

Joint GOI/ADB/OECD Workshop 13 - 15 Dec, 2011, Indonesia

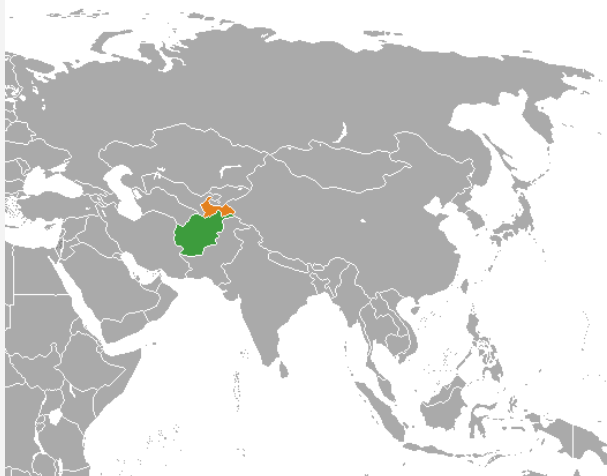
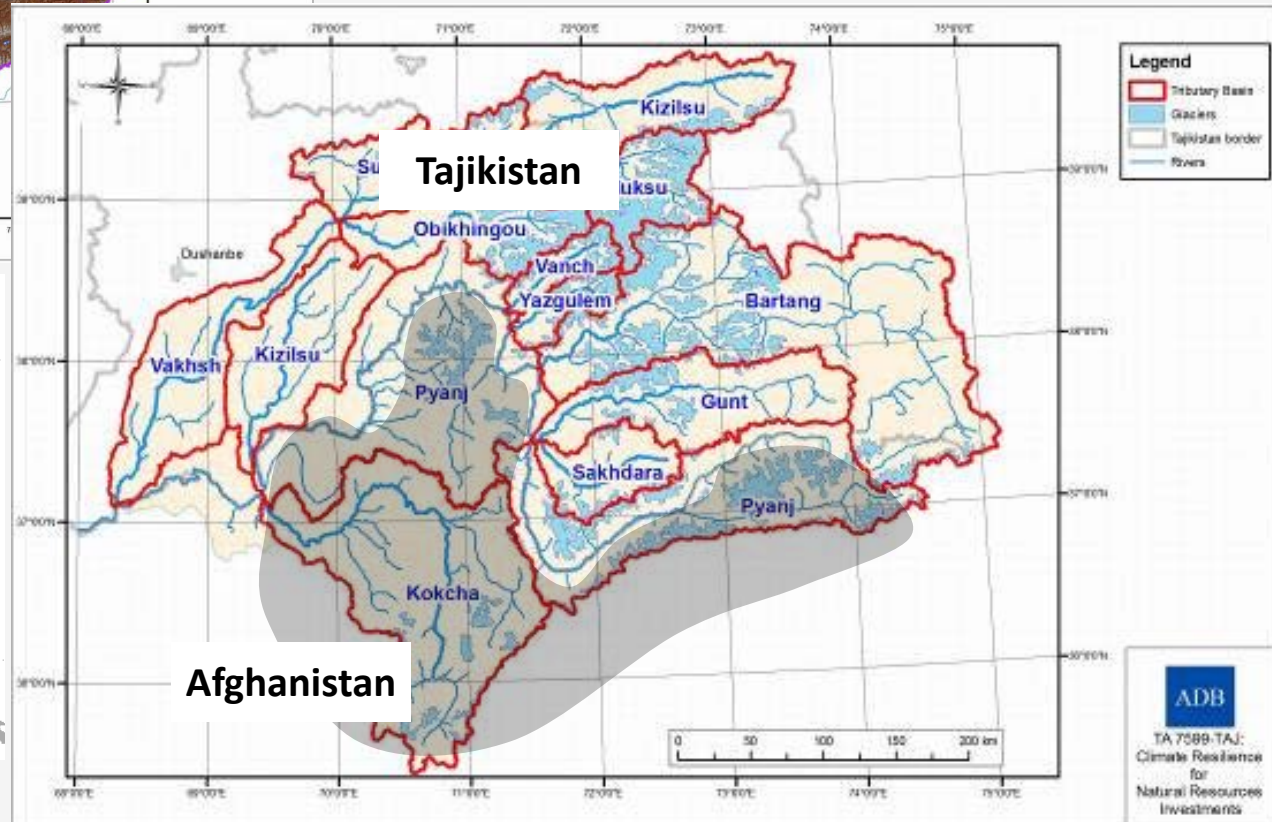
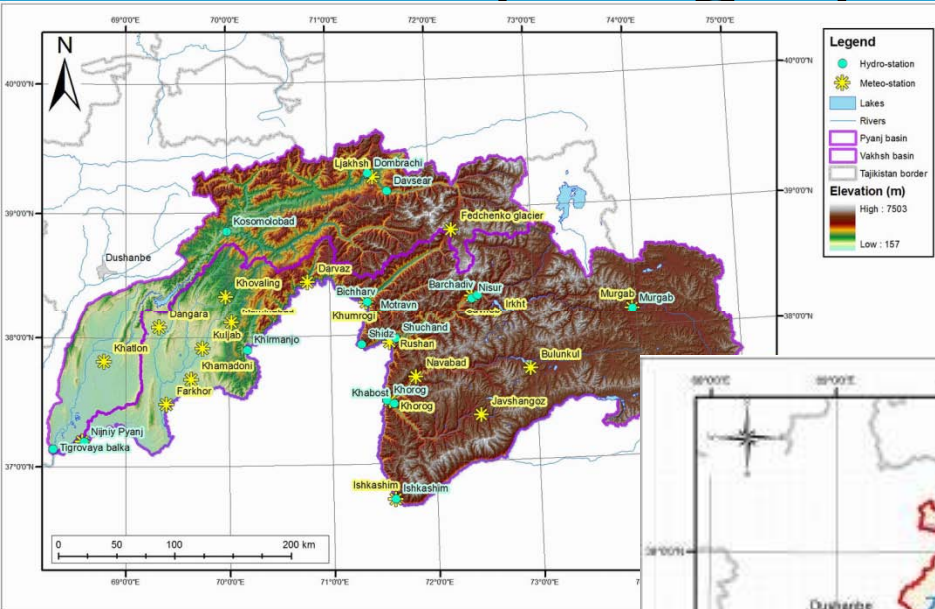
Sustainable Water Management (WM) for Food Security (FS)

ADB's Approach of WM for FS in Pyanj River Basin (PRB) (Tajikistan and Afghanistan)



R. Takaku, Water Resources Specialist, CWRD

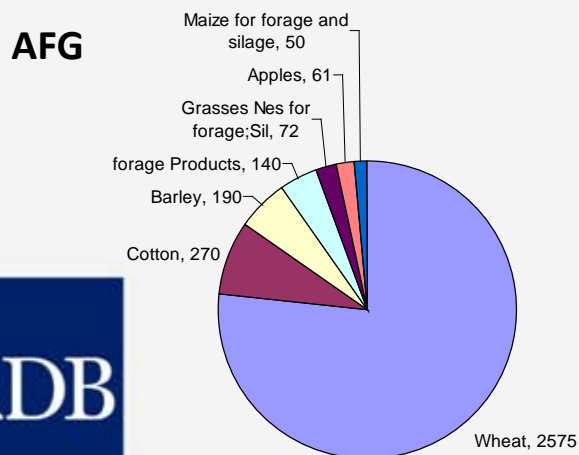
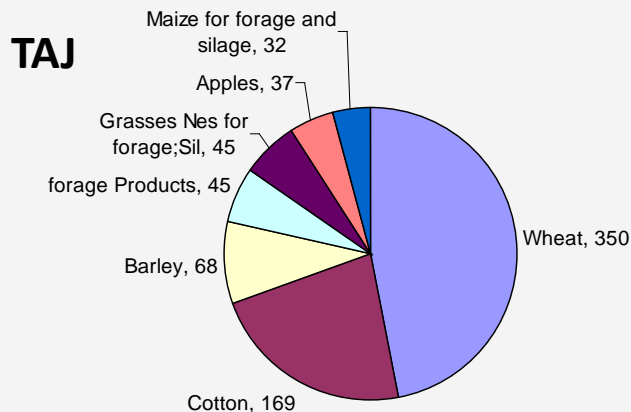
ADB's Approach of WM for FS in PRB (Geographic Location)



Source: Wikipedia

ADB's Approach of WM for FS in PRB (Crop and PRB Overview)

Harvested Area (,000 ha) for Top 7 Products (2009)



Overview of Pyanj River basin

	TAJ	AFG	Total (km ²)
Catchment area	58.2%	41.8%	114,000
% of country land area	46.4%	7.3%	TAJ : 143,100 AFG: 647,500
Natural surface flow in PRB comprise 33.4% of that in Amu Darya basin ¹			
1 Mean annual runoff, Interstate Commission for Water Coordination of Central Asia			
107,000 km ² are mountainous terrain and 6,500 km ² are lowland flood plain			



Source: FAOSTAT 2009

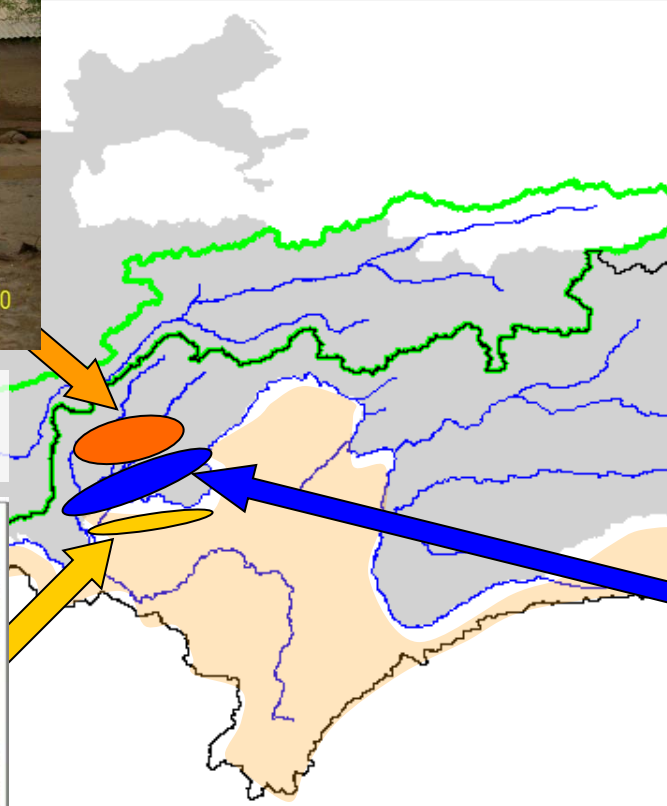
ADB's Approach of WM for FS in PRB (Major Water Related Threats to FS in PRB)



**Mudflows/Flash Floods
(Kuryab, Taj)**



Droughts (Taj&Afg)



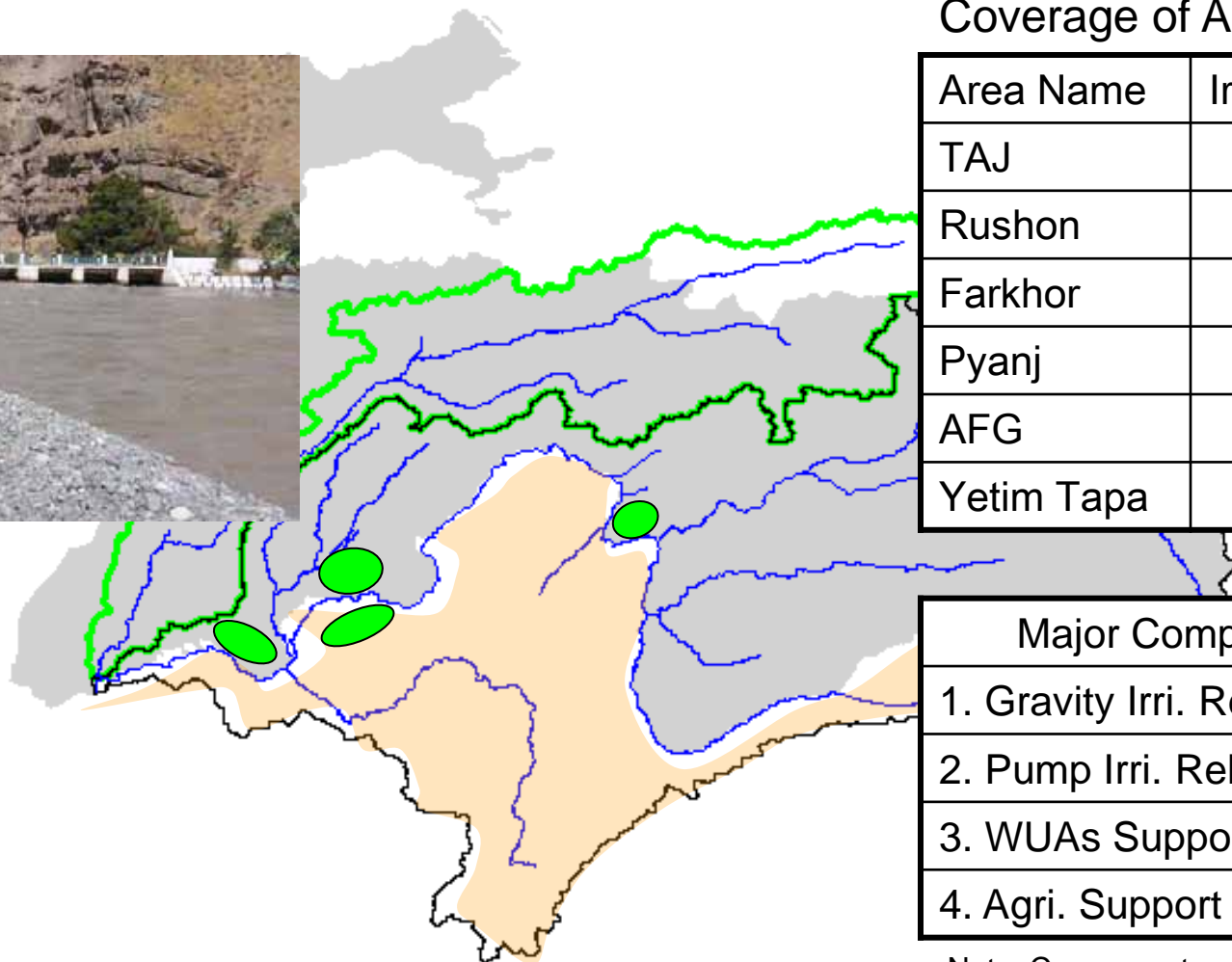
Land Erosions (Yangi Qala, Afg)



Floods (Hamadoni, Taj)

And others: High/Low Temperatures, Heavy Precipitation, Hail, Strong winds, etc

ADB's Approach of WM for FS in PRB (ADB's Aids for Droughts Mitigation in PRB)



Coverage of ADB's Aids

Area Name	Irrigated ha
TAJ	
Rushon	1,270 ha
Farkhor	17,800 ha
Pyanj	18,700 ha
AFG	
Yetim Tapa	5,000 ha

Major Components

1. Gravity Irri. Rehab.
2. Pump Irri. Rehab.
3. WUAs Support
4. Agri. Support to Farmers

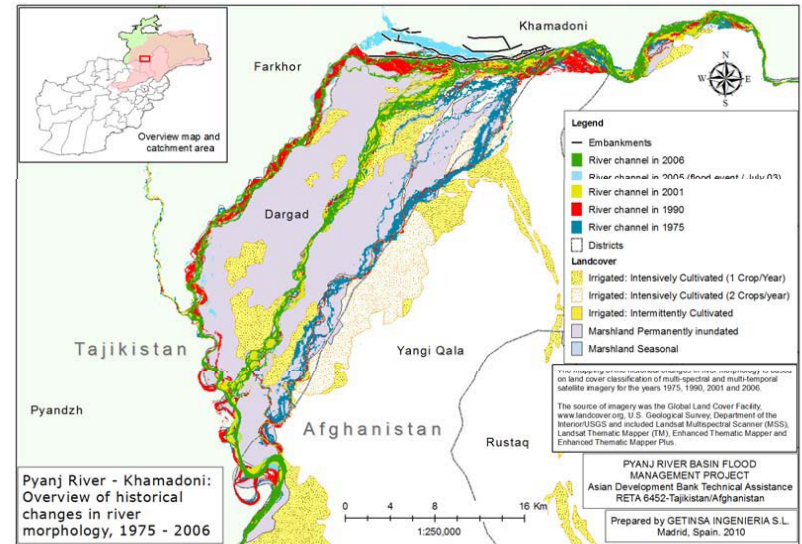
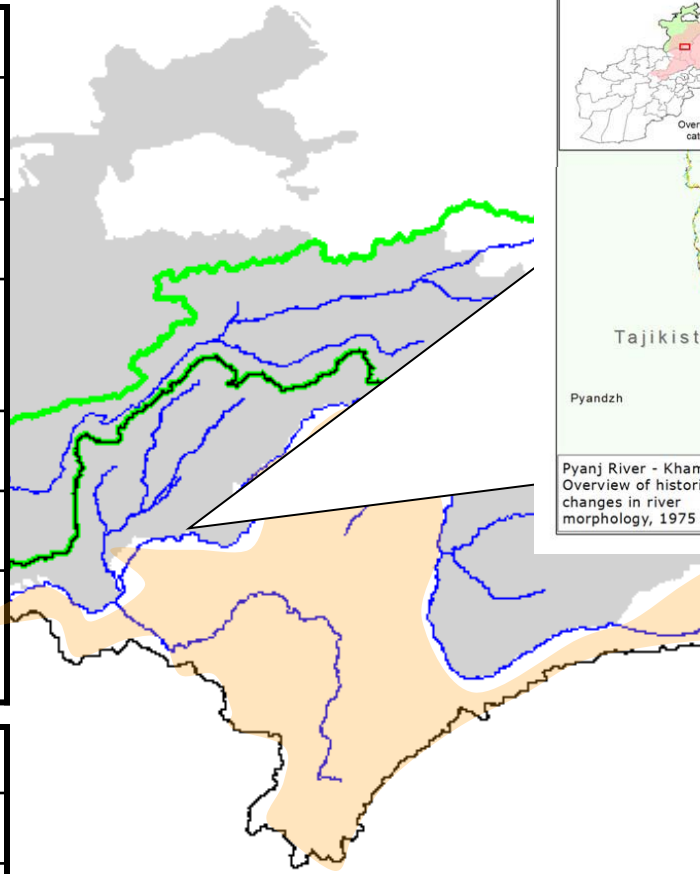
Note: Components vary in each area

ADB's Approach of WM for FS in PRB

(ADB's Aids for Mitigation of Floods and Land Erosions in PRB)

Coverage of ADB's Aids

Major Components	
Embankments and/or Porcupines	
Flood Risk Maps	
Flood Preraredness (NGO & Communities)	
Flood Forecasting	
Flood Warning	
Forest Vegetation (NGO & Communities)	



Country	Protected Area
TAJ	8,000 ha
AFG	12,000 ha

ADB's Approach of WM for FS in PRB (Some Innovations and Lessons Learnt in ADB's Aids)

Innovations

- Holistic Approach for Food Security
Droughts, Floods, Land Erosions
- Role Sharing Implementation with Coordination
Hard by Gov., Soft by NGO and Communities

Lessons Learnt

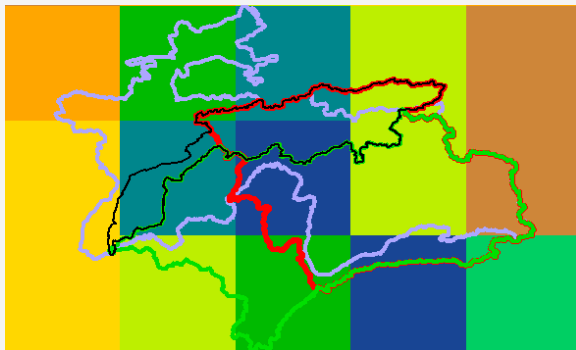
- Weakness of On-Farm Level Interventions
- Weak WUAs' Involvements in Planning
- Lack of Climate Change Impact Assessments in Project Designs



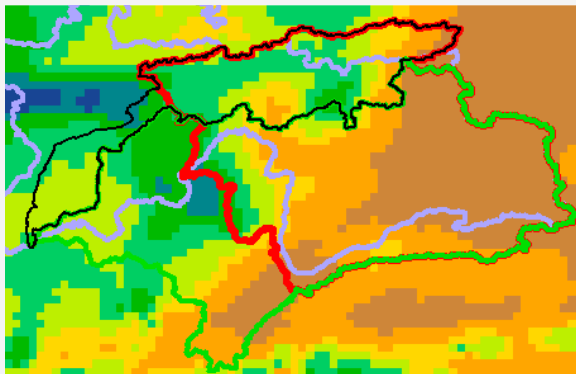
ADB's Approach of WM for FS in PRB (Climate Change (CC) Modeling)

1. CC Modeling

Original ECHAM5 (1.8 Degree)



Downscaled and corrected ECHAM5 (0.1 Degree)

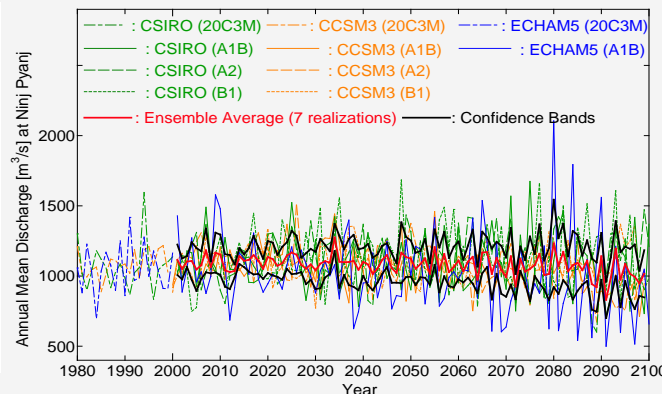


2. River Runoff Modeling

Sub-basins for hydrology Modeling

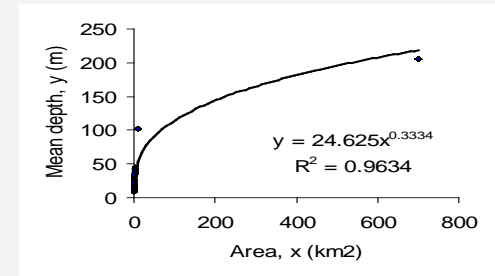


Sample of Historical and Future Annual Mean Discharge in one of sub-basins

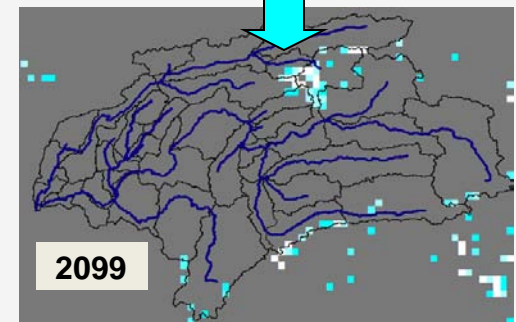
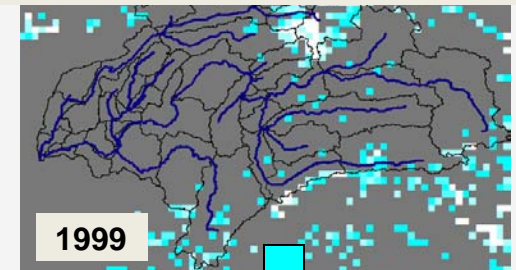


3. Glacier Modeling

Estimated Area-Depth Relationship of Glacier in Pamir

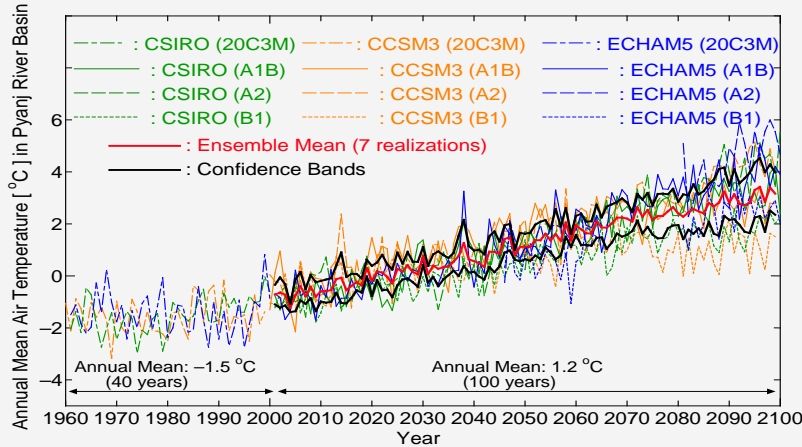


Projected Glacier Volume Distributions

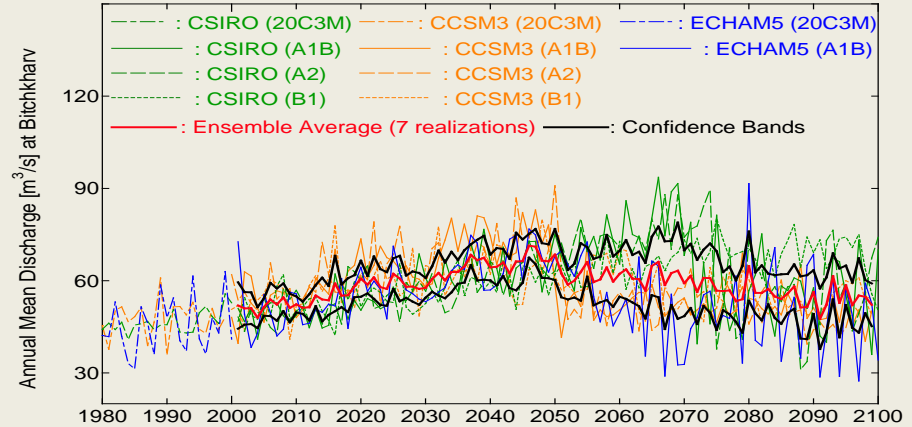


ADB's Approach of WM for FS in PRB (CC Projections)

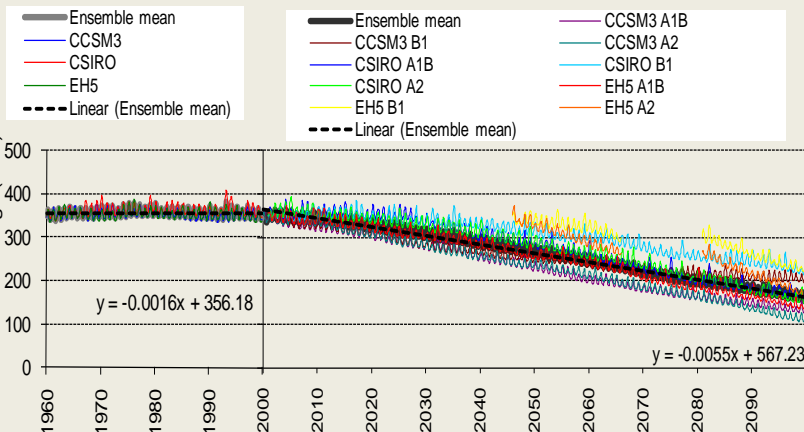
- AT and ET will increase



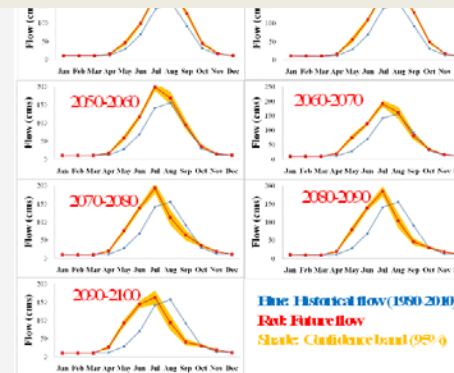
- Peak flow will be 2080 in several tributaries



- Faster glacier shrink rate



- High river-flow months will arrive earlier
- Supply deficits will increase from 2060



ADB's Approach of WM for FS in PRB (CC Impacts Assessment)

• Definitions of CC Impact and Frequency

		Definition (Summary)
Impact	Low	No loss of life or houses, Minor damage to land and infrastructure, Damage less than \$0.1 M.
	Medium	No loss of life, Significant damage to land and infrastructure, Damage \$0.1-\$1.0 M.
	High	Loss of life, Destruction of to land and infrastructure, Damage greater than \$1.0 M.
Frequency	Low	More than 10 years between events
	Medium	5-10 years between events
	High	Less than 5 years between events
Adaptive	Low	Little or no capacity to ameliorate CC impacts
	Medium	Limited capacity to respond to CC
	High	Significant capacity to plan for and to manage CC impacts

• Target CC Risks

- Meteorological Drought
- Hydrological Drought
- Flood
- Mudflow

• Target Assets

- Agriculture
(Cropped Area, Irrig. Canal)
- Population
- House
- Embankment
- Bridge
- Road

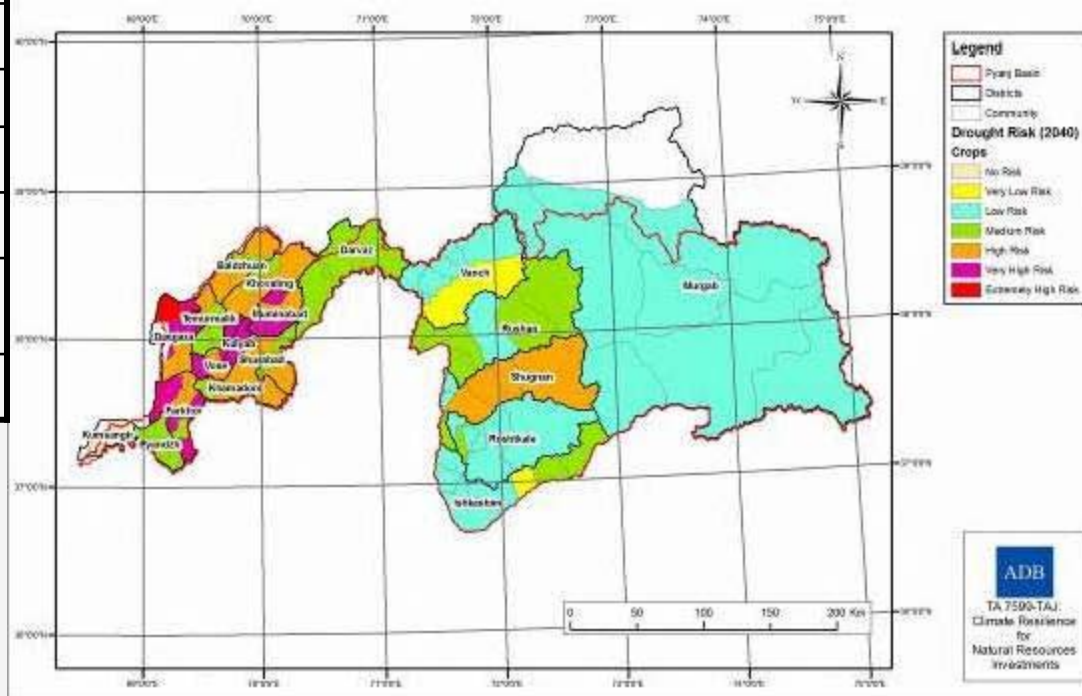
Climate Risk Index = Frequency of Climate Hazard x Potential Impact x Adaptive Capacity

ADB's Approach of WM for FS in PRB (Drought Risk to Crops in Each District)

Average Drought Risk in Districts

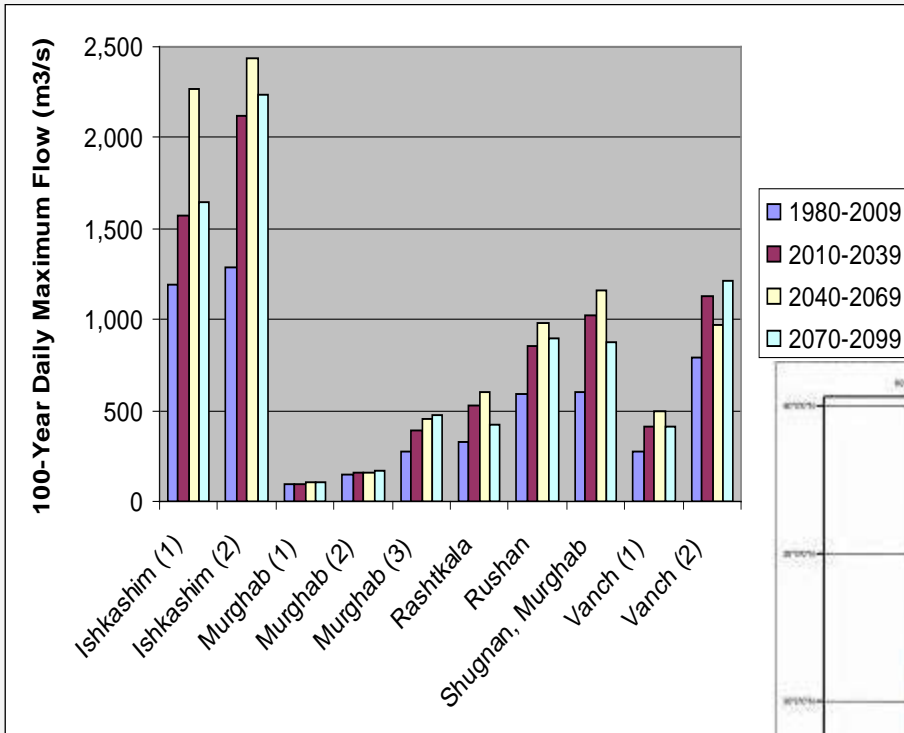
District	% Change in Mean Apr-Jun Precipitation compared with 2010		
	2040	2070	2100
Baljuvan	1.4	-1.6	-8.4
Dangara	1.4	-3.5	-10.4
Darvez	-0.1	-1.8	-8.4
Farkhar	0.5	-4.0	-10.8
Ishkashim	-3.4	0.4	-1.0
Khamadoni	0.9	-3.0	-9.9
Kulyab, Khovaling, Vose	1.2	-1.7	-8.9
Muminabad	0.9	-2.3	-9.2

Spring Precipitation Drought Risk to Crops (2040)

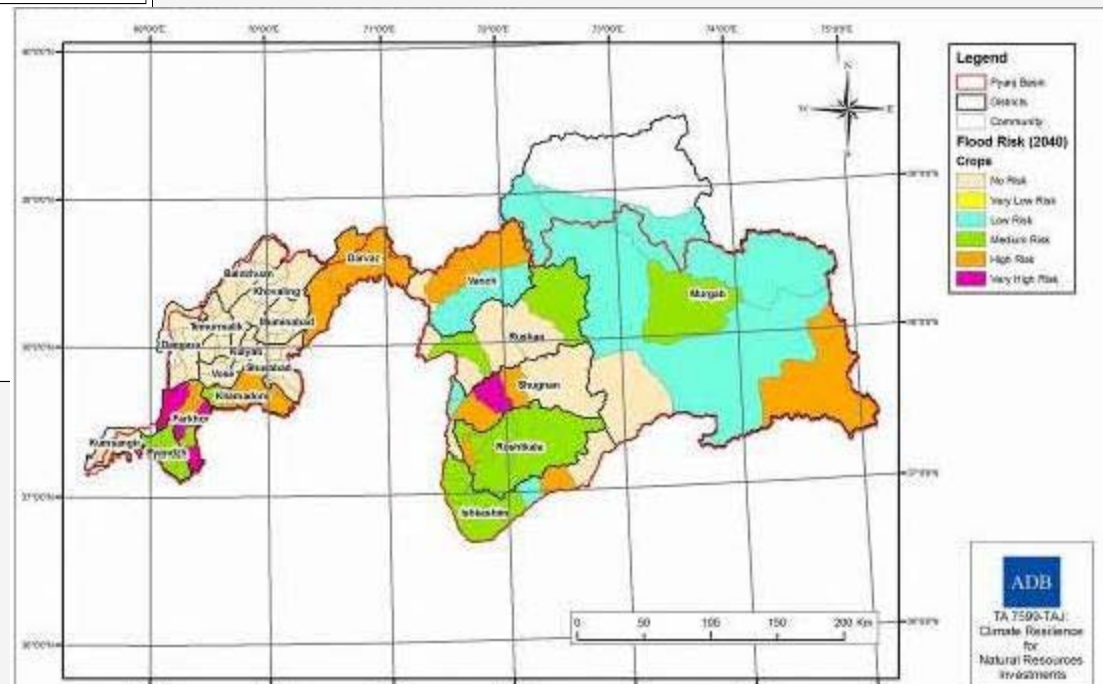


ADB's Approach of WM for FS in PRB (Flood Risk to Crops in Each District)

Future Flood Risk



Flood Risks to Crops (2040)



ADB's Approach of WM for FS in PRB (Potential Adaptation Options for future FS)

Some adaptation options will require agricultural policy reforms (**red colour**) and legal frameworks on integrated water resources management (**blue colour**)

Climate Hazard	Hydrological Response	Impacts on Assets	Possible Adaptations
Increasing temp., evapo- transpiration	<ul style="list-style-type: none"> • General glacier retreat • More melt water in med. term • Larger summer floods in main rivers • Less melt water in long term • Less soil moisture • Less groundwater recharge 	<ul style="list-style-type: none"> • Increased erosion of river banks and destruction of flood dikes in short and med.-term • Reduced surface water supply to downstream users in long term • Increased crop water requirements • Reduced spring flow and borehole yield 	<ul style="list-style-type: none"> • Investment in hard defenses • Preparation of flood management plans, flood warning systems • Water sharing agreements, storage, demand management • Alternative crop systems • Increased irrigation efficiency • Alternative water supplies
Less snowfall and more rainfall	<ul style="list-style-type: none"> • reduced river flow in summer 	<ul style="list-style-type: none"> • Less water available to all sectors in dry season 	<ul style="list-style-type: none"> • Drought management plans, water sharing agreements, dams and reservoirs, storage, demand management
More intense rain	<ul style="list-style-type: none"> • More fluvial flash floods and mudflows 	<ul style="list-style-type: none"> • Increased threat to land 	<ul style="list-style-type: none"> • Construct hydraulic infrastructure to route mudflows
Reduced rainfall in growing season	<ul style="list-style-type: none"> • Drought 	<ul style="list-style-type: none"> • Reduced productivity from rainfed agriculture • Increased demand for irrigation water 	<ul style="list-style-type: none"> • Review crop types, and where feasible convert to water efficient types • Improve irrigation efficiency at all levels of water delivery

ADB's Approach of WM for FS in PRB



Source: Tajikistan Strategic Program for Climate Resilience

ADB

Thank You for Your Attention