Hazard monitoring by using new generation satellite data: Pakistan Metrological Department's perspective
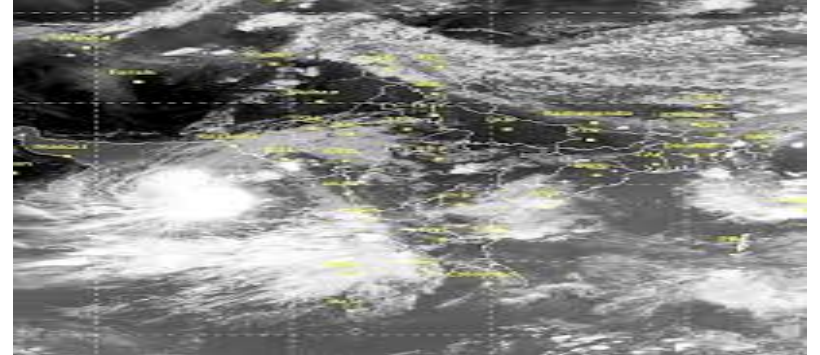
Ms. Humeira Hafeez

Pakistan Meteorological Department

Top Three Hazards

❑ **Monsoon Activity**

❑ **Tropical Cyclone**

❑ **Drought**

Monsoon Activity

❑ Hazard period (July-Sep)

❑ Heavy rainfall causing floods.

❑ Floods (more than 20 million people affected in 2010 only)

❑ Riverine Floods (Indus river system and its tributaries), secondary rivers (Swat, Tochi, Haro etc)

❑ Flash floods in mountainous areas (Indus river basin, Kashmir, KPK, FATA, Baluchistan, Southern Punjab)

❑ Urban floods due to monsoon, cloud burst (Rawalpindi, Lahore, Sialkot, Karachi, Peshawar, Jhal Magsi)

Floods in Last 20 Years

Pakistan witnessed floods in,
- ❑1995
- ❑2003
- ❑2007
- ❑2010 (Most severe)
- ❑2011
- ❑2012
- ❑2013
- ❑2014
- ❑2015

Flood in Pakistan
(2010)

Province/ Agency	Total Affected Districts	Cropped Area Affected (Ha)	Population Affected (million)	Houses Damaged	Road Milage (Km)	Villages Affected	Water- courses damaged	Person Died	Persons Injured
Punjab	11	746,900	8.20	375,773	2,819	1,778	2,598	110	262
Sindh	17	1,043,500	7.185	879,978	8,467	11,988	6,990	411	1,235
KP	24	121,500	3.80	257,294	6,511	544	1,790	1,156	1,198
Balochistan	12	132,500	0.70	79,720	2,077	2,896	47	54	104
FATA	#	7,220	#	5,419	1,257	#	0	#	#
Gilgit-Baltistan	7	7,900	0.10	3,157	382	347	960	183	60
AJK	7	33,100	0.20	6,843	3,575	0	657	71	87
G. Total	**78**	**2,092,600**	**20.185**	**1,608,184**	**25,088**	**17,553**	**13,042**	**1,985**	**2,946**
Source of information	*NDMA as on 24.2.2011*	*Page 153 of DNA Report*	*NDMA as on 24.2.2011*	*Page 89 of DNA Report*	*Page 129 of DNA Report*	*NDMA as on 24.2.2011*	*Page 153 of DNA Report*	*NDMA as on 24.2.2011*	*NDMA as on 24.2.2011*

Flood in Pakistan (2010)

Floods in Pakistan

Karachi 2013

Karachi 2013
24°51'36"N 67°0'36"E
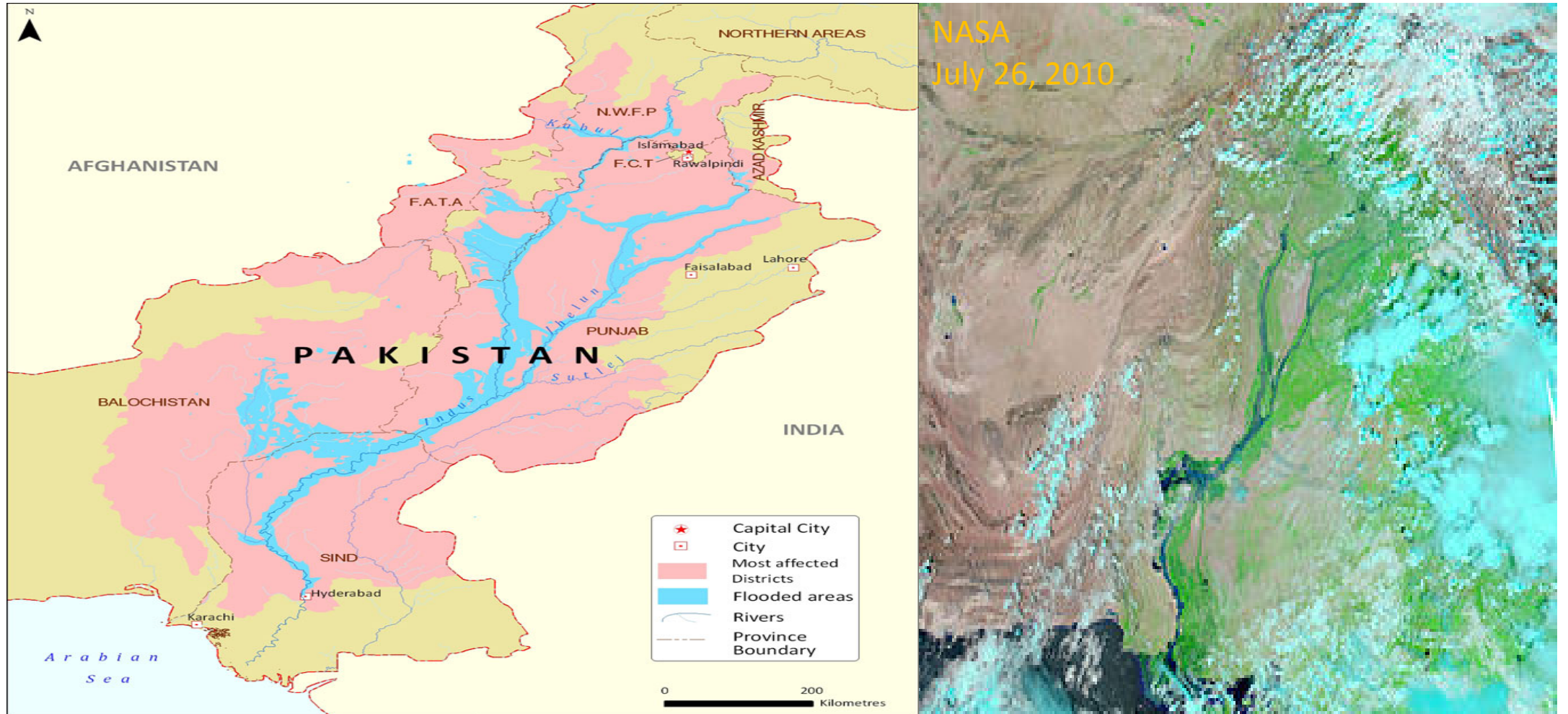
Floods in Pakistan

Sialkot 2014

32°29′50″N 74°32′10″E

Wazirabad 2014

32°26′N 74°07′E

Floods in Pakistan

Rawalpindi 2015
33°36'N 73°02'E

Norrowal 2015
32°6'26"N 74°52'7"E

Floods in Pakistan

Lahore 2015

Lahore 2015
31°32'59"N 74°20'37"E

Floods in Pakistn

Swat 2015
35°23'N 72°11'E

Gigit baltistan 2015
35°23'N 72°11'E

Swat 2015

Chitral 2015
35°50'46"N 71°47'09"E
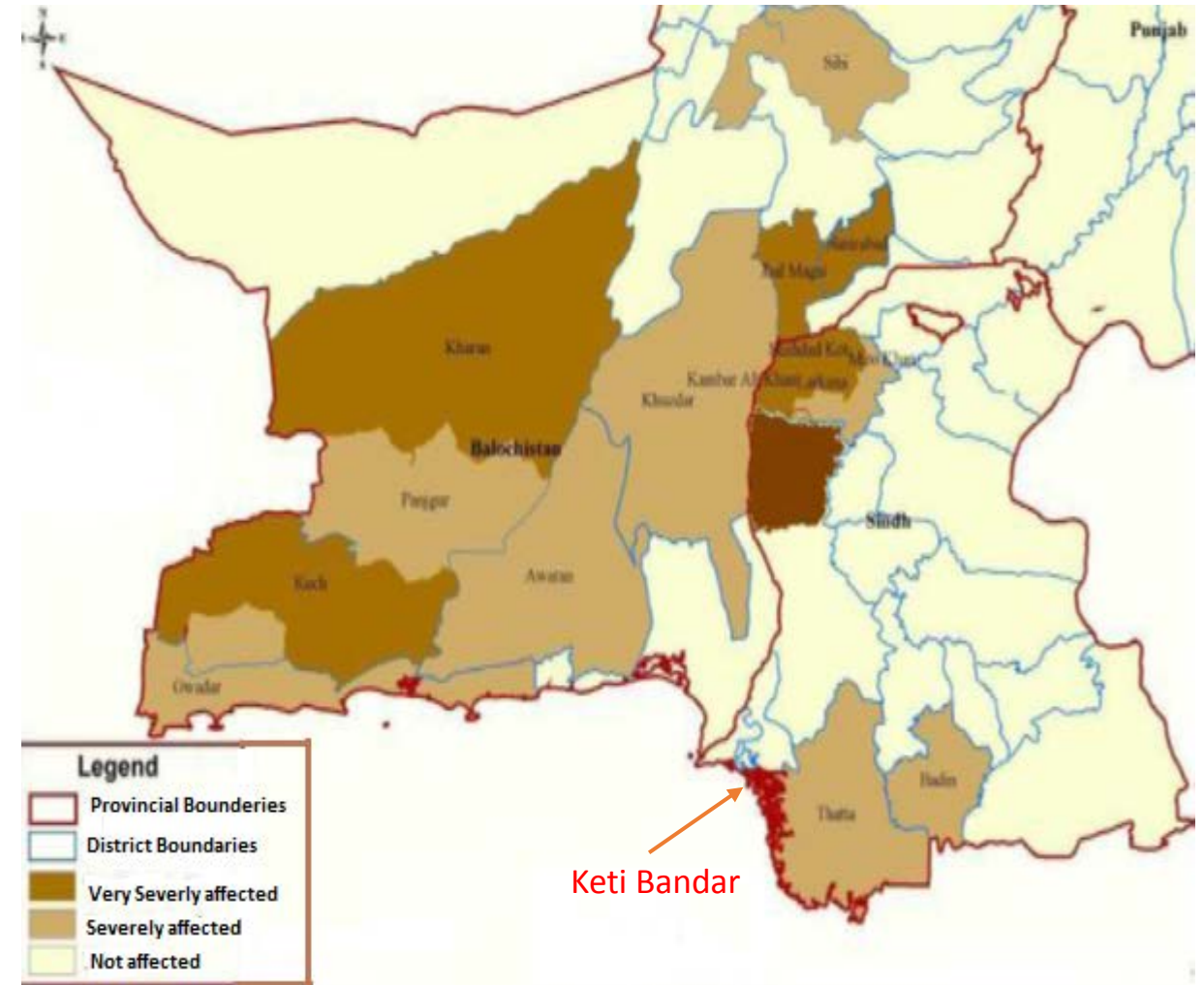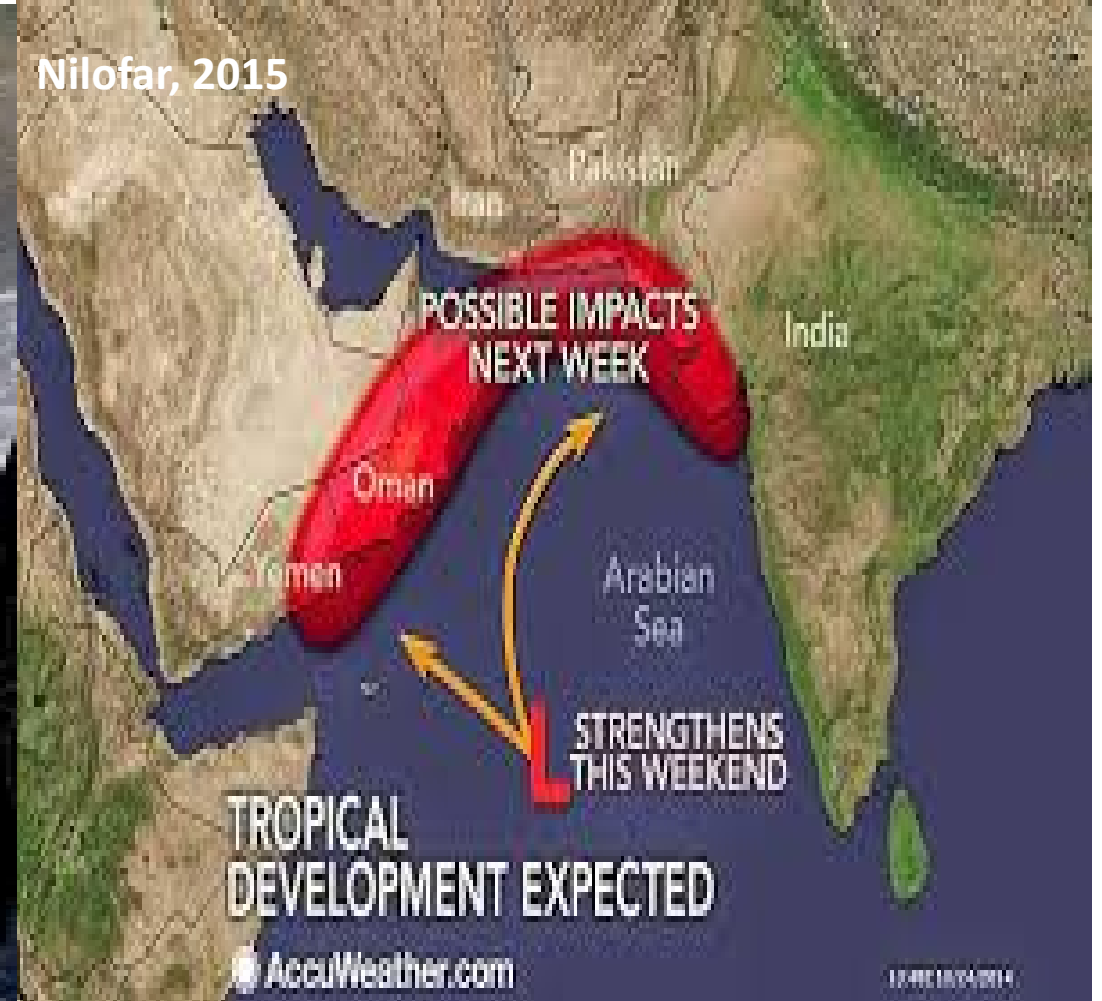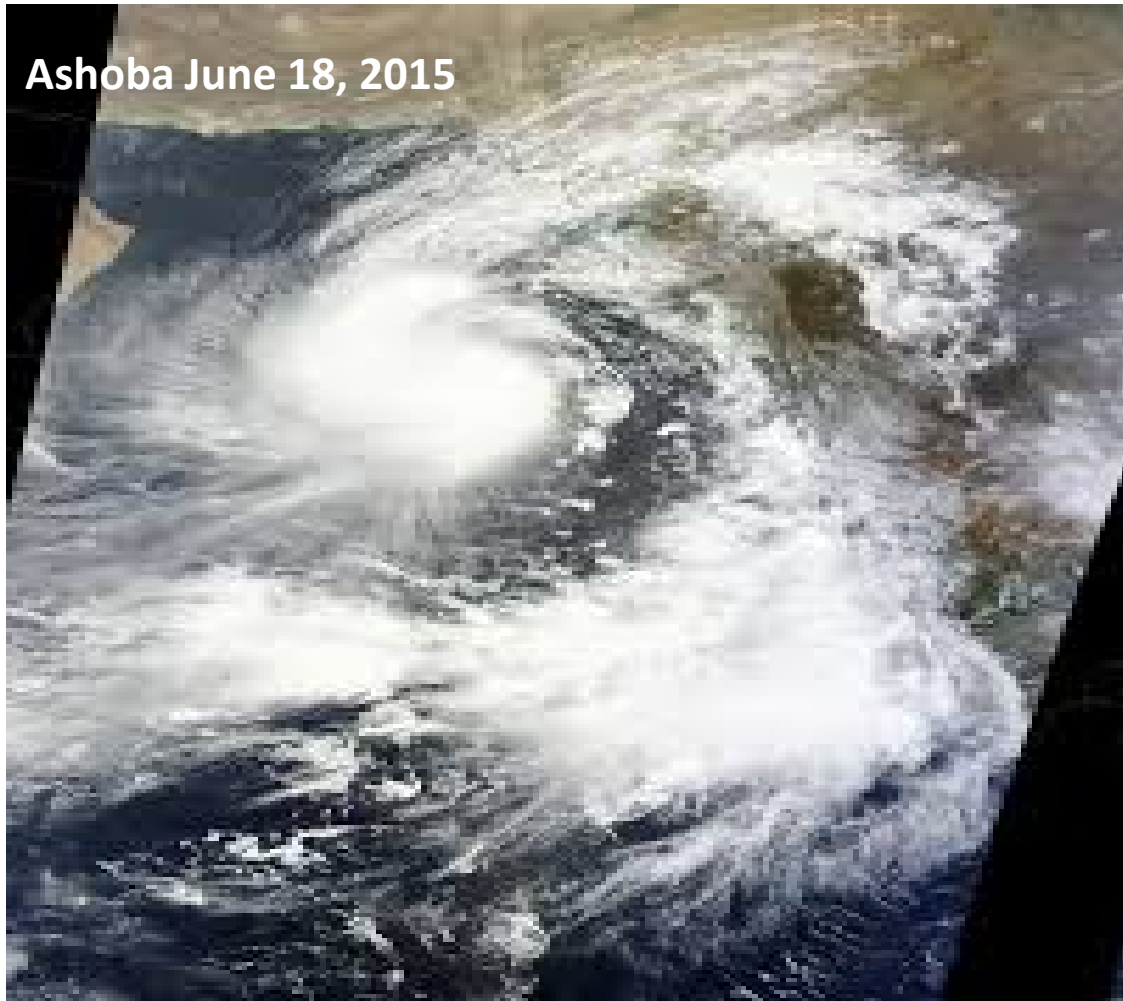
Cyclones in Pakistan

❑Coastal areas including many other areas of Sindh and Baluchistan province are prone to the Cyclone hazard.

❑Keti Bandar (Sindh Province) has history of being washed out 4 times due to cyclones.

Legend
- ▢ Provincial Bounderies
- ▢ District Boundaries
- ■ Very Severly affected
- ■ Severely affected
- ▢ Not affected

Keti Bandar

# Cyclones in Pakistan

Ashoba June 18, 2015

Nilofar, 2015

Major Cyclones across coastal areas of Pakistan (Last 25 years)

❑November 1993

❑June 1998

❑May 1999 (Yemyin)

❑June 2007 (cyclone 02A)

❑2010 (PHET)

❑2011 (Kiella)
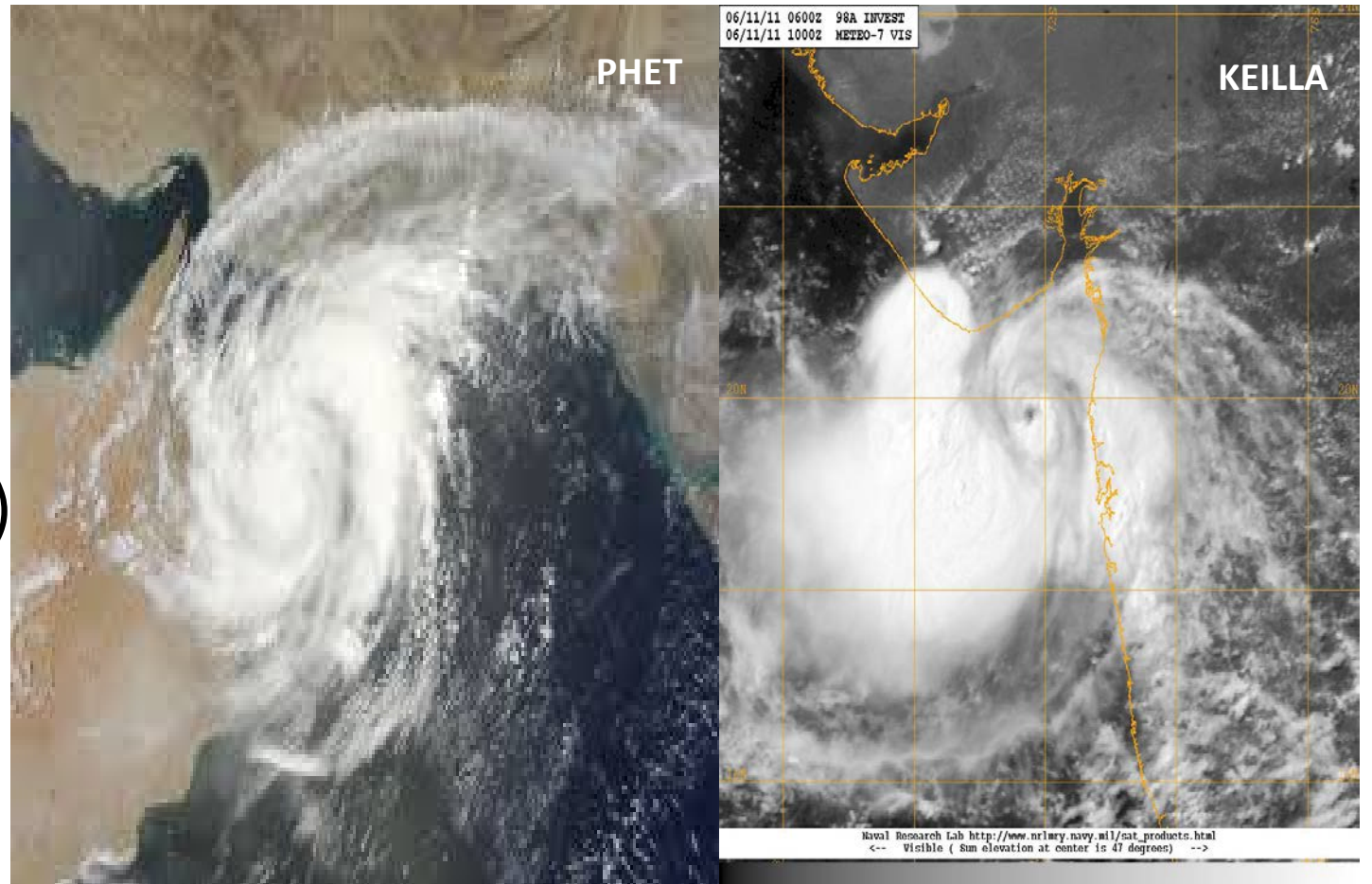
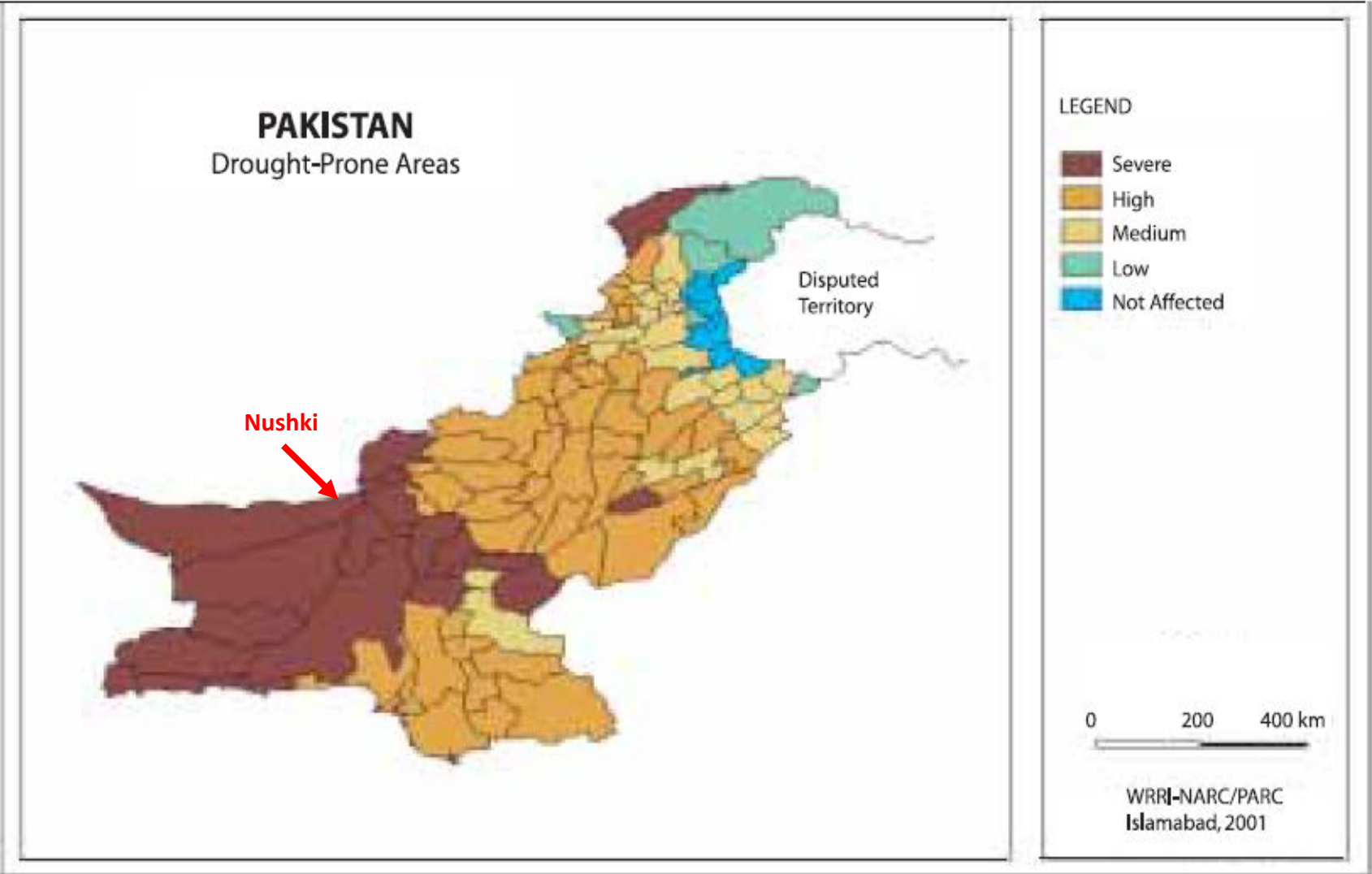# YEMYIN
(1999)

❑ Affected three coastal districts (Karachi, Thatha, Badin)

❑ 244 lost life

❑ 40177 animals perished

❑ 1449 villages affected

❑ 29873 houses damaged

❑ 0.5 million people affected

❑ 16 hospitals, 334 educational institutes,
208 Km of roads destroyed.

❑ Total financial loss= Rs. 3.231 billion
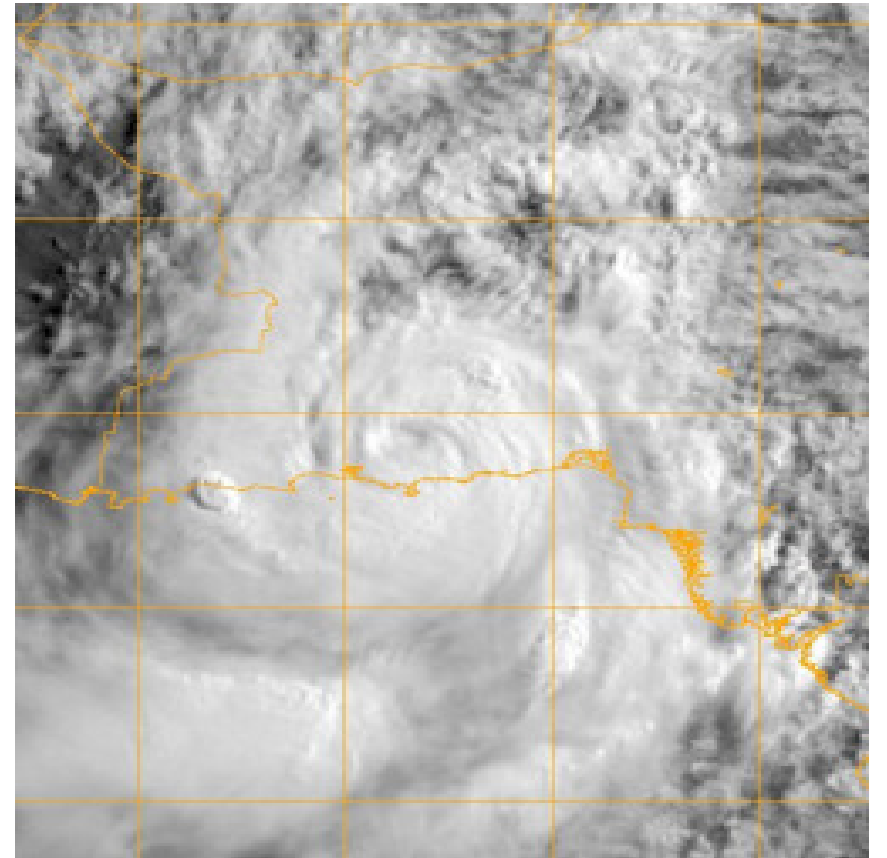
Drought in Pakistan

Drought in Pakistan

❏ Baluchistan and Sindh province of Pakistan has been the main victim of drought.

❏ Baluchistan & Sindh provinces experienced worst drought in 1871, 1881, 1899, 1931, 1942, 1999 (1999-2002 in Sindh and 1998-2005 in Baluchistan).

❏ 26 districts of Baluchistan were affected.

❏ Most affected areas of Sindh are Mirpur Khas, Sanghar, Dadu and Thatha.

Baluchistan
(Drought Period 1998-2005)

Year	Annual Rainfall (Billion m3)	Reduction in annual rainfall (%)
1997	63.1	---
1998	23.8	62
1999	25.2	60
2000	22.1	65
2001	23.4	53
2002	26.0	59
2003	30.9	51
2004	23.4	63
2005	48.5	23
Average (1998-2005)	27.9	56

Baluchistan
(Drought Period 1998-2005)

❑ 1.2 million people affected.

❑ More than 2 million animal killed.

❑ Nushki, bordering district didn't receive a single

drop of rain in 5 years.

Sindh
(1999-2002)

- ❑ 1.4 million people affected.
- ❑ 12.5 million acres of cropped area affected.
- ❑ Ground water depleted to 30-40 feet.
- ❑ 127 people died (mostly in Tharparkar)
- ❑ Killed around 1 million animals

PMD's expectations of new series of satellites for hazard monitoring

Major Hazard	Feature of new generation Geo. Met Satellite
Monsoon	**Multi-spectral bands** It will help the issuance of effective and timely forecast & warning related to the monsoon caused hazards.
Cyclone	**Rapid scanning** It will help in step by step monitoring of cyclone and will enable to adopt precautionary measures.
Drought	**Multi-spectral bands** It will be useful in monitoring the parameters causing the drought conditions in drought prone areas of Pakistan.

PMD's requirements to get desired benefits from the new generation of satellites

Major Hazard	Feature of new generation Geo. Met Satellite
Monsoon	**Training in imagery analysis** Training would support the retrieval of new signals from multi-spectral band observation. **Training in the basics of multi-spectral observation** Training would help the effective utilization of multi-spectral observations for the forecast and early warning related to monsoon induced hazards.
Cyclone	**Training in imagery analysis** Training would help in retrieval of new multi-spectral band signal observations that would help the timely and effective warning issuance.
Drought	**Training in the basics of multi-spectral observation** Training would help the effective utilization of multi-spectral observations for designing drought mitigation strategies to reduce its damages.

PMD's Future Plans

❑ The development of more effective weather monitoring and early warning system with more focus on monsoon related hazards and Cyclone by the help of useful features like multi-spectral bands and rapid scanning of this new generation Geo. Met. Satellite.

❑ Active participation in trainings and meeting related to these features and their utilization.