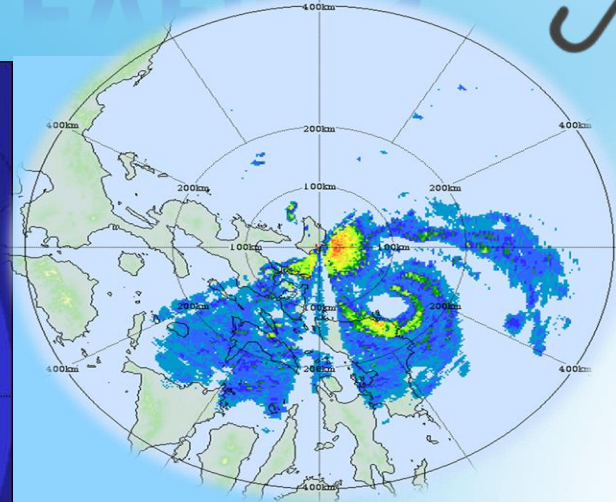
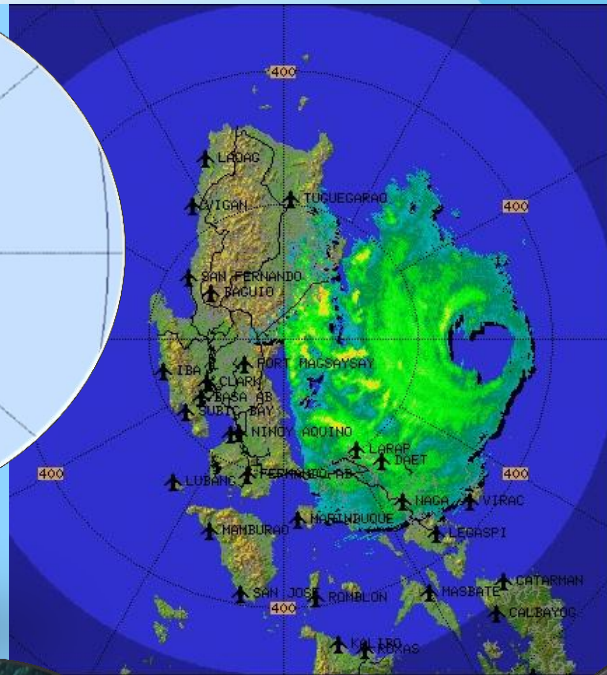
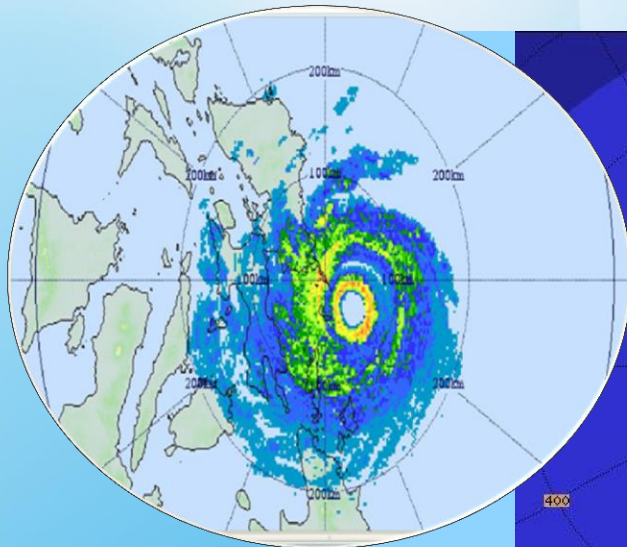


EXTREME WEATHER EVENTS



Esperanza O. Cayanan, Ph.D.
Chief, Weather Division



Table 1: The Long-Term Climate Risk Index (CRI): the 10 countries most affected from 1994 to 2013 (annual averages)

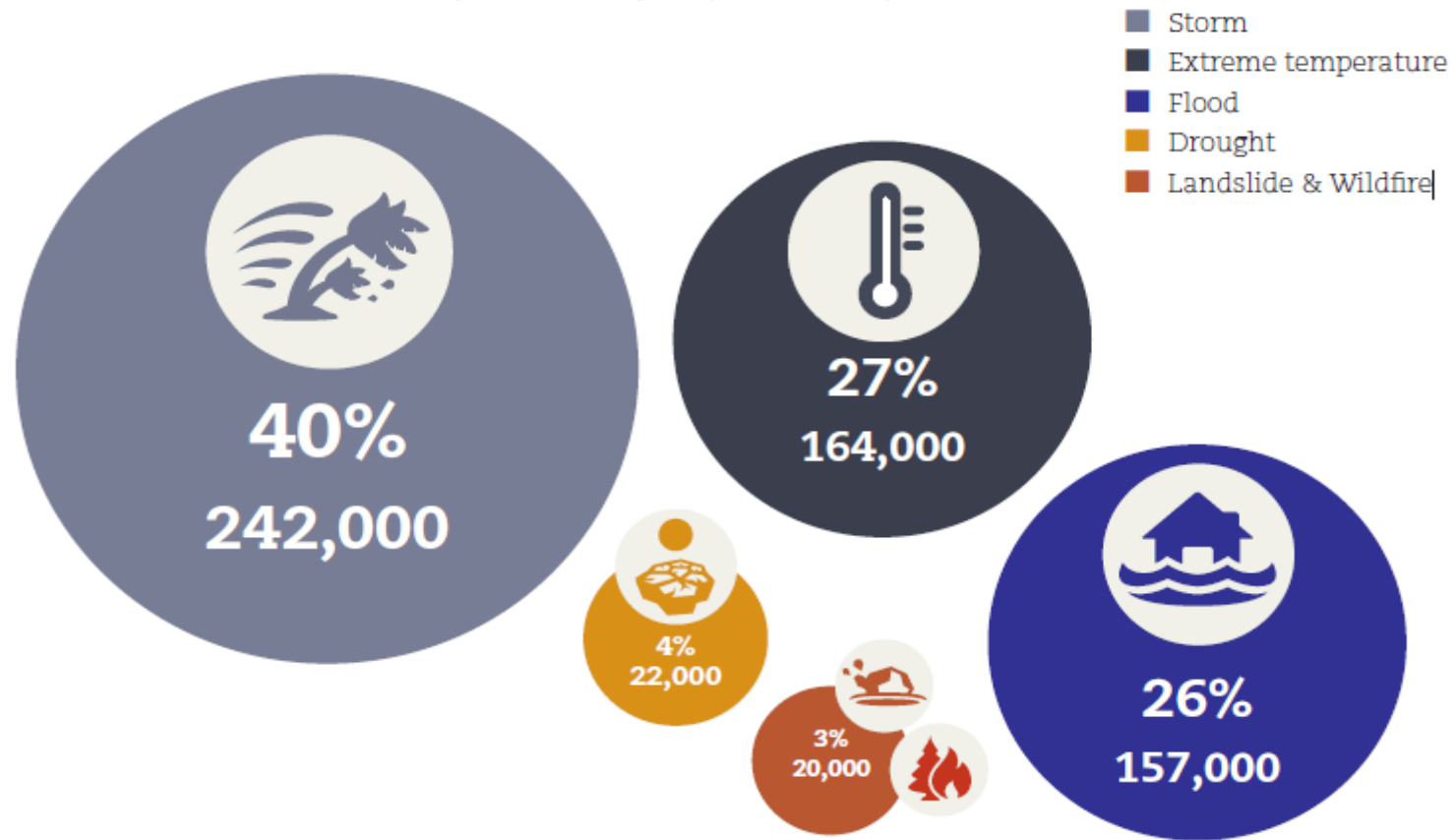
CRI 1994–2013 (1993–2012)	Country	CRI score	Death toll	Deaths per 100,000 inhabitants	Total losses in million US\$ PPP	Losses per unit GDP in %	Number of Events (total 1994–2013)
1 (1)	Honduras	10.33	309.70	4.60	813.56	3.30	69
2 (2)	Myanmar	14.00	7137.40	14.80	1256.20	0.87	41
3 (3)	Haiti	16.17	307.80	3.41	261.41	1.86	61
4 (4)	Nicaragua	16.67	160.15	2.98	301.75	1.71	49
5 (7)	Philippines	19.50	933.85	1.13	2786.28	0.74	328

Table 2: The Climate Risk Index for 2013: the 10 most affected countries

Ranking 2013 (2012)	Country	CRI score	Death toll	Deaths per 100,000 inhabitants	Absolute losses (in million US\$ PPP)	Losses per unit GDP in %	Human Development Index ¹⁰
1 (2)	Philippines	2.17	6479	6.65	24538.56	3.82	117
2 (65)	Cambodia	6.67	184	1.22	1495.52	3.24	136
3 (46)	India	12.67	7437	0.60	15147.02	0.22	135
4 (58)	Mexico	15.00	224	0.19	10589.70	0.51	71
5 (143)	St. Vincent and the Grenadines	15.33	9	8.18	96.58	8.33	91

EFFECTS OF WEATHER-RELATED DISASTERS

Numbers of people killed by disaster type (1995-2015)



14 | The Human Cost of Weather-Related Disasters 1995-2015
survey". BMJ Open 2001;1: e000109.

MOST DISASTROUS TROPICAL CYCLONES FOR 1950-2015 IN TERMS OF DEATH

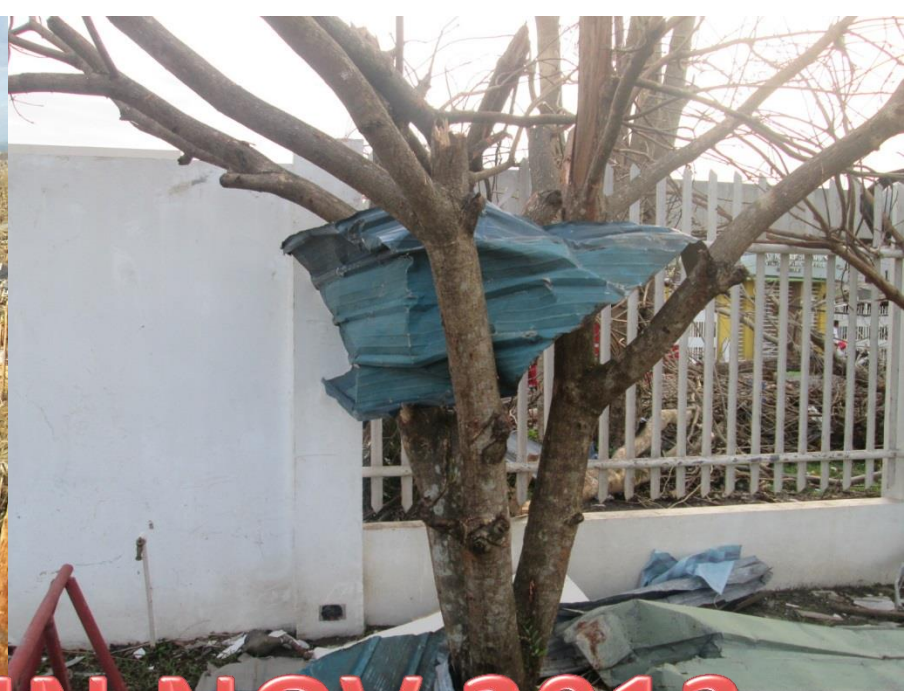
NAME	DATE	MAX WINDS (KPH)	GUSTS (KPH)	NO. OF DEAD	REMARKS
1) TY YOLANDA (HAIYAN)	NOV 06 - 09, 2013	235*	270*	6,268	CROSSED CENTRAL VISAYAS
2) TS URING (THELMA)	NOV 01 - 06, 1991	85	100	5,101	CROSSED CENTRAL VISAYAS
3) TS SENDONG (WASHI)	DEC 13 - 18, 2011	75	90	1,257	CROSSED NORTHERN MINDANAO
4) TY PABLO (BOPHA)	DEC 02 -09, 2012	185	220	1,248	CROSSED N.MINDANAO & S.VISAYAS
5) TY NITANG (IKE)	AUG 31 - 04 SEP1984	170	205	1,029	CROSSED SURIGAO & C. VISAYAS
6) TY TRIX	OCT 15 - 23, 1952	150	180	995	CROSSED N. SAMAR & S.LUZON
7) TY AMY	DEC 05 - 16, 1951	170	205	991	CROSSED VISAYAS
8) TY ROSING (ANGELA)	OCT 30 - 04 NOV 1995	220	255	936	CROSSED SOUTHERN LUZON
9) TY UNDANG (AGNES)	NOV 03 - 06, 1984	220	255	895	CROSSED VISAYAS
10) TD WINNIE	NOV 27 - 29, 2004	55		893	CROSSED SAMAR-BICOL AREA

IN TERMS OF DAMAGES TO STRUCTURES & AGRI

1) TY YOLANDA (HAIYAN)	NOV 06 - 09, 2013	235	270	P 95.483	CROSSED CENTRAL VISAYAS
2) TY PABLO (BOPHA)	DEC 02 - 09, 2012	185	220	P 43.164	CROSSED N. MINDANAO& S.VISAYAS
3) TY PEPENG (PARMA)	SEP 30 - 10 OCT, 2009	195	230	P 27.296	CROSSED NORTHERN LUZON
4) TY PEDRING (NESAT)	SEP 24 - 28, 2011	140	170	P 15.552	CROSSED NORTHERN LUZON
5) TY LANDO (KOPPU)	OCT 14-21, 2015	185	230	P 14.392	CROSSED PROVINCES OF CENTRAL
6) TY FRANK (FENGSHEN)	JUN 18 - 23, 2008	160	195	P 13.500	CROSSED VISAYAS, S. & C. LUZON
7) TY JUAN (MEGI)	OCT 16 - 21, 2010	225	260	P 11.500	CROSSED NORTHERN LUZON
8) STS ONDOY (KETSANA)	SEP 24 - 27, 2009	110	140	P 10.952	CROSSED CENTRAL LUZON
9) TY RUPING (MIKE)	NOV 10 - 14, 1990	240	275	P 10.846	CROSSED CENTRAL VISAYAS
10) TY ROSING (ANGELA)	OCT 30 - 04 NOV, 1995	220	255	P 10.799	CROSSED SOUTHERN LUZON

MOST OF DISASTROUS TROPICAL CYCLONES INVOLVE FLASHFLOODS





HAIYAN'S FURY IN NOV 2013...

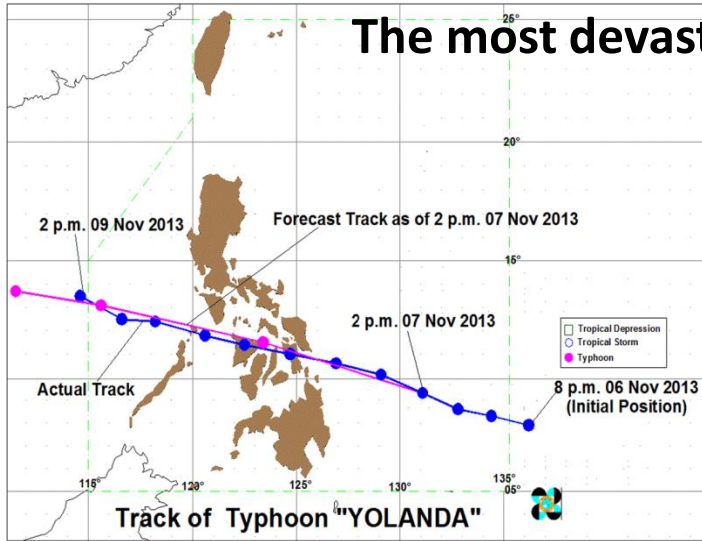


Super Typhoon HAIYAN "YOLANDA"

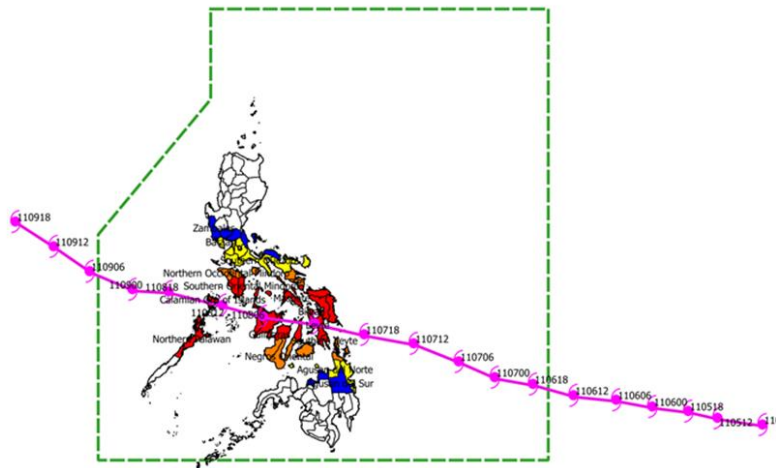
6-9 November 2013

24th Tropical Cyclone that entered PAR in 2013

The most devastating typhoon in Philippine history.

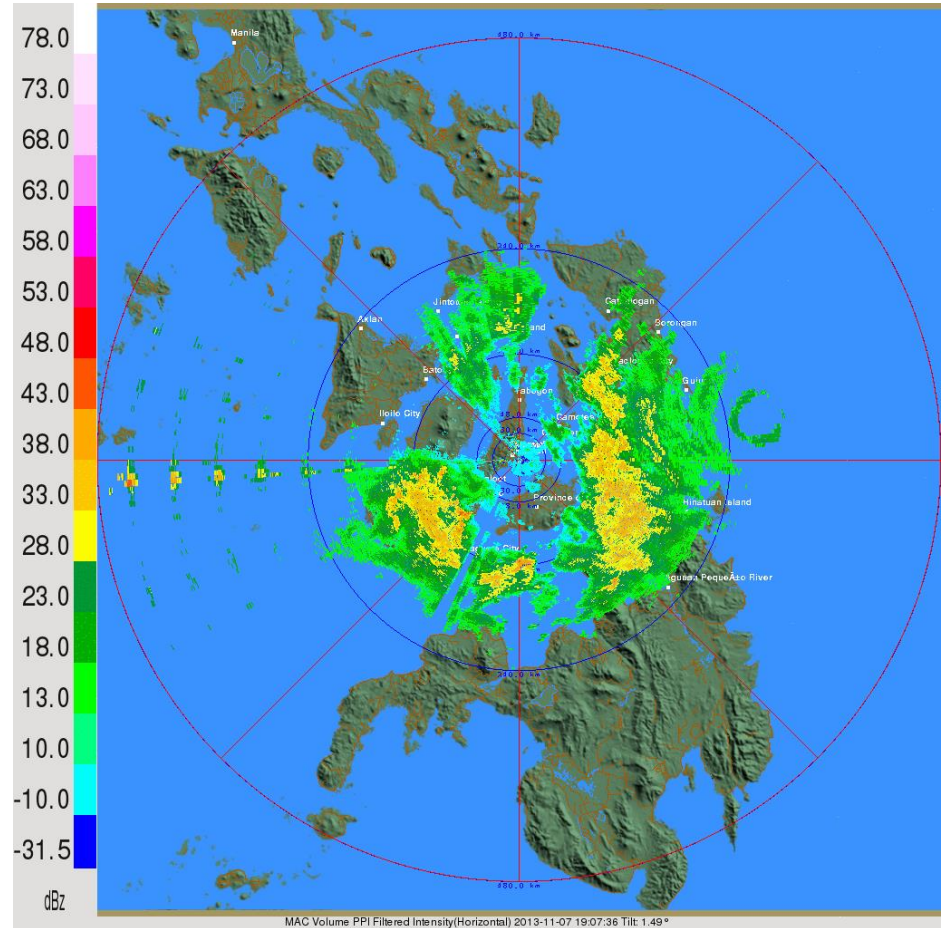


● Actual track ● Forecast track



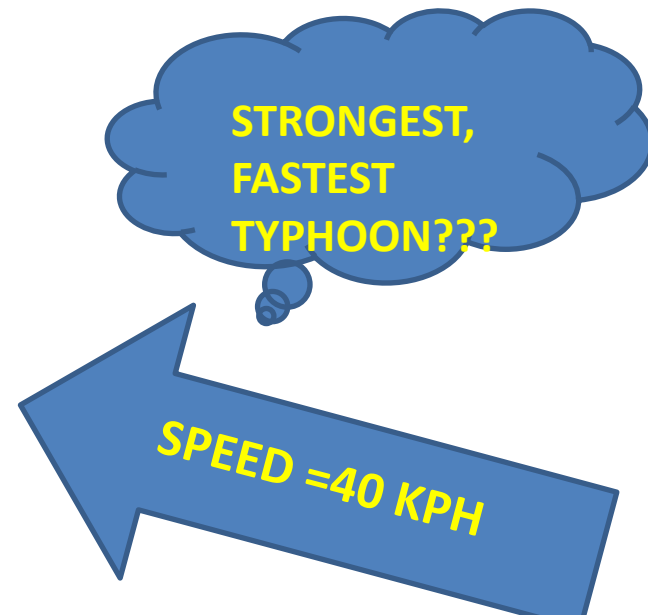
Track & Warnings for TY Yolanda

PSWS
 #1 #3
 #2 #4



MAC Volume PPI Filtered Intensity(Horizontal) 2013-11-07 19:07:36 Tilt: 1.49°

OBSERVED DATA



WINDS	MAX SUS.	GUSTINESS
Guiuan, E. Samar	160 kph	195 kph
Roxas City	130 kph	205 kph
Coron, Palawan	55 kph	160 kph
San Jose, Mindoro	75 kph	120 kph

PRESSURE: Lowest in Guiuan Station = 910 hPa

- Observed at 5:00AM, Nov.8, 2013
- Equivalent to **240 kph** max. sustained winds and **280 kph** gustiness

Highest winds: (JMA, JTWC)
 10-min sustained: **230 kph**
 1-minute sustained: **315 kph**
 Lowest pressure **895 hPa** (Estimated)

STORM SURGE	HEIGHT	INUNDATION
Tacloban-Palo, Leyte	5-6 m	600-800 m
Basey, Samar	5-6 m	600-800 m
Guiuan-Hernani, E. Samar	6-7 m	800-1000m



TOTAL DAMAGES: PhP 95.83 B

DEATH TOLL: 6,268

Source: NDRRMC



BGY 60-C OLD RD
SAGCAHAN, TACLOBAN

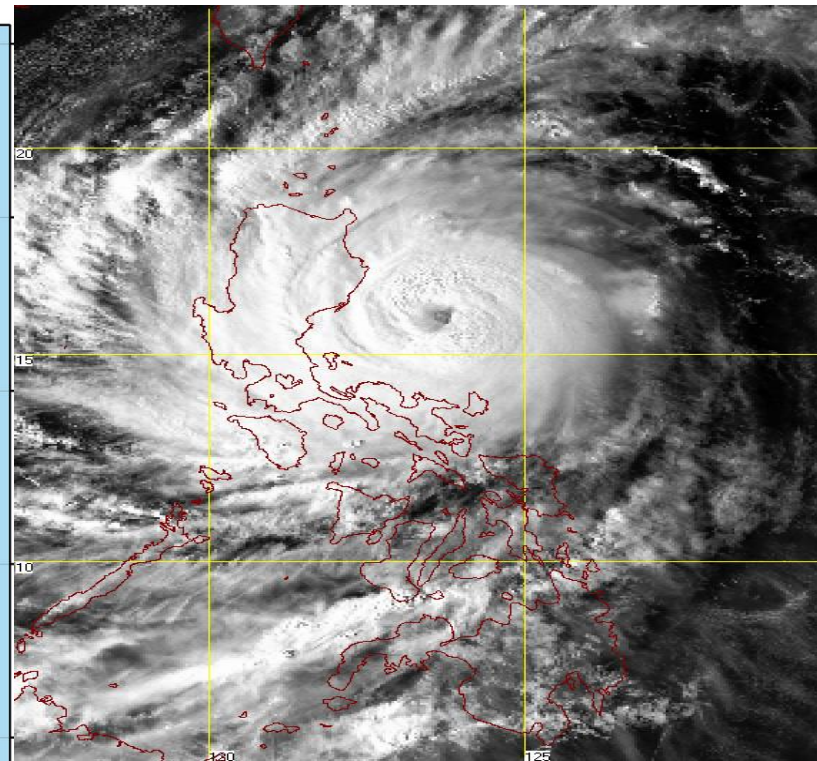
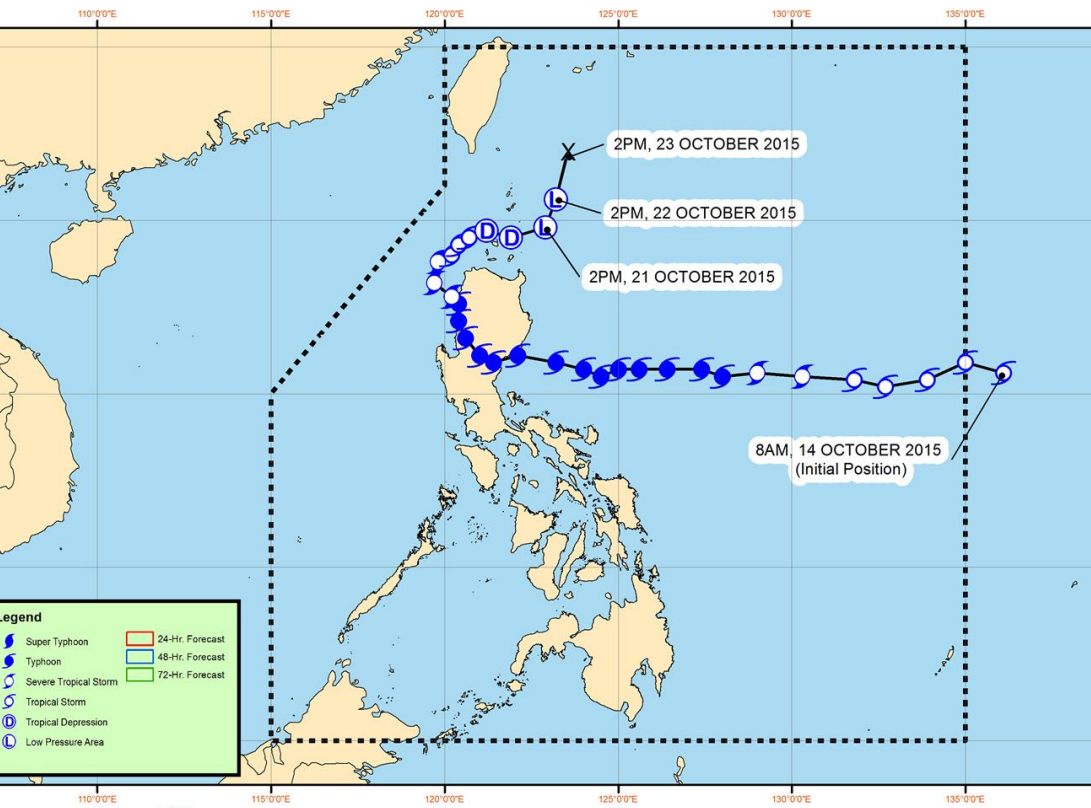
WaterLevel



TYPHOON KOPPU (LANDO)

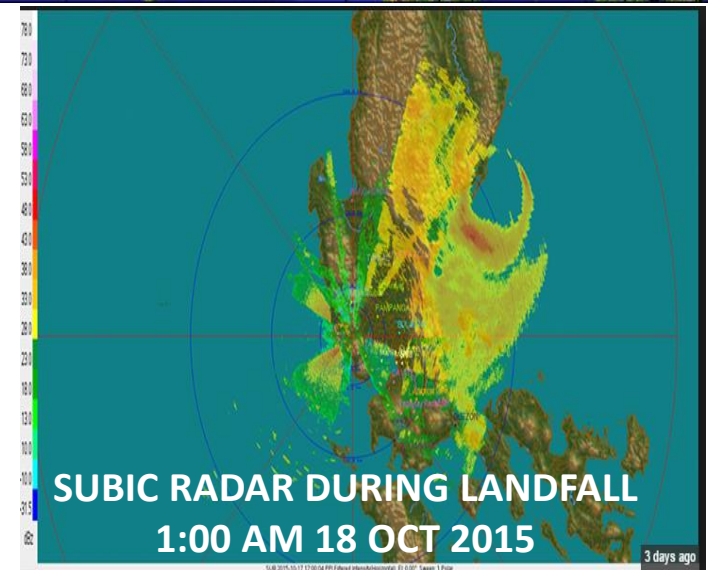
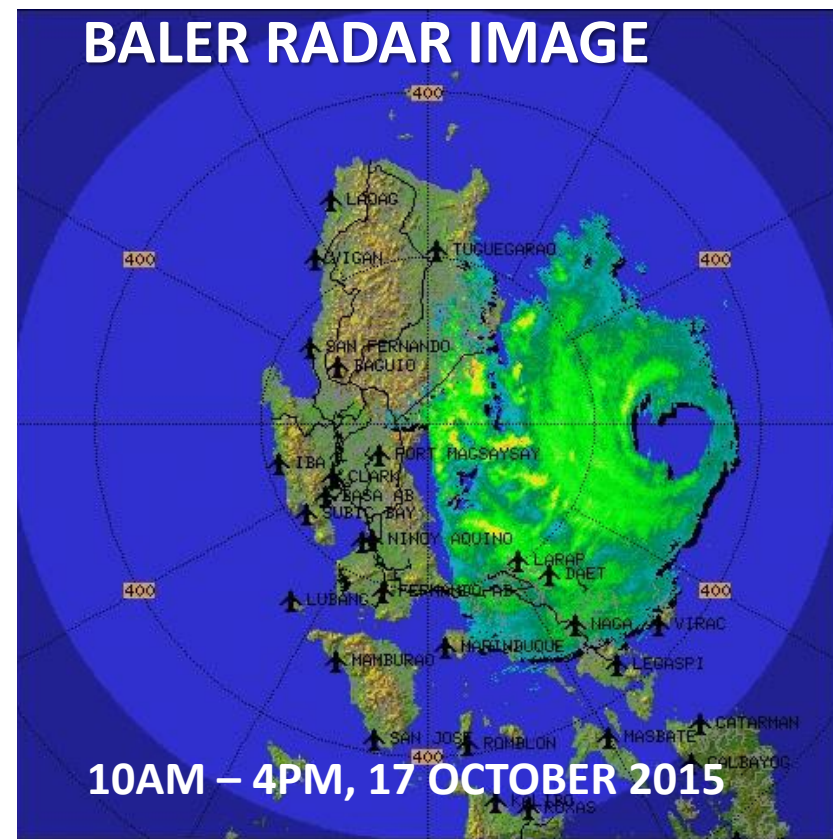
October 16-21, 2015

12th Tropical Cyclone in the Philippines for 2015



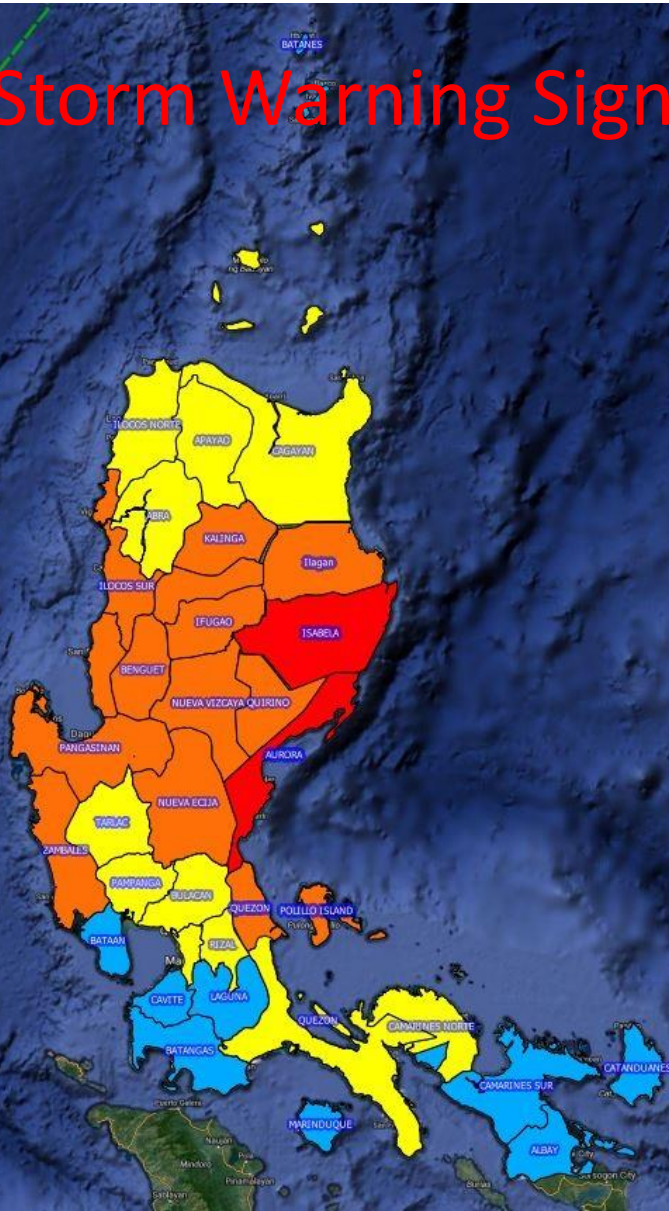
CHRONOLOGY:

- **Oct. 12** - Developed into a Tropical Depression outside PAR
- **Oct. 14** - **entered PAR** as a Storm
- **Oct 16** - Intensified into **Typhoon** moving Westward at 15kph towards Luzon
- **Oct 18** - made **landfall** over **Casiguran, Aurora** at **1:00AM**, w/ **185kph** max sustained winds and **220 kph gustiness**
- **Oct 18-19** – TY Lando stayed almost **stationary for ~12 hrs (at 3-5 kph speed)** over Nueva Vizcaya-N.Ecija area then slowly moved WNW-NNW towards Benguet-Ilocos Sur weakening to **120 kph sus winds**
- **Oct 20-21** – continued to moved **slowly (at 4-6kph)NNE** to Ilocos Norte then towards Batanes and **weakened into TD at 5AM Oct.21**
Finally it was downgraded to **Low Pressure Area** at **5PM Oct 21**.



TYPHOON KOPPU (LANDO)

Public Storm Warning Signals Issued



OBSERVED WIND, PRESSURE & RAINFALL

STATION	DATE	WIND SPEED
Baler	17 Oct	216 kph
Baguio City	19 Oct	126 kph
Casiguran	18 Oct	252kph
Infanta	18 Oct	108 kph
Dagupan	18 Oct	104 kph

STATION	DATE	PRESSURE
Baler	18 Oct	942.5 hPa
Infanta	18 Oct	987.8 hPa
Cabanatuan	18 Oct	988.0 hPa
Baguio	19 Oct	986.9 hPa

STATION	DATE	24-HR RAINFALL	% of Monthly Rainfall
Baguio City	19 Oct	775.4 mm	170.68%
Iba	18 Oct	154.8 mm	66.10%
Basco	19 Oct	164.2 mm	58.39%
Dagupan	18 Oct	114.5 mm	53.03%
Clark	18 Oct	103.4 mm	58.42%
Tuguegarao	17 Oct	113.4 mm	38.00%

DISASTER PREPAREDNESS MEETING w/ the PRESIDENT



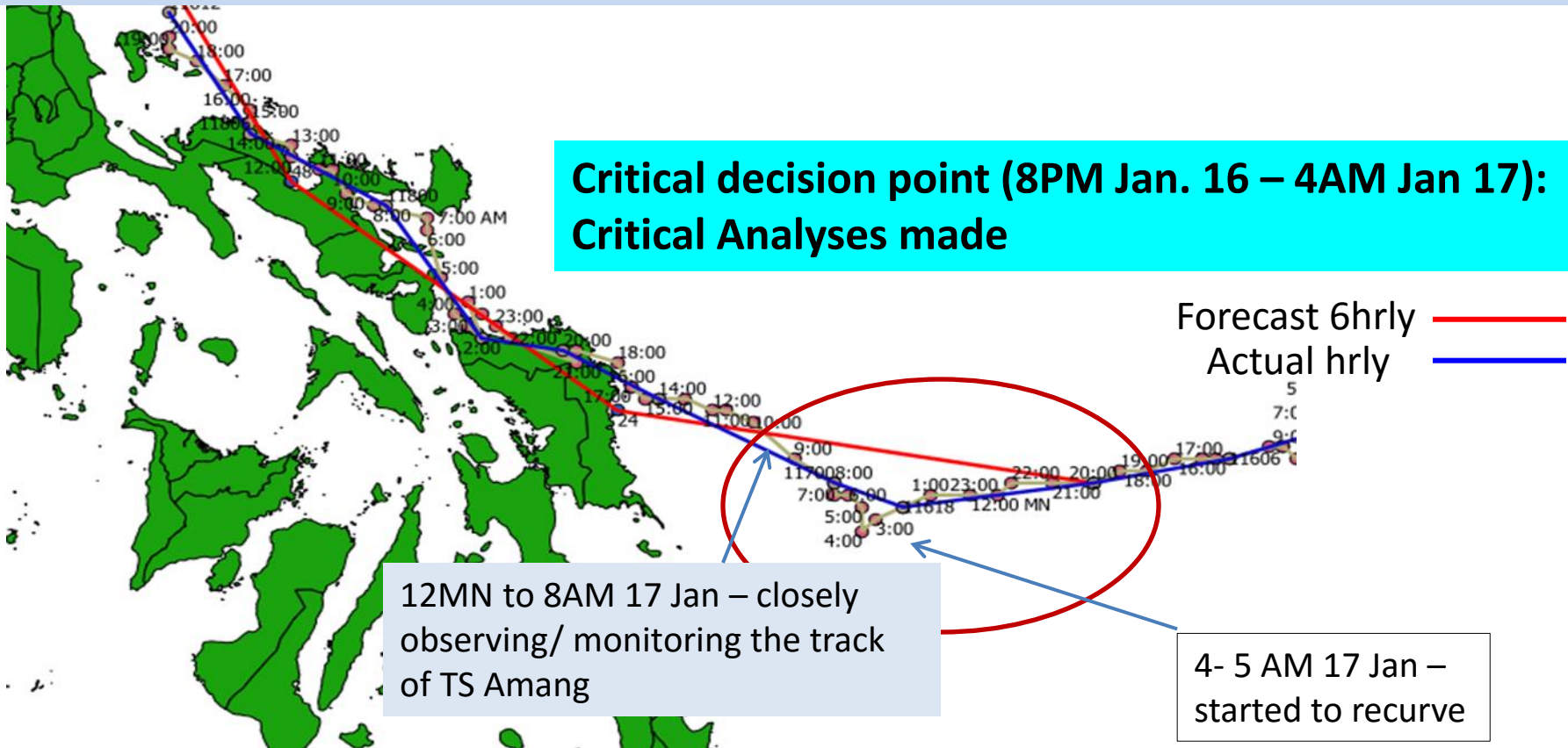
Oct 16, 2015

IMPACTS OF TYPHOON LANDO (KOPPU)



TS AMANG, 14-19 2015

1st Tropical Cyclone in 2015, during Papal Visit in Tacloban



- Starting 8PM, Jan 16, TS Amang unexpectedly shifted directions from northwest to southwest raising the possibility of directly hitting Tacloban.
- At 3-4AM Jan17, we observed the slowing down of movement of Amang.
- At 4-5 am TS Amang started to recurve westward a significant development indicating it would follow a northwesterly track as earlier predicted by PAGASA.



WAY FORWARD

IMPROVED WEATHER-RELATED PRODUCTS & SERVICES

- Weather Division is now ISO 9001:20018 CERTIFIED
- PAGASA Modernization Act
 - Automation
 - Re-engineering/Reorganization
 - Capacity building
- Strengthen linkages and collaboration

The **KEY** to **PREPAREDNESS**....

– **Everyone Should Have a PLAN!**



**Coming together
is a beginning;
keeping together
is progress;
working together
is **SUCCESS.****

– Henry Ford

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BAGYO-KA-LANG!

PINOY KAMI!

Thank you

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