



UNDP Programme on Climate Risk Management in Central Asia



Climate change and water resources in Central Asia: IWRM and CRM

Dr. Yegor Volovik
Regional Program Coordinator

«Капля воды — крупица золота»



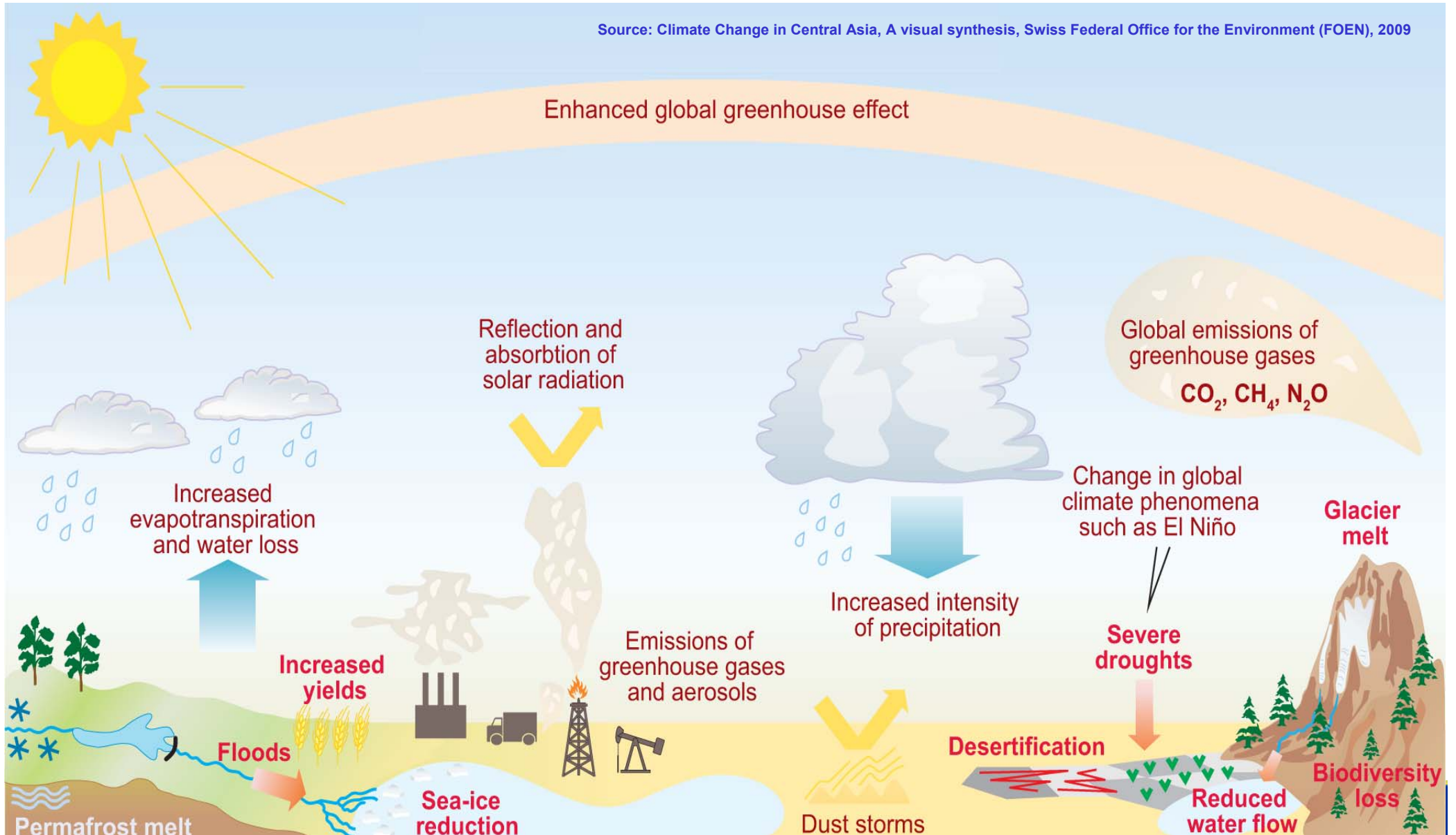
«A drop of water is a grain of gold»

Water Resources of CA

- Are significantly affected by climate change (both forming and water use regimes)
- Define various aspects of national and regional security
- Are the source and force of extreme weather events and natural disasters
- Used by all sectors of economy (often conflicting water use demands)
- Are form the boundary conditions and limiting factor for economic and social development
- All changes (also anthropogenic) have serious multiplicative effect on CA economies and societies
- Have transboundary nature

Main impacts of climate change in Central Asia

Source: Climate Change in Central Asia, A visual synthesis, Swiss Federal Office for the Environment (FOEN), 2009



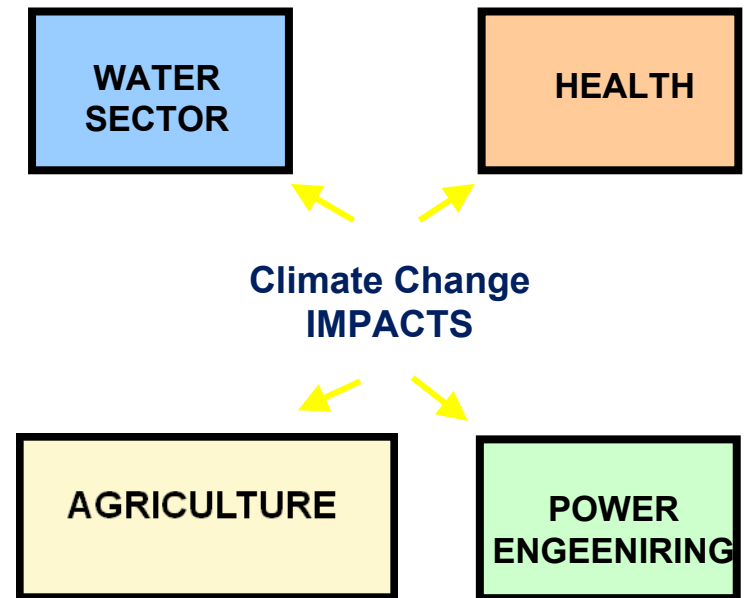
INDICATORS	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Air temperature ¹⁾	↑	↑	↑	↑	↑
Precipitation and snow ¹⁾	↑	↑↓	↑↓	↑↓	↑↓
Climate aridisation and desertification	↑	↑	↑	↑	↑
Extreme weather events and climate-related hazards ²⁾	↑	↑	↑		↑
Melting ice and permafrost ¹⁾	↑	↑	↑		↑
Water resources availability in the future ³⁾	↑↓	↓	↓	↓	↓
Health ⁴⁾	↑	↑	↑	↑	↑
1) Greenhouse gas emissions 1990-2005	↓	↓	↓		↑
2) Greenhouse gas emissions 2000-2005	↑	↑	↑	↑	↓
Policy instruments, actions and awareness	↑	↑	↑	↑	↑
Climate observation and weather services ²⁾	↓	↓	↓	↓	↓

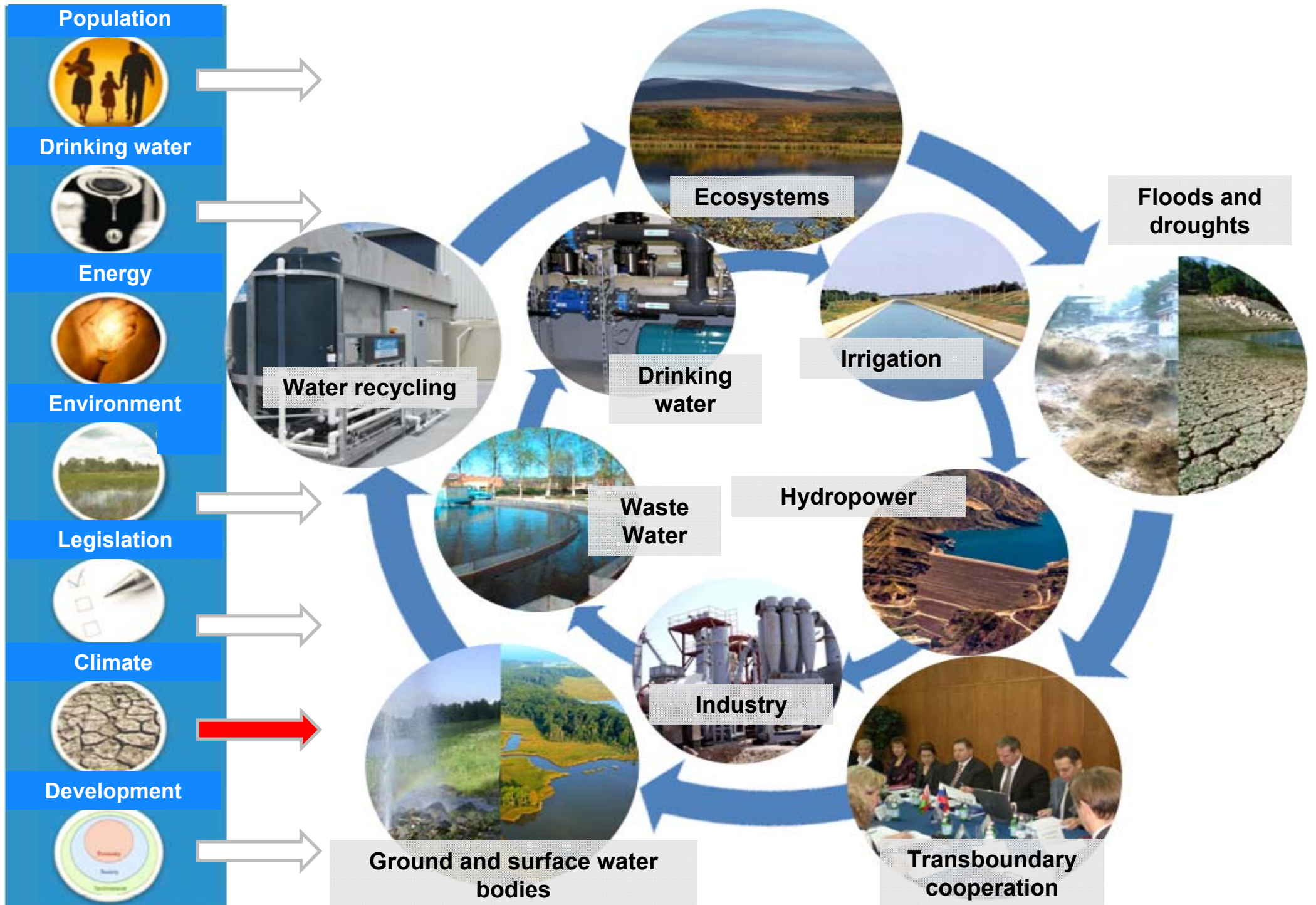
↑ increase, enhancement ↓ decrease, reduction ↑↓ mixed trends

¹⁾ 1950-2005 ²⁾ 1990-2009 ³⁾ 2050-2100 ⁴⁾ infectious and vector-born diseases, heat stress

Sources: Second National Communications of Kazakhstan, 2009; Kyrgyzstan, 2009; Tajikistan, 2008; Uzbekistan, 2008; Technical Needs Assessment and the Initial Communication of Turkmenistan

Climate Change in CA





Multiple impacts create complex water challenges

Climate Change Factors (*t° and GHG emissions/greenhouse effect*)

Floods and droughts



- Extreme Events
- Changed regime of water bodies
- More dry days in a year
- Sand storms

Ecosystems



- Reduction of biodiversity
- Extinction of species
- Weakening of ecosystem functions
- Basic food web collapse

Surface and Ground Sources



- Water quality decline
- Changed evaporation regime
- Disturbed surface/ground water balance

Glaciers and Permafrost



- Changes in hydrological regime
- Future reduction of surface river
- Changes in temperature and precipitation patterns

Sea level change



- Climate aridisation
- Desertification
- Coastal zone floodings
- damages to transport infrastructure in coastal zones
- sand storms

Multiple impacts create complex water challenges

Factors, caused by Climate Change

Irrigation



- Increased water demand
- Crop yields
- Water quality
- Growing season

Hydropower



- Changed hydrograph
- Increased storage capacity required
- Higher risk of floodings

Industry



- Intake/outfall elevations
- Flow/Quantity uncertainty
- Increased river discharge

Waste Waters



- WQ/additional treatment requirements
- Facility flooding/silting elevations
- Change of processes linked with water temperature
- Untreated water discharges during flooding events

Drinking water



- Intake uncertainty
- More advanced technologies required

The multiplicative effect of climate change

- **1st order factors:**
 - Increased temperature and GHG emissions/greenhouse effect
- **impacts/2nd order factors:**
 - changed precipitation and hydrograph patterns, glacier degradation, floods/droughts, ecosystem degradation, disturbed ground/surface balance, climate aridisation, deforestation, sand storms, heat/cold waves, more frequent natural disasters
- **impacts/3rd order factors:**
 - Food security, economic security energy supply, drinking water supply, hygiene/sanitation, vulnerability/exposure to risks of disasters

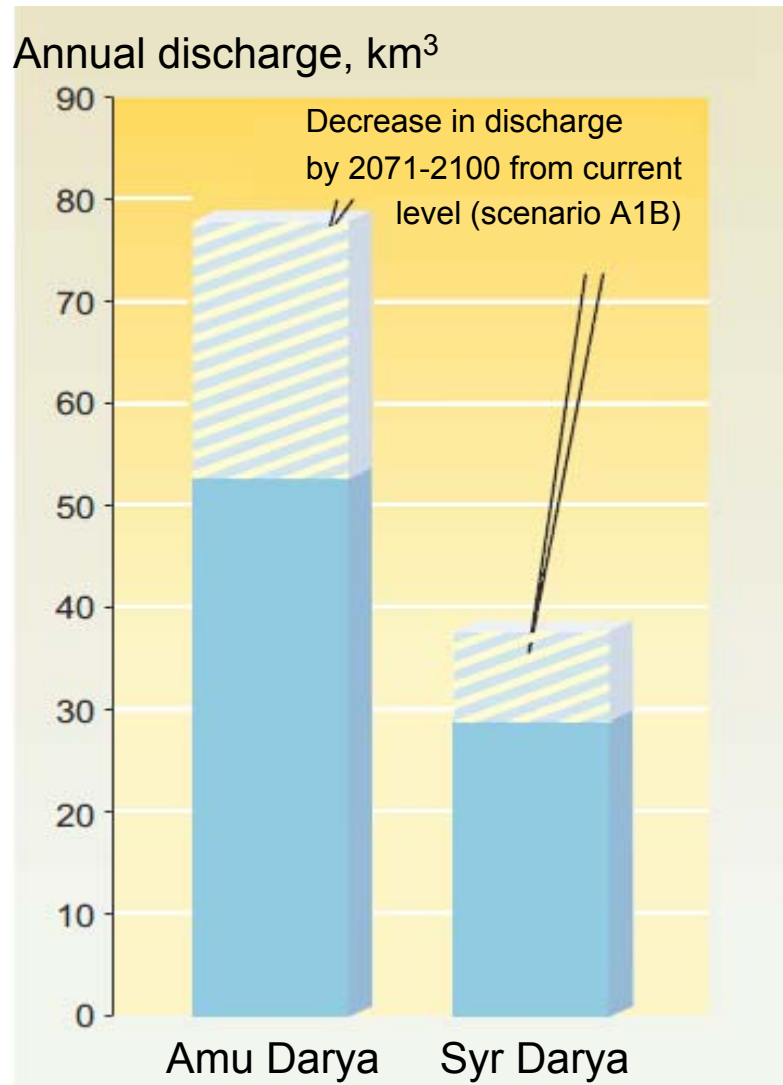
Compound Risks/Crises

Multiplicative effect of climate change

- **1st order factors:**
 - Increased temperature and GHG emissions/greenhouse effect
- **impacts/2nd order factors:**
 - **changed precipitation and hydrograph patterns, glacier degradation, floods/droughts**, ecosystem degradation, **disturbed ground/surface balance, climate aridisation**, deforestation, **sand storms**, heat/cold waves, **more frequent natural disasters**
- **impacts/3rd order factors:**
 - Food security, **economic security energy supply, drinking water supply, hygiene/sanitation, vulnerability/exposure to risks of disasters**

**WR are not only affected
by CC but also the key
media, causing the major
CC impacts!!!**

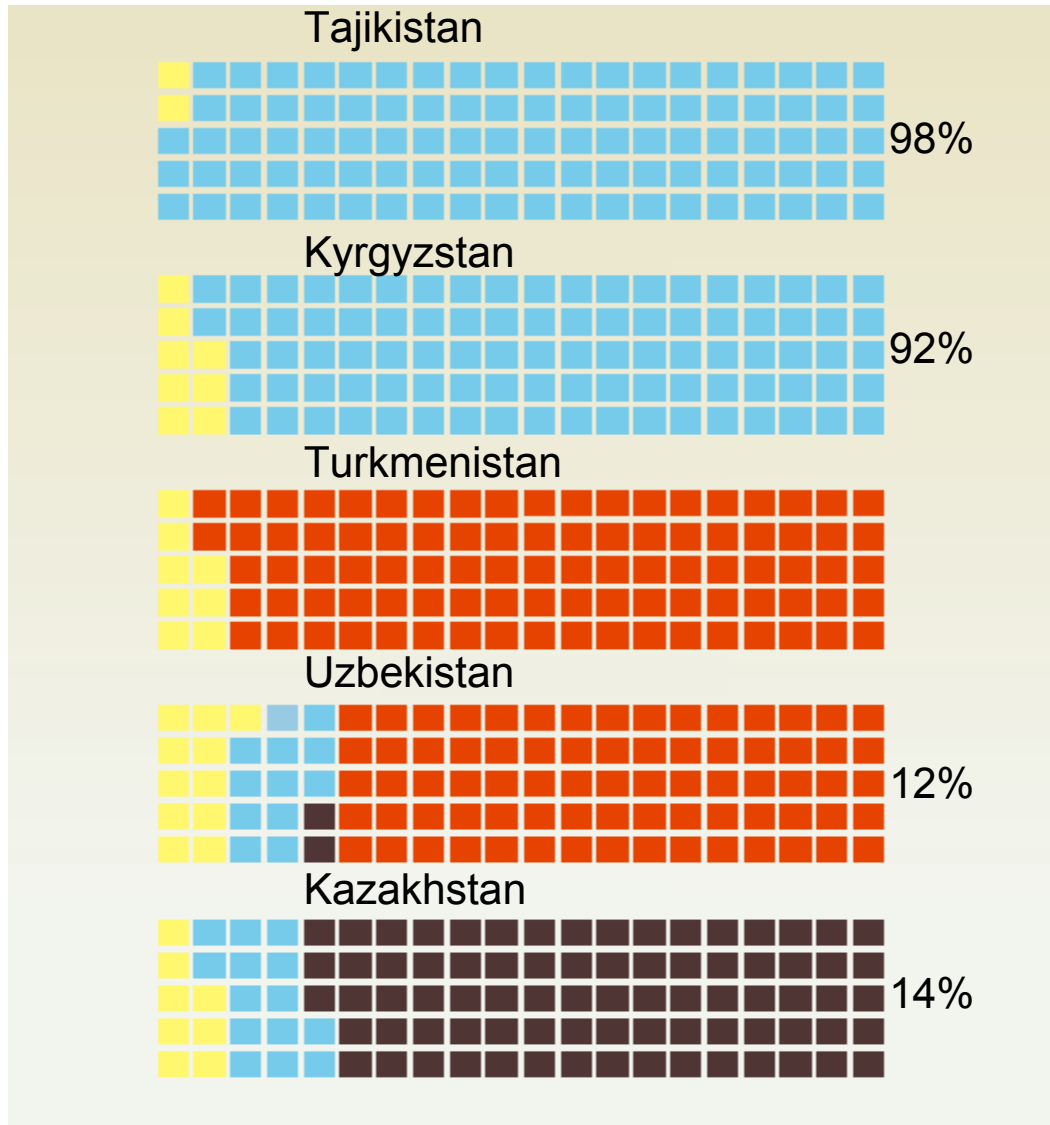
Predictions of Discharge Decrease



- Currently, despite intensive degradation of glaciers and permafrost – discharge of the main CA rivers **has not substantially changed in volume** (though a significant temporal change!), moreover, in some basins even increased by 6-8%)
- However, by 2050 discharge of the Amu Darya is **predicted to reduced** by 10-15% and Syr Darya – by 5% due to climate change and anthropogenic impacts

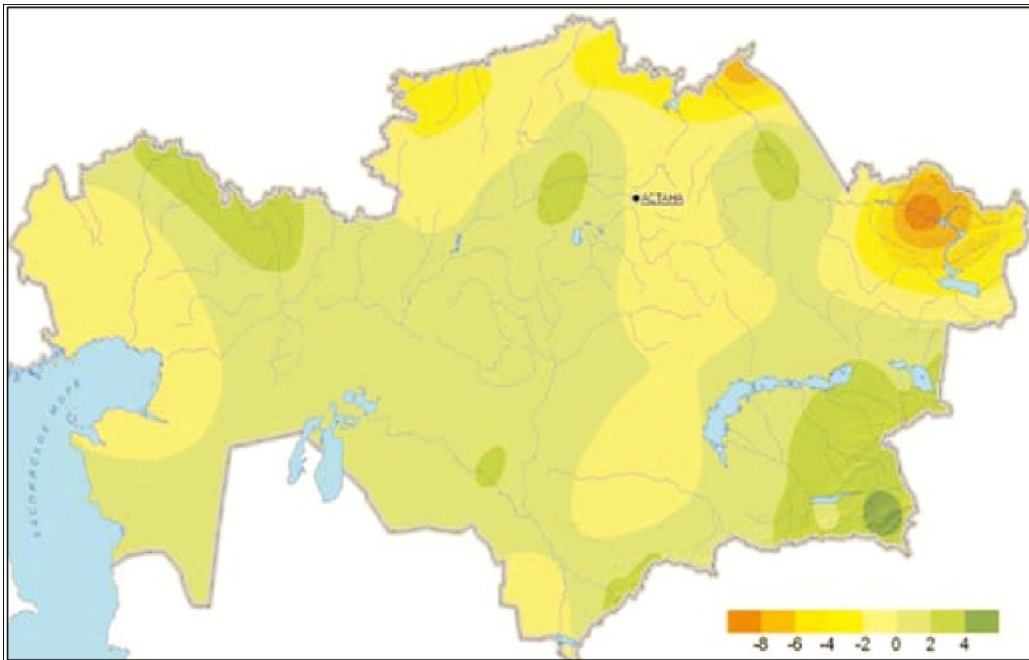
Source: Uzbekistan's Second National Communication, 2008; Kyrgyzstan's Second National Communication, 2009; Shiklomanov 2009

Energy Production(%)

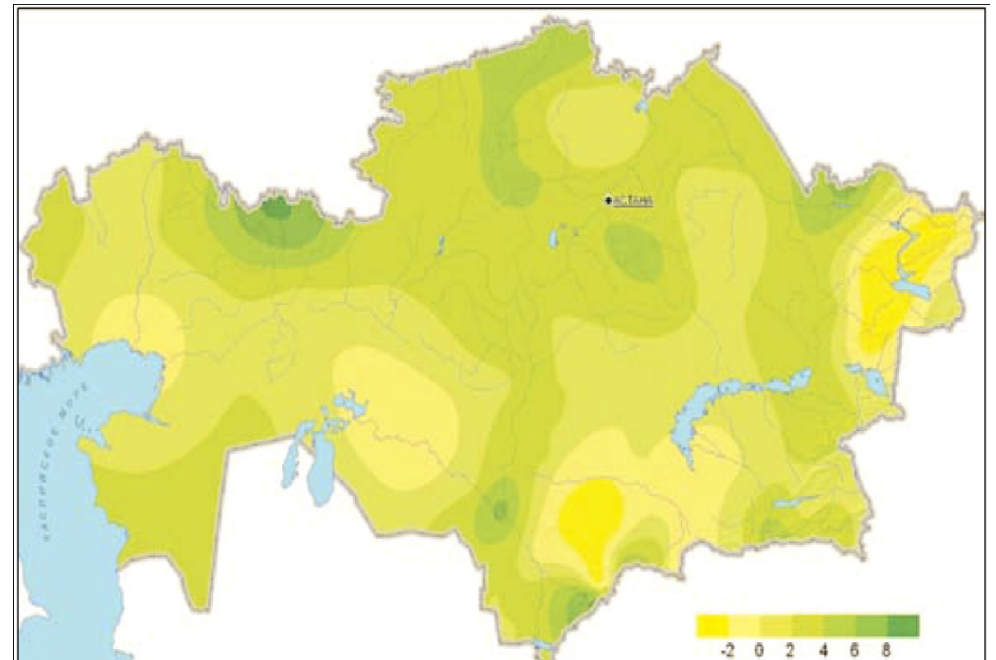


Change in precipitation patterns

Kazakhstan (mm/year)

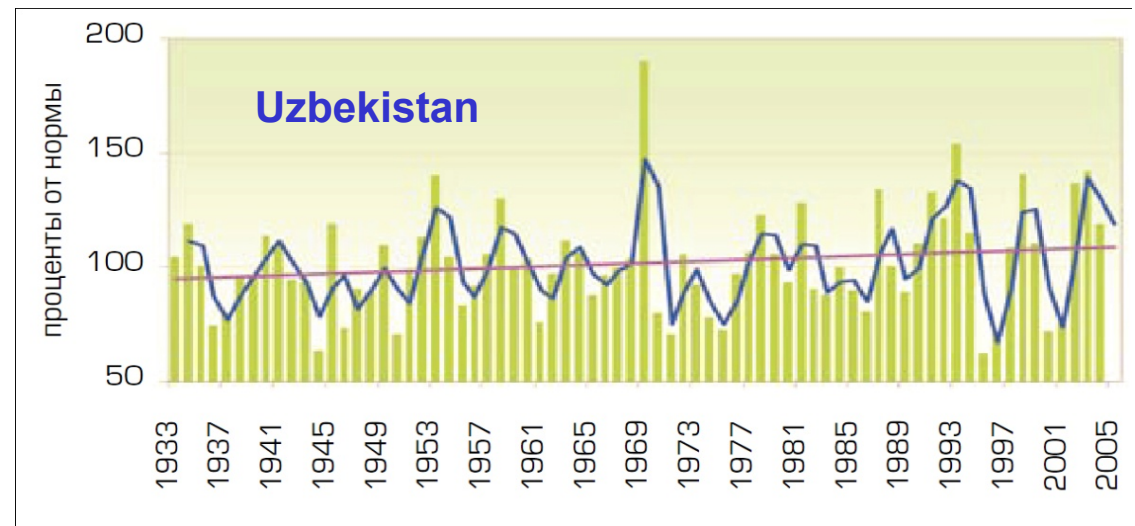
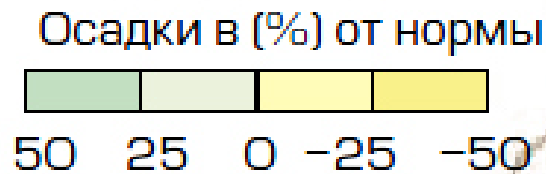
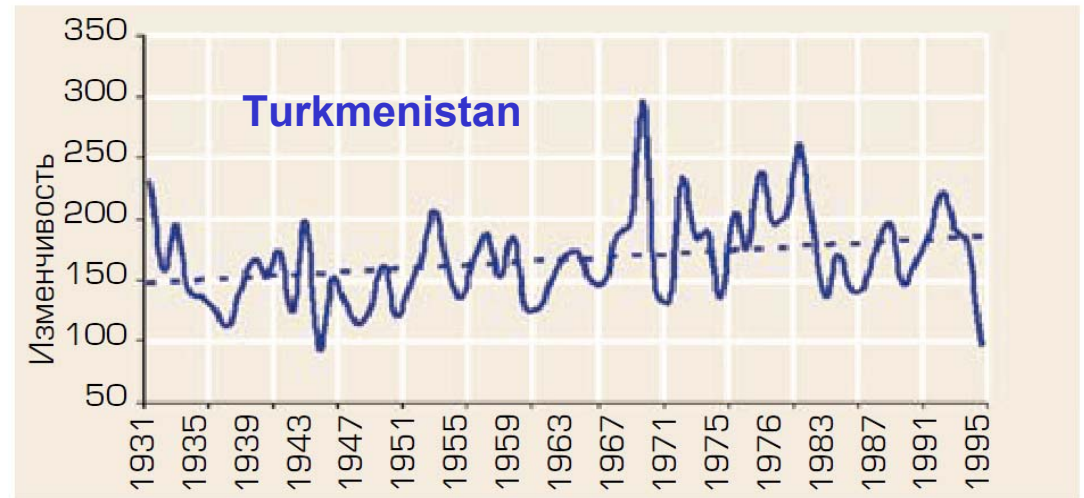
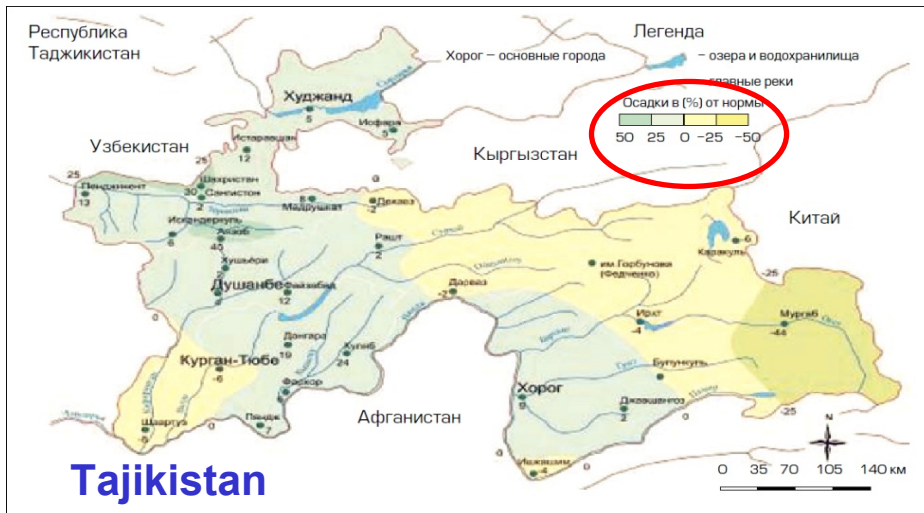


Summer



Autumn and Winter

Change in precipitation patterns



Changing Climate

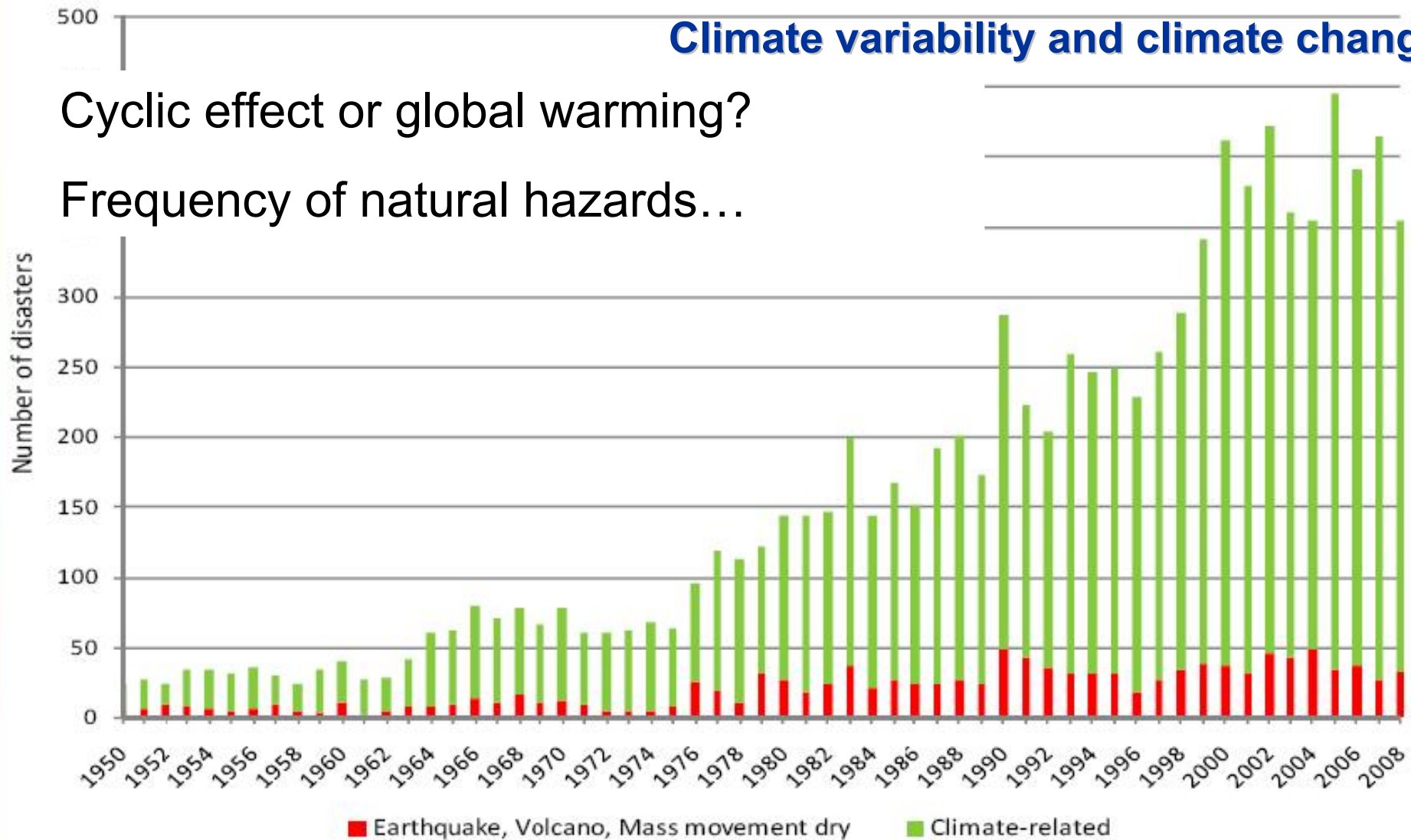
**Current Climate Variability,
Extreme Weather Events and
Natural Disasters**

Long-Term Climate Change

Climate variability and climate change

Cyclic effect or global warming?

Frequency of natural hazards...



Source: Climate related disasters compared to geophysical disasters.

http://ec.europa.eu/development/icenter/B2_cred_20090427.pdf



United Nations Development Programme



Why the problem of natural risk disasters is so important?

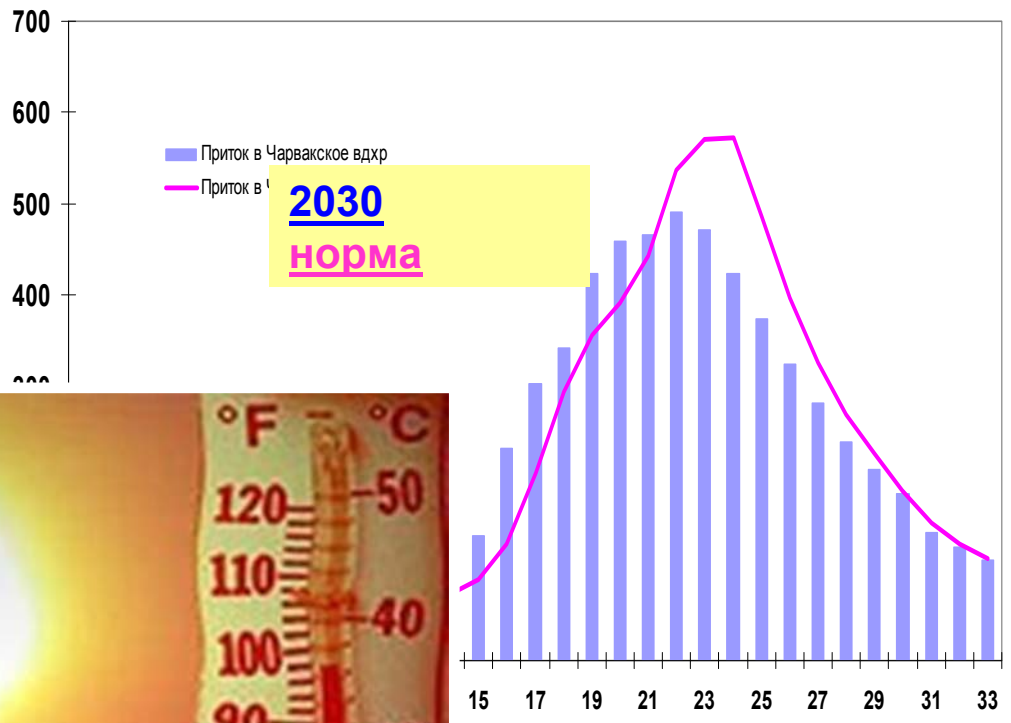
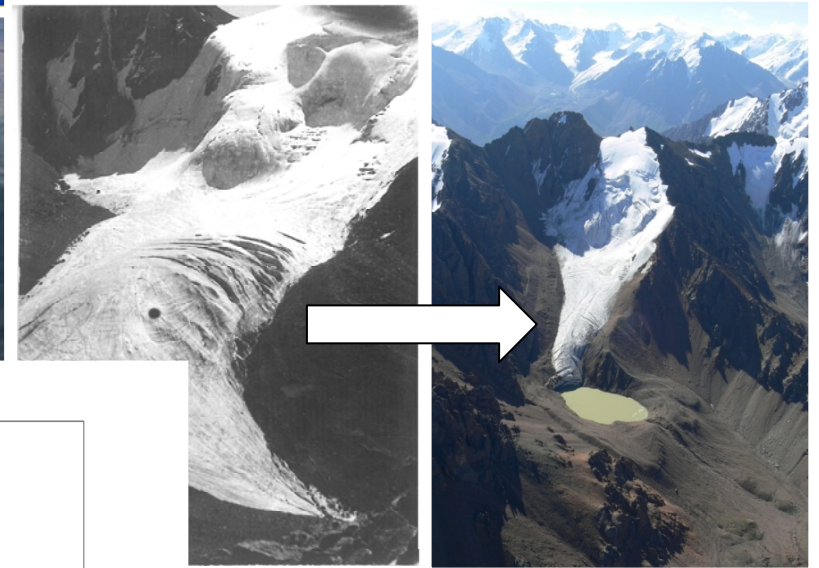
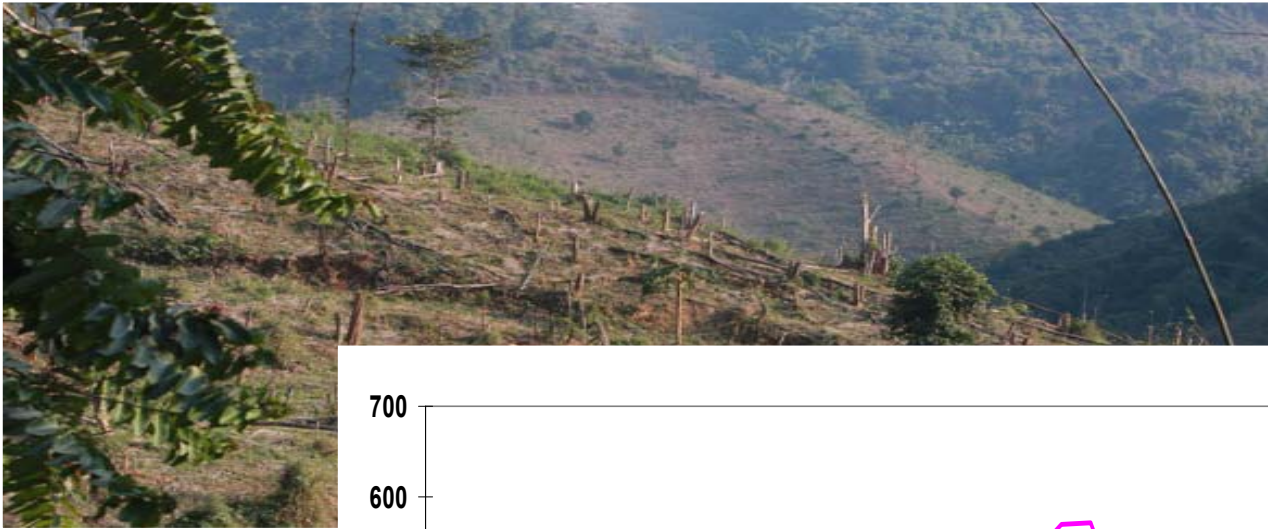
Economic loss as a % of GDP in case of natural disasters of 0.5% likelihood (once in 200 years) :

- 1. Tajikistan – 20.9%**
- 2. Turkmenistan – 12.1%**
- 3. Uzbekistan – 9.5%**
- 4. Kyrgyzstan – 4.6%**
- 5. Kazakhstan – 1.1%**

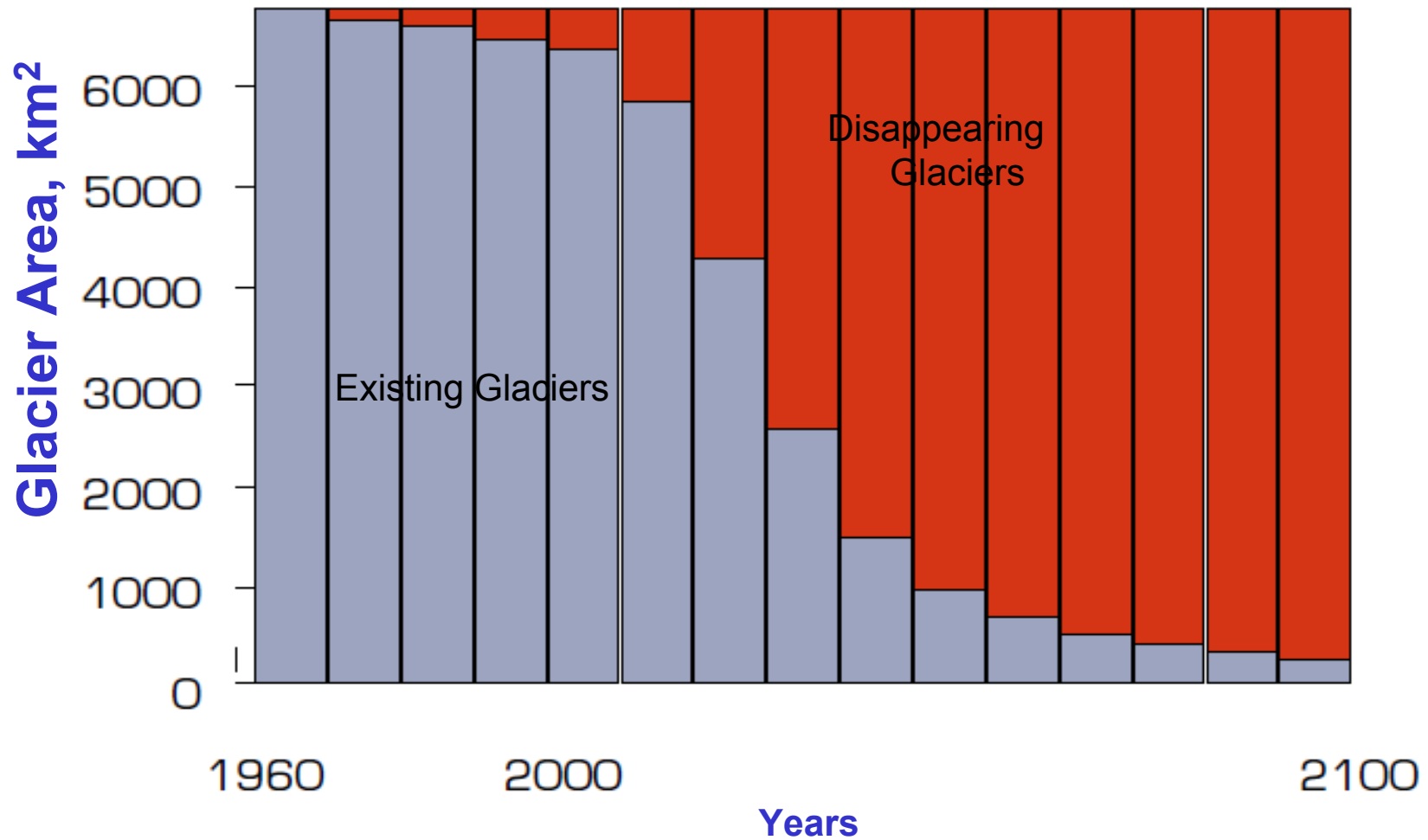
Source: Инициатива по управлению риском бедствий в Центральной Азии и на Кавказе (ИУРБ ЦАК), Сводный отчёт об оценке риска бедствий в странах ЦАК (2009г.)

Negative impacts of long-term Climate Change:

- Climate aridisation
- Desertification
- Deforestation
- Degradation of glaciers and permafrost
- Redistribution of precipitation (spatial, temporal, rain instead of snow)
- Changing of hydrograph patterns (spatial, temporal)
- Ecosystem degradation and loss of Biodiversity
- Evapotranspiration and evaporation
- Sea level change



Distribution between existing vs disappearing glaciers in CA



Why do we care about glacier degradation?

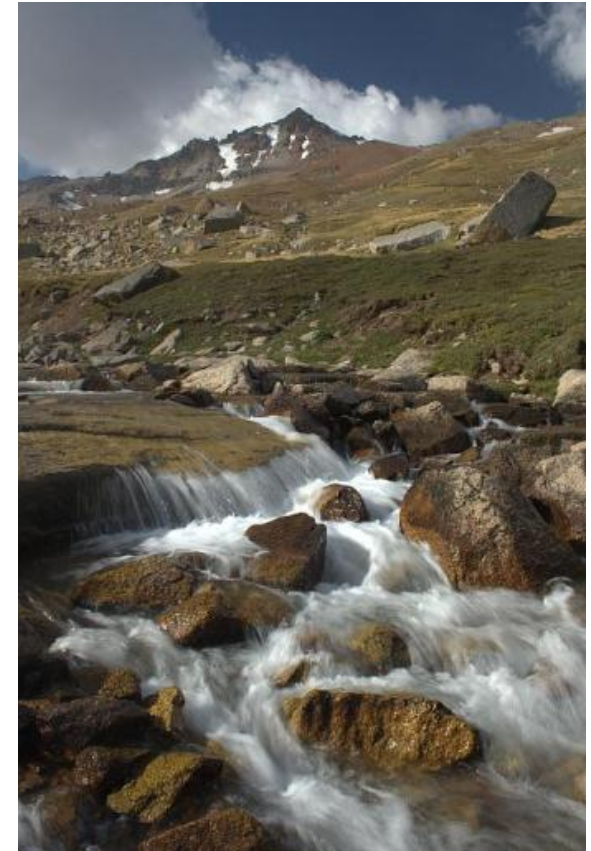
Irrigation



Hydro Power Production



Natural Hazards

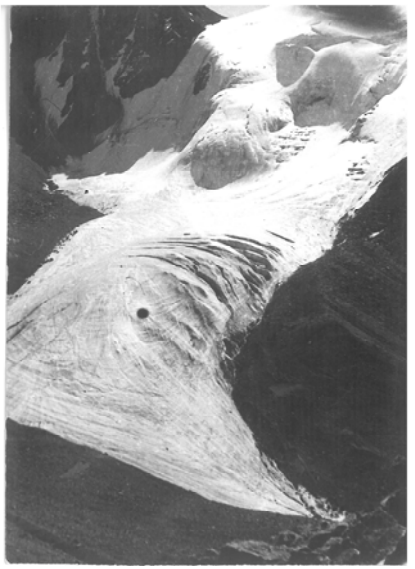


Landscape Change

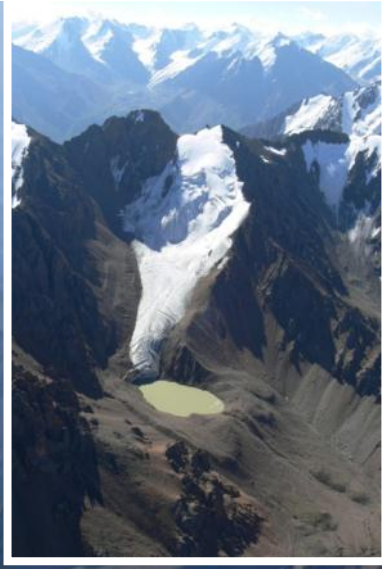


Tourism





1958

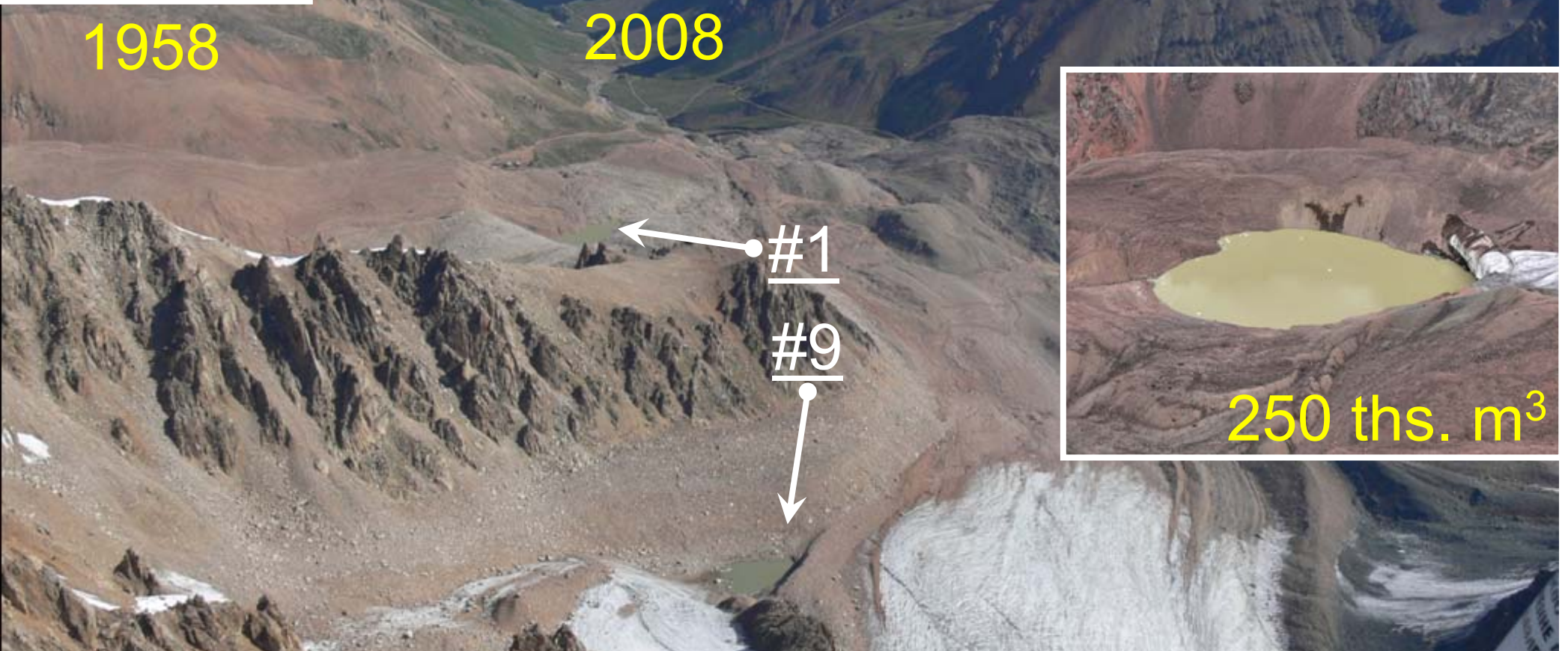


2008



Glacier: Manshuk Mametovoy

#6



#1

#9



250 ths. m³

Near future: The effects of flooding



Loss of food security



Less economic activity



More water borne diseases



Less access to clean water



Long-term: The effects of drought



Loss of food security

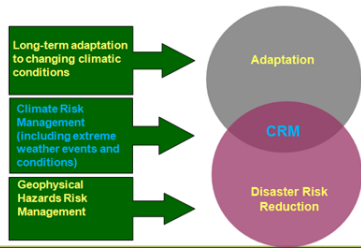


Less economic activity



Less access to clean water



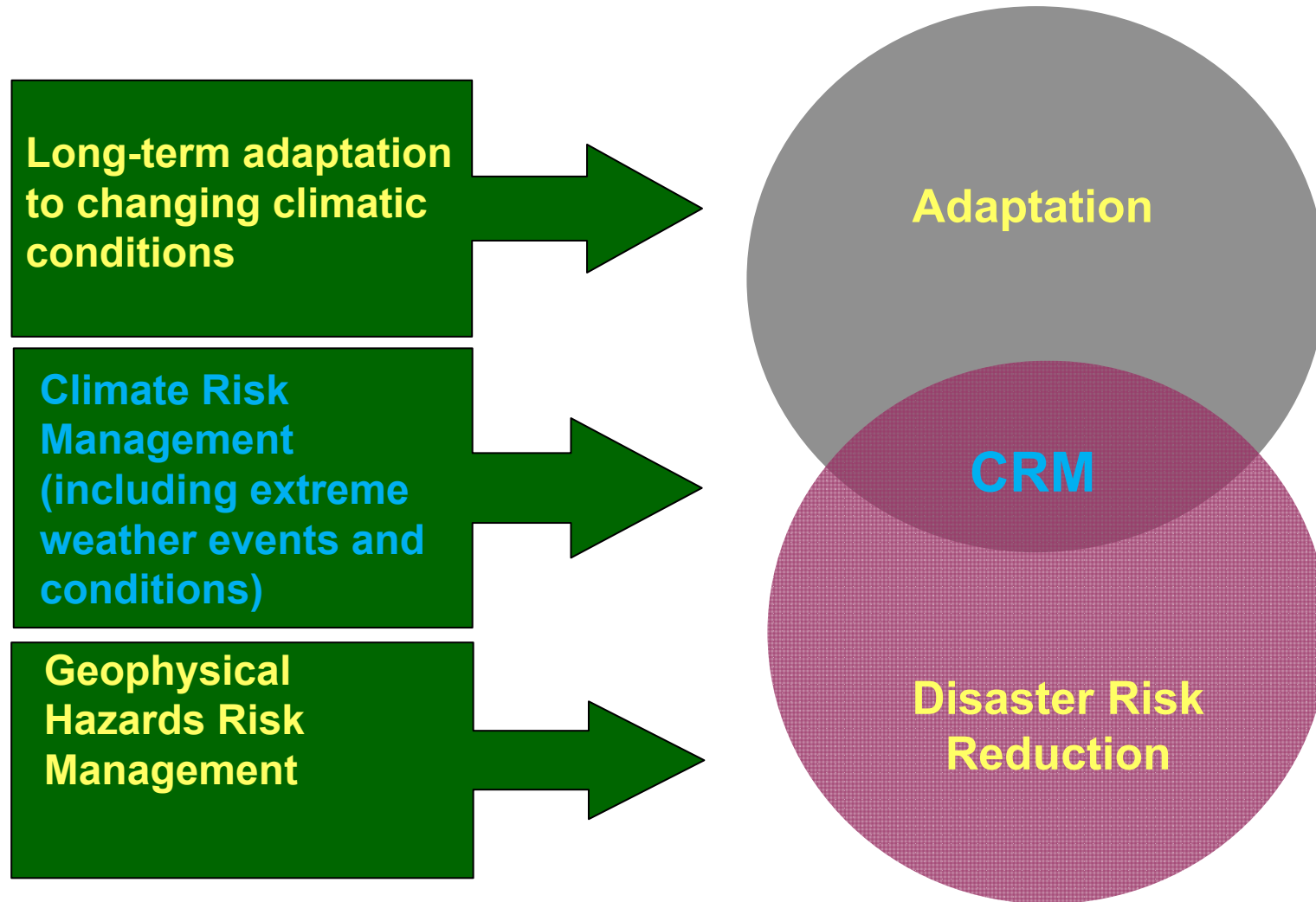


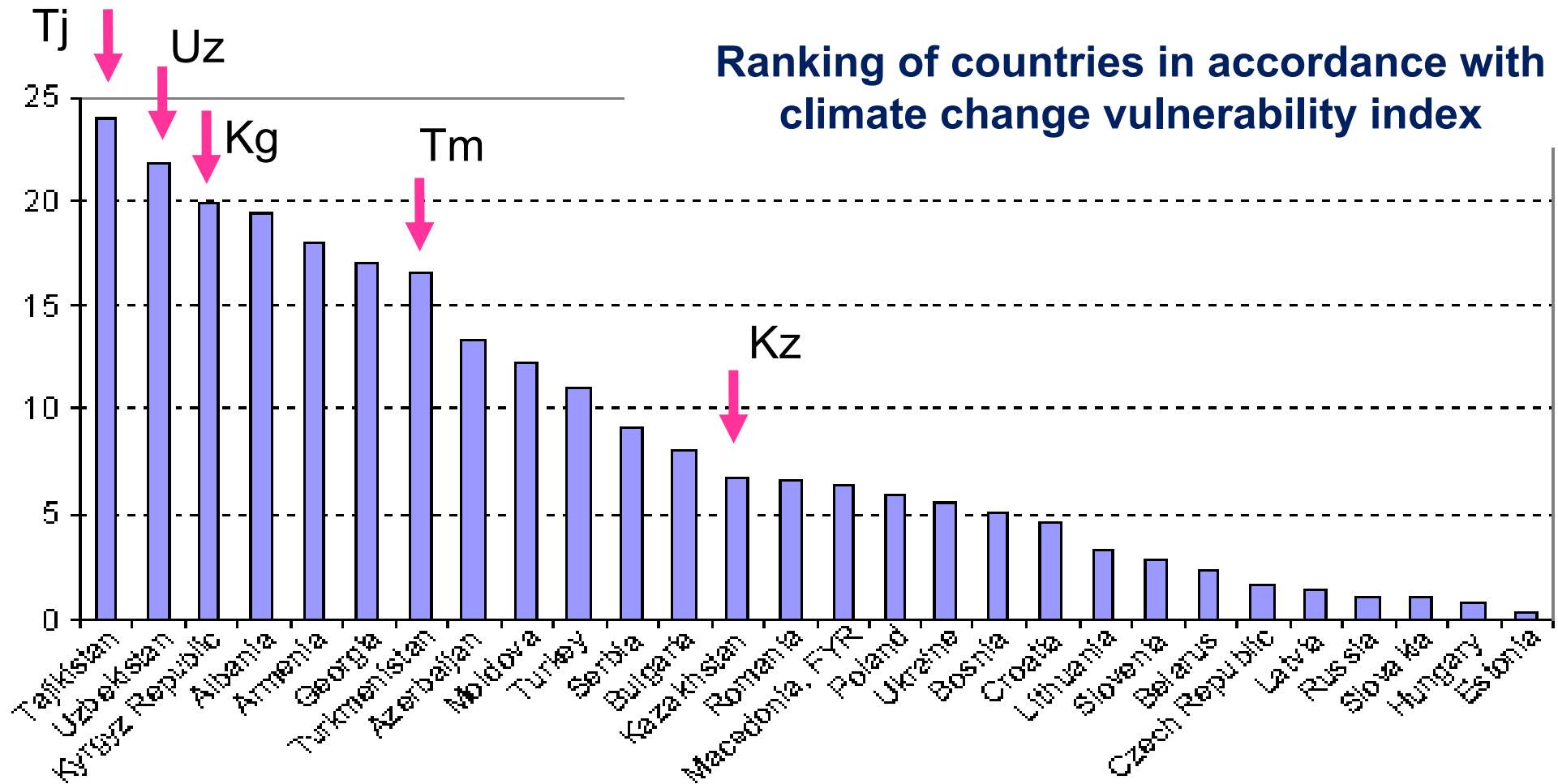
“Climate Risk Management (CRM) is a term is used for a large and **growing** body of work, bridging the climate change adaptation, disaster risk management and development sectors.”

Definitions

Climate risk management is the culture, processes and structures directed towards realising potential opportunities, whilst managing adverse effects. It is the systematic process of using administrative decisions, organisations, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to minimise the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

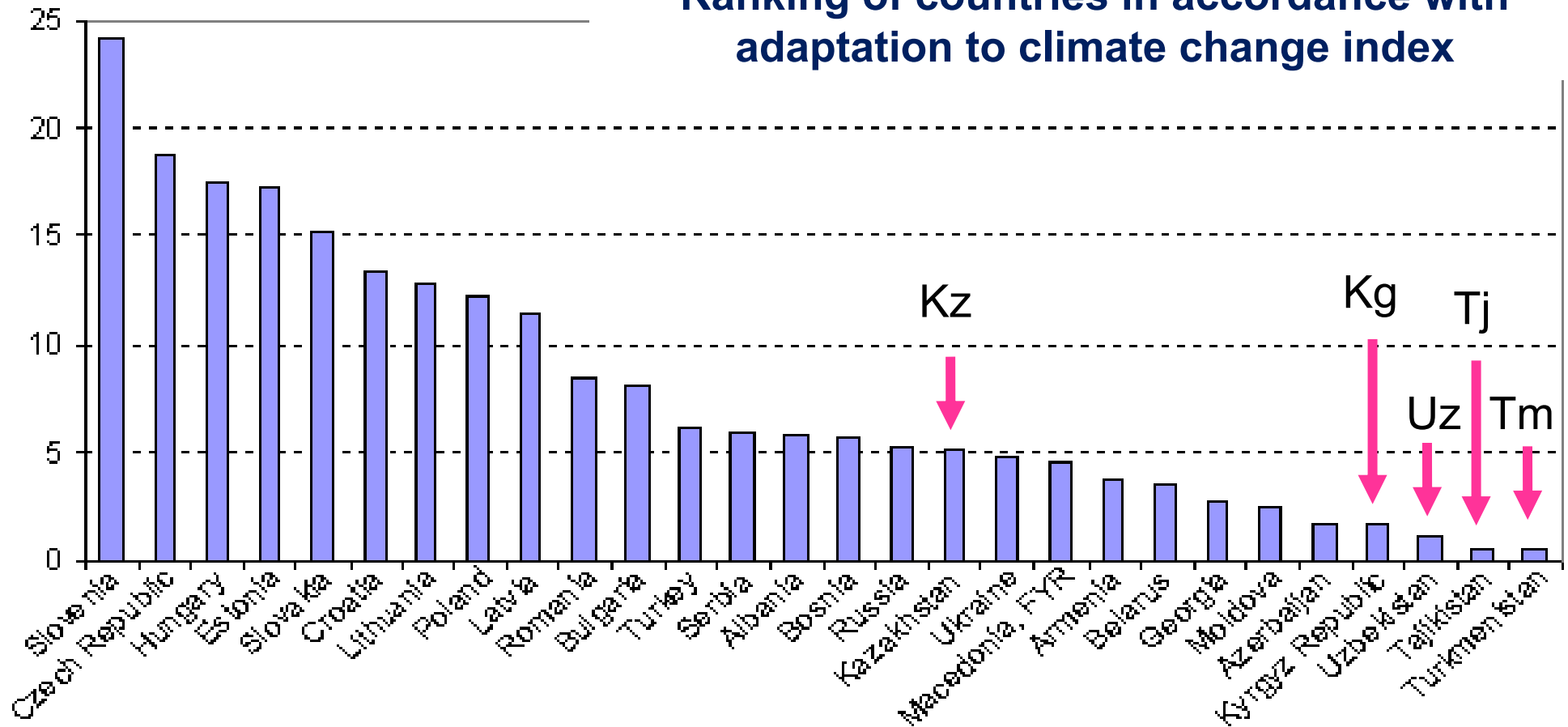
Correlation between CC Adaptation and Disaster Risk Reduction





Source: World Bank.2009. Adapting to climate change in Europe and Central Asia Report. Washington DC. WB

Ranking of countries in accordance with adaptation to climate change index



Source: World Bank. 2009. *Adapting to climate change in Europe and Central Asia Report*. Washington DC. WB

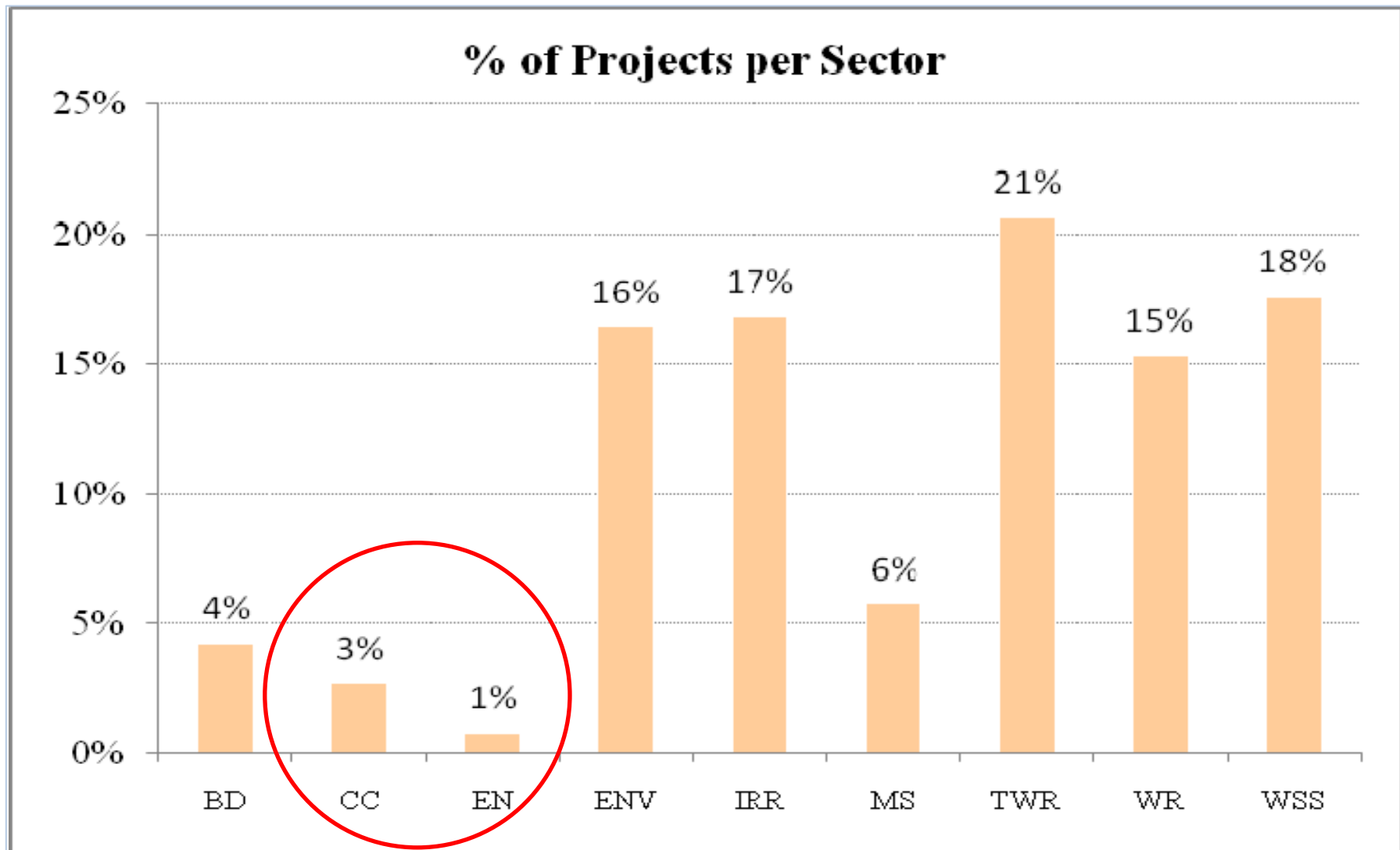
Complementarity of CRM and IWRM

**Climate Risk
Management**



**Integrated Water
Resource
Management**

Inter-Sectoral Character of WR Projects (2000-2011)



Minimisation of negative effects of WR susceptibility

- Effective management and rehabilitation of irrigation infrastructure and water supply systems
- Using of modern water saving and recycling technologies
- Using of alternative and renewable sources of energy
- Environmental requirements are to be taken into account while developing new projects
- Strengthening of enabling environment for water resource management and introduction of IWRM principles, effective governmental water use management system
- Cross-sectoral cooperation and integrated planning of socio-economic development
- Strengthening capacity of international and inter-governmental organisations involved in water resource management at transboundary level
- Account for current variability and long-term climate change in terms of adaptation

UNDP Central Asian Climate Risk Management Programme

Objective:

To promote adaptation and reduction of climate-related disasters in CA and to integrate CRM into core development policy and strategies in CA

USD 12 million, 2010-2014

Regional Project

- ✓ understand CC implications;
- ✓ improve existing knowledge;
- ✓ enhance methodological, material and technical base;
- ✓ strengthen regional expertise

National projects

Kazakhstan

Kyrgyzstan

Tajikistan

Turkmenistan

Uzbekistan

- ✓ Implement measures to increase resilience of population and reduce climate risks

National CRM Projects in CA countries

1. Strengthening capacity for CRM at systemic, institutional, and individuals levels

2. Demonstration of CRM approaches at local level

3. Knowledge Management and Lessons Learned

Kazakhstan

Water use efficiency in agriculture(Almaty region)

Kyrgyzstan

Pasture/livestock management (the Suusamir Valey)

Tajikistan

Agroforestry (the Gissar Range)

Turkmenistan

More effective risk assessment and information exchange (high-mountains agriculture (Nohur), oases irrigation (Sakar Chaga) and desert livestock management (Er bent))

Uzbekistan

Droughts management (the Kashkadarya river basin)



Thank you!

