



AWCI Implementation Plan-Phase II

PAKISTAN CASE

Dr. Ghulam Rasul

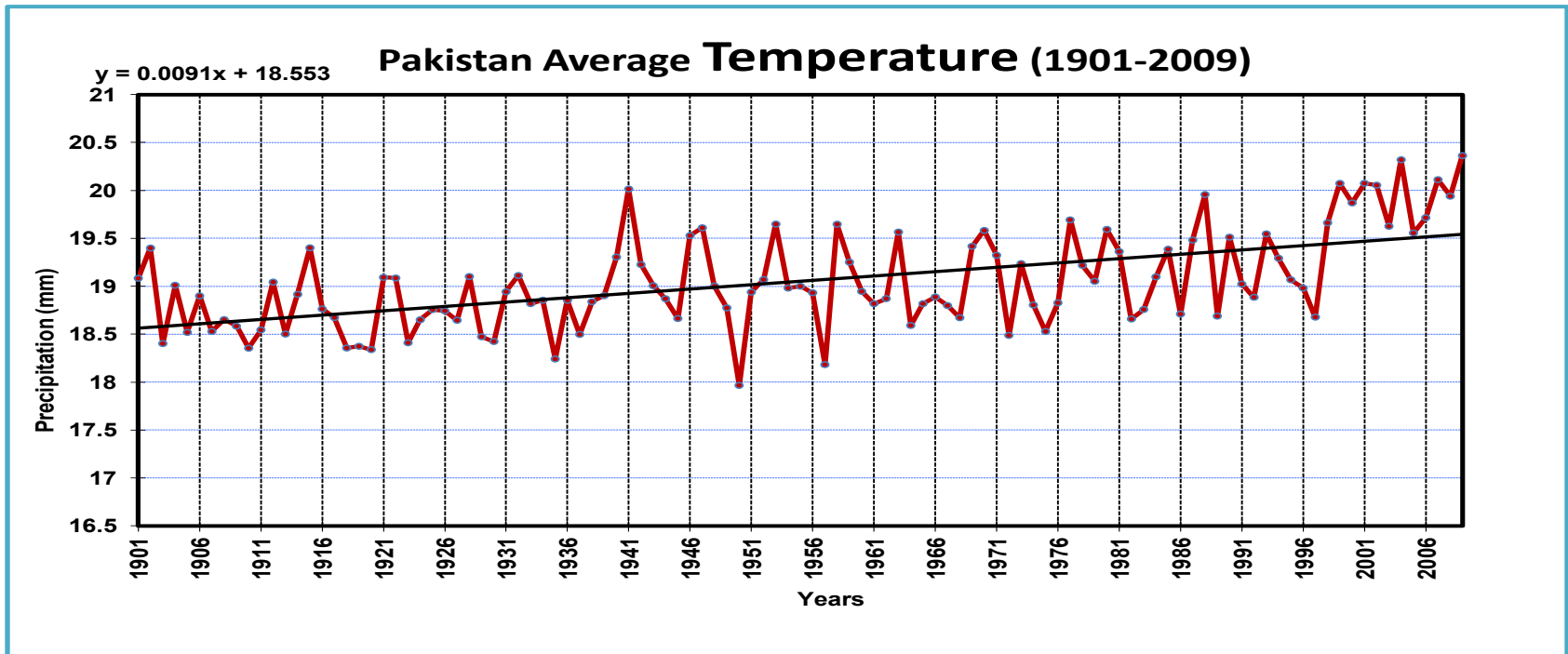
Chief Meteorologist

Research & Development Division

Pakistan Meteorological Department

rasul@pmd.gov.pk

CLIMATE PROFILE OF PAKISTAN

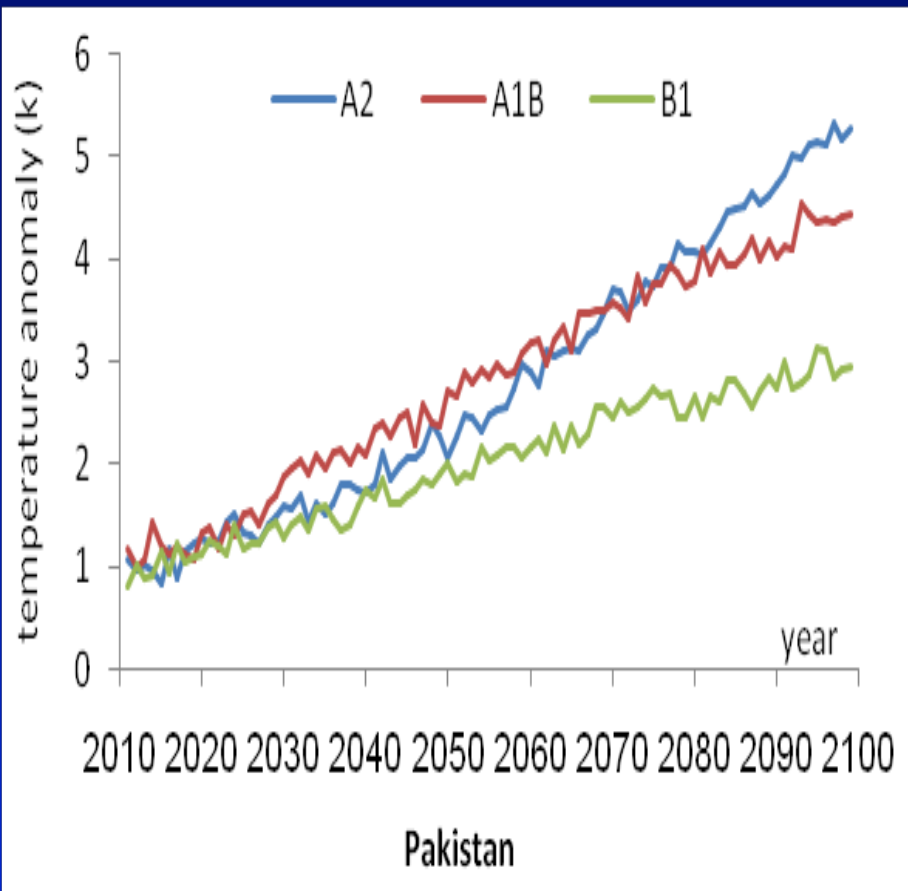


RECENT HISTORY OF EXTREME EVENTS

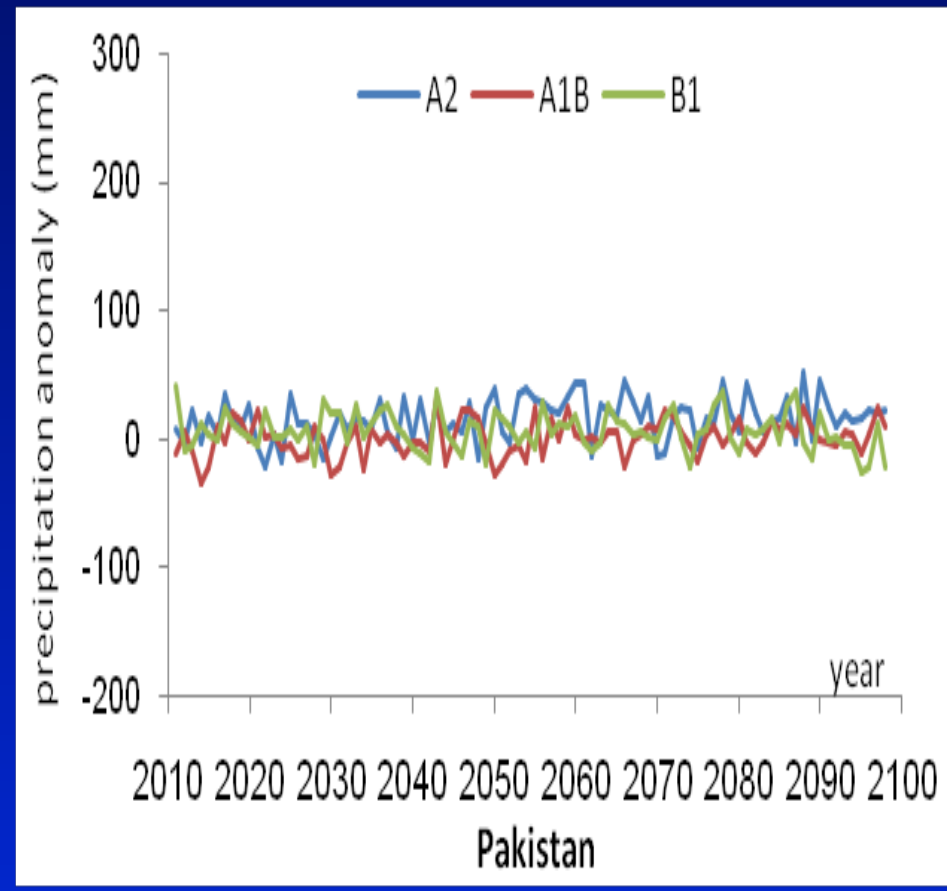
- Cloudburst Events 2001, 2003, 2007, 2008,2009, 2010, 2011
- Prolonged Drought 1999-2002
- Historic River Flooding 2010 and 2011
- Tropical Cyclones 1999,2007,2009
- Severe Urban Flooding 2001, 2003, 2007, 2008, 2009, 2010, 2011
- Snowmelt flooding 2005, 2007 and 2010
- Drought at sowing stage 1999-2002, 2005, 2007, 2008, 2009, 2012
- Sea water intrusion affected 6200 hectares land since 2003
- Heat Waves in Spring 2006, 2007, 2010, 2011 (Reduced wheat yield)

FUTURE PROJECTIONS

TEMPERATURE



PRECIPITATION



CRITICAL ISSUES

- **Too Much and Too Less Water**
- **Depletion of Ground Water**
- **Hydropower**
- **Land slides/ Erosion**
- **Sea Level Rise**
- **Temperature Rise/ GLOF**
- **Transboundary and International Coordination**
- **Shifting Snow Residency, Glacier Melt, Snowline Shift-Biodiversity**

NEEDS

Observations:

- *in-situ telemetric network (mountain areas)*

PMD being NMHS operates 105 hydromet and met (manne/automatic) stations throughout the country. Still at low elevation 15% area is not monitored and 75% are the data gaps in mountainous areas including glaciers and river basins.

- *remote sensing (satellite, radar) currently and in future*

Data gaps are filled with satellite information which is not freely available at finer resolution. Most of the river catchments do not come under radar coverage, at least 5 radars may serve the purpose of flood warning up to some extent.

Data Access

- *satellite data access (operationally coupled with in-situ near real-time data)*

Satellite imageries are accessible coupled with met observations but they are coarse resolution. There is no software available for satellite data processing and its integration to Numerical Models.

- *global data access (Numerical Weather Prediction, Reanalysis, Climate Projection)*

Models

Only data are accessible for the models available at IPCC website and pseudo free Regional Models are being used for climate modeling studies. Capacity building in NWP and Climate Projections is highly desirable.

Management systems (Forecasting, Early Warning, Decision support System)

- *National/local government (climate proofing, urban management, risk reduction measures, adaptation strategies)*

- *community-based*

All the above management systems are in place but their effectiveness can be optimized through enhancing their capacity by technological input and training of manpower.

Implementation proposal

Challenges

- Extreme Climate Variability
- Winter and summer monsoon variability
- Lack of technical and human capacity in NWP and Seasonal Forecast
- Flood Forecasting and Warning
- Climate Impact Modeling
- Reliable and fine Resolution Climate Projections

Requirements

- High speed cluster computing system
 - Denser AWS network in glacier zone
 - Capacity building in weather and climate modeling
- Improved seasonal forecasting techniques
- Impact Assessment and modeling
 - Access to remote sensing data and processing software
 - International collaboration

Project Proposal

Impact of Climate Change on Water Cycle Variability in Pakistan

Brief Introduction

Global warming resulting in accelerated melting of HKH glaciers and enhanced precipitation variability over time and space coupled to generate highly variable river flows. Upper Indus Basin comprises 10 sub-basins and fed by more than 5000 glaciers in addition to summer monsoon at lower reaches of the Indus River System. Surplus amounts of water associated with extreme events caused urban, riverine and flash flooding. Deficient rains gave rise to prolonged social, hydrological and agricultural droughts. Sustainable crop production and power generation have become a challenge due to lack of capacity of prediction with sufficient lead time and accuracy. A schematic diagram covers intended framework.

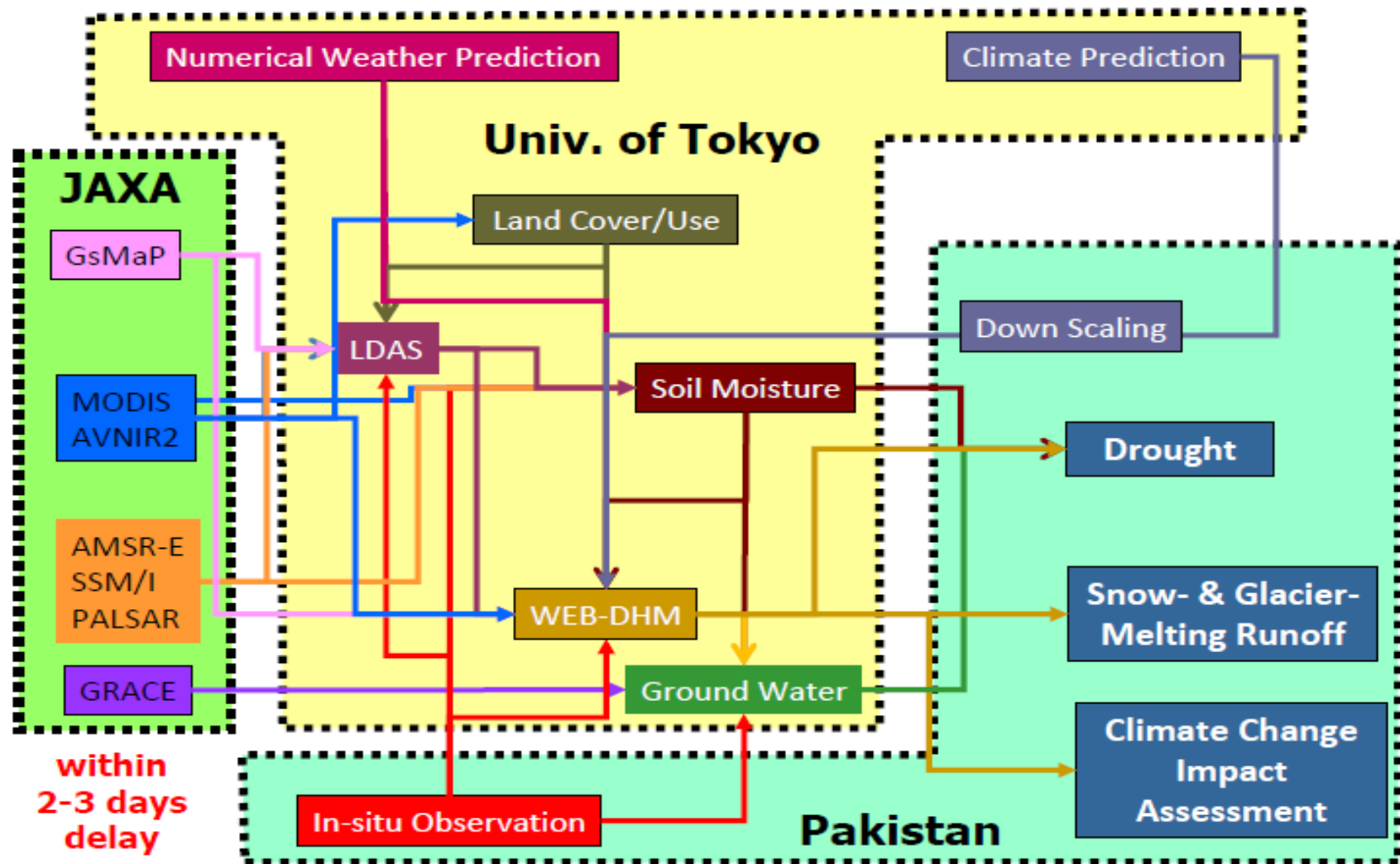
Pakistani Collaborators

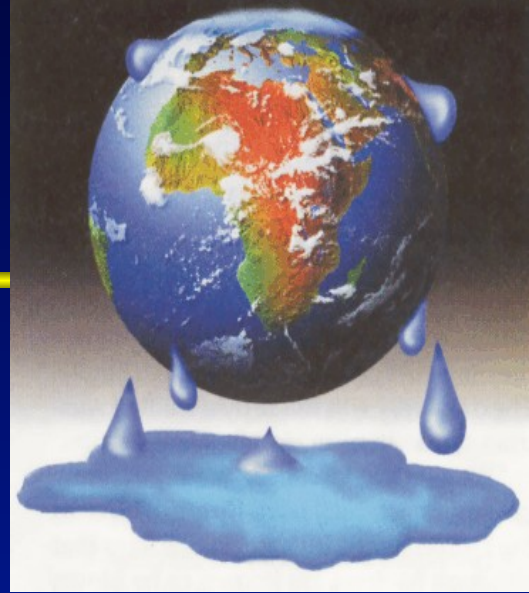
Project PI: Dr. Ghulam Rasul

Project Coordinator: Dr. Bashir Ahmad

Participating Scientists: Furrukh Bashir, Waheed Iqbal, S. Ahsan Bukhari, Muhammad Arshad

Way Forward





Thank You