



**In the name of Allah - The  
most Beneficent & Merciful**

**GOVERNMENT OF PAKISTAN**

**INDUS RIVER SYSTEM AUTHORITY**

**PRESENTATION**

**ON**

**“WATER RELATED DISASTER AND ITS  
MANAGEMENT IN PAKISTAN”**

# **"AN ASSESMENT OF WATER RELATED DISASTERS AND ITS MANAGEMENT IN PAKISTAN"**

**Presented By**

**Mr. FIDA HUSSAIN**

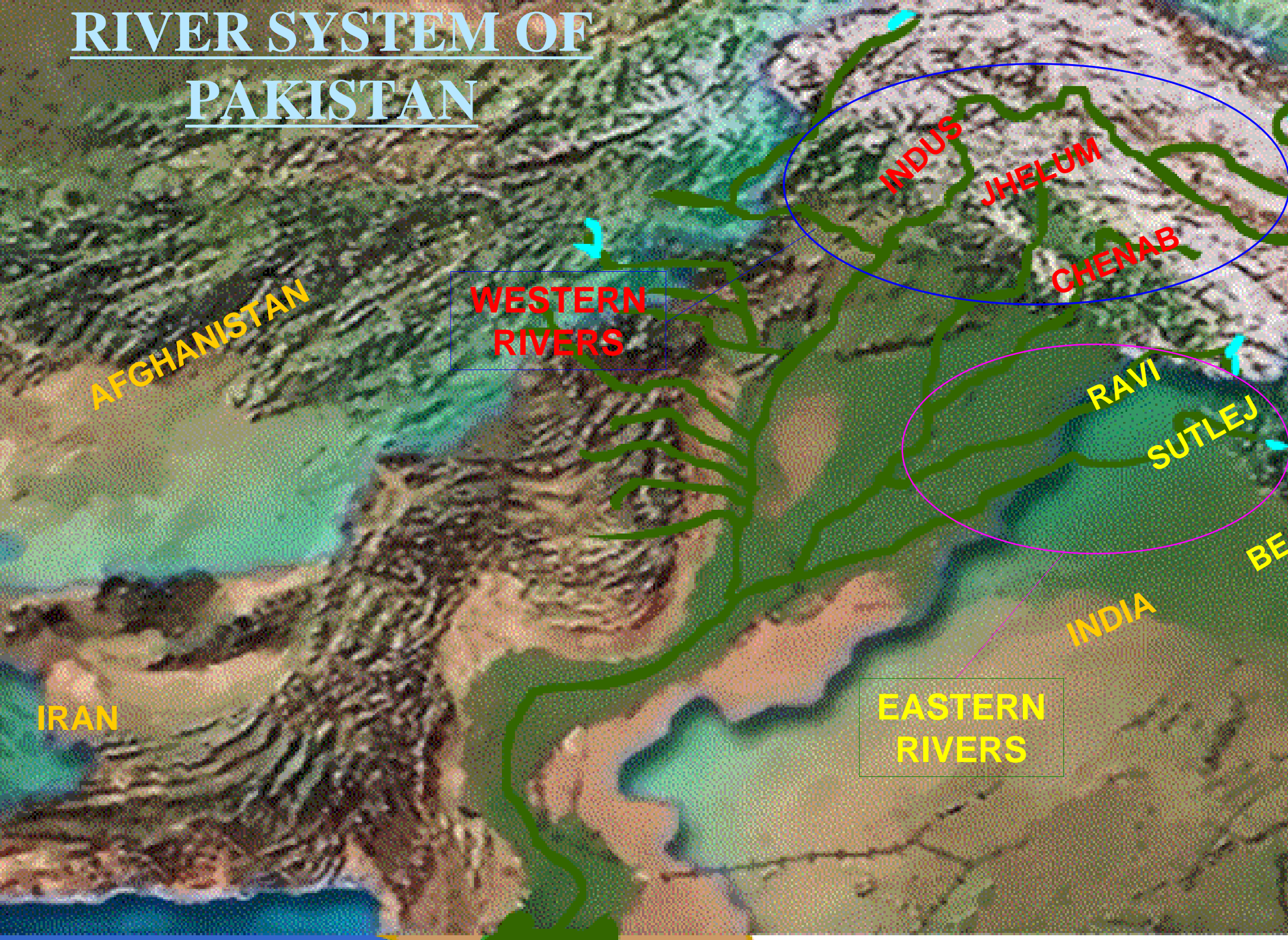
*At Thematic Workshop in Indonesia*

**(26<sup>th</sup> – 29<sup>th</sup> November 2007)**

# PAKISTAN'S PROFILE

- POPULATION 155 MILLION
- GEOGRAPHICAL AREA 796,100 KM<sup>2</sup>
- Provinces 4 No.
- IRRIGATED AREA 36 M ACRES
- ANNUAL WATER AVAILABILITY 142 MAF
- ANNUAL CANAL WITHDRAWALS 104 MAF
- GROUND WATER PUMPAGE 44 MAF
- PER CAPITA WATER AVAILABLE (2003) 1,200 M<sup>3</sup>
- AGRICULTURE PRODUCES 25 % OF GDP

# RIVER SYSTEM OF PAKISTAN



AFGHANISTAN

WESTERN  
RIVERS

INDUS  
JHELUM  
CHENAB

RAVI  
SUTLEJ

IRAN

EASTERN  
RIVERS

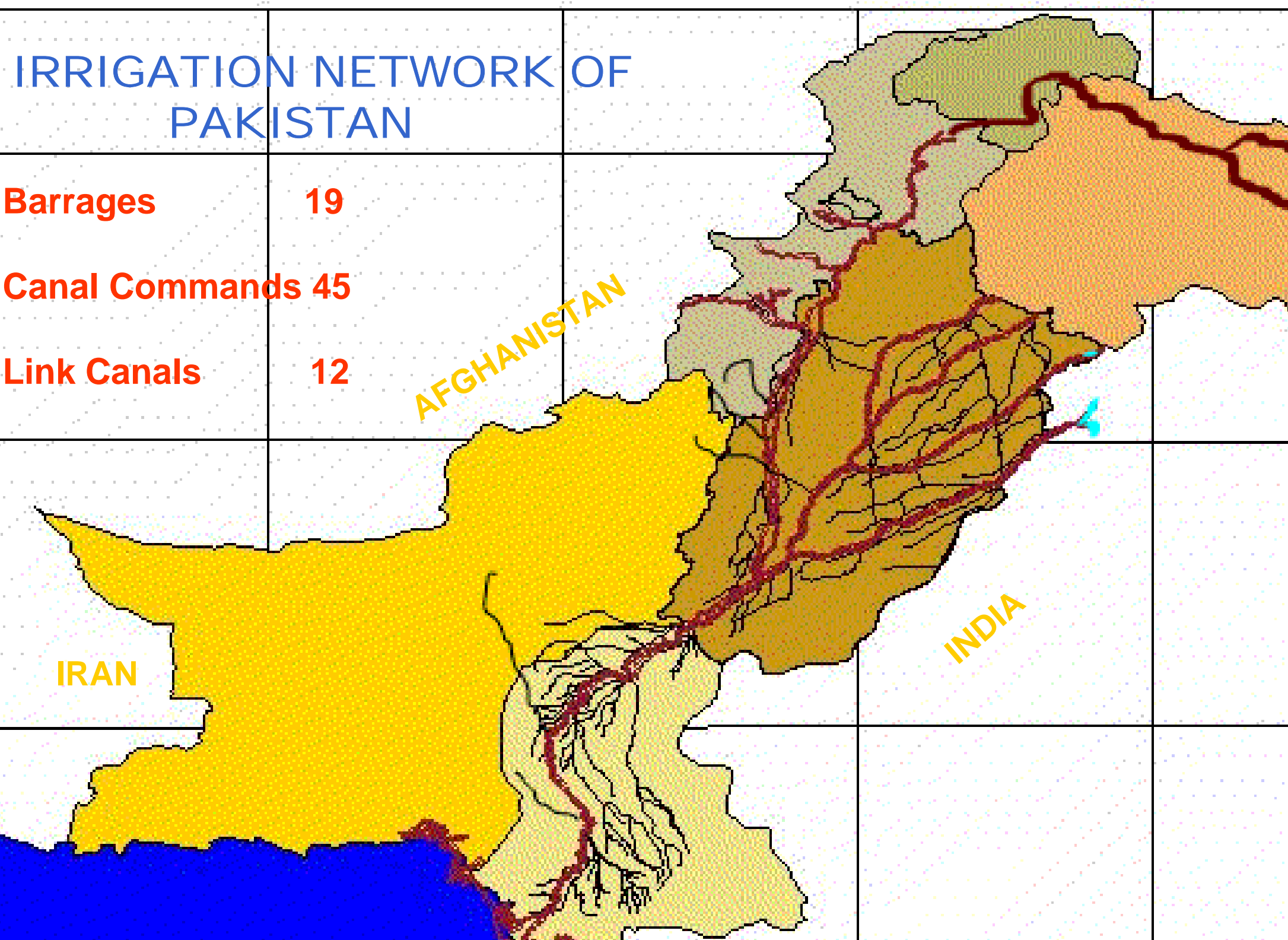
INDIA  
BE

# IRRIGATION NETWORK OF PAKISTAN

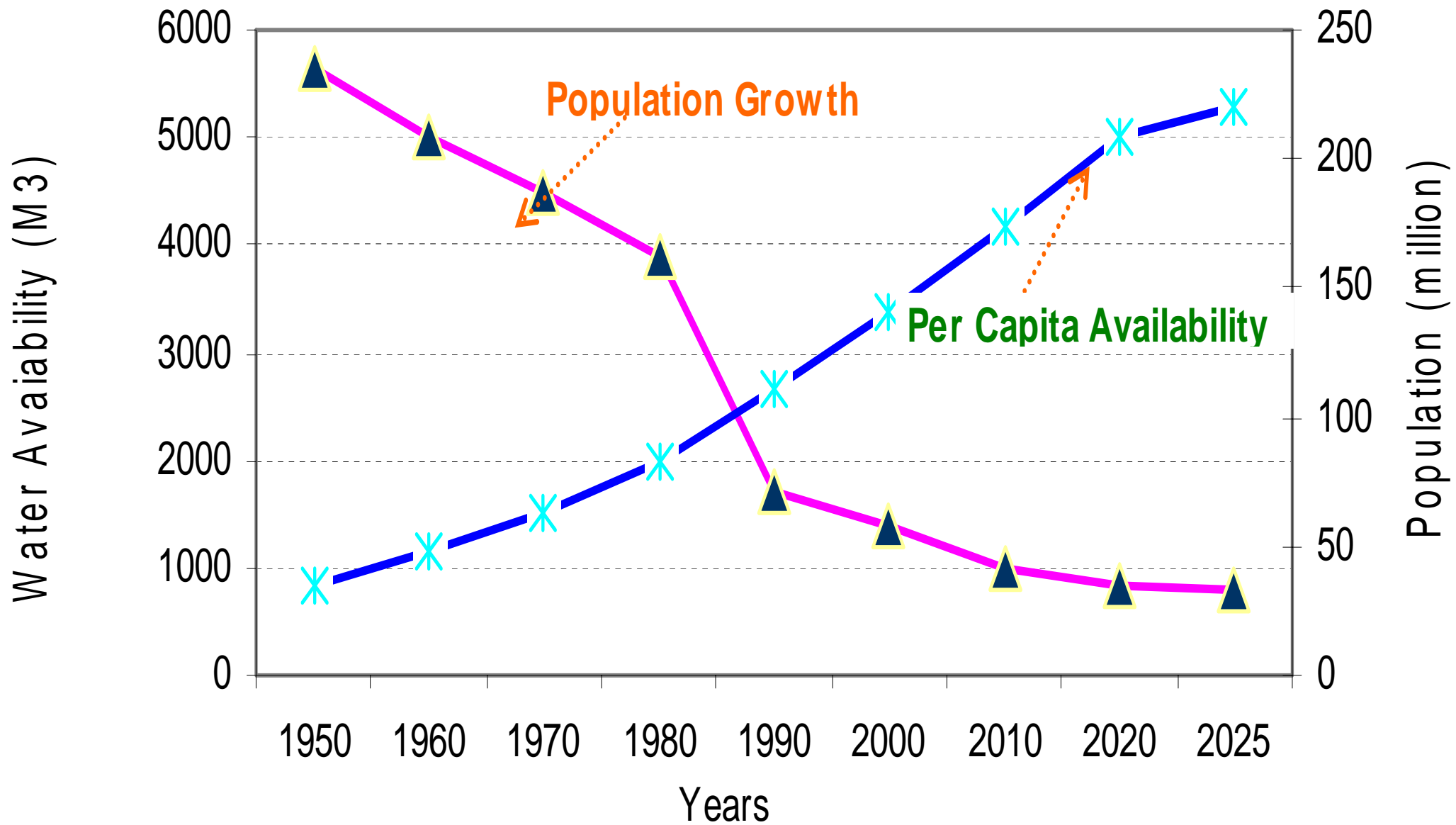
➤	<b>MAJOR STORAGE RESERVOIRS</b>	<b>03</b>
➤	<b>BARRAGES</b>	<b>19</b>
➤	<b>INTER-RIVER LINK CANALS</b>	<b>12</b>
➤	<b>IRRIGATION CANAL COMMANDS</b>	<b>45</b>
➤	<b>SMALL DAMS</b>	<b>84</b>

# IRRIGATION NETWORK OF PAKISTAN

<b>Barrages</b>	<b>19</b>
<b>Canal Commands</b>	<b>45</b>
<b>Link Canals</b>	<b>12</b>



# Per Capita Water Availability





# **WATER-RELATED DISASTERS IN PAKISTAN**

- **Droughts**
- **River Erosion**
- **Flooding**
- **Cyclones/Storms**

# CAUSES OF FLOODS IN PAKISTAN

- ❑ Floods in rivers are caused by heavy concentrated monsoon rains
- ❑ Sometimes augmented by snowmelt flows
- ❑ The monsoon low depression that causes intense rain develops either in the Arabian Sea or the Bay of Bengal (India). But major flooding is generally associated with the depression from the bay of Bengal moving across India in west/north-westerly direction and turning north at the border with Pakistan. The mountain ranges in the extreme north of Pakistan provide perennial source of inflow into rivers.
- ❑ Additional contribution by weather systems from Arabian Sea (Seasonal Low), and Mediterranean Sea (Westerly Wave) producing destructive floods in one or more of the main rivers of the Indus System
- ❑ Temporary natural dams as a result of landslide or glacier movement also sometimes cause floods

# HISTORICAL FLOOD DAMAGES

<b>Year</b>	<b>Damages (in US million \$ at 2002 Price level)</b>	<b>Human Lives Lost</b>	<b>Villages affected</b>
<b>1950</b>	<b>207</b>	<b>2,190</b>	<b>10,000</b>
<b>1956</b>	<b>135</b>	<b>160</b>	<b>11,609</b>
<b>1957</b>	<b>128</b>	<b>83</b>	<b>4,498</b>
<b>1973</b>	<b>2176</b>	<b>474</b>	<b>9,719</b>
<b>1976</b>	<b>1476</b>	<b>425</b>	<b>18,390</b>
<b>1978</b>	<b>944</b>	<b>393</b>	<b>9,199</b>
<b>1988</b>	<b>470</b>	<b>508</b>	<b>1,000</b>
<b>1992</b>	<b>1276</b>	<b>1008</b>	<b>13,208</b>
<b>1995</b>	<b>160</b>	<b>591</b>	<b>6,852</b>
<b>2001</b>	<b>50</b>	<b>219</b>	<b>50</b>
<b>Total</b>	<b>7,022</b>	<b>6,051</b>	<b>84,525</b>

# FLOOD DAMAGES IN 2007

Province	Punjab	Sindh	NWFP	Balochistan	FATA	Grand Total
<b>Village Affected</b>	12	1,486	N.A	5,000	N.A	<b>6,498</b>
<b>Persons Affected</b>	172	402,507	N.A	2,000,000	N.A	<b>2,402,679</b>
<b>Area Affected (Acres)</b>	N.A	66,9843	38,098	204,045	N.A	<b>911,986</b>
<b>Cropped Area affected (Acres)</b>	2,817	114825	2,706	321,672	493	<b>442,513</b>
<b>House Damaged partially</b>	66	38550	2,554	117,445	1,357	<b>159,972</b>
<b>House Damaged fully</b>	6,603	N.A	1,011	36,819	212	<b>44,645</b>
<b>Persons Died</b>	52	185	132	205	7	<b>586</b>
<b>Persons Injured</b>	N.A	104	140	N.A	28	<b>272</b>
<b>Cattle Heads Perished</b>	40	40,204	734		28	<b>41,236</b>
<b>Relief Camps Established</b>	4	127	N.A	N.A	N.A	<b>131</b>
<b>Persons in relief Camps</b>	N.A	33,579	N.A	N.A	N.A	<b>33,579</b>

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# FLOOD DAMAGES IN 2007

Lack of safe drinking water, sanitation and hygiene, shelter, health and even temporary houses continue to be major issues for the thousand affected people particularly in the provinces of Balochistan and Sindh



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# FLOOD DAMAGES IN 2007



# DISASTER DUE TO CYCLONES

- The climate change is causing increase in the frequency and intensity of storms, changes in their tracks and create strong Cyclones.
- Fourteen cyclones were recorded in Coastal Belt of Pakistan between 1971 and 2001.
- Cyclone of 1999 in Thatta and Badin districts wiped out 73 settlements, and it killed 168 people, and 11,000 cattle, 0.6 million people were affected.
- 1800 small and big boats and partially damaged, 642 boats, caused a loss of Rs. 380 million.
- The losses to infrastructure were estimated at Rs. 750 million.

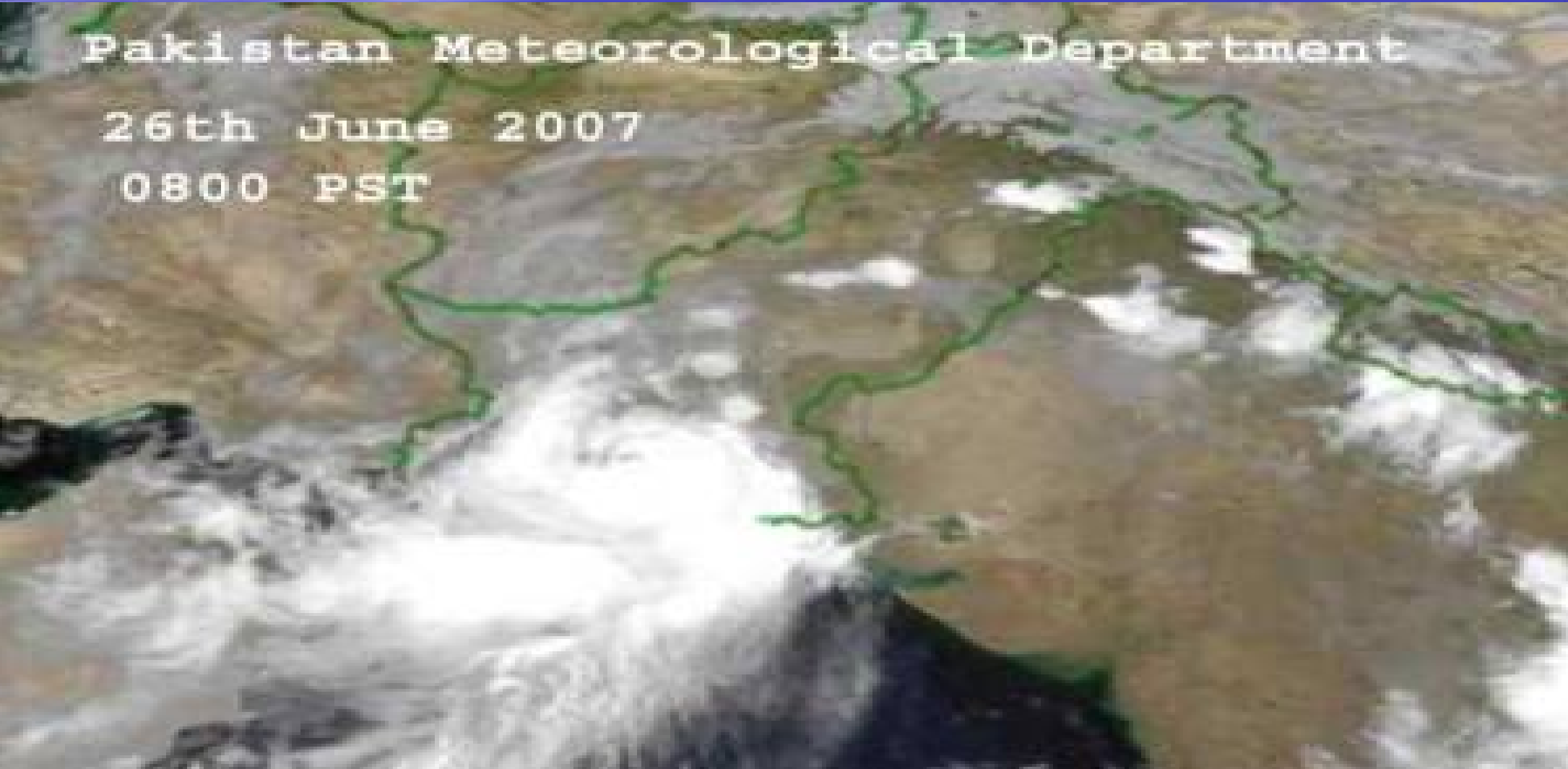
# DISASTER DUE TO CYCLONES

Cyclone entering into Pakistani coast during June 2007 extended several kilometers inland

Pakistan Meteorological Department

26th June 2007

0800 PST





# FLOOD MANAGEMENT IN PAKISTAN

- **Objectives**
- **Feasible and Effective Measures**
- **Strategies**

# **FLOOD MANAGEMENT OBJECTIVES**

- ❑ Reduction of floods and flood damages**
- ❑ Protection of cities, vital infrastructural installations, prioritized economic areas and other areas in that order**
- ❑ Exploring more effective use of existing flood control facilities**
- ❑ Improvements in Watershed and River Management Practices**
- ❑ Improvement in Flood Forecasting & Advance Warning System**

# **FEASIBLE AND EFFECTIVE MEASURES**

**i) Structural Measures**

**ii) Non-structural Measures**

**❖ Flood Protection Works**

**❖ Flood Warning System and Flood Forecasts**

**iii) Institutional Arrangements for Flood Control**

# INVESTMENT ON FLOOD PROTECTION WORKS

*(1977- June 2002)*

- To safeguard the areas from inundation, about 5,600 km of embankments have been constructed along major rivers and their tributaries in system.
- In addition, more than 600 spurs have been constructed to protect these embankments.
- The province-wise detail of the investment on flood protection works is as given below:

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# INVESTMENT ON FLOOD PROTECTION WORKS

*(1977- June 2002)*

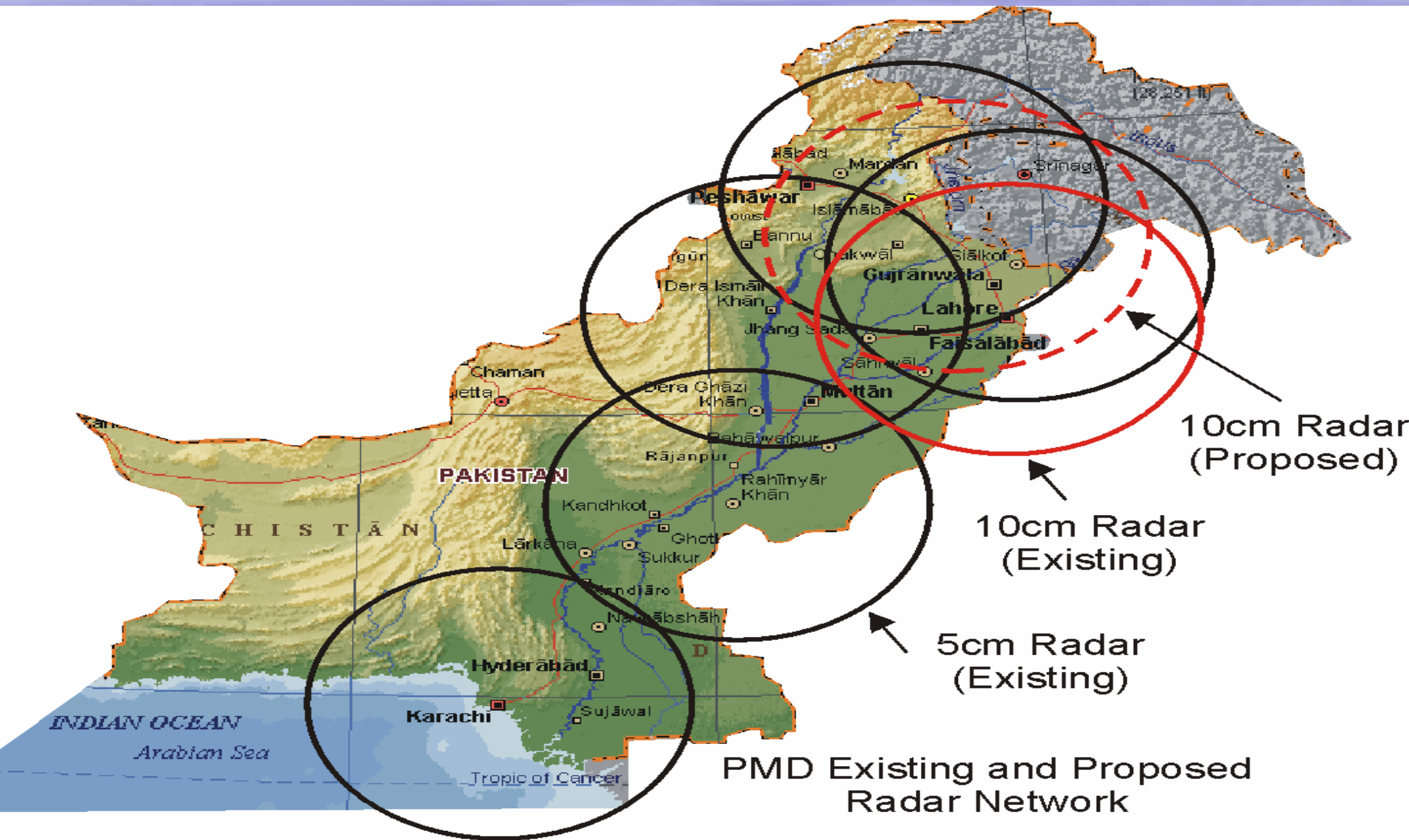
Province/Federal Agency	Investment (PKR Million)	Investment (% age)
<b>Punjab</b>	4,456.30	44.31
<b>Sindh</b>	3,576.00	35.56
<b>NWFP</b>	1043	10.37
<b>Balochistan</b>	750	7.46
<b>FATA</b>	120	1.19
<b>Northern Areas</b>	81.40	0.81
<b>AJ &amp; Kashmir</b>	29.40	0.29%
<b>Total</b>	<b>10,056.1</b>	<b>100%</b>

# EXISTING FLLOD MANAGEMENT FACILITIES

## (Non-Structural)

- ❑ 24 Telemetric gage stations within the upper catchments of Indus and Jhelum rivers to early record the rain data.
- ❑ 10-CM QPM Weather Radar System at Lahore, 5.36-CM Weather Radar at Sialkot, 5 CM Weather Radars at Karachi, Rahim Yar Khan, D.I.Khan and Islamabad.
- ❑ 69-HF Radio Communication sets for effective data transmission
- ❑ Meteoroburst Telecommunication System for improved gauging & telemetry.
- ❑ Mapping of flood prone areas along the Indus River and its major tributaries using GPS techniques and related development of a Digital Terrain Model (DTM).
- ❑ Indus Basin Flood Forecasting System (FFS), through Rainfall-Runoff Computer modelling.

# EXISTING AND PROPOSED RADAR SYSTEM NETWORK



# ORGANIZATIONAL SETUP FOR FLOOD CONTROL

- ▶ National Disaster Management Authority
- ▶ Indus River System Authority (IRSA)
- ▶ Flood Commission
- ▶ National Flood Forecasting Division (NFFD)
- ▶ Provincial Irrigation Departments (PIDs)
- ▶ Water & Power Development Authority (WAPDA)
- ▶ Emergency Relief Cell, Cabinet Division
- ▶ Provincial Flood Relief Departments
- ▶ Pakistan Commissioner For Indus Waters
- ▶ Provincial Rescue and Police
- ▶ Pakistan Forest Department
- ▶ Information Departments (Pakistan Television & Radio)
- ▶ Provincial Communication Departments
- ▶ District Administrations



# NATIONAL FLOOD PROTECTION PLANS

Since 1977 two 10-years National Flood Protection Plans has been implemented.

- **National Flood Protection Plan-I (1978-87), funded by GOP, 170 schemes completed.**
- **National Flood Protection Plan-II (1988-98), funded by 80% ADB and 20 % GOP, 257 schemes completed.**
- **National Flood Protection Plan-III (1998-2012), funded by ADB and GOP.**

# FLOOD MANAGEMENT – STRATEGIES

## Structural

- ❑ Construction Of Embankments
- ❑ Construction Of Spurs/Battery Of Spurs
- ❑ Construction Of Dikes/Gabion Walls/Flood Walls
- ❑ Construction Of Dispersion/Diversion Structures
- ❑ Channelization Of Flood Waters
- ❑ Construction Of Delay Action Dams
- ❑ Construction Of By-pass Structures

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# FLOOD MANAGEMENT – STRATEGIES

## Non-Structural

1. *Improved Flood Forecasting System through :*
  - ❑ **Effective Data Collection and Dissemination System**
  - ❑ **Real Time Rain-Fall and River Flow Data Collection**
  - ❑ **Weather Radar Prediction System**
  - ❑ **Modern System of Transmission of Flood Forecasts**

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# FLOOD MANAGEMENT – STRATEGIES

## *2. Improved Early Flood Warning System*

- **Based on effective Flood Forecasts, early Flood Warning System**
- **Reliable interaction between all related Flood Control and Relief Agencies**
- **In-time warning and evacuation arrangements by Provincial Relief Departments, District Administrations & Pakistan Army.**

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# FLOOD MANAGEMENT – STRATEGIES

- **Technical and operational capacities of relevant scientific organizations involved in the disaster risks to monitor and predict hazards on effective Flood Forecasts and early Flood Warning System.**
- **Replacement of existing technology with most modern**
- **Capacity building of existing community organizations at the district, and tehsil level.**
- **Involvement of Media, NGOs etc. at various levels.**
- **Establishment of Global Impact Change Study Center established to study climatic changes in the region.**

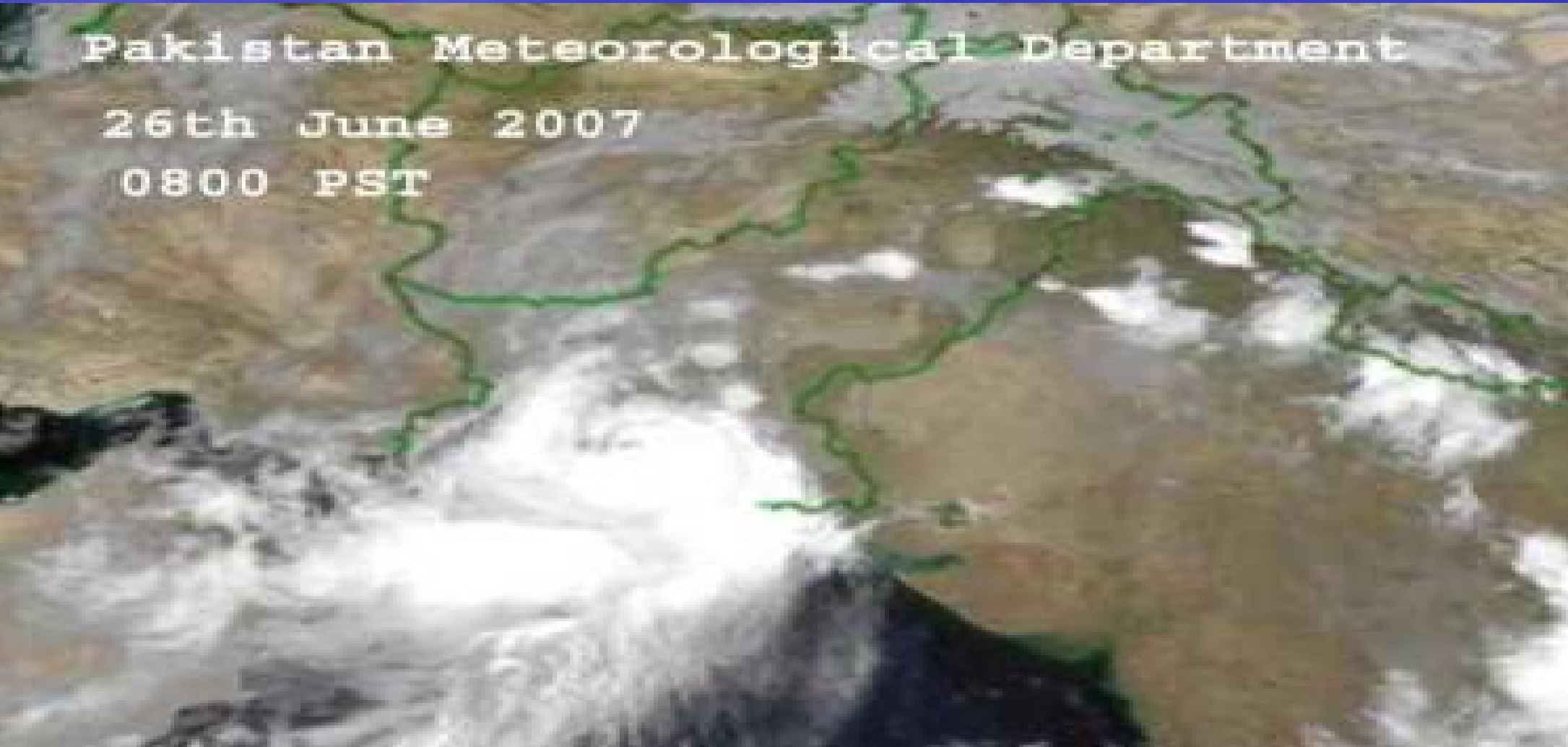
# CYCLONES IN 2007

A Cyclone entered into Pakistani coast during June 2007, extended several kilometers inland (Balochistan province) and destroyed crops, electric and communication installations, human settlements and other infrastructure and areas are left water logged where cultivation is not possible for months.

Pakistan Meteorological Department

26th June 2007

0800 PST



**THANKS**