Heavy Rainfall for the Block, District & Location level :Decision Making - Early warning system



Dr. K NAGA RATNA Scientist-E Meteorological Centre, Hyderabad

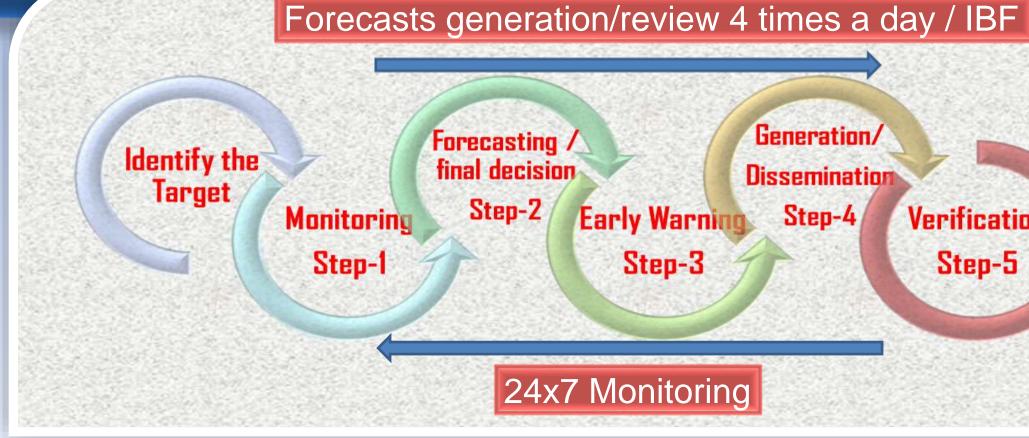




Targets/Decision making

Identify the target

- 1. Monitoring
- 2. Forecast
- Product Generation/Dissemination 3.
- 4. Verification





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Verification Step-5



Step1: Monitoring

Gathering the products/information, Identify the decision on forecast and weigh the evidence based onobservations

a. Monitoring the Current Observation's and Past 24 Hour Rainfall at 03UTC. b. Synoptic Features (Past 3 Days)

> (Synoptic System Features (Low, Depression or Trough) (Present 24 Change, Presure Departure, Temperature 24 Change, Temp. Dep.) (Upper Air Wind Analysis/RSRW)

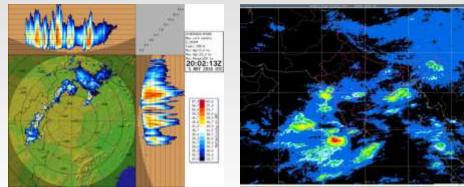
c. Model Forecast At Various Ranges(Nowcast, Short Range, Medium Range Forecast) d. Deterministic and Probalistic Forecast Products on Heavy Rainfall Intensity and spatial

Distribution to the District and Block Level.

e. Satellite Products(Such as INSAT, HEM others)

f. Radar Products(reflectivity, PPI, Vertical and

horizontal winds, shear)





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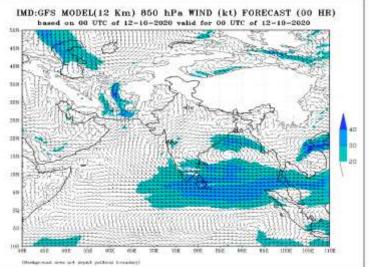


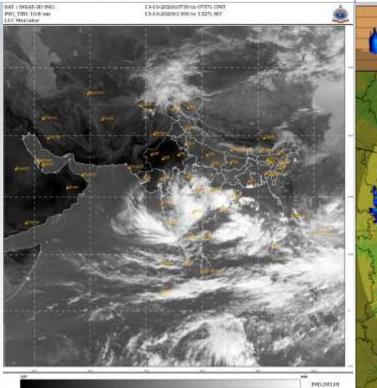
Step2: Forecasting

Step2: Forecasting

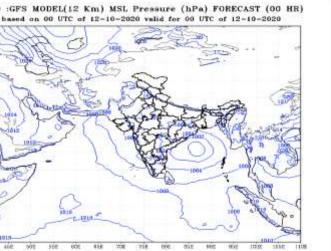
Choose among the products available /alternatives

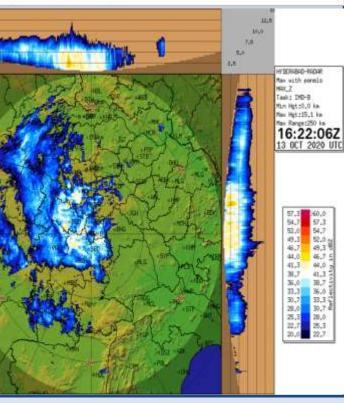
- Detection of intensity of Rainfall occurrence. 1)
- II) Detection of Specific Regions for probable zone of occurrence of Heavy Rainfall based on **Deterministic and Probabilistic Model outputs** Comparison of the climatology of the block and Station and the present situation to determine the future forecast for the next 3 Days.
- III) Finalization of the Forecast for the Potential zone of the Rainfall at the Block/ District Level.
- IV) Utilisation of South Asian Flash Flood Guidance













Step3: Early Warning

Step3: Early Warning Take Action based on risk levels and issue IBF Finalize the Early warning for the Heavy Rainfall of the next 3 Days Green : No warning (Very Low Risk, NO Impact) Yellow: Be Updated (Low Risk Level, Watch any Increase/Decrease in the WX Conditions) Orange: Be Alert (Medium Risk Level, Be prepared for the Situation) Red: Take Action (High risk Level, Ready to take Action)

	High		2	7	10	Co	olou
	Medium		1	6	9	Risk level]
ikelihood	Low			4	8	Very Low	J
lih	Very Low			3	5	Low	
Jike		Very Low	Low	Medium	High	Medium]
			Impact			High	,





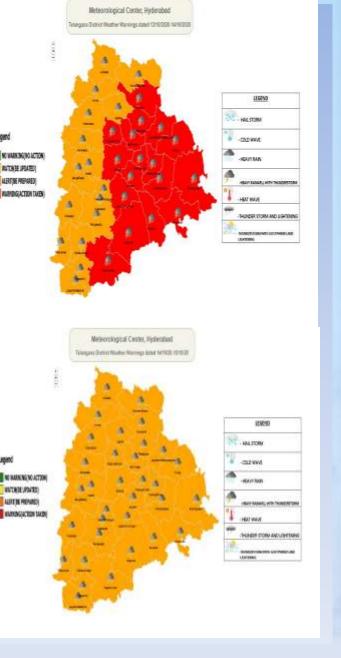


Step4(a): Product Generation

- After analysis and Finalization of the Forecast and Warnings Color codes for the Heavy Rainfall of the Block and District Level.
- Generate the Forecast and Warning Maps and Prepare the Impact Based alerts Using QGIS and Web GIS.
- Generate the Flash Flood Forecast for the Water Sheds level .

(భూవితేరాళానమంత్రరతవశాఖ) వాతావరణకందరం, బేగంపీటవిచూనాశ్రియం, హైదరాబాద్ -600 016.		भारतीयमौसमविज्ञनविभाग मौसमविज्ञानकेन्द्र बेगुम्पेटएअरपोर्ट,हैदराबा -500 016.	India Meteorological Department Meteorological Centre, Begumpet Airport, Hyderabad-500 016.	
DATE: 2	DISTRICT -07-2021 1) Chief Secret 2) Relief Com 3) Concern Di 4) GHMC Hy	missioner, SDMA, Telangana strict Collectors, Telangana derabad adio, Hyderabad		
Date		Warnings	Impact	
Day1:From: 1600hrs1ST of 22/07/2021 To : 0830 hrs IST of 13/07/2021	HEAVY RAIN'V pinces in Addition Minicipana, dispit Simila, Kamured HEAVY to VEB occur at ISOLA Peddapalli, Jaya Khamman, Sury (Rural), Jangaon Medak districts HEAVY RAIN'V places in Muhugu Yadadri Ehuvang Malkaji giri, Maha districts of Telana Thunderstorm acco Winds (speed upto ISOLATED places Hyderabad City:	ey likely to occur at ISOLATED 6. Kurneran, Biesen, Asthind, al Nurnel Vizimatori, Rajanna dy distocts and XY HEAVY RAIN Very likely to TED places in Karinmagar, shankar Bhupalapally, rapet, Mahabubabad, Warangal , Siddipet, Vikarabad, Sangareddy, and also Very likely to occur at ISOLATED Badradri Kothagudem,Nalgonda, iri, Rangareddy, Hyderabad, Medchal bubnagar,Nagarlannool, Wanaparthi agna. mpanied with Lightening and Gusty 30-40 KMPH) very likely to occur at in all districts of Telangnaa. Generally Cloudy sky, Moderate to indershowers very likely to occur in	Moderate Flooding/inundation in low lying areas Water pooling on roads and low lying areas in many locations. Traffic regulation of Rail/road/air and congestion at many locations. Wet and slippery roads. Agriculture land submerge/crop damage Social diruptions of water /electricity etc Tree/branches/electric pole etc fall Reservoirs water level increase/rise	







Step4(b) : Dissemination

- Dissemination through various media to the Govt. officials , agriculture, State Disaster Management Authority, Urban centre, Police Dept. Fire dept. Airport Authority, Railways, **Tourism, Public and other agencies.**
- Dissemination Through Mail, FAX, Print /E-media, Social Media, Twitter, Facebook, whatsapp, YouTube.



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Heavy Rainfall for the Block, District & Location level

Step 5: Verification

- Verifying the forecast and warnings with the Available station and State Govt. Rain Gauge Data.
- 1. Feed back/ground truth information from Public/Govt help us in better verification and improvement of forecasts.
- 2. Feed back/suggestions/ground truth information from Public/Govt are welcome.

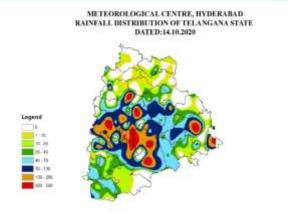
1	Date of the Events	No. IBF Forecast Issued	% of Realized		Date of the Events	No. IBF Forecast Issued
	14-07-2021 to 15-07- 2021	21	90%	C.		
					14-07-2021 to 15-07-	8
	21-07-2021 to 23-07-2021	24	100%		2021	
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	B		ारत मौसम METEOROLO	_		TMENT

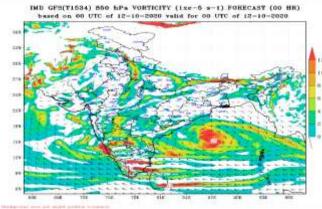


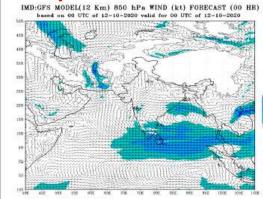
% of Realized

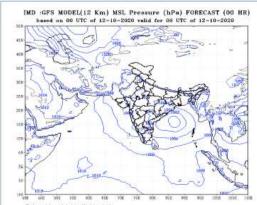
72%(HEAVY RAIN)

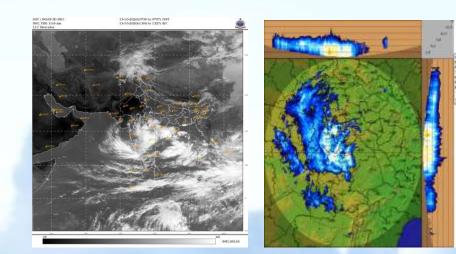
Case study 1: 14oct 2020 Flood occurred due to Extremely Heavy rainfall Hyderabad city and its surroundings(GHMC). Model outputs

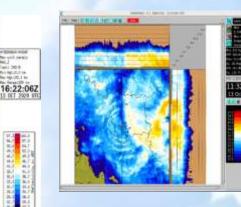












Radar and satellite





IBF bulletin issued for the Disaster Event

IBF bulletin issued for the Hyderabad city

nt, 1940-27908506/279061 199515362	GOVERNMENT OF IND India Metsorological Departme MelCentre, Regumpediarpart Hyderabad SED HEAVY RAINFALL WARNI Warning Hol 40 Ref - Take Action	МРАСТ ВИ
TIME OF ISSUE: 1330HRS IST		DATE: 13th October, 202
Adam	Instanti -	Warning
 Rosal, Ruil and Air traffic may be regulated effectively. Ineory restrict the effectively. Manisolphi Corporation may take appropriate action to control water born disease. Necessary advisory may be restored water born disease. Necessary advisory may be restored. Necessary advisory may be restored. Manisolation of the transmission of the basis of DMD imputs SDMA for necessary achieve. 	Plateding rooter largeng at many parts of hew lying areas in Diotsists of Educations and the largentian of the largentian of the avera different near largent in the same largen of the distance for the same frontes to few days. Reservoint, over flowlyneid thingter Ageisabare hards submergediency damage.	11.11.2.2.1010/Eleck Take Antiser and Antiber and Antiber and Antiber and Antiber and Antiber and Antiber and Antiber and Antiber and Antiber and A
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Meteorological Centre, Hyderalitad

	WARNING, NO. 06
	(RED - TAKE ACTION)
: 13th October, 2020	TIME OF ISSUE: 2030 HRS IST
Date	13 th October, 2020
	Generally cloudy sky. Light to Moderate Rain or thundershowers very likely to occur in most parts, at
	times intense spells in some areas of city.
Forecast	
	 Massive Water pooling on roads and
Impact Expected	low lying areas in many/most places.
impact Expected	 Traffic congestion at most locations.
	 Wet and slippery roads.
	 Tree and electric poles fall.
	 Electricity.water and other social disturbances for few hours.
	 Drainage clogging.
	 Restricted movement.
	 Necessary advisory may be issued by
Activity Suggested	Municipal corporation for displaying
	the warnings and necessary action for
	clearing water.
	 Necessary advisory may be issued by
	road, rail and Air traffic department for
	traffic regulation.
	 Response force may be advised to take
	necessary action.
	 Electricity and water department may
	be advised.

Next bulletin will be issued at 0830 HRS IST of 14th October, 2020

Date of the **Events** 15-08-2020 to 18-8-2020

12-09-2020 to 18-09-2020

19-09-2020 to 21-09-2020

10-10-2020 to 14-10-2020

Interactive Maps for the Next Two days



HYDERABAD CITY IBF

Date of the Events	No. IBF Forecast Issued	% of Realized
14-07-2020 TO 15-07-2020	8	NOT REALIZED
14-09-2020 to 18-09-2020	16	80%
19-09-2020 to 21-09-2020	16	80%
10-10-2020 to 14-10-2020	13	90%



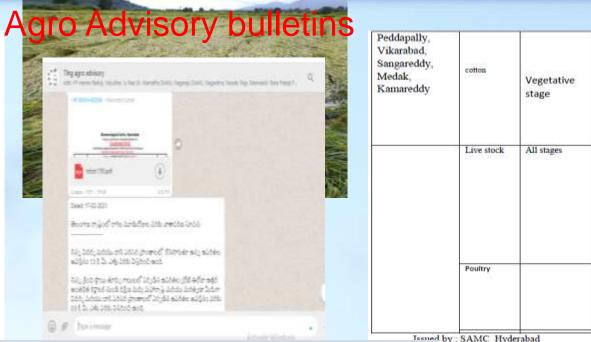
भारत मौसम विज्ञान विभाग INDIA METEOROLOGICAL DEPARTMENT

DISTRICT WISE IBF

No. IBF Forecast Issued	% of Realized
16	75%
20	80%
12	80%
13	90%



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101,5000	Feiecast Date		-		1 101	+ 111	(another		14.001	
ADRAMAN	07.10-3816	1	81	71	17	49.	43	338	3	
ADIKANAD	08-10-2826	1	30	ш	100	80	5.5	318	1	
ADILA6AD	09-10-2838	1	:11	21	84	80	3.5	47		
ACILADAD	10-18-2928	16	11	п	17	64	5.4	144	1	TS & Sylferning utorgeelth feavy rate. Neeky to occur, at isolated places
ADILABAD	11-18-3938	10	11	п	87	- 64	4	111	7	TS & lightening storgaeth heavy ison likely to occur at isolated places.
IHADRADRI-KOTHAGODEM	07-18-3920	54	36	28	85	12	4.4	294		Th with lightening likely at isolated places
INADRADIS-KOTHAGUDEM	08-10-2020	1.	10	21	96	11	2.8	261	7	TS with lightening likely at losigned places
INVOLVENTIA STREAM	09-10-3826	11	11	ш	96	14	1.8	105	1	This lightening alongesith heavy take likely to ontain at takened places
INADRADES ROTHAGUDEM	10-10-3020	- 11	- 14	ц	92 .	11	13	148	. 6	T) & lightening stargesith heavy test likely to occur at induited places
IHADRADRI KOTHAOUDEM	11-10-3826	15	- 11	21	91.	88	3.4	194	1	To 6 lightening alongseth heavy rain likely to occur at installed places
GRAAAD	07-16-2026	1	30	11	12	81	61	318	2	
HYDEBABAD	08-12-2010		81	22	- 60	51	2.8	104		
HYDERABAD	09-10-2020	1	.81	22	- 18	57	45	342		
ORBARAD	10-10-3010	10	31.8	22	85	54	4.5	258	*	The with lightening their an automatic places
HYDERARAD	11-10-2020	6	31.5	22.5	79	17	1.2	115	7	TS with Spherice likely at isolated places
AGITIAL	07-10-2020	1	-10	25	83	65	55	815		
AGITIAL	08-10-2020	1		25				334		
IAGITIAL	09-16-3820		30	25	- 88	70		150	7	TS with lightnong likely at tachatest places
IAGITIAL	10-10-2020	14	12.5	н	10	47	6	141	1	This typestic and the server sale likely to cancer at holdered places
IAGITUAL	11-10-2020	45	13.5	26		68	17	100		75.6 lightening alongset5 heavy rate liters in occur. at industed places
ANGOAN	07-10-2020		12	-36		85	9.1	316		
ANGOAR	98-18-2828	1	31	-34	303	70	6.5	336	5	
ANGOAN	09-10-2320		- 81	24	10	26	3.8	117	1	TS with lightnessing likely of to detect places
ANGOAN	10-18-2828	3	32	24		79		158	7	TS & lightening alongeth many rain Neely to occur at believed places
ANGONA CONTRACTOR	11-10-3010	11	.91	-11	軽	85	5.5	194		T) with typening likely at induced players
INTRODUCED BILIFALAPALLY	07-18-3920	1	10	н			5.6	318		15 with Sylmeony Holy at tacking plants
IAYASHANKAR BHUYALAPALLY	08-10-3920		- 12	34	20	87	1	315	5	TS with lightening likely of technist places
IAYRSHANKAR-BHURALAPALLY	09-16-3920	1	10	11	86	86	2,5	116	2	TS & lightening alongsaith heavy role. Hisky to occur at turbated places
IAYAGHAMBAR BHUPKLAPALLY	10-16-2020	1	- 84	- 26	86	84	3.8	116	3	Thatth tylenoong Holy at isoleten places
AYESHEMBAR BHUPBLAPALLY	13-38-2020	11	8	11	- 94	77	4	110	7	The web high-soning tikely of toolk/net play



Issued by ; SAMC_Hyderabad

ct no. 040 27908506, 040 27906172

24 Hours Flash Flood RISK (FFR) till 1330 IST of 28.07.2023

Moderate Risk likely over few watersheds in the Peddapalle, JayashankarBhupalpalle, Mulugu, Vikarabad, Jagitial, Warngal(u), and Warngal®,Siddipet,Jangaon, Mahabubabad, Sangareddy, Medak, Yadadri bhuvanagiri, Rangareddy, mahabubnagar, Rajanna Siricilla, Nizamabad, Kamareddy Districts in Telangana

Surface runoff Inundation may occur at some fully saturated soils & low-lying areas over AoC as depicted in map due to expected rainfall in next 24 hours.

Note: Next Bulletin will be issued based on 1930 IST of 27.07.2023.

Integration of Flash Flood Guidance with General Warnings for impact based forecast at local level

naries at aphylical d This April in Link Head his Ven his Hope 6 hr. product Dis 264, 86, 2004, 3r dates a Tar Baby Ind ACC'UNC. Mercan and Olumn 124 Read and Tokad Section in Car Location Specific Applies on some of Incomoration of last Richtley, hold, Sel 12,24 & 36 Solida and adjoining area of Northigo base and Lipper admite input like ratier, hrs, product addresiesh of Najke; Taxy an sale@e, gauge, elc. 100 land dete to Kelas ad-Impact hased quittance Taken a Die Dit ver Actionable State Pat of inter star of Lation & Los. /Subdivision Meteorological Hydrological trigge Planning product Meteorological -Hydrological trigger Flood Based model forecast Threat Mainly for advance preparations of disaster authorities 5 days warning Flash Flood Risk Subdivision driven Broad generalized view Meteorological Trigger Heavy Rainfail Warning General Forecasting

realized rainfall in past 24 hours and Quantitative precipitation forecast for 7 Days to Commission

& Heavy rainfall warnings for 7 days

FMO Hyderabad office

Issues daily Hydromet Bulletin in Monsoon Season

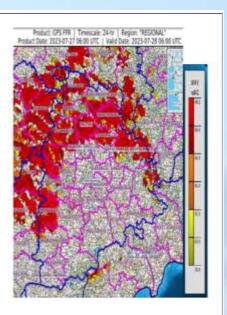
Hydromet Bulletin covering synoptic situation,

and also Cyclonic Strom events.

Flood Forecasting Division of Central Water Of both Godavari and Krishna rivers, sub-basin wise Flood Warning is issued by CWC



Seedling rot, reducing optimum plant population and educed number of squares per oranch	 Arrange proper drainage channels in black cotton soils
	In the view of thunderstorm accompanied with lighming and gusty winds Keep animals away from open water, pond or river. Keep animals away from tractors and other metal farm equipment. Avoid the tying of cattle to electrical poles, tree trunk and ensure that the cattle should be in the safe sheds or thatched shed.
	Water & pipe lines may be covered with gumy bags to provide cool water. Ensure proper cross ventilation to avoid ammonia accumulation





Somesh Kumar, I.A.S.



CHIEF SECRETARY GOVERNMENT OF TELANGANA

Date: 22.12.2020

M. Oak

Hyderabad. 2 Off.:+01-40-2345 2020 +91-40-2346 5340

Fax +91-40-2345 3700

Dr. K. Naga Ratna The Head Meteorological Centre, Hyderabad, Hyderabad-500016

| wish to express my appreciation to IMD Hyderabad that provided forecast and warnings in time, prompt and accurate way during recent monsoon season 2020 and Hyderabad floods 2020 during October 2020.

Telangana state disaster management authority (TS-SDMA) and IMD Hyderabad had very close collaboration and association in executing the timely forecasts in operational work like rescue, rehabilitation and reducing the disaster risk.

I would look forward for rendering IMD's support to the state organization in minimizing the disaster risks. Wishing for new collaborations in near future and development of weather forecasting services in realtime.

With best wishes

Gan - C

SOMESH K	(UMAR)
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14:09		5 159 %I @D
4	Tweet	



My heartfelt appreciations to you all dear officers,

The services you been rendering in rescue & relief operations of the flood affected, across Telangana, is exemplary & #BeyondTheCallOfDuty.

Plz continue the same spirit, in partnership with other Depts, till normalcy restored.





others 0 Tweet y

our reply	

GREATER HYDERABAD MUNICIPAL CORPORATION

Directorate of Enforcement, Vigilance & Disaster Management, Ground Floor, Head Office, GHMC, Hyderabad.

Date: 12-10-2020

No Sir/Madam.

Sub: - GHMC – DIR. – EV&DM – Disaster Management – High Alert - Heavy Rainfall Predictions by IMD on 12th, 13th and 14th of October 2020 – Initiate necessary measures - Reg.

Adverting to the Heavy rainfall warnings issued by Indian Meteorological Department (IMD), Hyderabad during 12th, 13th and 14th of October 2020, it is imperative to act on High abert and take necessary steps viz.

- Alert Monsoon Emergency teams & station them at possible inundation locations in centres nearby to possible inundation areas and ensure availability > Identify Rehabilitation of basic amenities.
- Ensure the availability of necessary equipment & machinery to tackle flood emergency
- > Ensure the availability of transport facility to evacuate/shift the population from possible imundation areas

In this regard, the Zonal Commissioner's, GHMC are requested to initiate necessary measures to tackle the possible emergencies that may arise due to heavy rainfall.

THIS MAY BE TREATED AS MOST URGENT.



All the Zonal Commissioner's GHMC

Copy submitted to The Commissioner, GHMC

Copy to All the Deputy Commissioner's GHMC



/DIR / EV&DM/GHMC/2020

The depression over West central Bay of Bengal has moved West -North westwards and lay centred about 319 km South East of Visakhapatnam, 350 km East Southeast of Kakinada, AP and 380 km East South east of Narsapur, AP.

It is very likely to intensify further into a deep depression in Bay of Bengal during next 24 four hours it is very likely to move West- northwest wards and cross north Andhra Pradesh coast between Narsapur and Visakhapatnam, close to Kakinada during mid night today.

As per IMA, Hyderabad and Amaravathi, squally wind speed reaching 55-65 kmph gushing to 75 kmph is likely along and off coastal Andhra Pradesh and Tamam coast.

Dr. K. Nagaratna, Director, IMD, Hyderabad, While talking to AIR this morning said that there would be heavy rains and gusty winds DEPARTMENT

Sub: HMWSSB-O&M Dn. XVII- Inflows to Himayathsagar Reservoir -Proposed Operation of Flood Gates - Request to alert public in Print & Electronic media - Reg.

With reference to the subject cited above, it is to submit that the FTL (full tank level) of Himavathsagar is 1763.50 fts with the capacity of 2.968 TMC. Due to recent rain falls in the catchment area the reservoir level reached to 1762.00 fts (2.603 TMC) recently. As per IMD forecast report, there may be expected heavy rain fall in Telangana state in the coming few days. To safeguard dam, the flood gates of Himayathsagar reservoir to be lifted at any time after reaching 1763.00 fts level depending upon inflows and further the inflows and outflows will be balanced accordingly

In this regard, it is requested to alert in Print & Electronic media in the down stream of Himayathsagar reservoir and all along Musi river

Date: 12/10/2020 Place: Himayathsagar

At 324 mm, Greater Hyd scores one-day maximum after 20 years

Preeti.Biswas@timesgroup.com

Hyderabad: October 13, 2020 went down as the rainiest day in the history of Greater Hyderabad, as the city received a month's rain on a single day, bringing life to a crippling halt. The city and its outskirts recorded 324 mm rainfall in just 24 hours, according to the Telangana State Development Planning Society (TSDPS). It was twenty years ago, on August 24, 2000, that the city had [**]**]]]]

recorded 241.5 mm of rainfall in 24 hours, triggering the Hyderabad floods.

toudy shut too toudy

Officials at the India Meteorological Department (IMD) said the core city area was las-

Continued on P4

hed with 268 mm of rainfall from October 1-14 of which 191.8 mm on Tuesday alone. "Since the deep depression

was centered over Hyderabad, it led to the torrential rains.

GOVERNMENT OF TELANGANA





O/o. The General Manager O&M Division XVII HMWSSB

PRESS RELEASE

. . . .

Your faithfully,

Sd/-General Manager O&M Division XVII, HMWSSB.

But it was indeed unprecedented as our observatory has never witnessed such a high amo-re unt of rainfall in October." said Naga Ratna, in-charge direc- the tor, the Indian Meteorological ur Department (IMD).

lar

catchment areas

In October, 2017, Hyderabad Re received 248.3 mm of rainfall in a span of 15 days, and tur- are ning back the clock to October and 1916, Hyderabad received 355.1 Th mm of rainfall in 31 days, which is an all-time record, the DU IMD said.



भारत मौसम विज्ञान विभाग

India Meteorological Department **Ministry of Earth Sciences** Government of India

Meteorological Centre HYDERABAD मौसम केंद्र हैदराबाद

मौसम की जानकारी / Weather Information



मौसम के अपडेट के लिए / For Weather updates हमारा अनुसरण इस पर कीजिये / Follow us on फेसब्क, ट्विटर, यूट्यूब और इंस्टाग्राम/ Facebook, twitter, youtube and instagram

O https://www.instagram.com/meterologicalcenter/

https://twitter.com/metcentrehyd

https://m.facebook.com/imd.hyd.3/ F

https://www.youtube.com/channel/UCgLcdtiKuvTFJpdnl2ZmoNA · YouTube

040-27908506/27906172



mausam.imd.gov.in/hyderabad

Mausam App for location specific forecast, Damini App for Lightening alerts, Meghdoot App for Agriculture forecasts















