

# **Sea Water Level Rise A Case Study Arabian Sea**

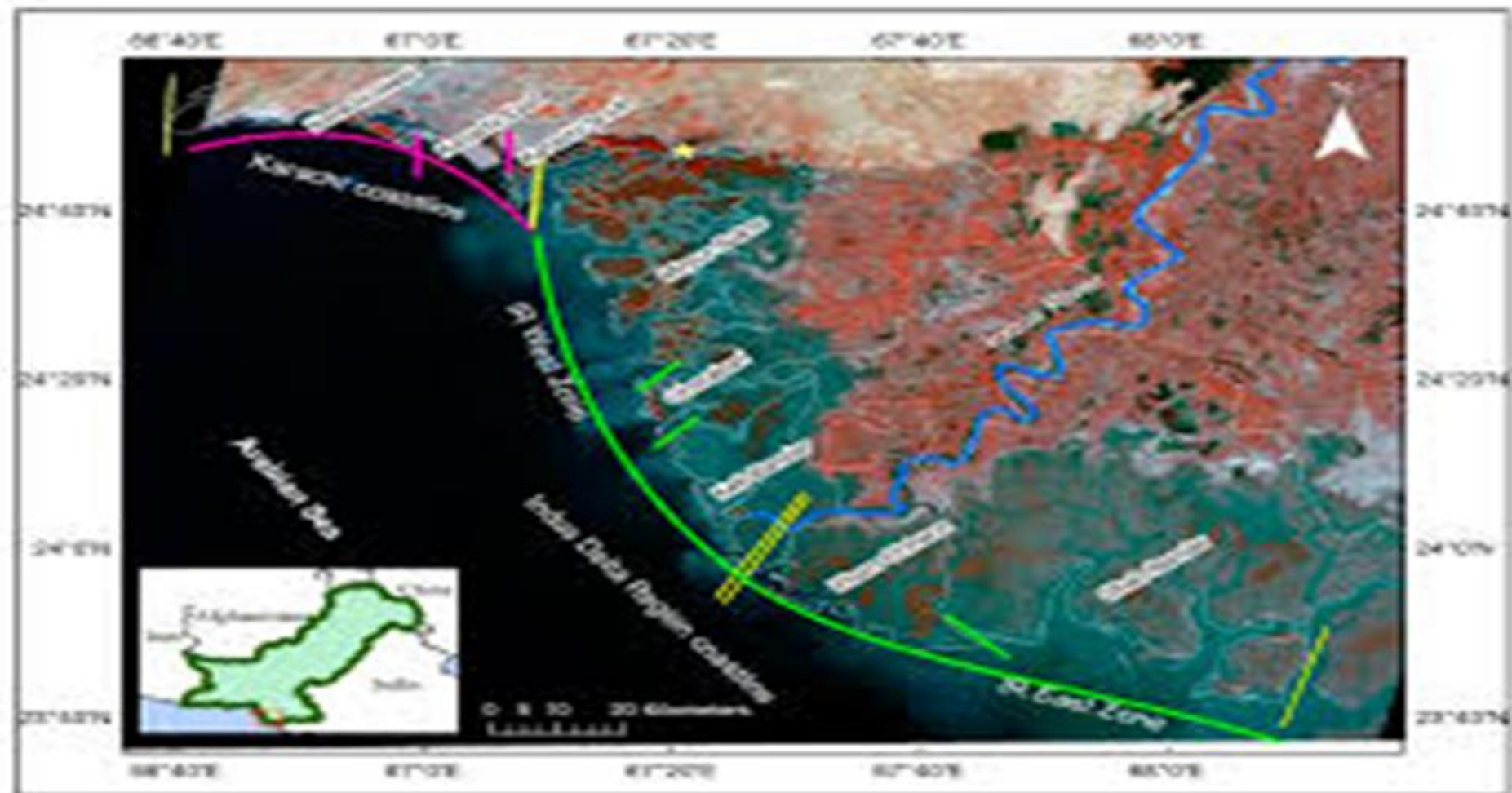
*Gillani Naseer Ahmad FIE, Sr. Fellow  
Development Economics former Sr.  
Civil Servant now Chair Development  
Finance*

# Sea Level Rise

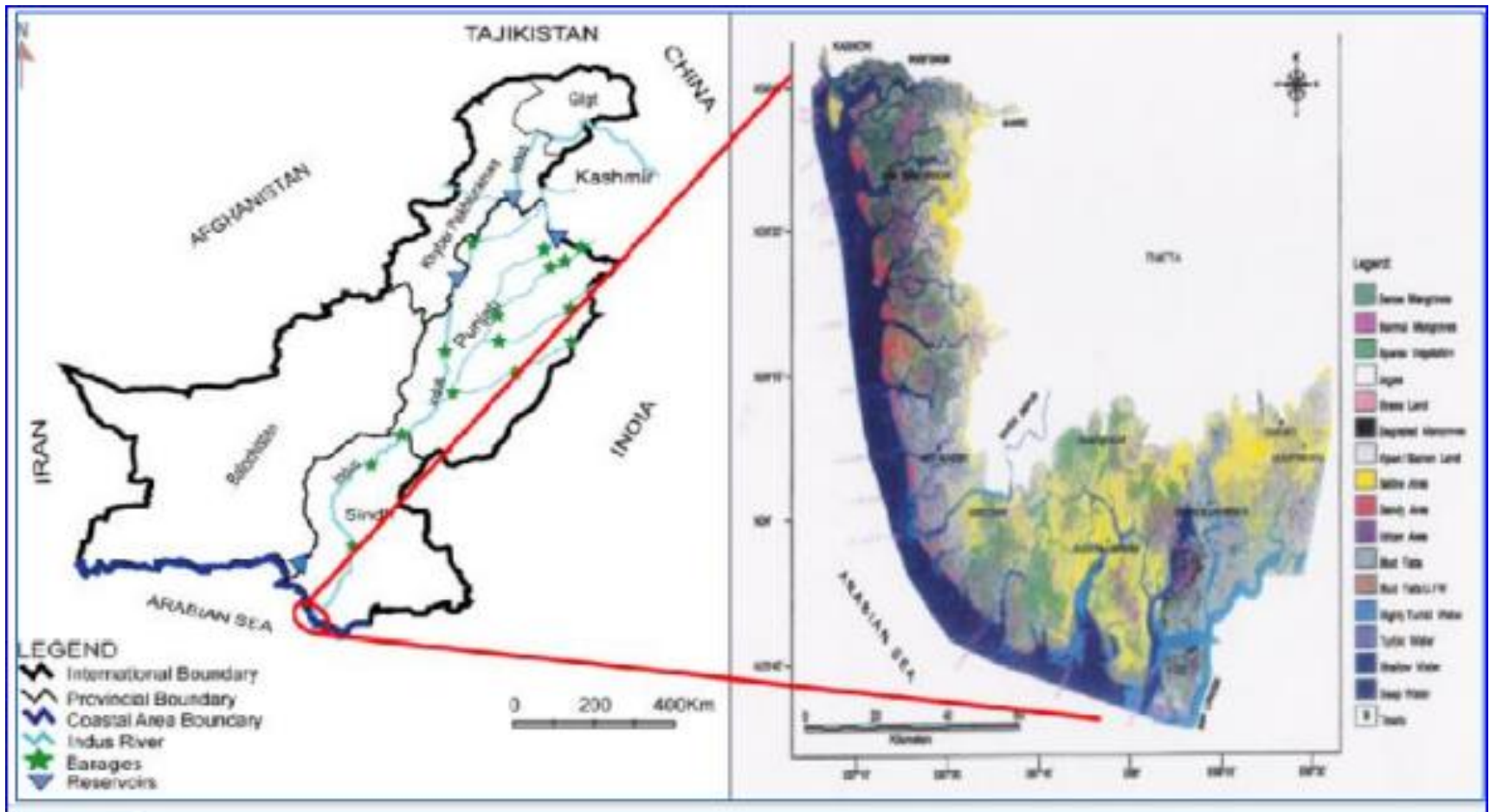
- Warming of thermal regime of the interacting atmosphere with land and ocean caused the change in the dynamics of weather processes, accelerated melting of seasonal snow/glacier and expansion of water.
- All these changes are related to the sea level rise either temporarily or permanently.
- El~Nino phenomenon is an example of upwelling of sea water as well as pushing toward the nearby coastline.
- It results in rise of sea level in the windward side of the coastline for a period of time El~Nino conditions exist in a particular oceanic part

# Sea level Rise not only a Threat for Islands

- Scenarios indicate that a rising sea level would have a wide range of impacts on coastal environments and infrastructure. Coastal erosion, wetland and coastal plain flooding, inundation of deltaic plains, salinization of aquifers and taking land into Sea , soils, and a loss of habitats for fish, birds, and other wildlife water layers of the sea water.



# Location of Indus Delta





# FACTS

- On the average, the trend line indicates 6mm rise per annum if the thermal regime continues to heat up at the present rate .
- During the 20th century, sea level rose about 15-20 centimeters (roughly 1.5 to 2.0 mm/year).
- Satellite measurements taken over the past decade, indicate that the rate of increase has jumped to about 3.1 mm/year, which is significantly higher than the average rate for the 20th century.

# Impact 1

- 42607 ha land of Indus delta is degraded due to surface seawater intrusion.
- Thus, there was a 7.1% increase in the tidal floodplains area of the delta in the last 45 years.
- Out of total degraded land of 42607 ha, 31656 ha land is now under the seawater while 10951 ha new land is converted into the tidal floodplain area.



# Impact 2

- It was further investigated that tidal floodplain area on the left bank of the Indus is about 4208 km<sup>2</sup> or about two times larger than the right side (2220 km<sup>2</sup> ).
- Permanent water in tidal flood plains has increased from 7.1% to 18.1% of the total tidal floodplain area.

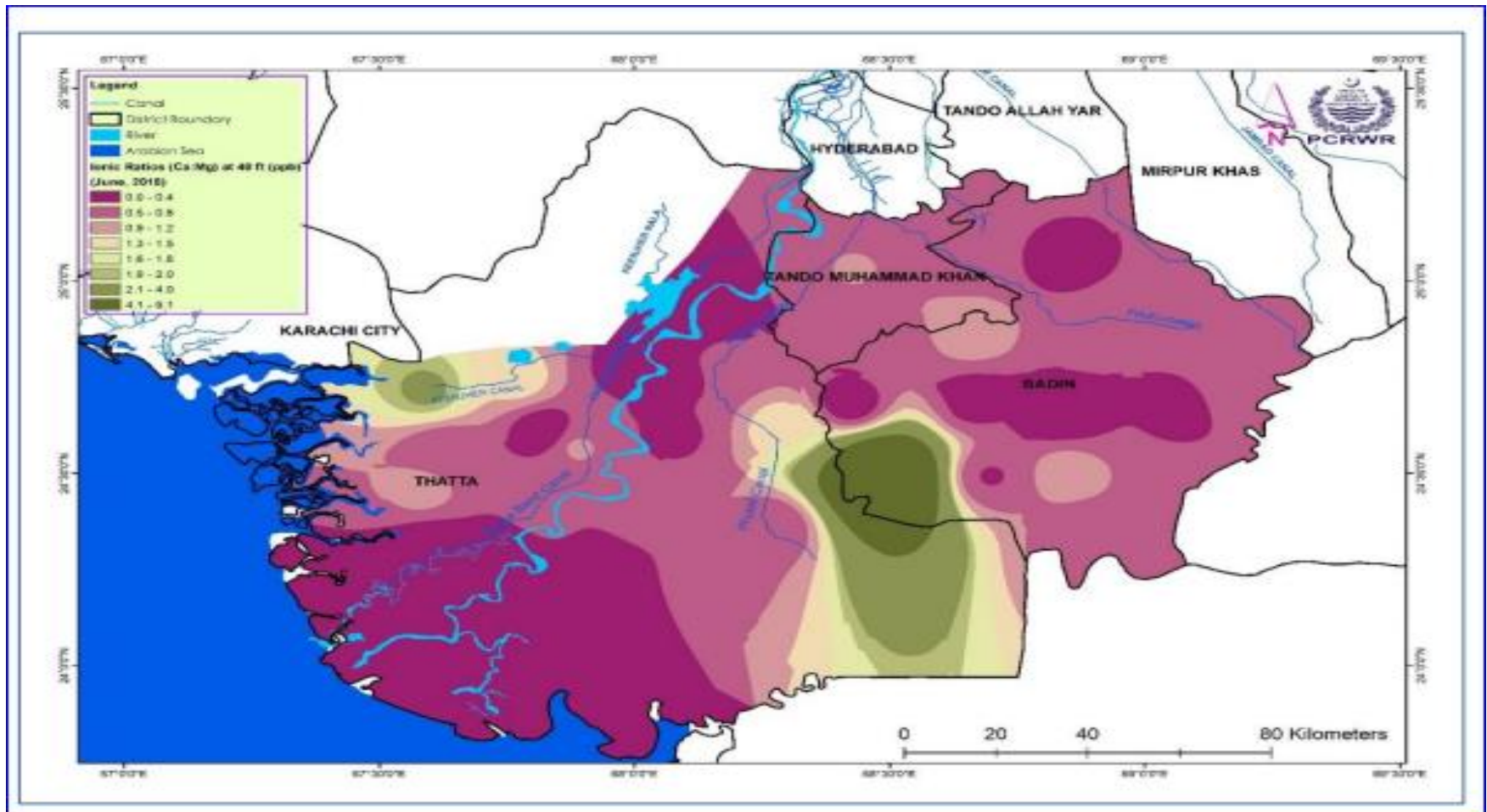
# Impact 3

- In case a tsunami wave of 5 m height or a cyclone capable of raising sea level up to 5 m hits the coastal belt of the Indus delta, 9376 km<sup>2</sup> (71% of the delta) will be flooded
- which reflects high vulnerability of submergence of the delta and risk of life of coastal communities of the delta.

# Impact 4

- Coast line change has increased six meter in last thirty years
- Tidal flood plain has increased by 400 thousand hectares in the same period.
- Some 1.15 Mha have been damaged by subsurface saline water intrusion.
- Planning Commission of Pakistan entrusted a comprehensive study to the ministry of science & Technology

# Ground Water Quality Aquifer Damage



# AREA Effected Directly



# Way forward    Enabling Environment

- An enabling environment through policies, the legislative framework, and financing and incentive structure is required. Policies aimed at setting goals for water use, protection and conservation, and addressing the serious management challenges faced, and modernizing and upgrading institutional structures to meet these effectively

# Technical Needs for Solution

- From 2023 Backward say 40 years sea level information on 10 daily , monthly ,seasonal and annual basis .
- Lunar impact on sea level of above pattern
- Air winds speed and directions data
- Temperature of Arabian Sea and Coast line on above frequency
- Development of simple model to find out relation of temperature rise sea level rise

# Solution Input

- Satellite Imageries of same frequency
- A simple model to predict future temperatures
- Simulated future Temperatures and sea levels
- Mathematical model simulating air winds speeds and directions
- 4 Dimensional Model( temperature ,wind speed, wind direction ) to predict future sea encroachment on coast line.
- Storms History and prediction Model



# Diagnostic

- Future Area under direct threat
- Extent and spread of aquifer damage
- Impact on mangroves and aquatic life , biodiversity
- Impact on agriculture, livelihood, and GDP

# Moving towards Solution

- Biological Measures
- Changing Cropping Pattern
- Taking Saline Ground Water to Sea
- Physical Structure
- Shelter homes
- Early warning

# Steps

- International agency should not use INGO or Intergovernmental institutions to take preliminary study as it is time consuming full of conflicts and biases
- Appoint an independent single individual local but senior expert allowing him to hire a few support individuals.
- Deliverables; consultations with government , experts of regional Seas/ Oceans local community ,academia an RFP, draft proposal