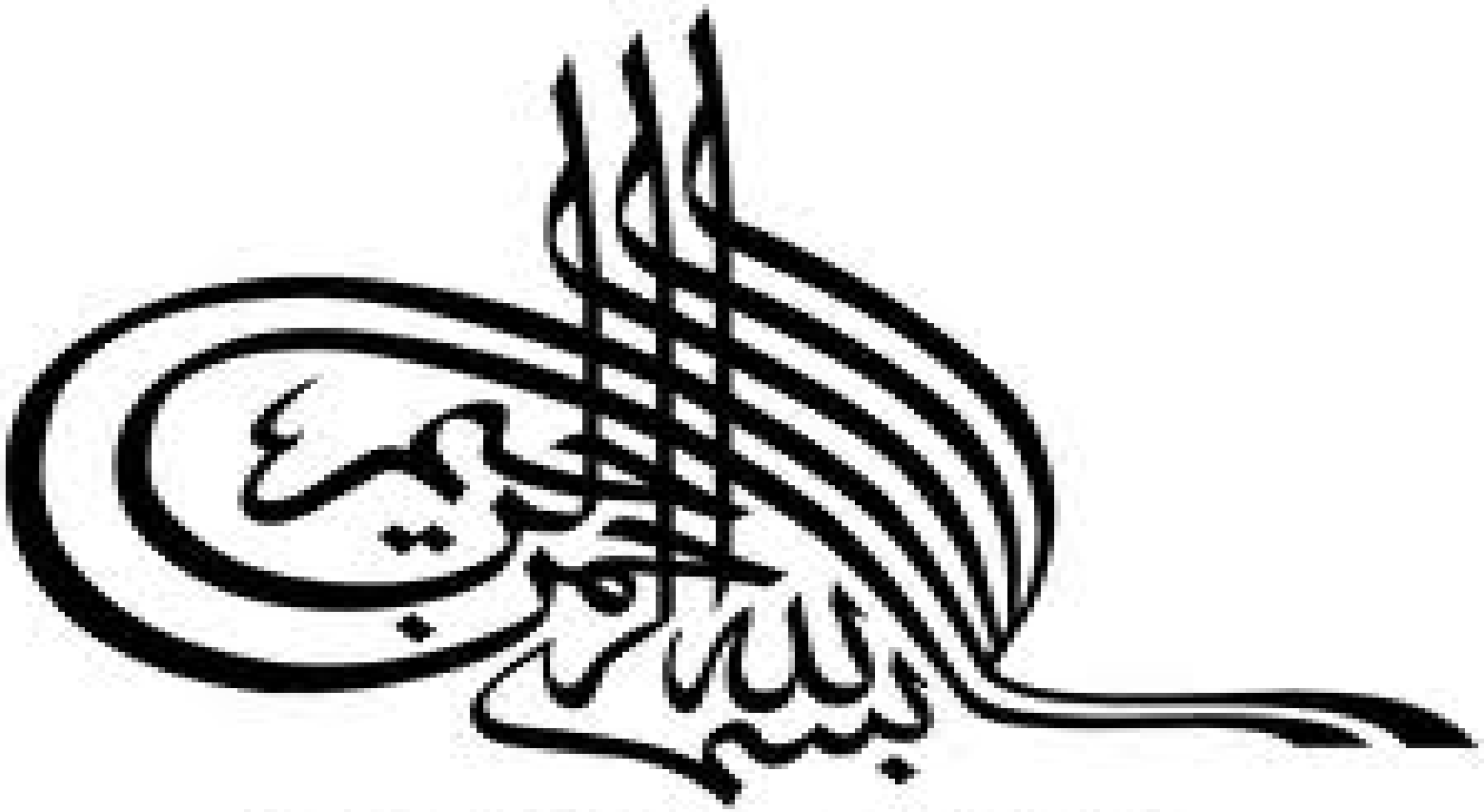


In the name of Allah,
the Most Beneficent,
the Most Merciful

Enhancing Water Security of Indus Basin through IWRM

Pakistan Meteorological Department

Presented By.

Sahibzad Khan (Director)
Regional Meteorological Centre Lahore .

Water resources of Pakistan

- Pakistan is one of the world agro based countries, with an average rainfall of 240 mm a year. The country's water resources consist mainly of rainfall, glaciers and ground water. The population and economy are heavily dependent on an annual influx into the Indus river system (including its tributaries Jhelum, Chenab, Ravi, Beas, and Sutlej rivers) of about 80 billion cubic meters of water flowing mainly through India and heavily depends on glacier melt in the western Himalayas.

The Indus basin

- The Indus basin is located in 4 countries, of which the largest part in Pakistan, and substantial upstream parts in India China and Afghanistan. More than 40% is located at an elevation higher than 2000m a.s.l. The total hydrographic basin , as defined by the International Water Management Institute(IWMI) – has an area of 1 137819 km2.

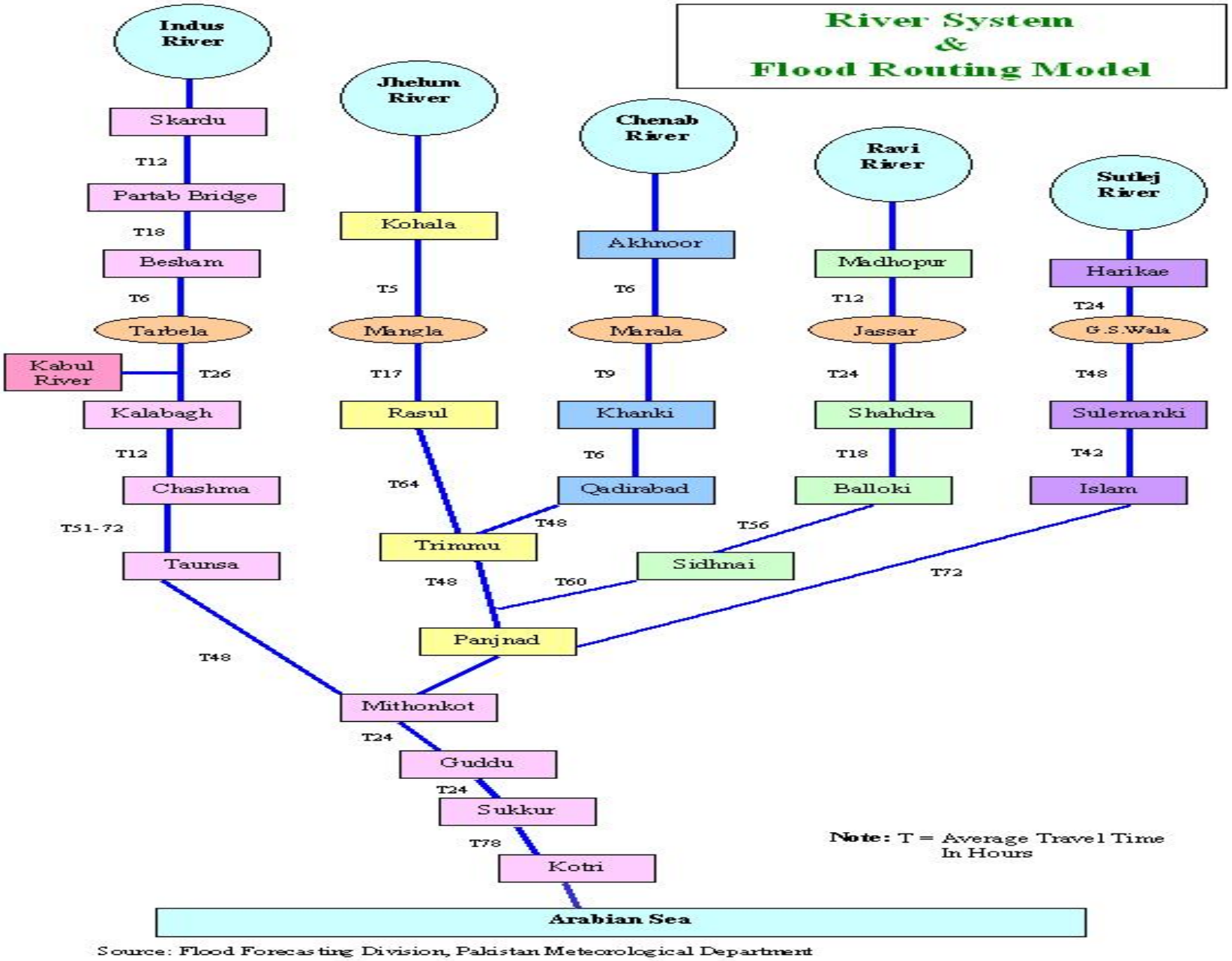
Expanse of the Indus basin

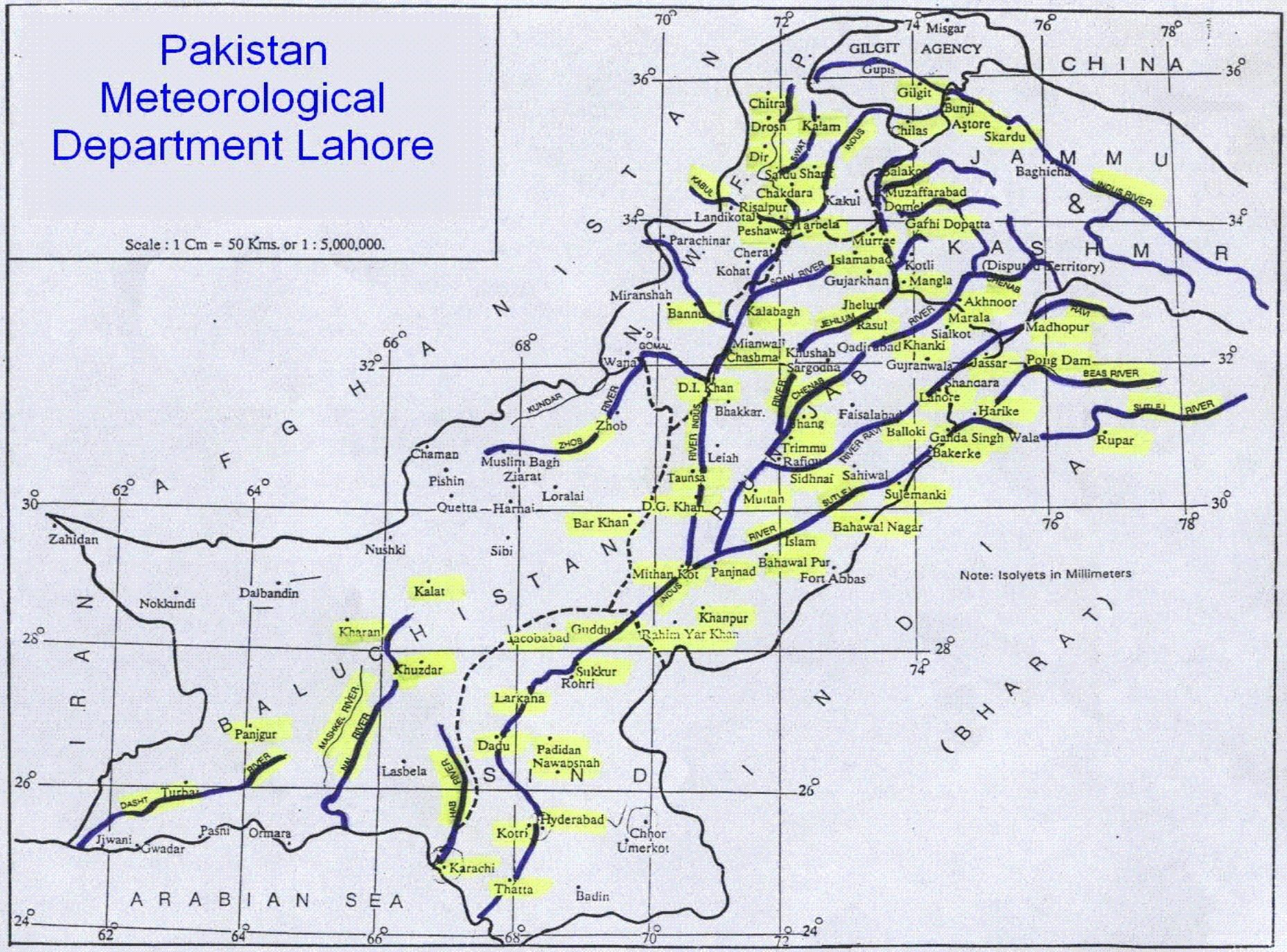
Indus Basin location and Flow.

- The Indus River rises in the Tibetan plateau in the vicinity of Lake Mansarovar. It flows in Tibet for about 200 miles before it enters Ladakh, (part of Kashmir under Indian control) and then flows on towards Gilgit in Pakistan. Flowing through the North in a southerly direction along the entire length of Pakistan, it falls into the Arabian Sea near Pakistan's port city of Karachi. With a total length of 3,200 km (1,988 miles). The Indus river feeds ecosystems of temperate forests, plains and arid countryside. Its five major tributaries are the Jhelum, the Chenab, the Ravi, the Beas and the Sutlej (also having origin in Tibetan plateau). Another two tributaries of the Indus, the Kabul and the Kurram, lies in Afghanistan. Most of the Indus basin lies in Pakistan and India.

Distribution of the catchment area of Indus River Basin

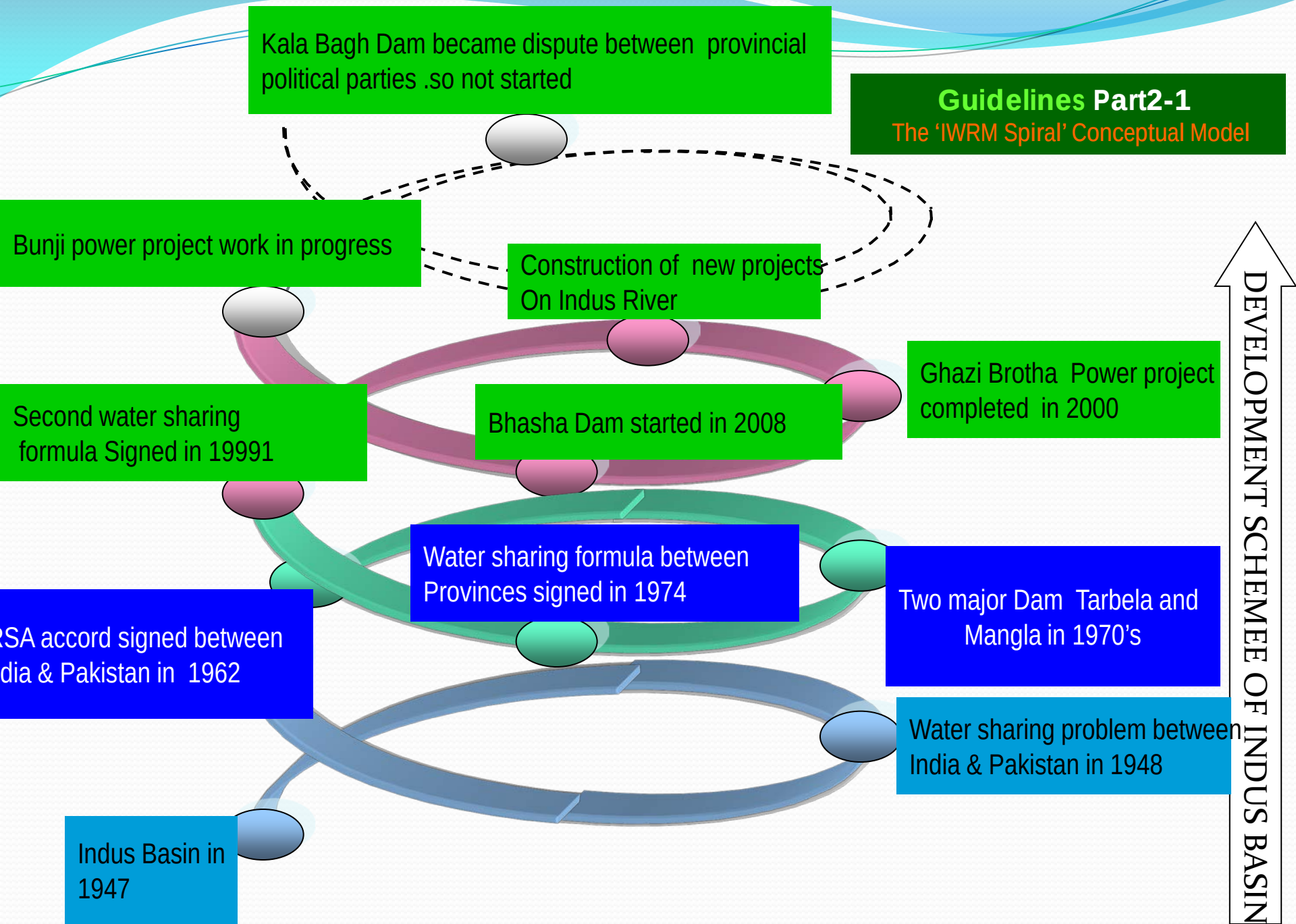
Country	Drainage Area (million ha)	Percent area of country in the basin (%)	Comments
Pakistan	59.80	52.48	-
India	38.32	34.35	1600 km2 Indian control, claimed by China
China	8.58	6.83	9600 km2 Chinese control, claimed by India
Afghanistan	7.21	6.33	-
Total	113.91	100	-


River System
&
Flood Routing Model
Indus River
Skardu
T12
Partab Bridge
T18
Besham
T6
Tarbela
Kabul River
T26
Kalabagh
T12
Chashma
T51-72
Taunsa
Jhelum River
Kohala
T5
Mangla
T17
Rasul
T64
Chenab River
Akhnoor
T6
Marala
T9
Khanki
T6
Qadirabad
T48
Ravi River
Madhopur
T12
Jassar
T24
Shahdra
T18
Balloki
T56
Sutlej River
Harikae
T24
G.S.Wala
T48
Sulemanki
T42
Islam
T72
Trimmu
T48
Sidhnai
T60
Panjnad
T48
Mithonkot
T24
Guddu
T24
Sukkur
T78
Kotri
Arabian Sea
Note: T = Average Travel Time In Hours
Source: Flood Forecasting Division, Pakistan Meteorological Department


Pakistan
Meteorological
Department Lahore
Scale : 1 Cm = 50 Kms. or 1 : 5,000,000.
Note: Isolyets in Millimeters
AFGHANISTAN
IRAN
BALUCHISTAN
PUNJAB
SIND
INDIA (BHARAT)
CHINA
GILGIT AGENCY
JAMMU & KASHMIR (Disputed Territory)
ARABIAN SEA
Misgar
Gupis
Gilgit
Chitral
Drosh
Kalam
Chilas
Astore
Skardu
Bunji
Baghicha
Dir
Saidu Sharif
Balakot
Muzaffarabad
Kakul
Risalpur
Landikotal
Peshawar
Tarnela
Gafhi Dopatta
Parachinar
Murree
Cherat
Kohat
Islamabad
Kotli
Gujarkhan
Mangla
Miranshah
Bannu
Kalabagh
Jhelum
Rasul
Akhnoor
Marala
Sialkot
Madhopur
Wana
Mianwali
Chashma
Khushab
Sargodha
Qadirabad
Khanki
Gujranwala
Jassar
Pong Dam
D.I. Khan
Bhakkar
Jhang
Faisalabad
Lahore
Shangara
Harike
Zhob
Chaman
Muslim Bagh
Ziarat
Pishin
Loralai
Quetta
Harnai
Taunsa
Leiah
Trimmu
Rafiqui
Sidhnai
Sahiwal
Balloki
Ganda Singh Wala
Bakerke
Rupar
Multan
Sulemanki
D.G. Khan
Bar Khan
Bahawal Nagar
Islam
Bahawal Pur
Panjnad
Fort Abbas
Mithan Kot
Zahidan
Nushki
Sibi
Dalbandin
Nokkundi
Kalat
Kharan
Jacobabad
Guddu
Rahim Yar Khan
Khanpur
Khuzdar
Sukkur
Rohri
Larkana
Panjgur
Dadu
Padidan
Nawabshah
Lasbela
Turbat
Pasni
Ormara
Jiwani
Gwadar
Hyderabad
Kotri
Chhor
Umerkot
Karachi
Thatta
Badin
KABUL
SWAT
INDUS
INDUS RIVER
KURRAM
RIVER
ZHOB
GOMAL
JEHLUM
CHENAB
RAVI
BEAS RIVER
SUTLEJ RIVER
SOAN RIVER
MASHKEL RIVER
NAL RIVER
DASHT
RIVER
HUB
70°
72°
74°
76°
78°
36°
34°
32°
30°
28°
26°
24°
66°
68°
62°
64°

Guidelines Part2-1

The 'IWRM Spiral' Conceptual Model



Challenges Faced by Indus Basin

- The Indus basin is one of the regions in the world

that is faced with major challenges for its water sector, due to

- population growth.
- rapid urbanization.
- industrialization.
- environmental degradation.
- unregulated utilization of the resources.
- inefficient water use and poverty,

all aggravated by climate change.

Internal management of water resources & sharing of best practices.

- The issue of internal water resources management becomes very important given the fact that physical separation of the Indus tributaries has hampered the possibilities of efficient integrated basin management. In view of growing water scarcity, it is the responsibility of both states to ensure internal water resources management by following the principles of Integrated Water Resources Management (IWRM) and share best practices in water conservation techniques in agricultural, industrial and domestic uses. There is a need for a paradigm shift in water management from technocratic approach that looks almost exclusively towards engineering solutions to a socio-centric approach which lays emphasis on indigenous physical and human resource management and is more resource-efficient and ecology friendly.

Various national and international reports on Pakistan's water situation

- *Pakistan Strategic Country Environmental Assessment Report, 2006,* says water availability per person has drastically fallen from about 5,000 cubic meters in 1947 to 1,100 cubic meters. It projects that water availability will hit below 700 cm per capita by 2025. The World Bank in its report (2005) observed: "Pakistan is already one of the most water-stressed countries in the world, a situation which is going to degrade into outright water scarcity."In 2007, the Asian Development Bank (ADB) report stated that Pakistan is "nearly at water scarcity threshold of 1,000 cubic meters/person/year. "The *Economic Survey of Pakistan (2009-10)* puts the per capita availability of water in the country at 1066m 3/person. This clearly shows that Pakistan has become a water-scarce country.
-

Conclusions

- The Indus river basin – shared by Pakistan, India, China and Afghanistan, is one of the most depleted river basins in the world. The basin is confronted with a lot of current and future challenges. Irrigated agriculture is by far the most important water demand stakeholder, but water demands for domestic and industrial purposes are increasing, due to population increase. Because the challenges are so massive and sustainable WRM requires the inclusion of all available options, so it is essential for scientists and policy makers to have a holistic vision for the Indus basin. The challenges of the Indus basin need to be taken upon the concept of IWRM, regarding the Indus basin as a natural system, independent of political borders, where flooding needs to be tackled by means of "river management" measures, not merely "river control" strategies.

- *END*