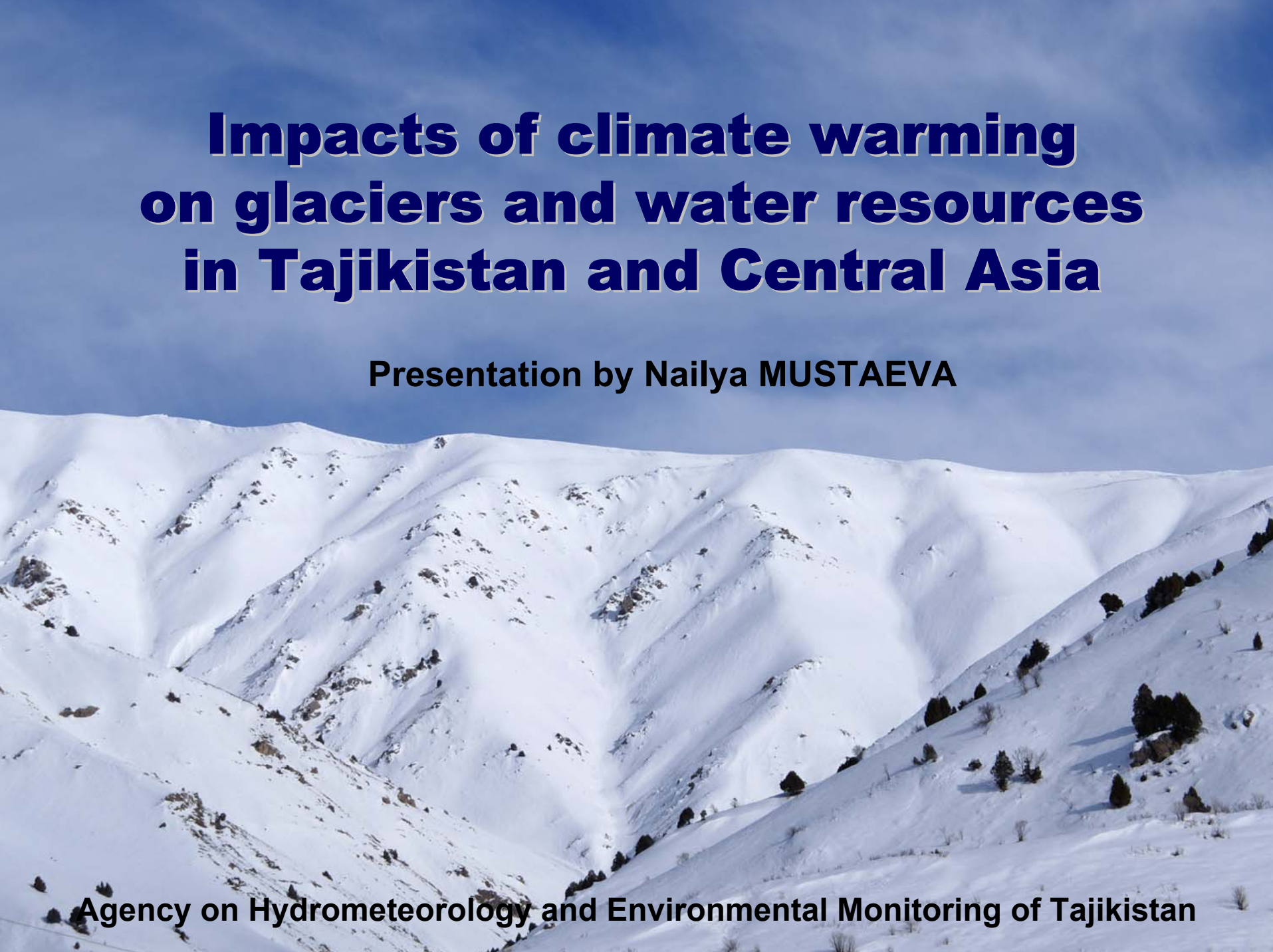
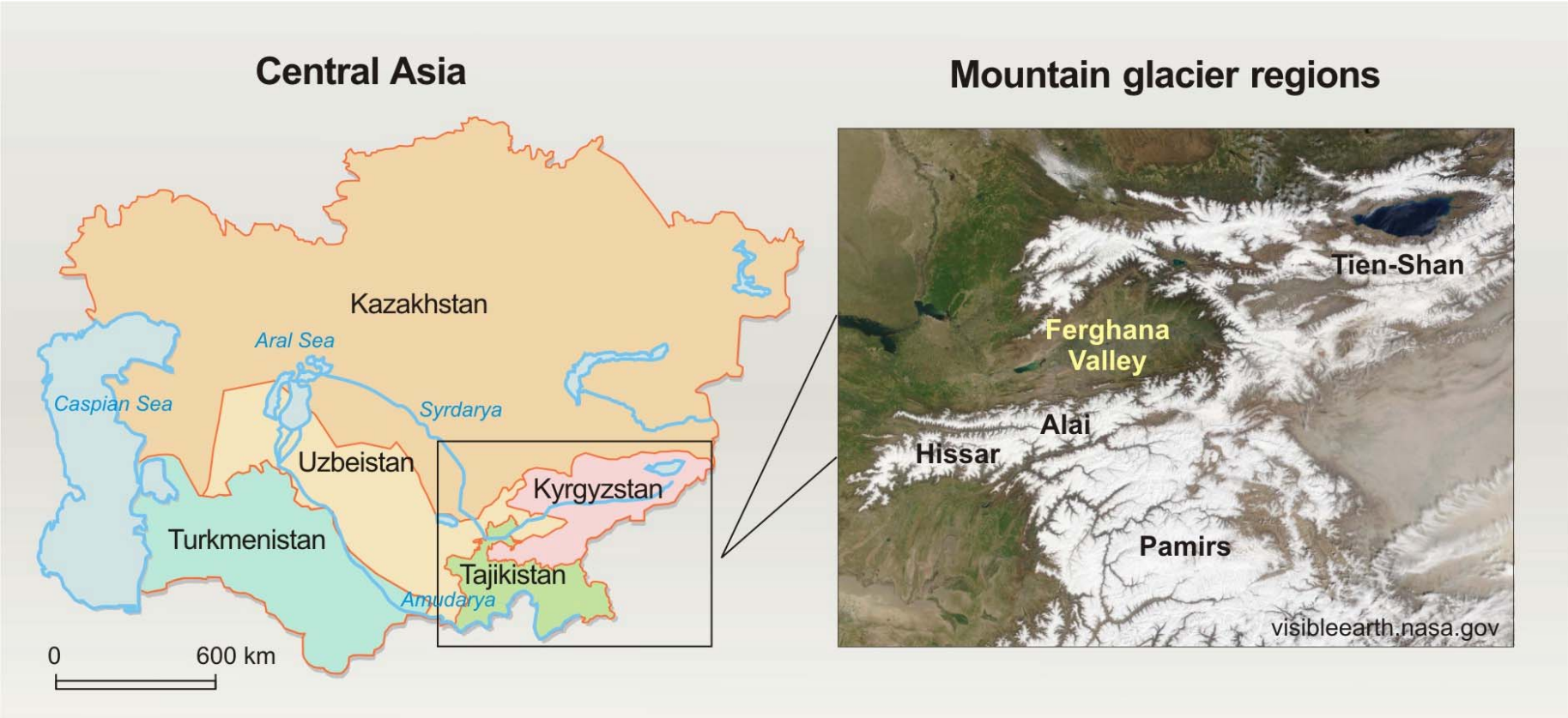
Impacts of climate warming on glaciers and water resources in Tajikistan and Central Asia

Presentation by Nailya MUSTAEVA



Agency on Hydrometeorology and Environmental Monitoring of Tajikistan

Central Asia: mostly arid hot desert area, two vital rivers, 10% mountains



Total glacier area around 12,000-14,000 km2, estimated glacier volume 1000 cub.km

GLACIERS in Central Asia are:

- essential water supplies for **agriculture and hydropower, especially in dry years**
- key **tourist destinations and mountain sport** sites
- sources of **GLOFs and floods**

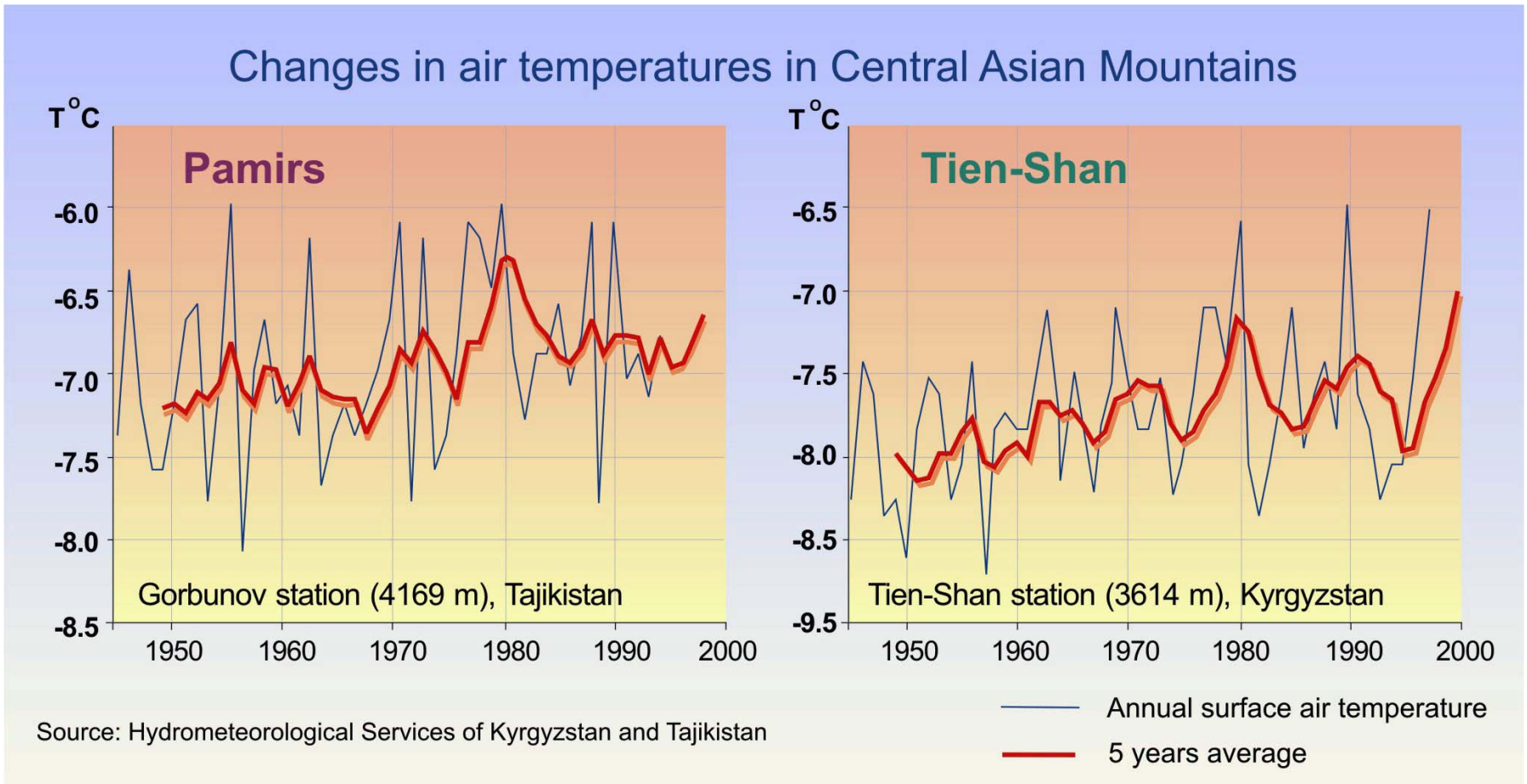
Mountains are the main water towers of Central Asia

And glaciers are important reservoirs of frozen water

Zeravshan glacier, Tajikistan


Amu Darya riverheads: water jets are coming from a Pamir glacier terminus
to form the major river system of Central Asia – AMU DARYA

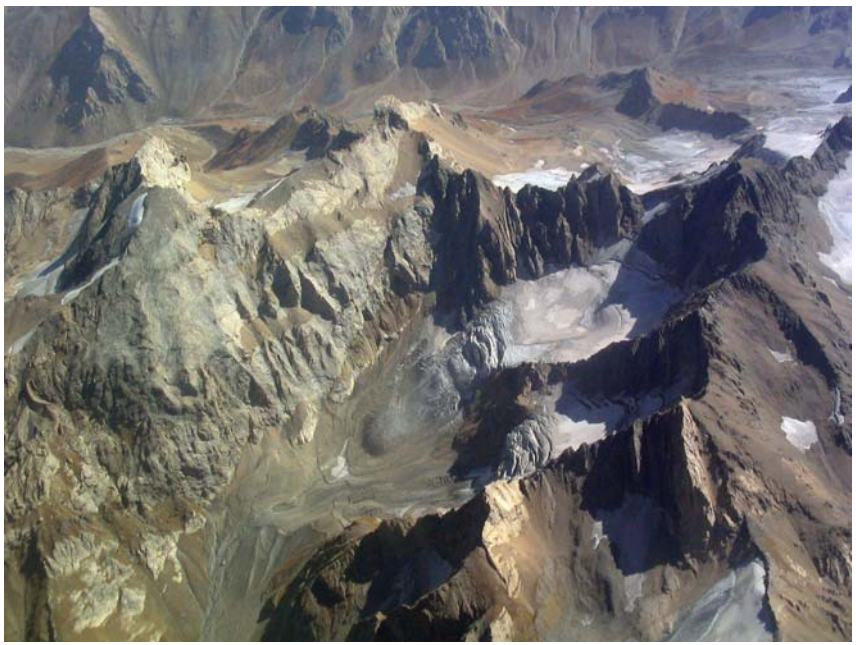
Temperatures are increasing in most mountain regions of Central Asia



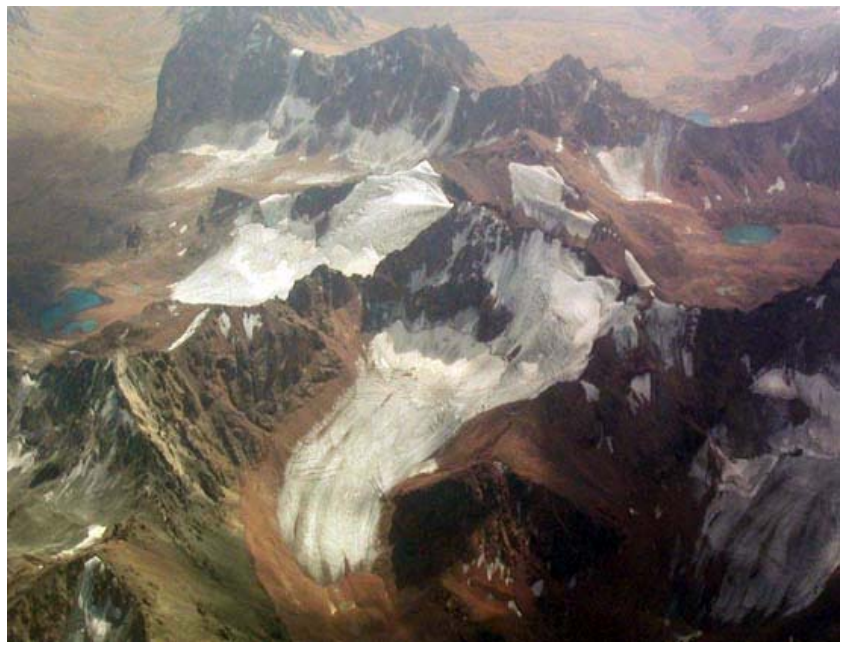
Air temperatures in high altitude and nival-glacier zones are projected to increase into the 21st century by 1-3 C

Such increase may have very dramatic effect on glaciers and water resources

Under current climate warming conditions glaciers of Central Asia are retreating fast!

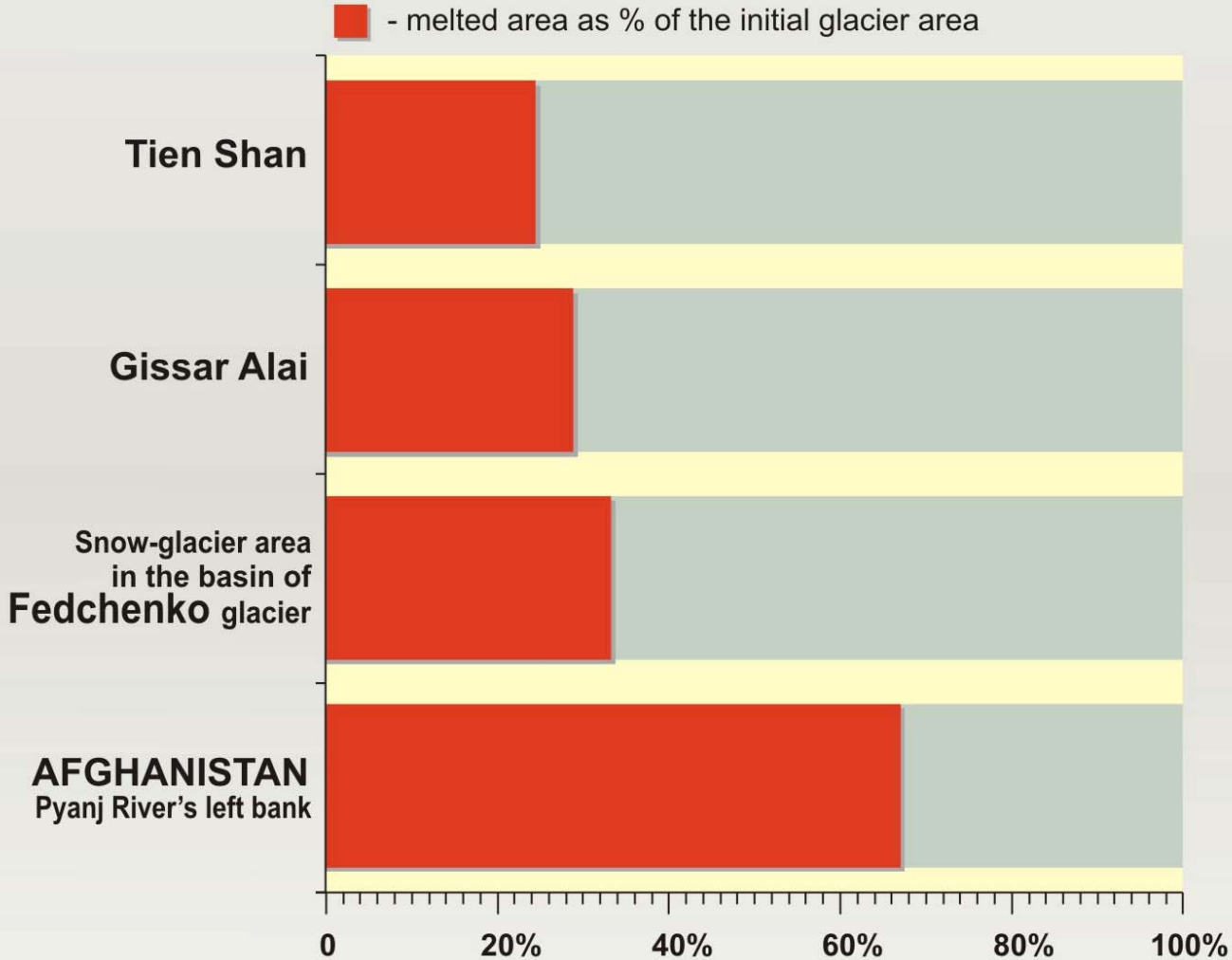


Tajikistan: **Hissaro-Alai and Pamir Mountains**



Kyrgyzstan and Kazakhstan: **Tien Shan Mountains**

Change in surface area of Central Asian glaciers in the last half of the 20th century



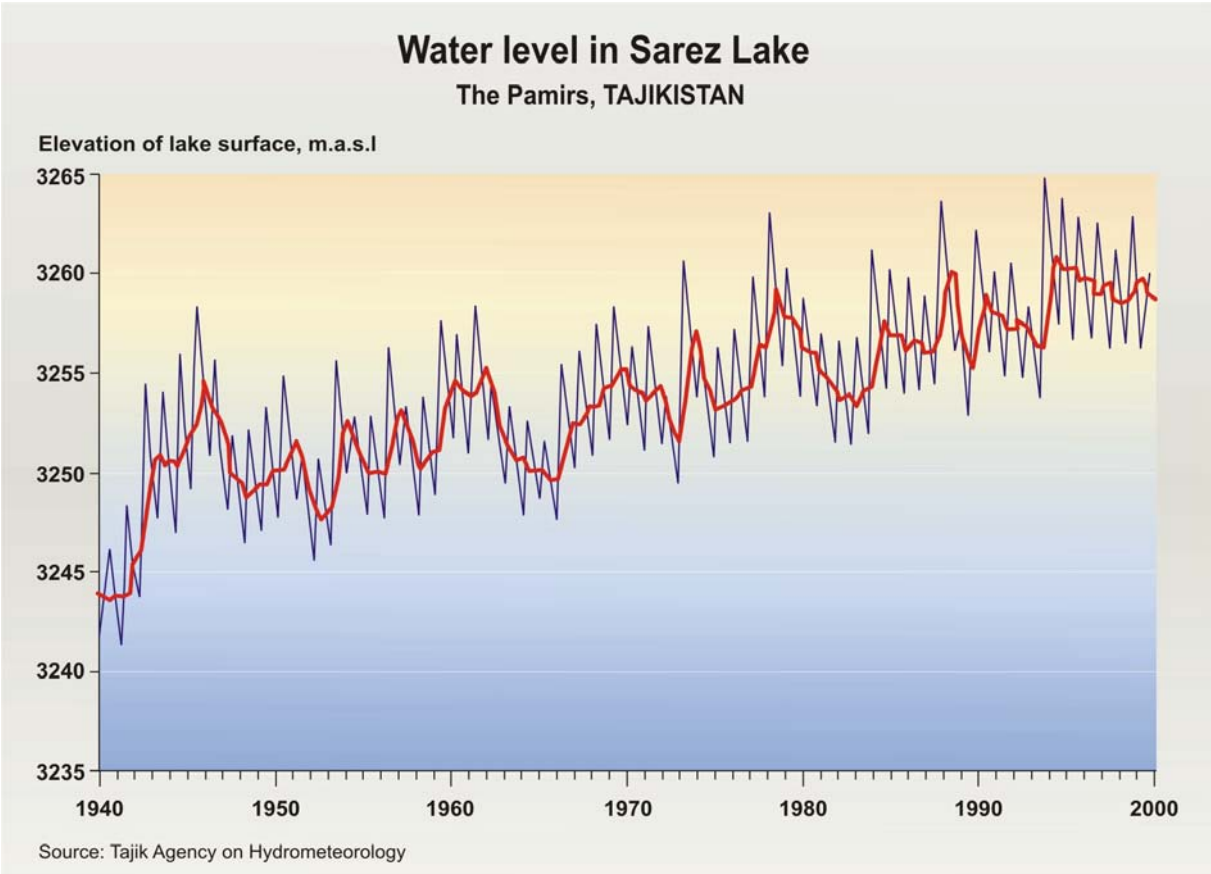
Compilation of data from V. Dikih, U. Pilgui, A. Yablokov

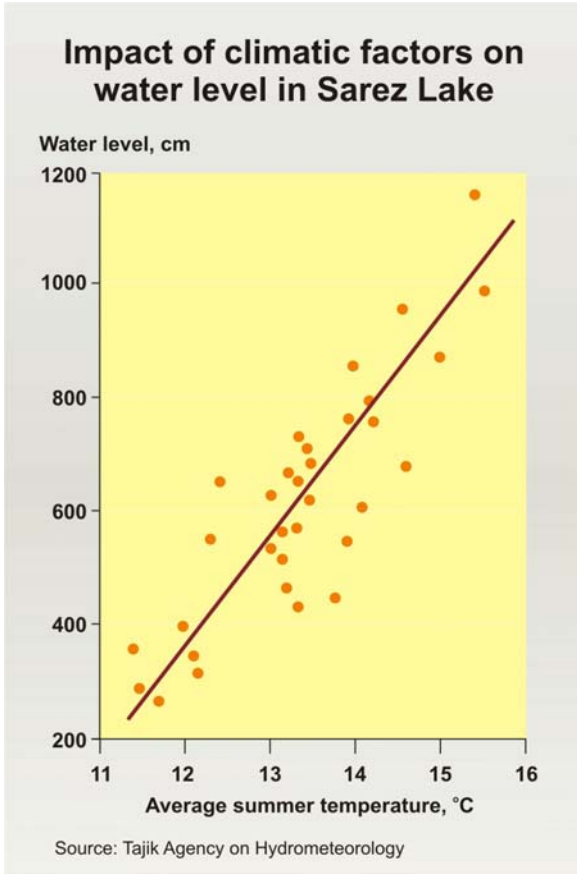

Glaciers play very important role in water supply in Central Asia (on average 10-30%)
Formerly glacier - currently dust
Due to climate warming some glaciers have completely disappeared in the recent decades

Cross-links: climate change, glaciers, water, disasters

Alaudin post glacial landscape and lakes

Glaciers and natural hazards: rising water levels in lakes and rivers

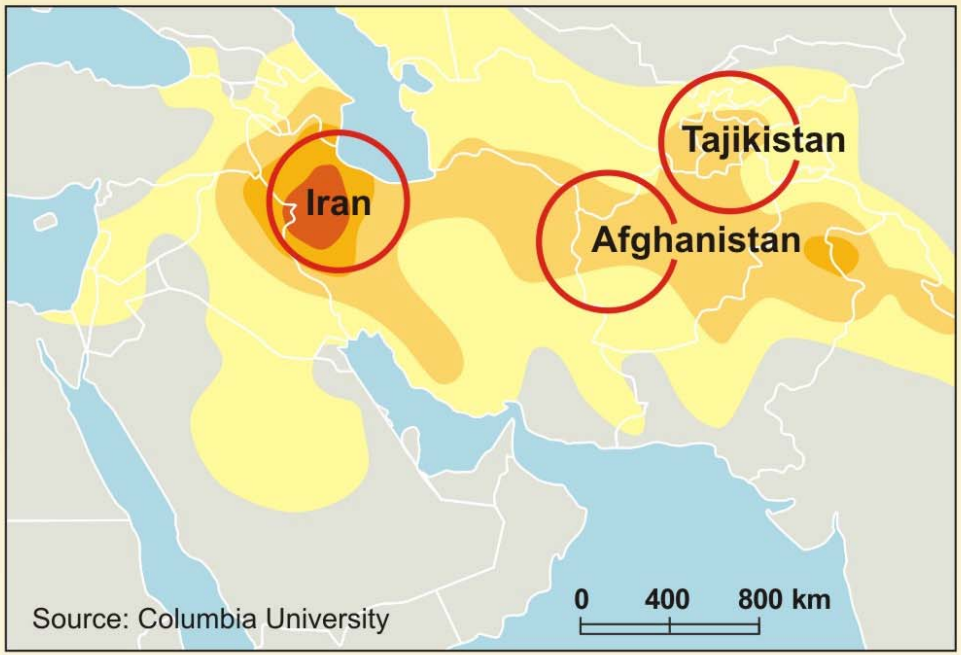




Rapid melt of glaciers may increase the risk of natural disasters. Sarez Lake and many glacial lakes could become more dangerous. Risk of sudden floods due to GLOFS and water level rise in rivers may increase

Contribution of glacier melt to water supply during severe drought

Severe drought in Central Asia



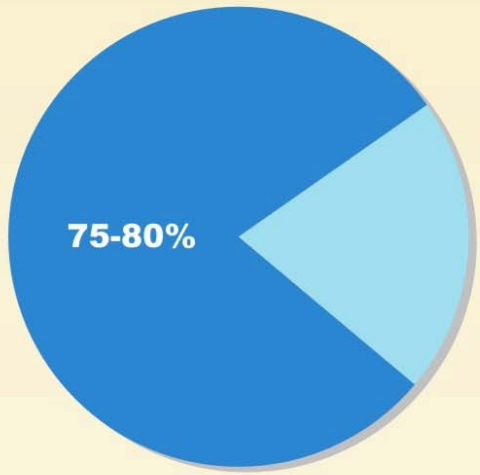
Rainfall deficit in 1999-2001

-100 -250 -400 -550 -700 mm

- areas significantly affected by drought

Glacier water in the rivers during the dry years

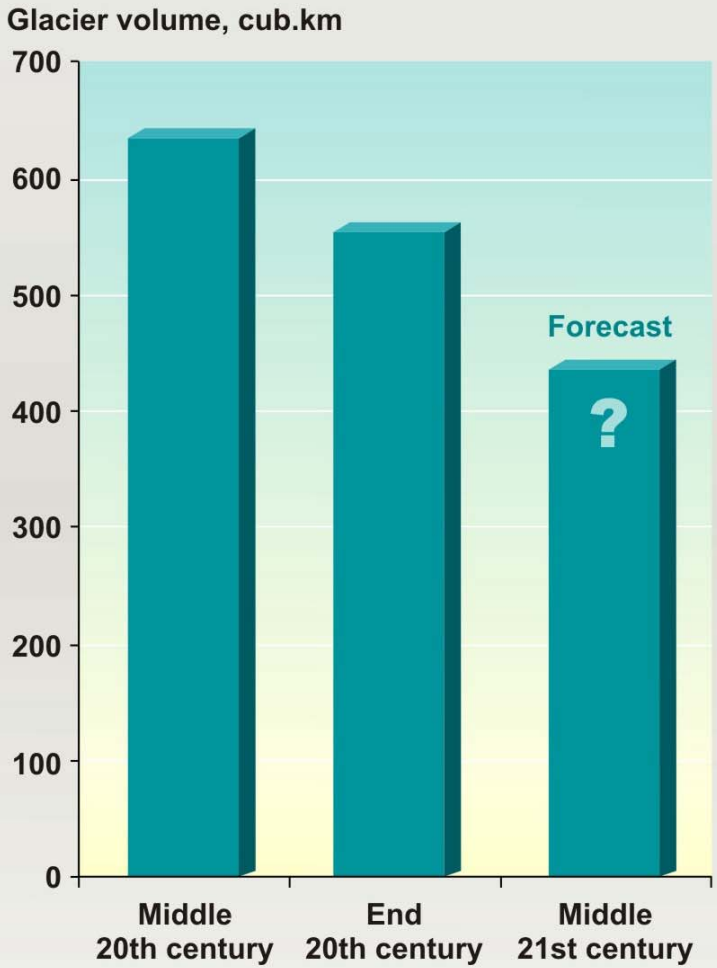
Contribution of water from glaciers into river flow of Vaksh and Pyanj during the dry years in jun-sept



- glacier melt contribution

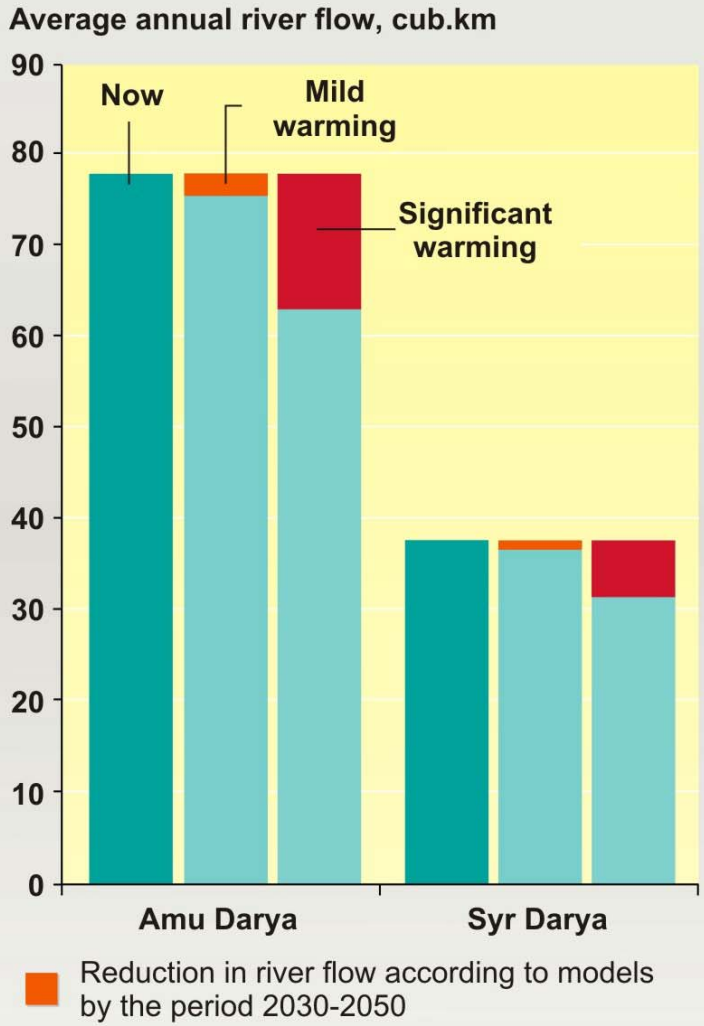
Glaciers provide bulk of water in dry hot summers. When they vanish, water dependent sectors of Central Asian economies could experience great difficulties, if timely adaptation measures are not implemented

Change in glacier volume in TAJIKISTAN



Source: Tajik Agency on Hydrometeorology and Environmental Research

Impacts of climate change on river flow in Central Asia



Source: Tajik Agency on Hydrometeorology

Hydropower and irrigation are very dependent on glacier water