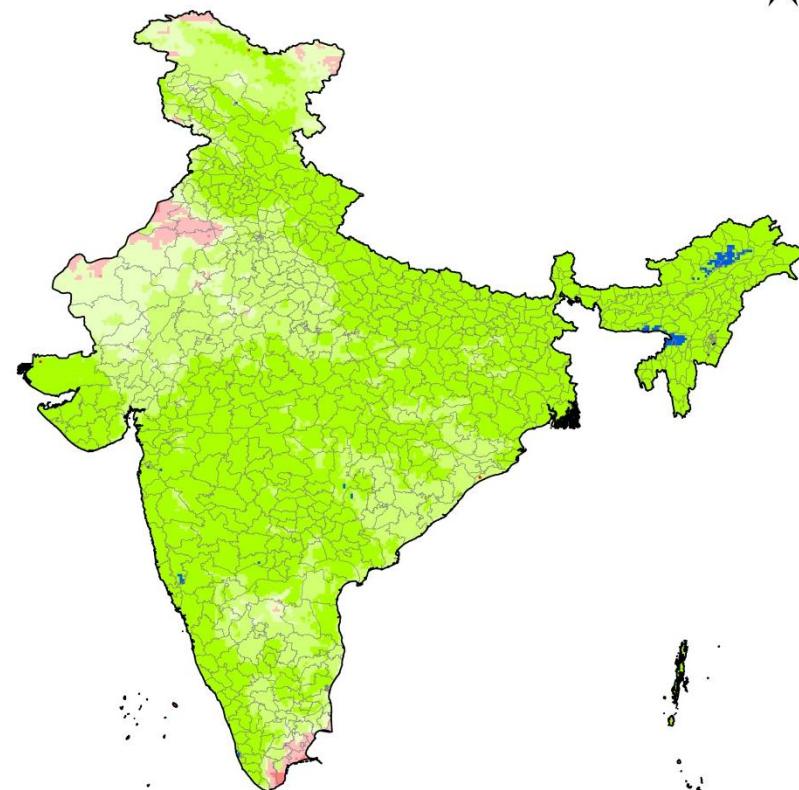
1 cm = 194 km  
0 165 330 660 990 Kilometers

India Boundary  
India District Boundary

Soil Moisture in %  
(0-5 cm vertical average)

- 0 - 3
- 3 - 6
- 6 - 10
- 10 - 15
- 15 - 25
- 25 - 50
- > 50

Soil Moisture at 19:30 Hrs of 07 July 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product



1 cm = 194 km  
0 165 330 660 990 Kilometers

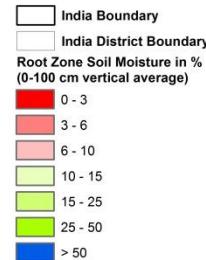
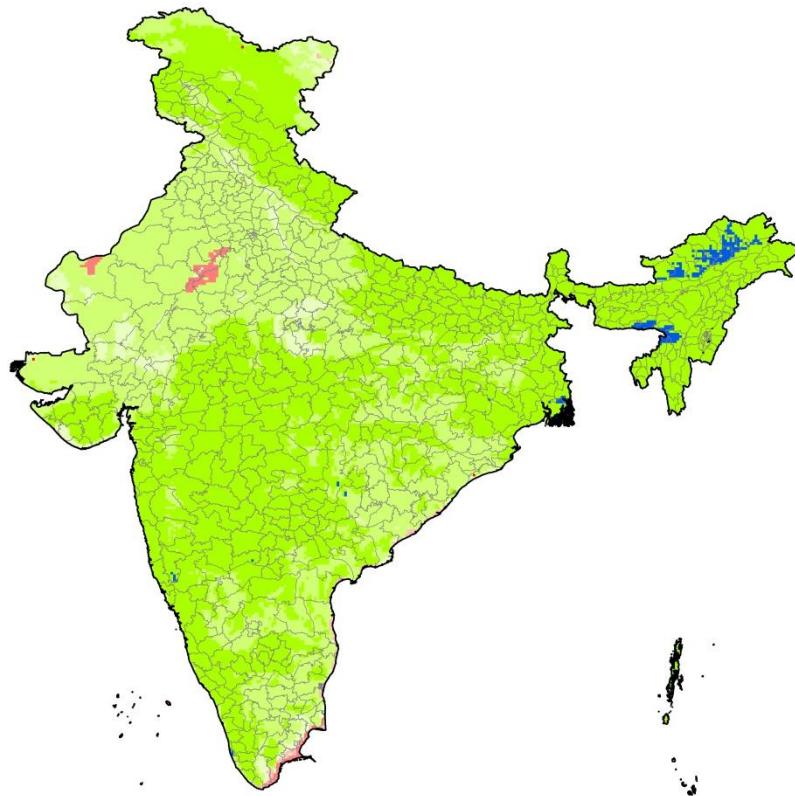
India Boundary  
India District Boundary

Soil Moisture in %  
(0-5 cm vertical average)

- 0 - 3
- 3 - 6
- 6 - 10
- 10 - 15
- 15 - 25
- 25 - 50
- > 50

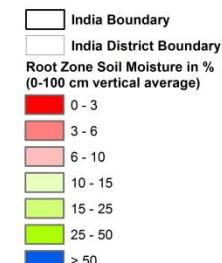
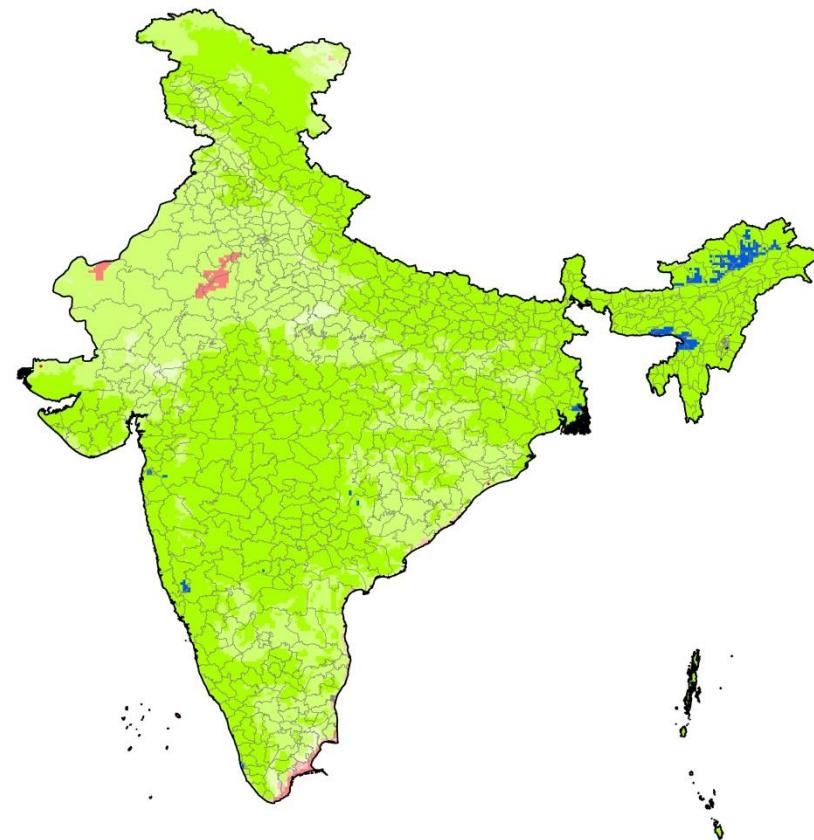
# Root Zone Soil Moisture

Root Zone Soil Moisture at 19:30 Hrs of 30 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product



1 cm = 194 km  
0 165 330 660 990 Kilometers

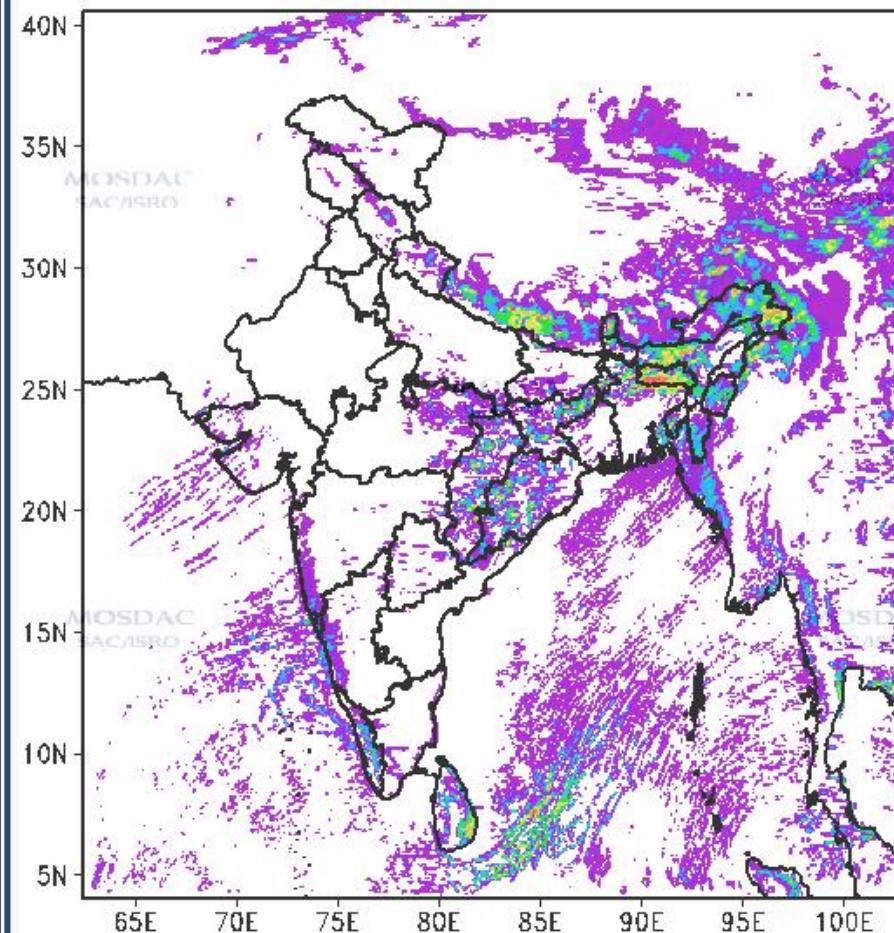
Root Zone Soil Moisture at 19:30 Hrs of 07 July 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product



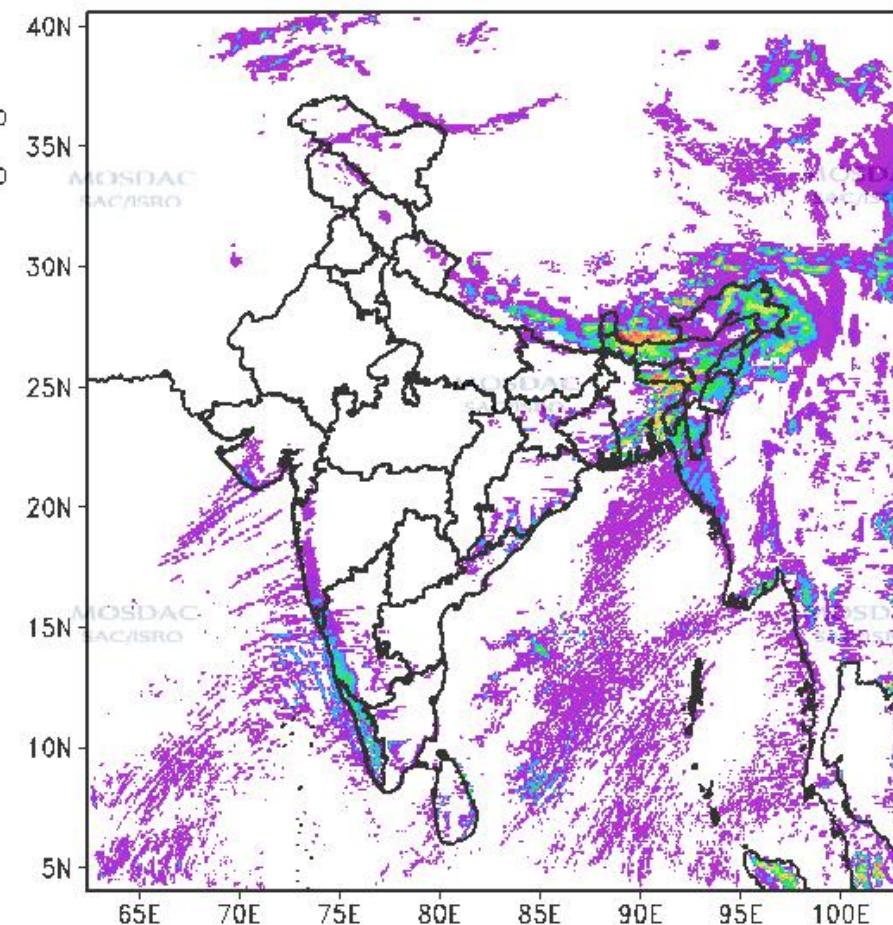
1 cm = 194 km  
0 165 330 660 990 Kilometers

# Accumulated Rainfall

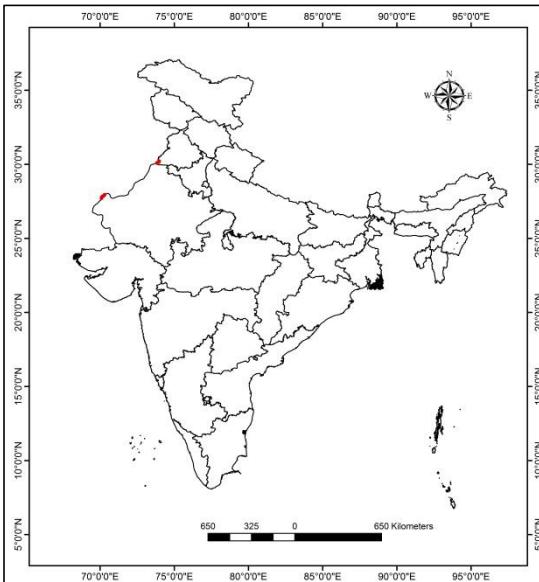
03 hr accumulated rain (mm)  
between 06Z 10JUL2020 – 09Z 10JUL2020



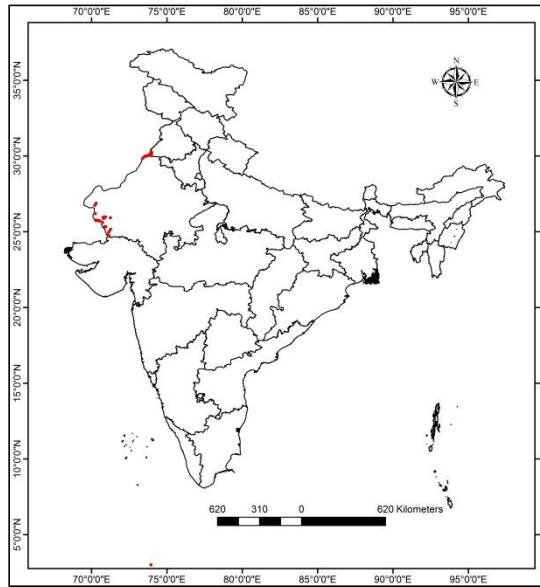
03 hr accumulated rain (mm)  
between 06Z 11JUL2020 – 09Z 11JUL2020



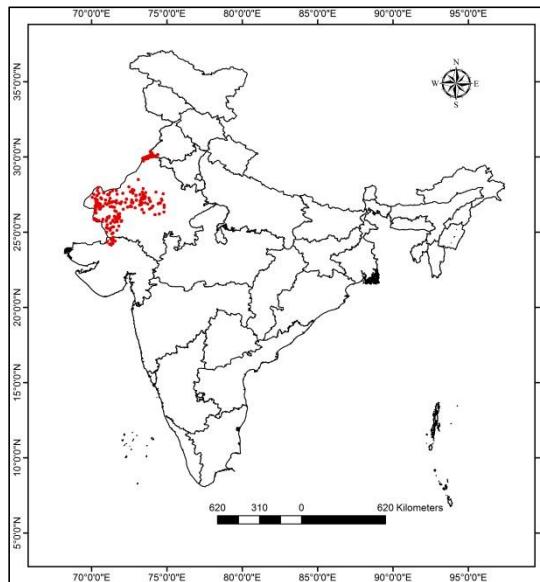
# Fortnightly Progression of Locust Swarms in India



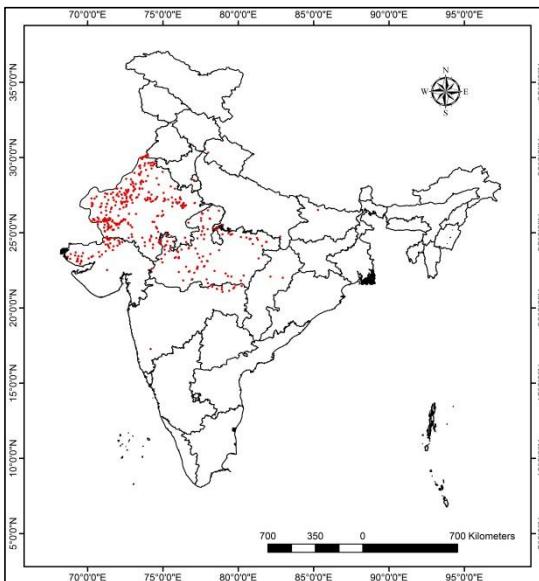
**1<sup>st</sup> – 15<sup>th</sup> April, 2020: 74 sq.km.**



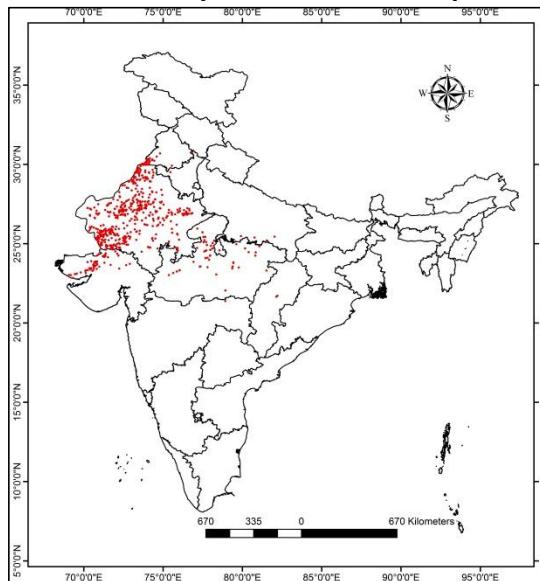
**16<sup>th</sup> – 30<sup>th</sup> April, 2020: 13604 sq.km.**



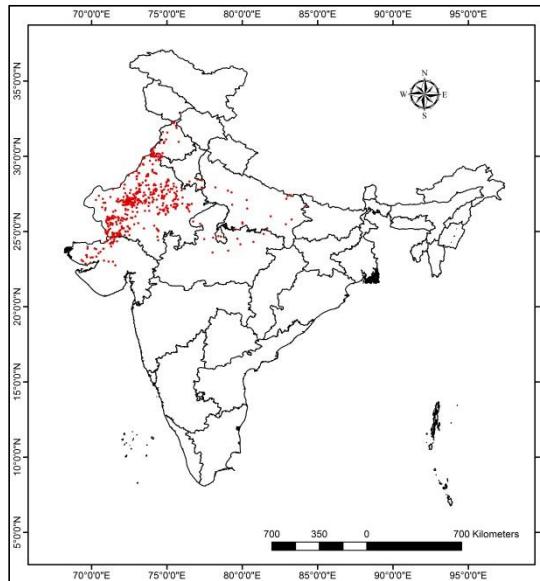
**1<sup>st</sup> – 15<sup>th</sup> May, 2020: 1,32,315 sq.km.**



**15<sup>th</sup> – 31<sup>st</sup> May, 2020: 6,45,723 sq.km.**

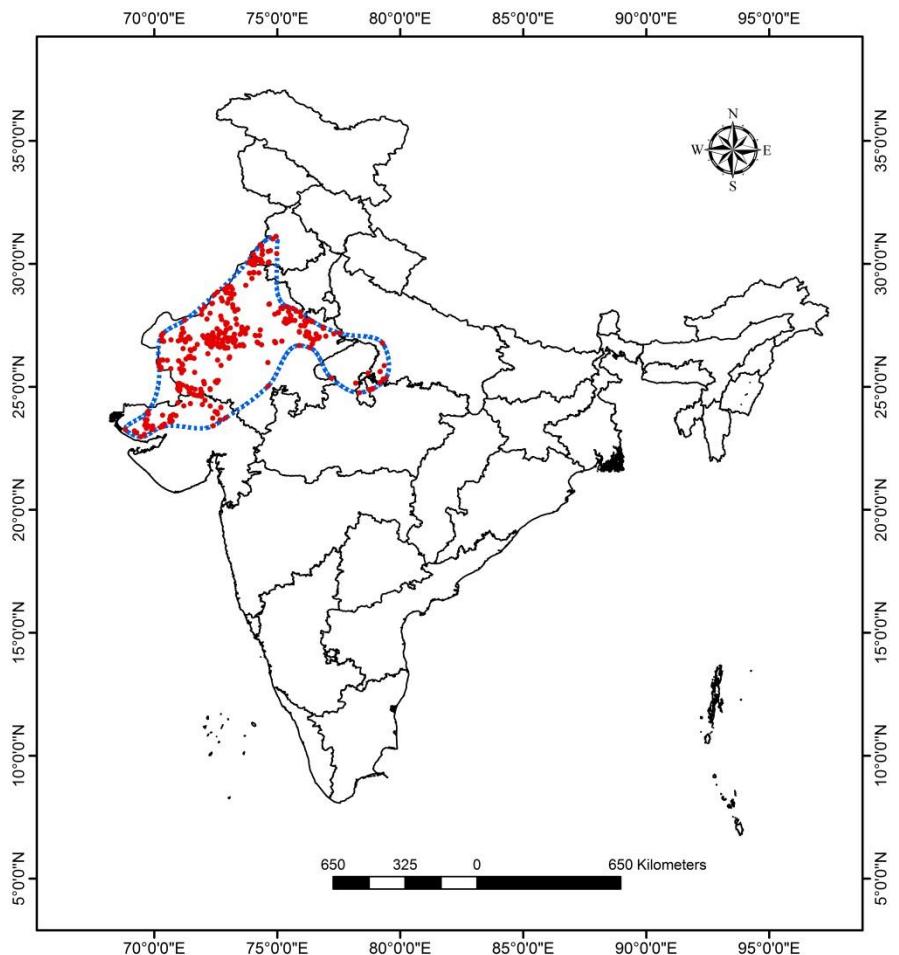


**1<sup>st</sup> – 15<sup>th</sup> June, 2020: 5,10,991 sq.km.**

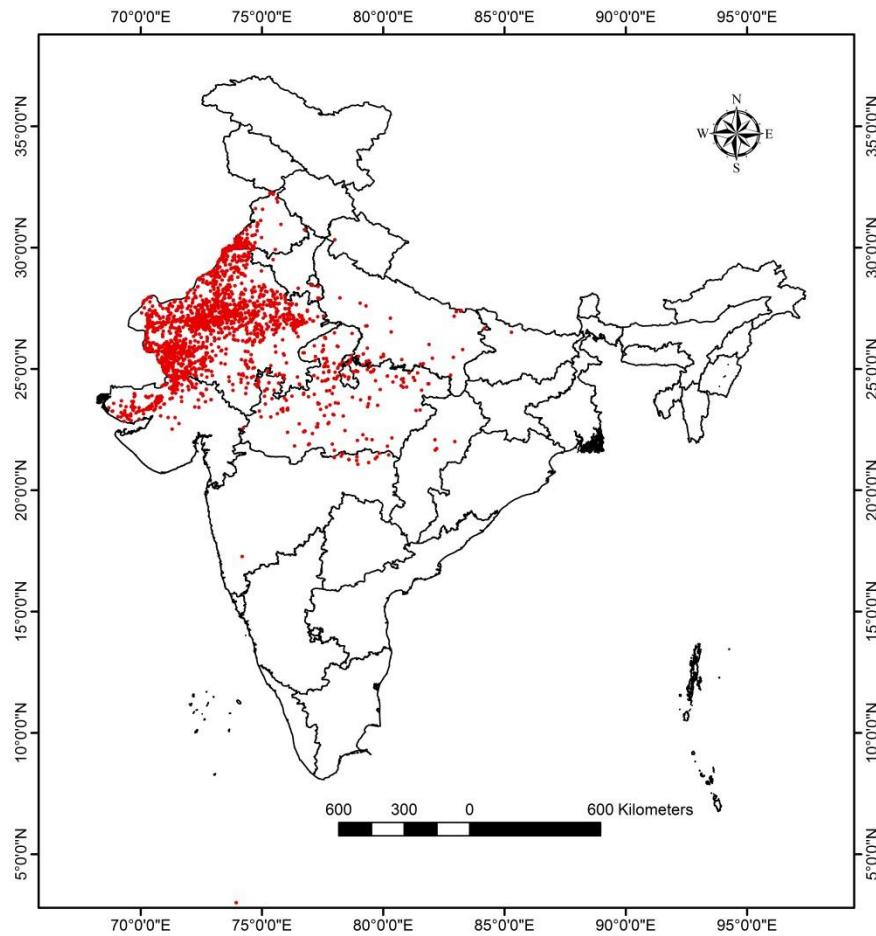


**16<sup>th</sup> – 30<sup>th</sup> June, 2020: 5,36,348 sq.km.**

# Current and Cumulative Incidents of Locust Swarms in India

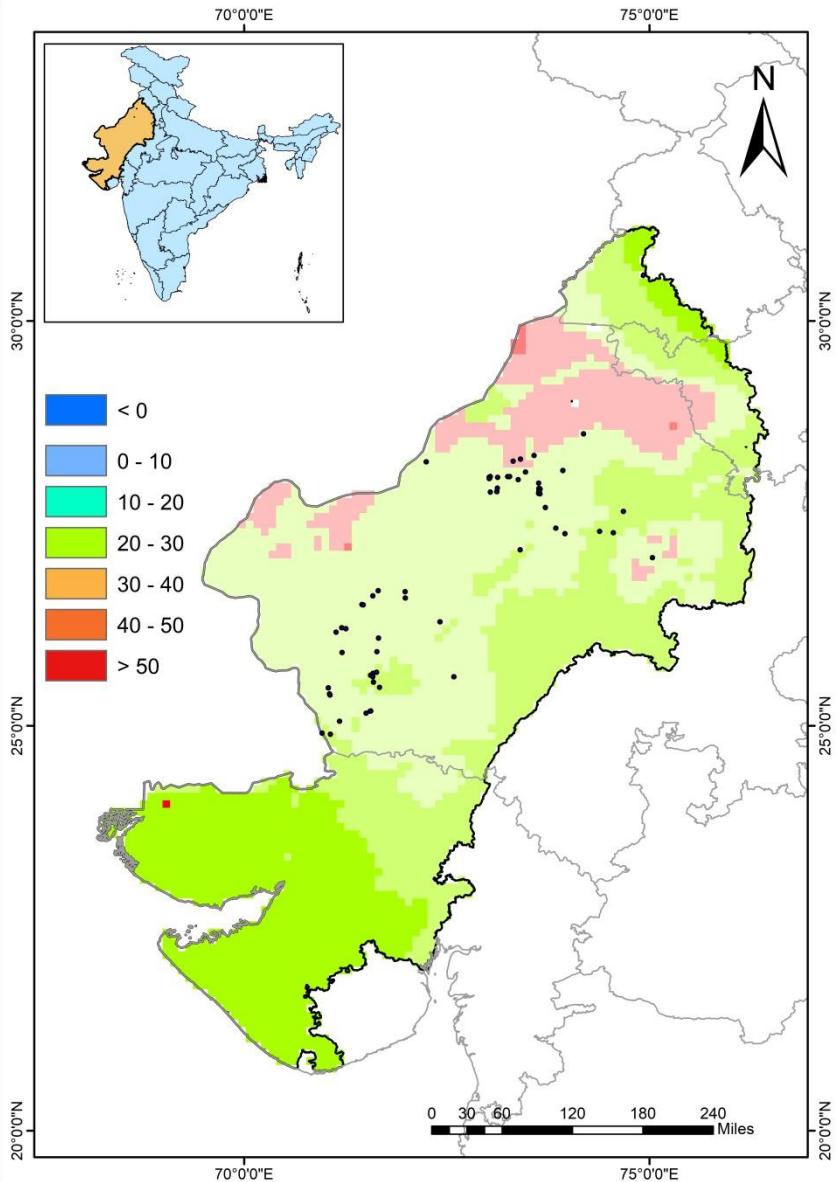


1<sup>st</sup> – 7<sup>th</sup> July, 2020: 3,75,976 sq.km.



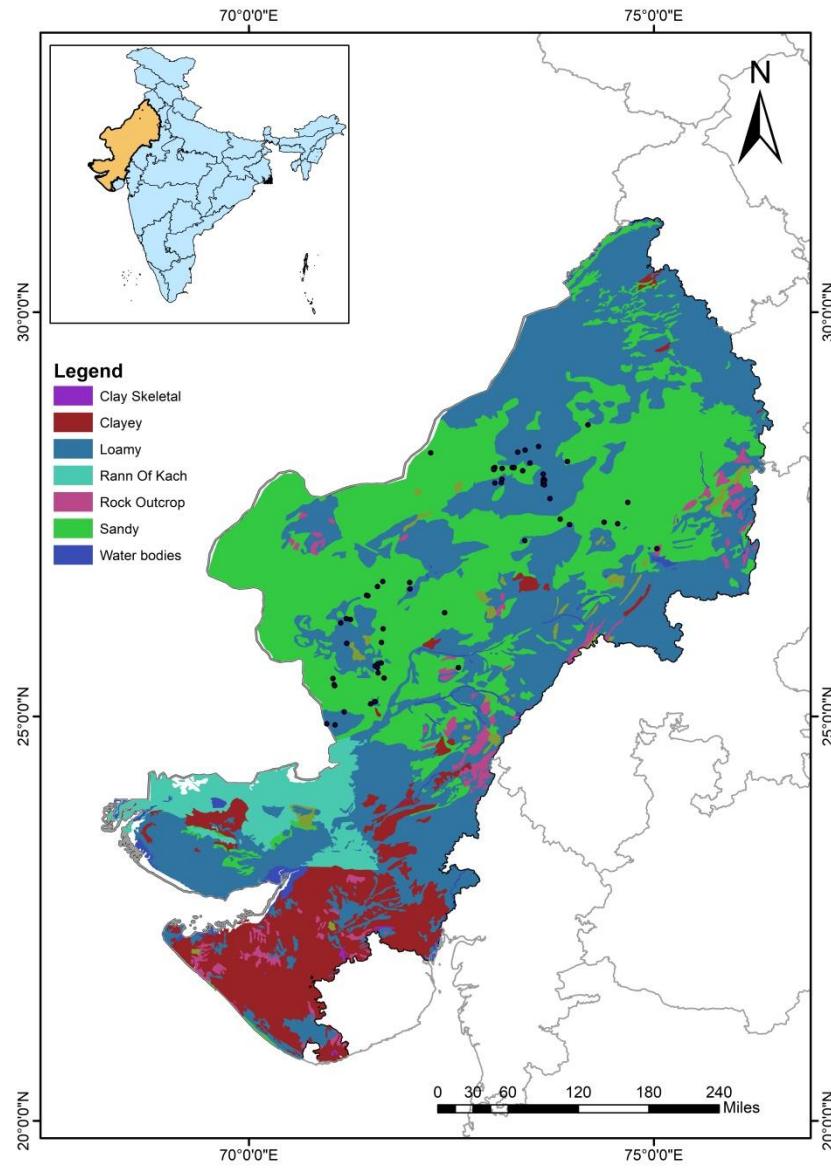
1<sup>st</sup> April – 7<sup>th</sup> July, 2020: 9,78,708 sq.km.

# Locust Breeding Points in Thar Desert Region



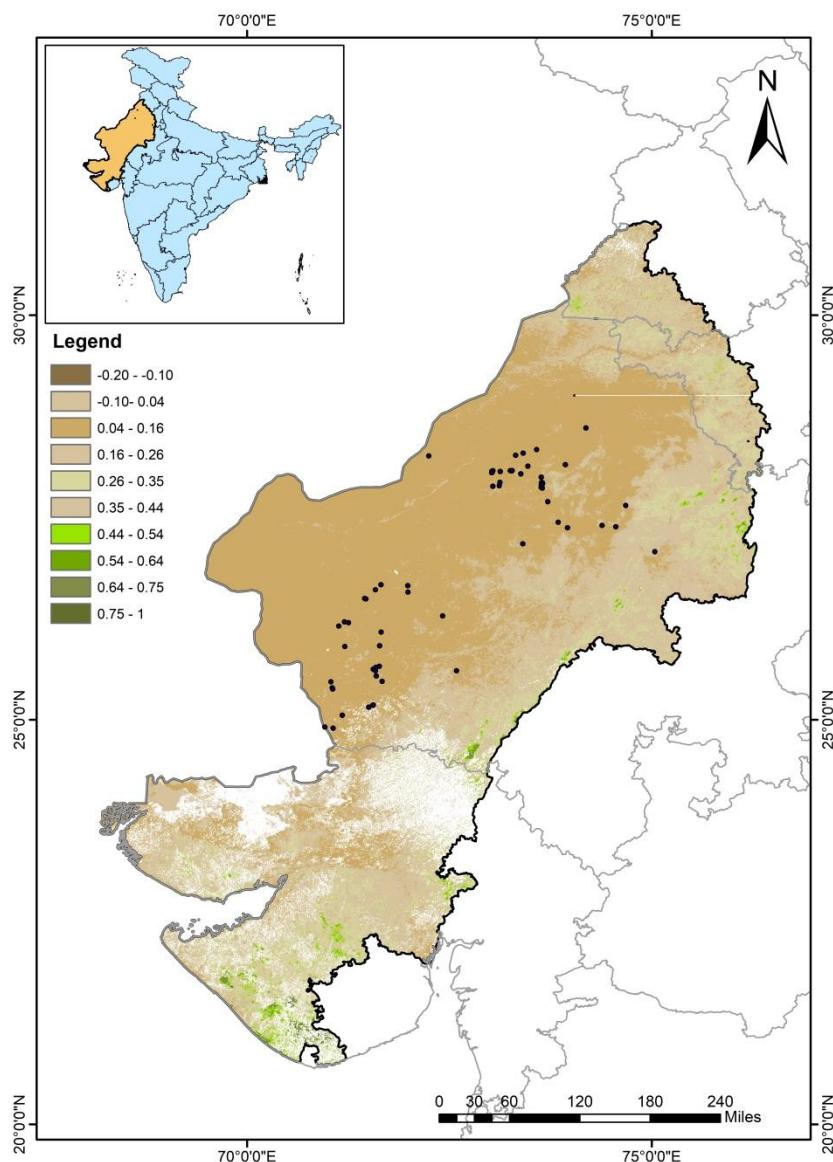
Soil Moisture Map of Thar Desert Region

SMAP Enhanced L4 Global 3 hourly Daily 9 km Product

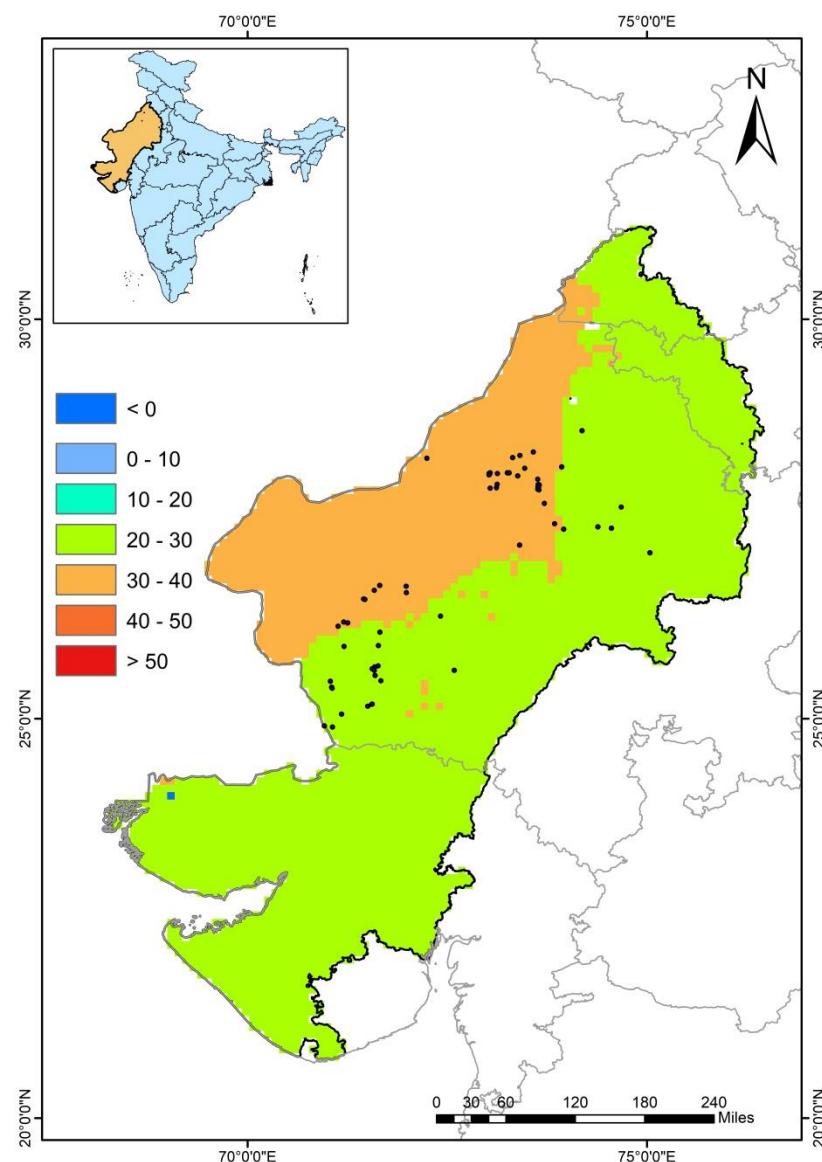


Soil Texture Map of Thar Desert Region

# Locust Breeding Points in Thar Desert Region



**Normalized Difference Vegetation Index**  
Proba V – 8 day Composite data



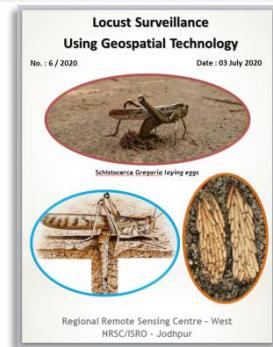
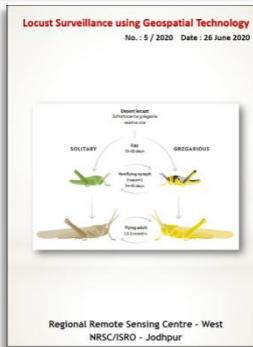
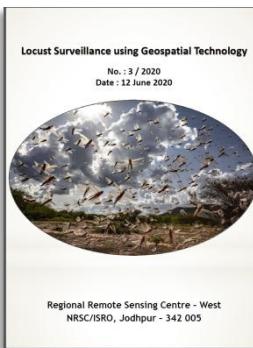
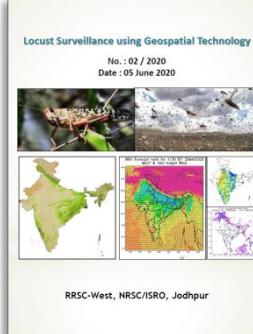
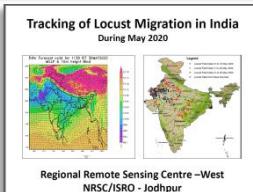
**Land Surface Temperature of Thar Desert Region**

SMAP Enhanced L4 Global 3-hourly Daily 9 km Product

## Locust Swarm Sightings Reported by NEWS Media

Source	Headlines	Date	Reported Areas
The Indian Express	Locust menace: FAO asks India to be on high alert for next four weeks	05 July 2020	Jaisalmer, Barmer, Bikaner, Jodhpur, Nagaur, and Dausa of Rajasthan, and Alert in Madhya Pradesh, Punjab, Gujarat, Uttar Pradesh, Maharashtra, Chhattisgarh, Haryana and Bihar.
Amar Ujala	भारत पर फिर हो सकता है टिड़ी दल का हमला, सरकार ने छह राज्यों को हाई अलर्ट पर रखा	05 July 2020	Active : जैसलमेर, बाड़मेर, जोधपुर, नागौर, सिकार, जयपुर और अलवर (राजस्थान) टीकमगढ़ (मध्यप्रदेश) Alert : राजस्थान, मध्यप्रदेश, पंजाब, गुजरात, उत्तर प्रदेश और हरियाणा
The Hindu	FAO issues locust alert for India	05 July 2020	Rajasthan, Madhya Pradesh, Punjab, Gujarat, Uttar Pradesh, Maharashtra, Chhattisgarh, Haryana and Bihar
Livemint	Locust menace: FAO asks India to be on high alert for next 4 weeks	05 July 2020	Rajasthan, Madhya Pradesh, Punjab, Gujarat, Uttar Pradesh, Maharashtra, Chhattisgarh, Haryana and Bihar
Amar Ujala	लोहारू के बाद बहल क्षेत्र के गांवों में दिखे टिड़ी दल	06 July 2020	सुरपुरा कला, मंडोली कला, मंडोली खुर्द और गोकलपुरा (बहल, हरियाणा)
Hindustan Times	Rajasthan: Locusts destroy crops in Dholpur	07 July 2020	Dholpur district in Rajasthan.
Hindustan Times	Armed with pesticides, Mi-17 choppers fight locust swarms	07 July 2020	New Delhi, Rajasthan
Jagran	राजस्थान, मध्य प्रदेश और यूपी में टिड़ीयों का ताड़व, सरकार ने कीटनाशकों का छिकाव तेज किया	08 July 2020	राजस्थान के बाड़मेर, बीकानेर, जोधपुर, नागौर, अजमेर, सीकर और जयपुर, मध्य प्रदेश के टीकमगढ़ और उत्तर प्रदेश के झांसी जिले
Amar Ujala	सुबह होते ही टिड़ी दल ने गांवों में किया हमला	10 July 2020	मुसनौता, पंचनौता, गावडी जाट, रापड़ सराय (हरियाणा)
DAWN	Major locust swarms may reach Pakistan later this month	10 July 2020	Pakistan
Jagran	Tiddi Dal Attack In UP: आगरा से महज 40 किमी दूरी पर है आफत, अलर्ट किया जारी	10 July 2020	पिनाहट ब्लॉक के गांव उदयपुर खालसा, आगरा (उत्तर प्रदेश)
Jagran	Tiddi Dal Attack: फिर दिल्ली के करीब टिड़ी दल, राजस्थान की सीमा से सटे गांवों में उड़ रहे टिड़ी	10 July 2020	राजस्थान, मरवंगढ़ (हरियाणा)

## Feedback and Suggestions



I am happy to the Bulletin issued by RRSC with extensive set of geospatial layers. I am hopeful the concerned officials in various States make use of this valuable guide for tackling the menace of locusts attacks. Will appreciate if you can also attach the feedback received from various users at ground level.

Dr. V. Jayaraman, Ex-Director, NRSC

Timely publications of Locust bulletin with multi source data is worth appreciation.

Dr. C. S. Jha, Regional Centres, NRSC

Very good study. Thanks for sharing the bulletin.

Dr. P.V.N. Rao, RSA, NRSC

It's important study, I congratulate you and team for bringing out this bulletin. Addl. Chief Secretary also appreciated the efforts.

Dr. B. Pateriya, PRSC, Ludhiana

Congratulations for the excellent report on Locust spread and other associated analysis.

Prof. M.P. Poonia  
Birla Institute of Scientific Research

Please send your feedback to rrsc\_w@nrsc.gov.in | ssrao@nrsc.gov.in