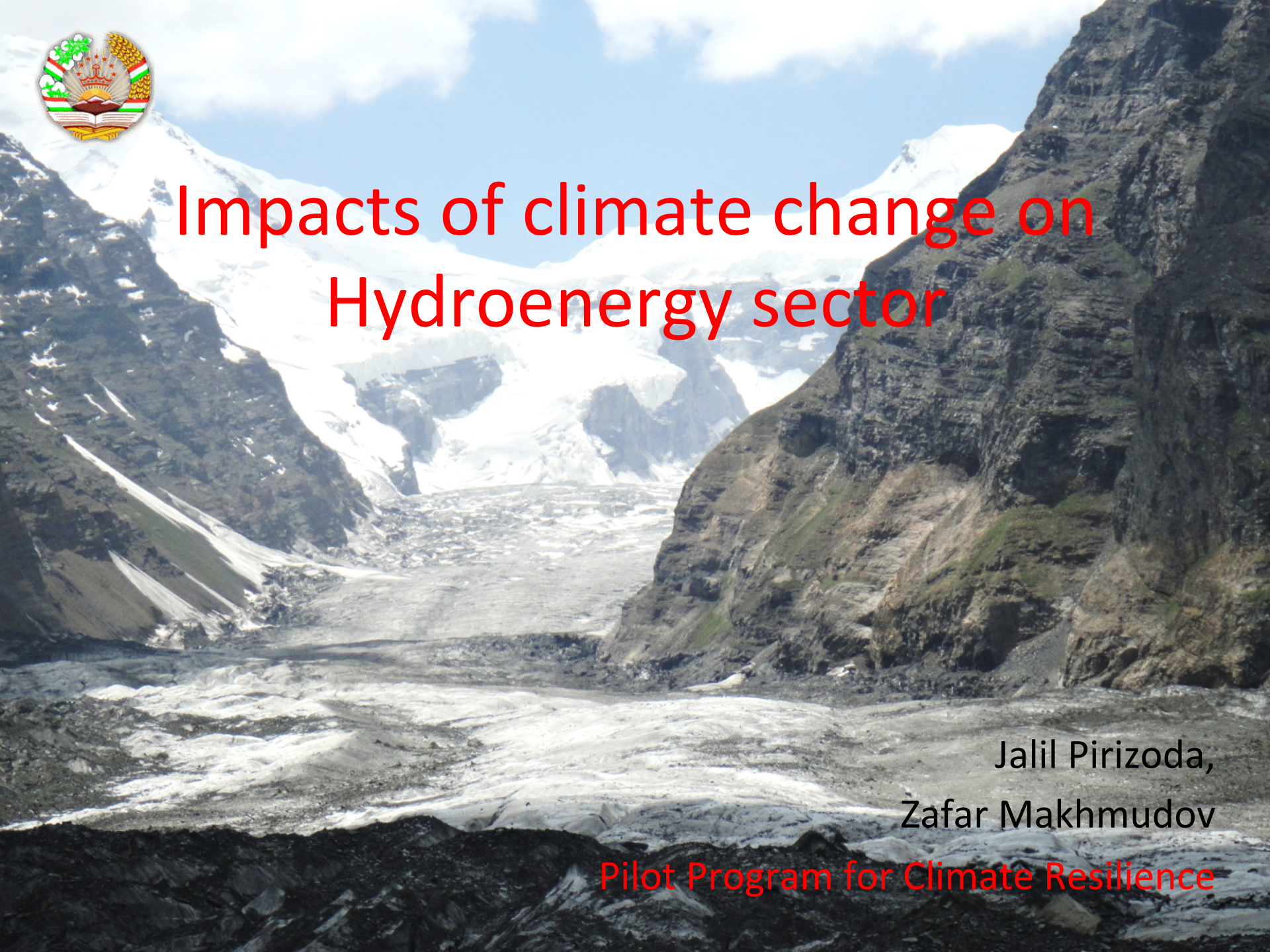


Impacts of climate change on Hydroenergy sector

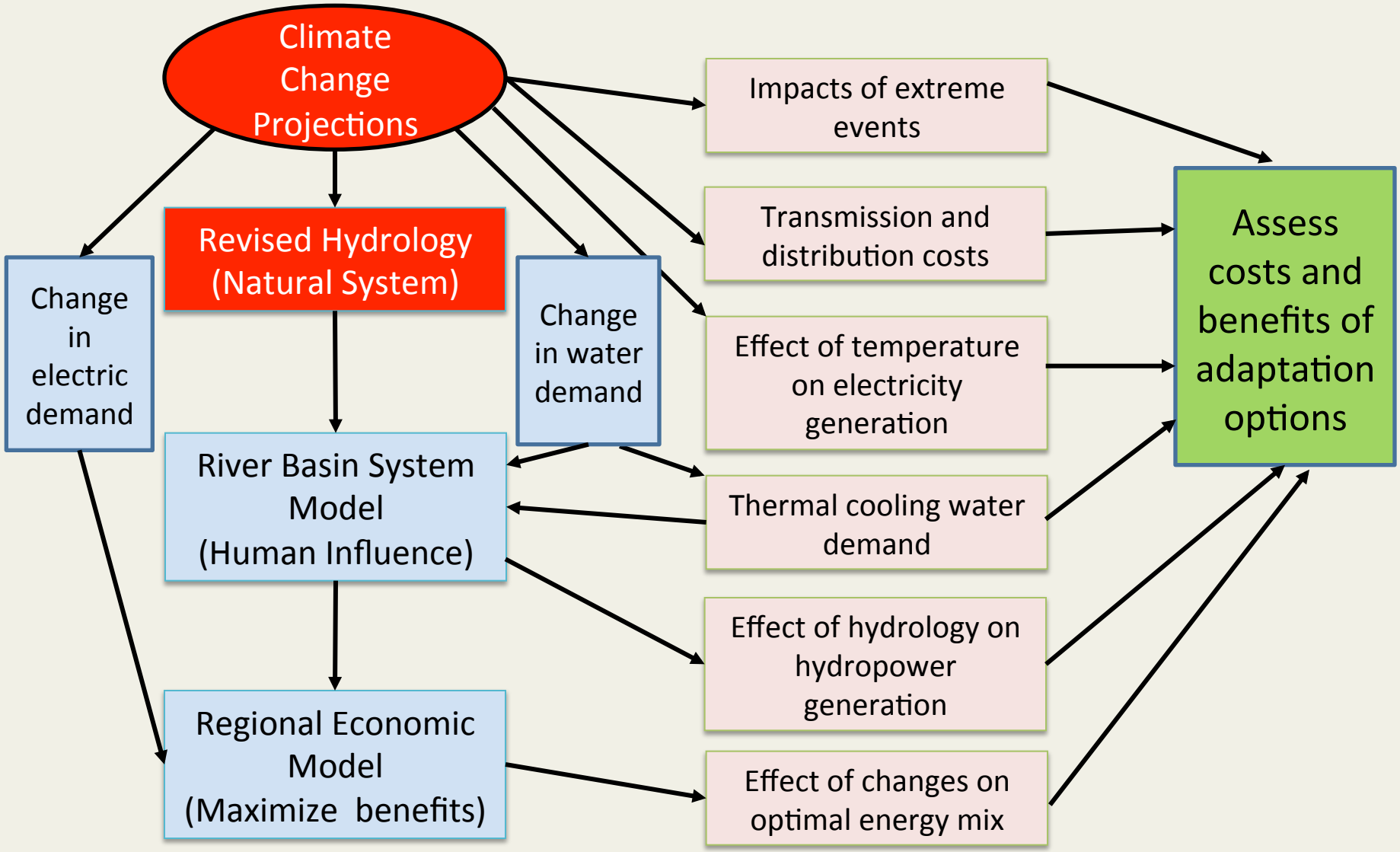
Jalil Pirizoda,
Zafar Makhmudov
Pilot Program for Climate Resilience

Projections of Water Resource Changes and its impact on energy sector

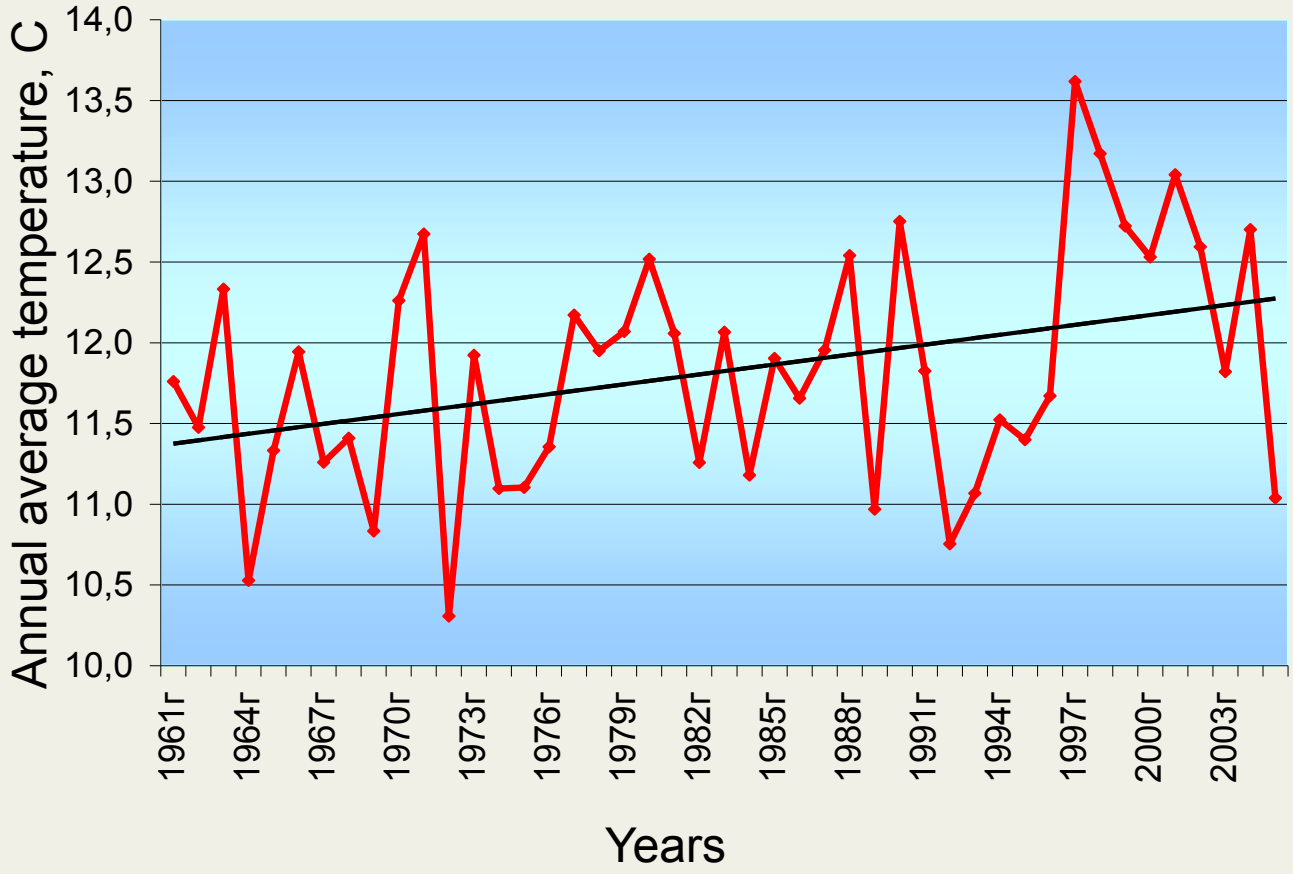
Sources of information:

- The Second National Communication of Tajikistan to UNFCCC;
- PPCR Phase I:
  - Improving climate resiliency of hydro energy sector in Tajikistan (EBRD)
  - Tajikistan climate science and impact modeling partnership (ADB)

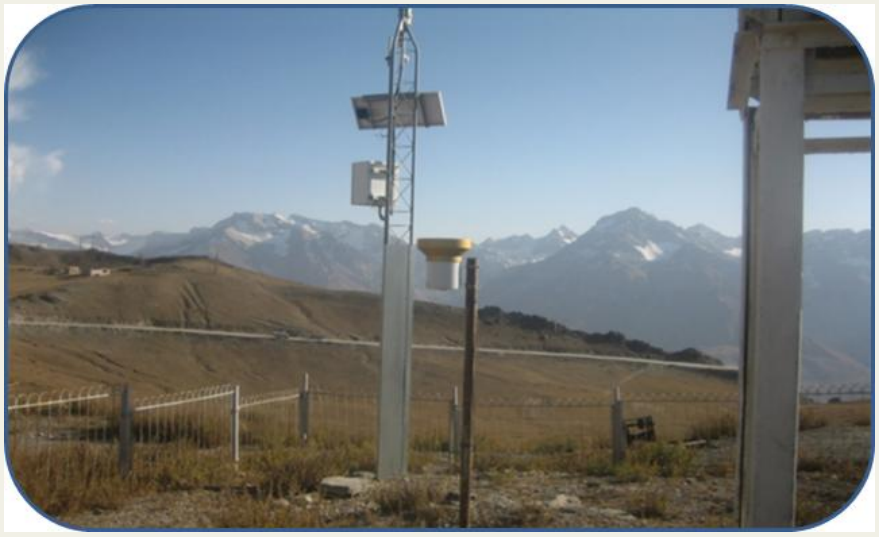
HAZARD-IMPACT MODELS | **IMPACT METRICS FOR ENERGY SYSTEM** | **ADAPTATION ANALYSES**



Fluctuation of surface temperature according to reference weather stations in Tajikistan

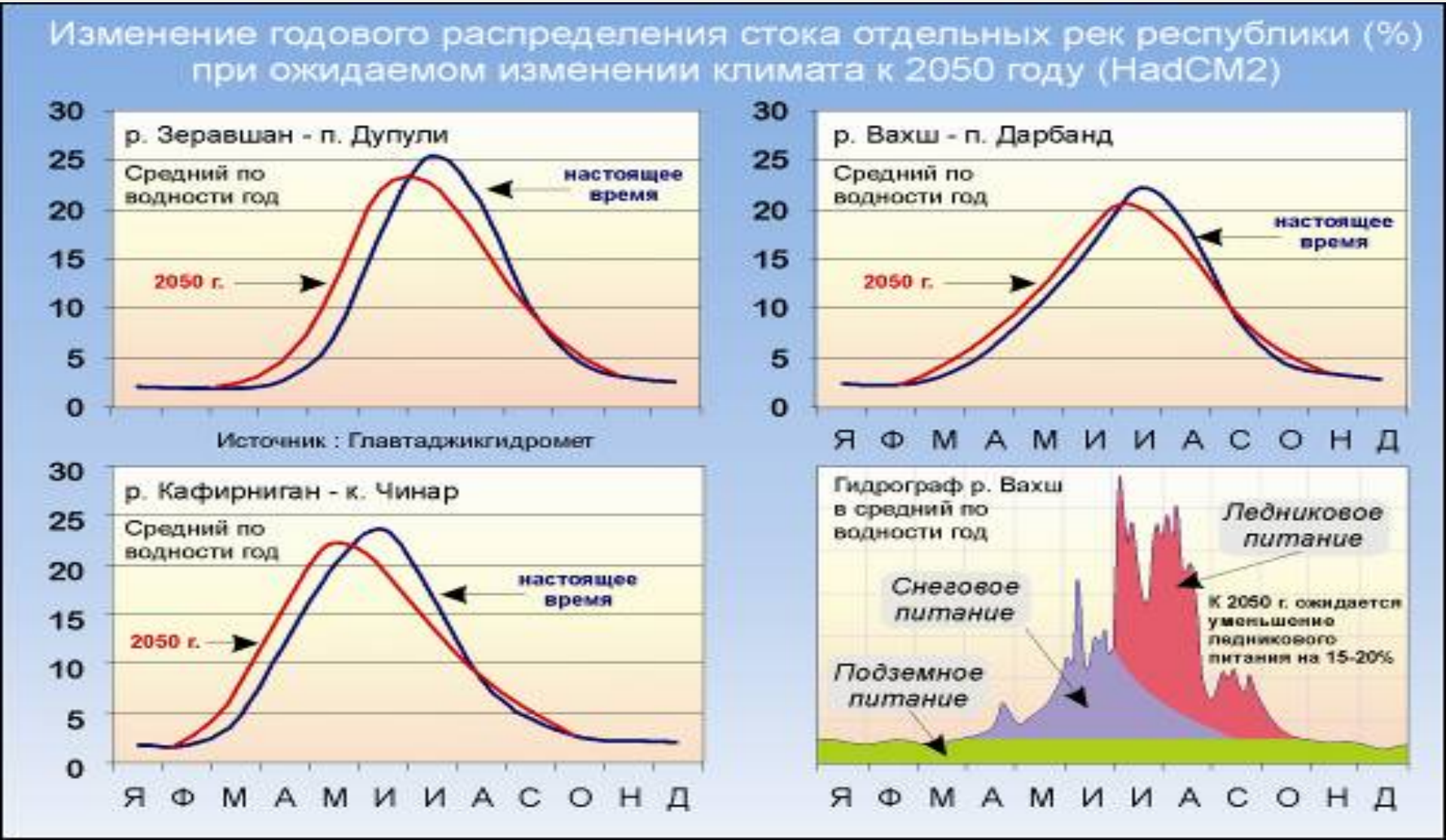


Hydrometeorology stations in Tajikistan

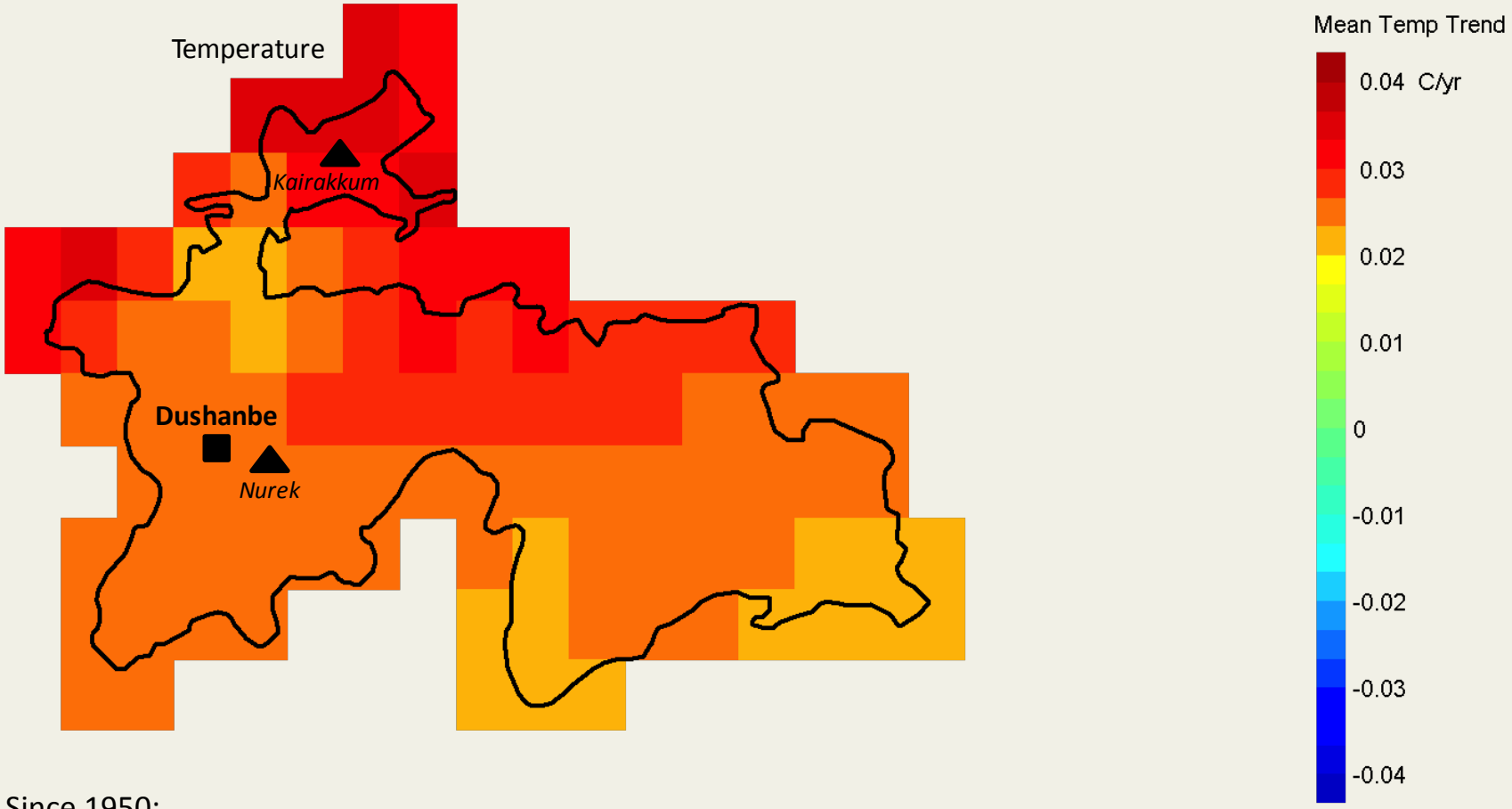


Estimation of Water Resources up to 2050

Estimation of Water Resources up to 2050



Observed changes of temperature

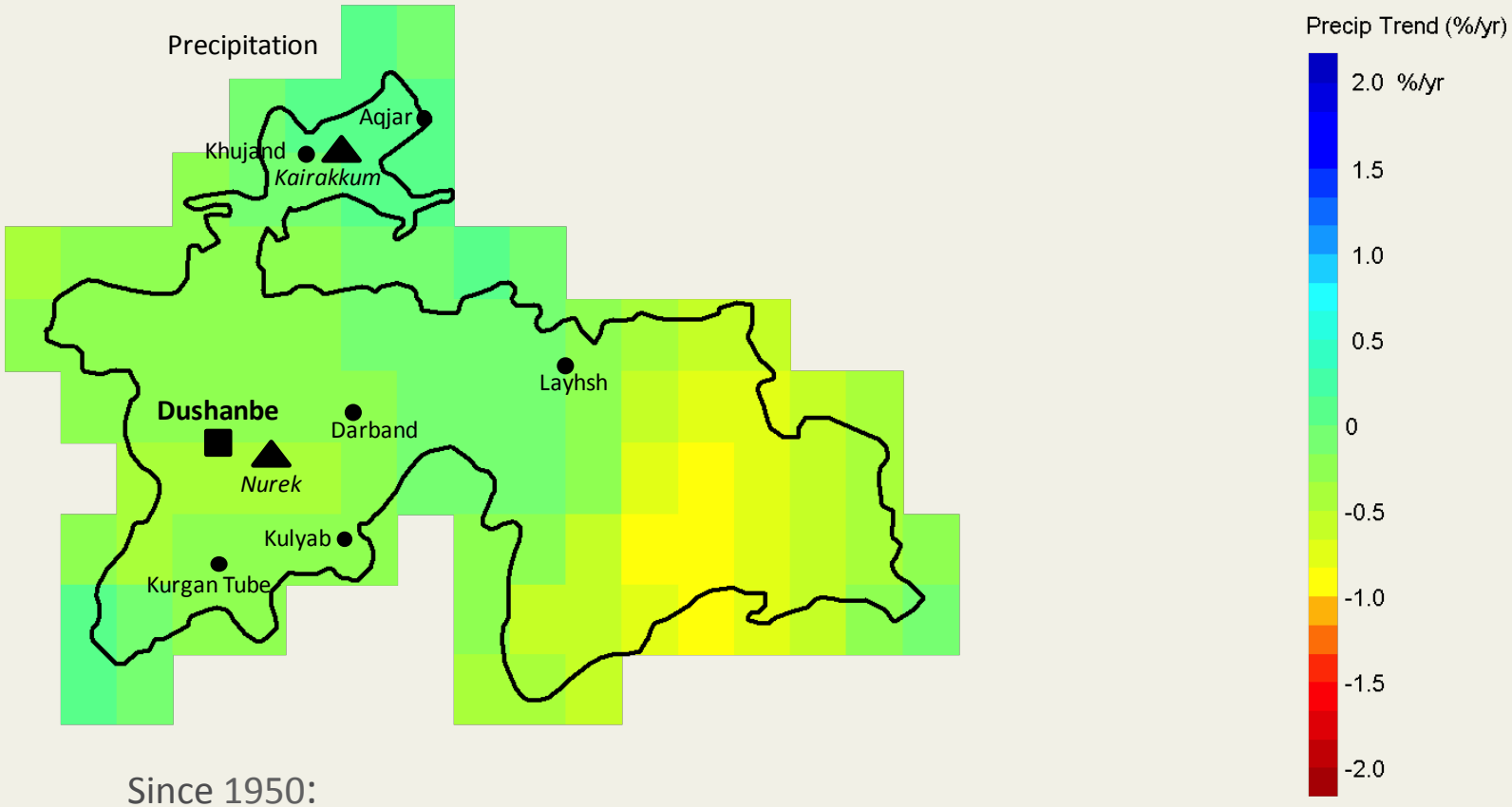


Since 1950:

- Annual temperature increase ↑1.2°C
- Rapid warming is observed in:
  - –In the north
  - –During autumn and winter seasons

Source: PPCR, EBRD (2011)

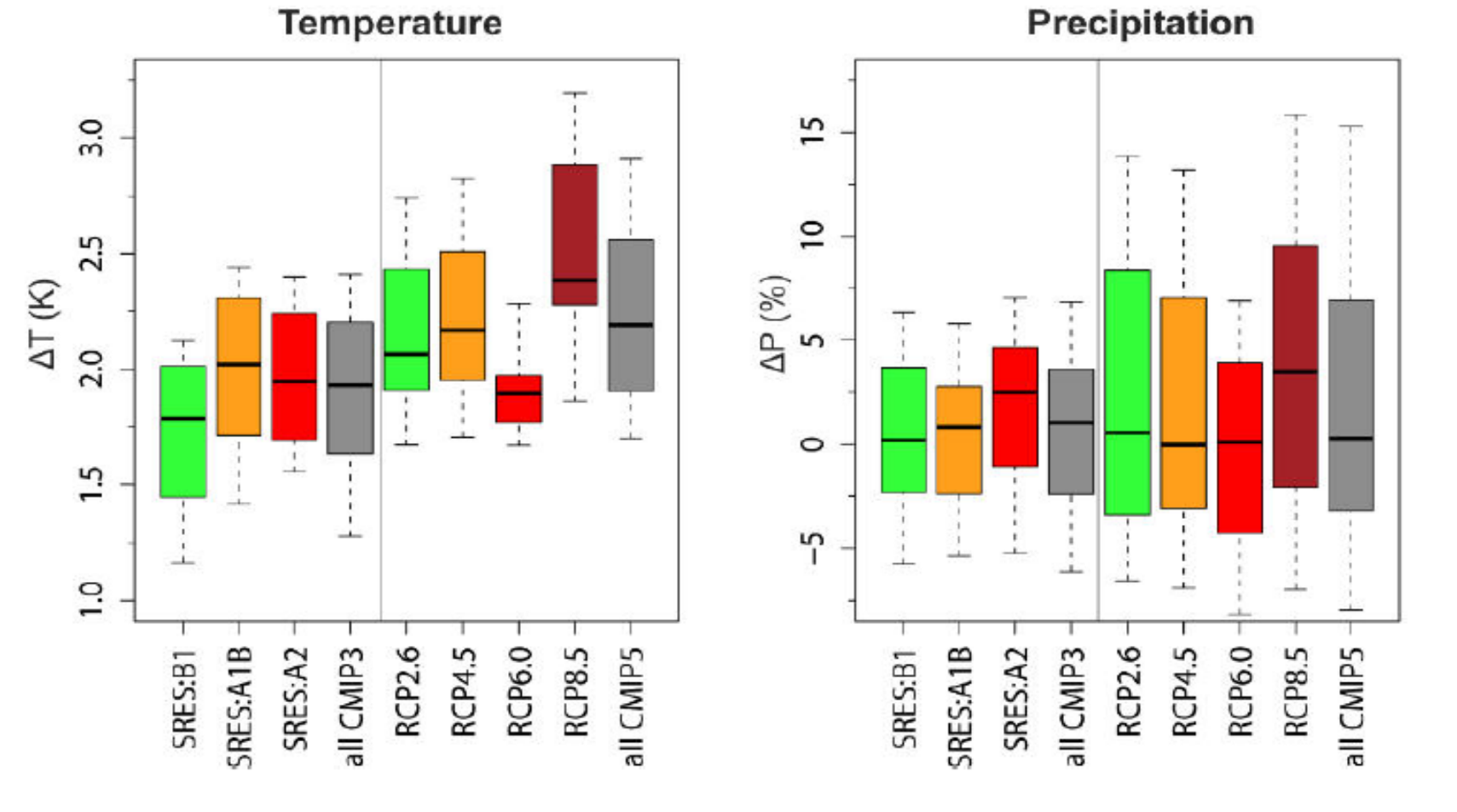
Observed changes of precipitation



Since 1950:

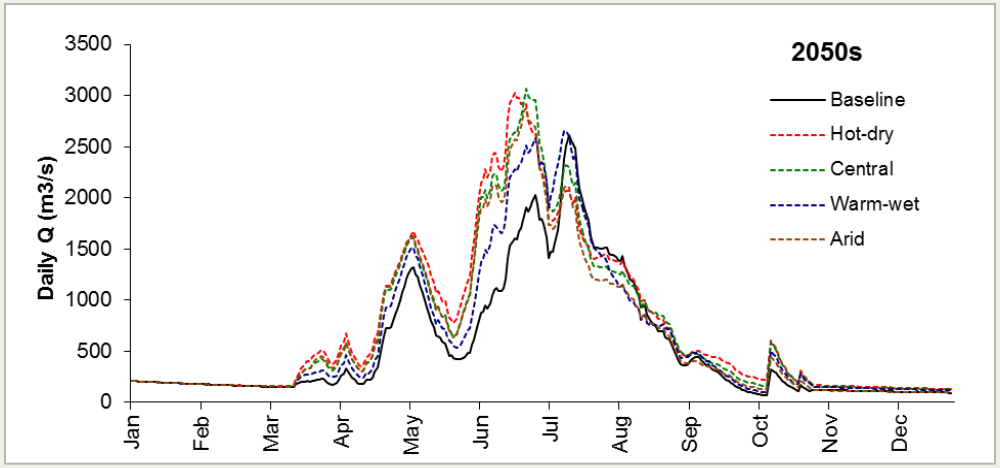
- Annual precipitation ↑↓ 20%
- In the Pamirs decrease of precipitation is expected during the autumn andwinter seasons (level of precipitation in winter remains the same)

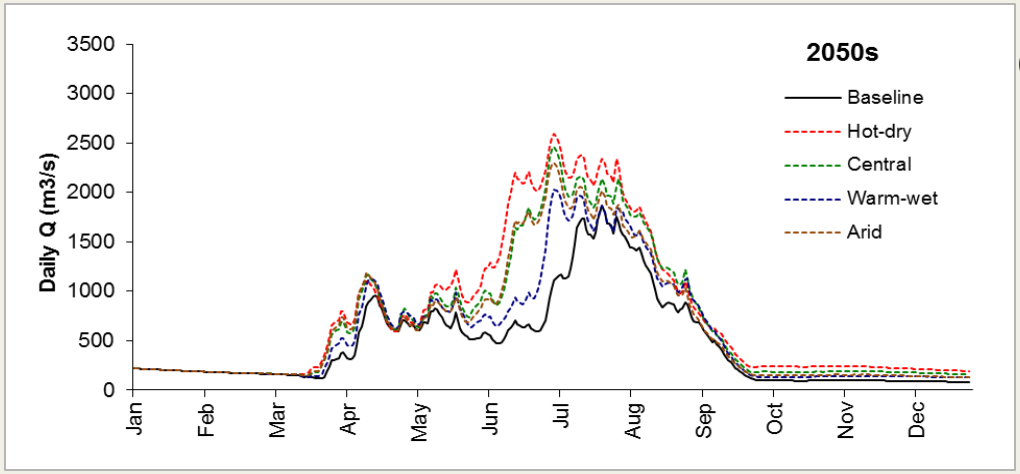
Source: PPCR, EBRD (2011)



Forecasted changes of average weather temperature and precipitations for Amudarya and Syrdarya basins as per different projecsion of emissions up to 2030.
Source: Lutz et al. (2013).

Annual runoff changes





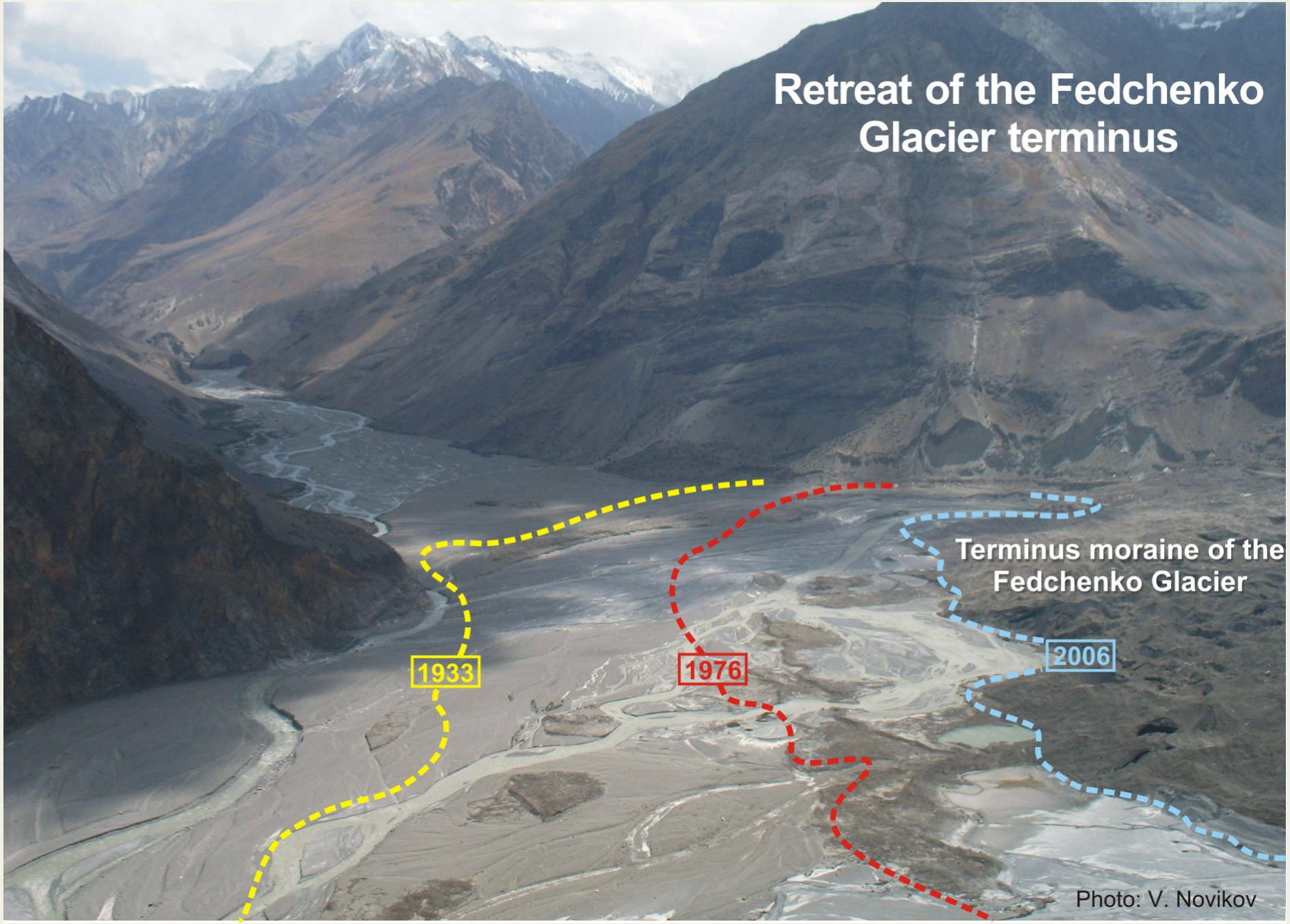
Modeling of daily water runoff in the headwaters of Vakhsh (Nurek dam) using runoff modeling based on icemelting (SRM):

- Black line= modeling of 'base data' on runoff (upper line) 2005 and (lower line) 2001

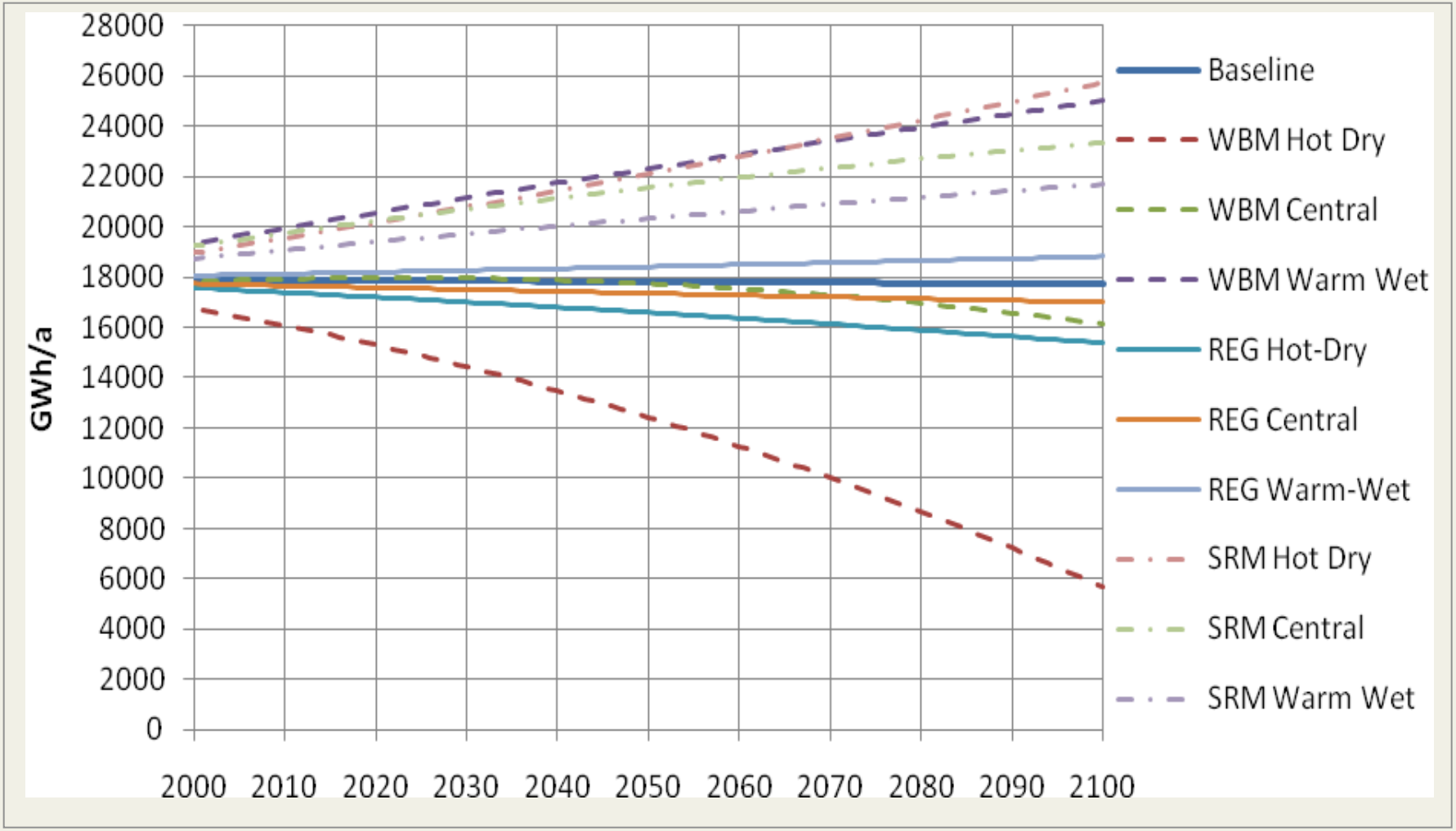
- Dashed line – runoff in 2050, on the basis 4 climatic scenarios (hot - dry, Central, warm - wet, and arid)

Source: Professor Robert Wilby, Loughborough University, UK


The impact assessment showed that during the whole period of instrumental observations (since 1930s), the glaciation area of Tajikistan decreased by around 30%


Retreat of the Fedchenko Glacier terminus
Terminus moraine of the Fedchenko Glacier
1933
1976
2006
Photo: V. Novikov

Unidentified implications of climate change for hydropower generation

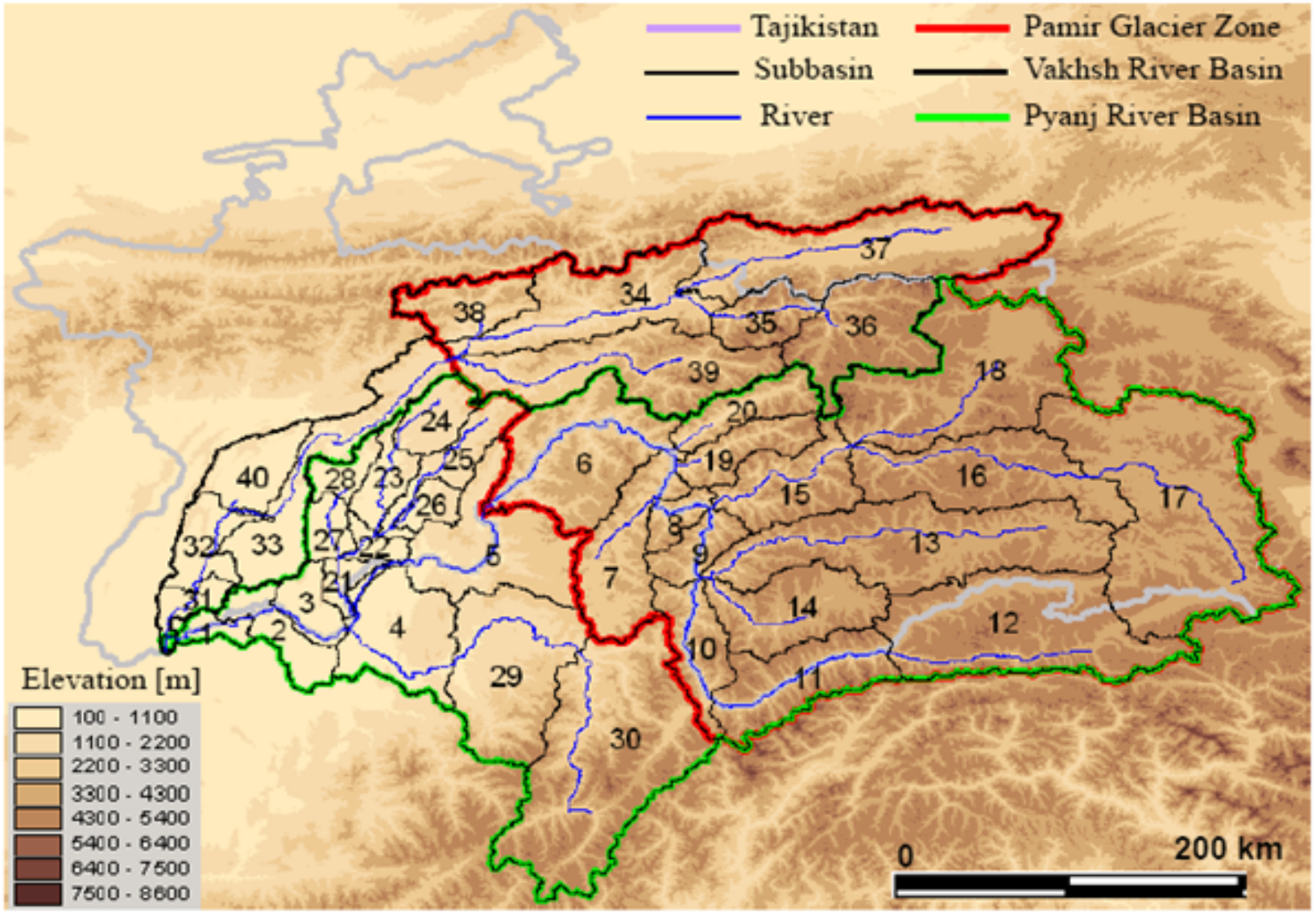


Projections of future annual average energy production in Vakhsh Cascade

Source: PPCR, EBRD (2011)

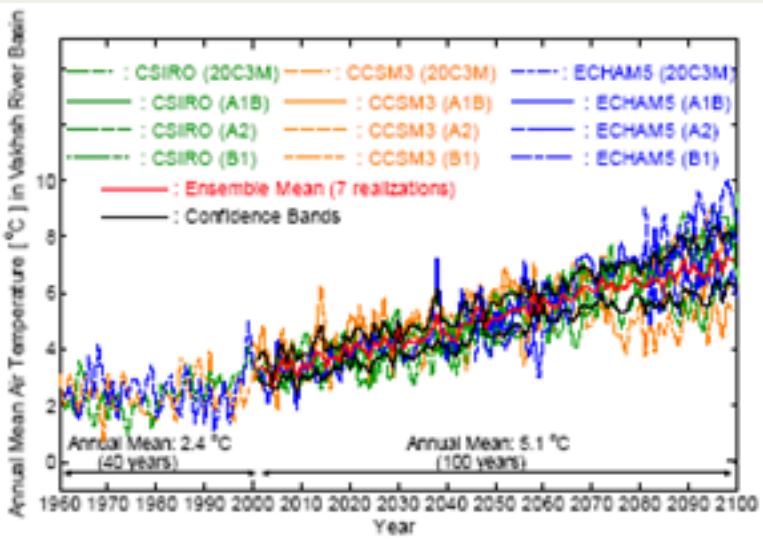
Hydro Power Plants in Tajikistan

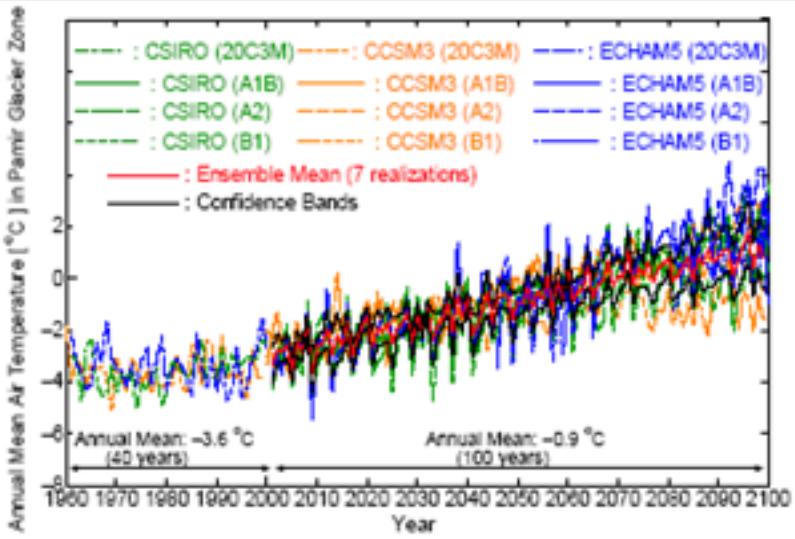
- 98% of energy from HPPs
- 5% of potential is currently used

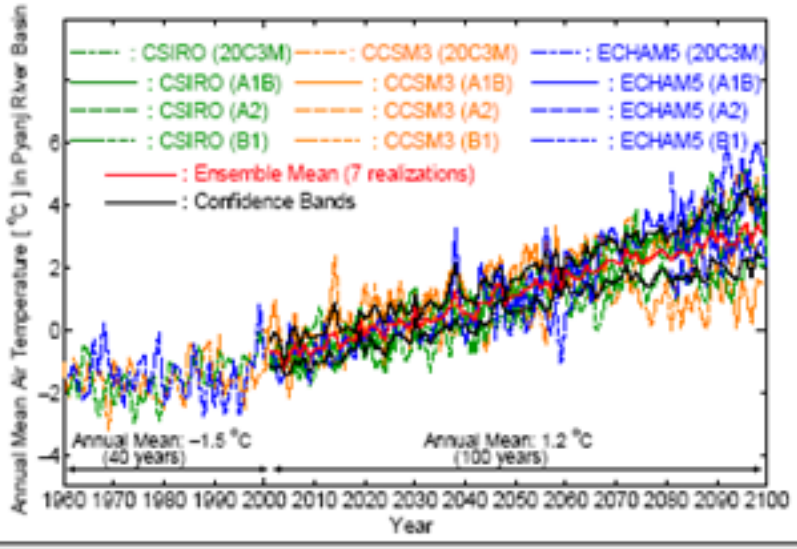


Source: PPCR, ADB, 2012

Historic and future annual average weather temperature for Vakhsh and Pyanj river basins, also for the Pamirs' glaciation area

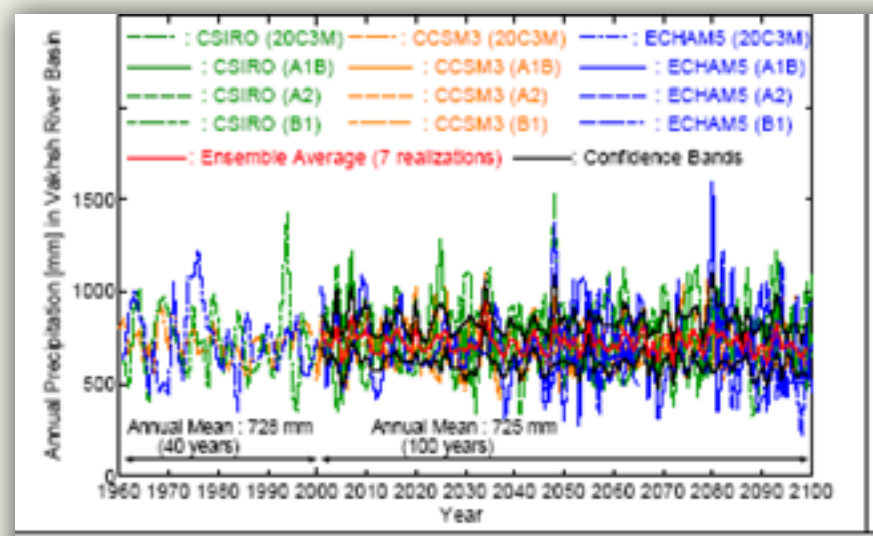


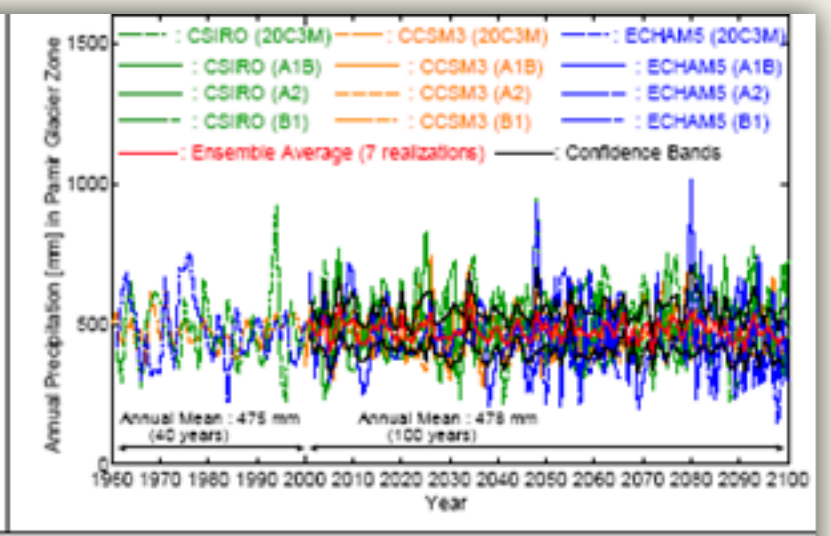


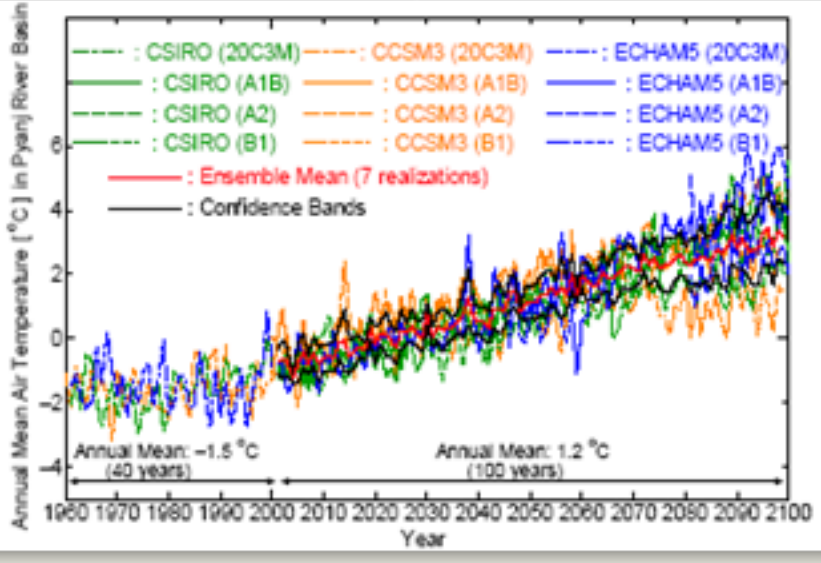


Source: PPCR, ADB, 2012

Historic and future annual average precipitation for Vakhsh and Pyanj river basins, also for the Pamirs' glaciation area

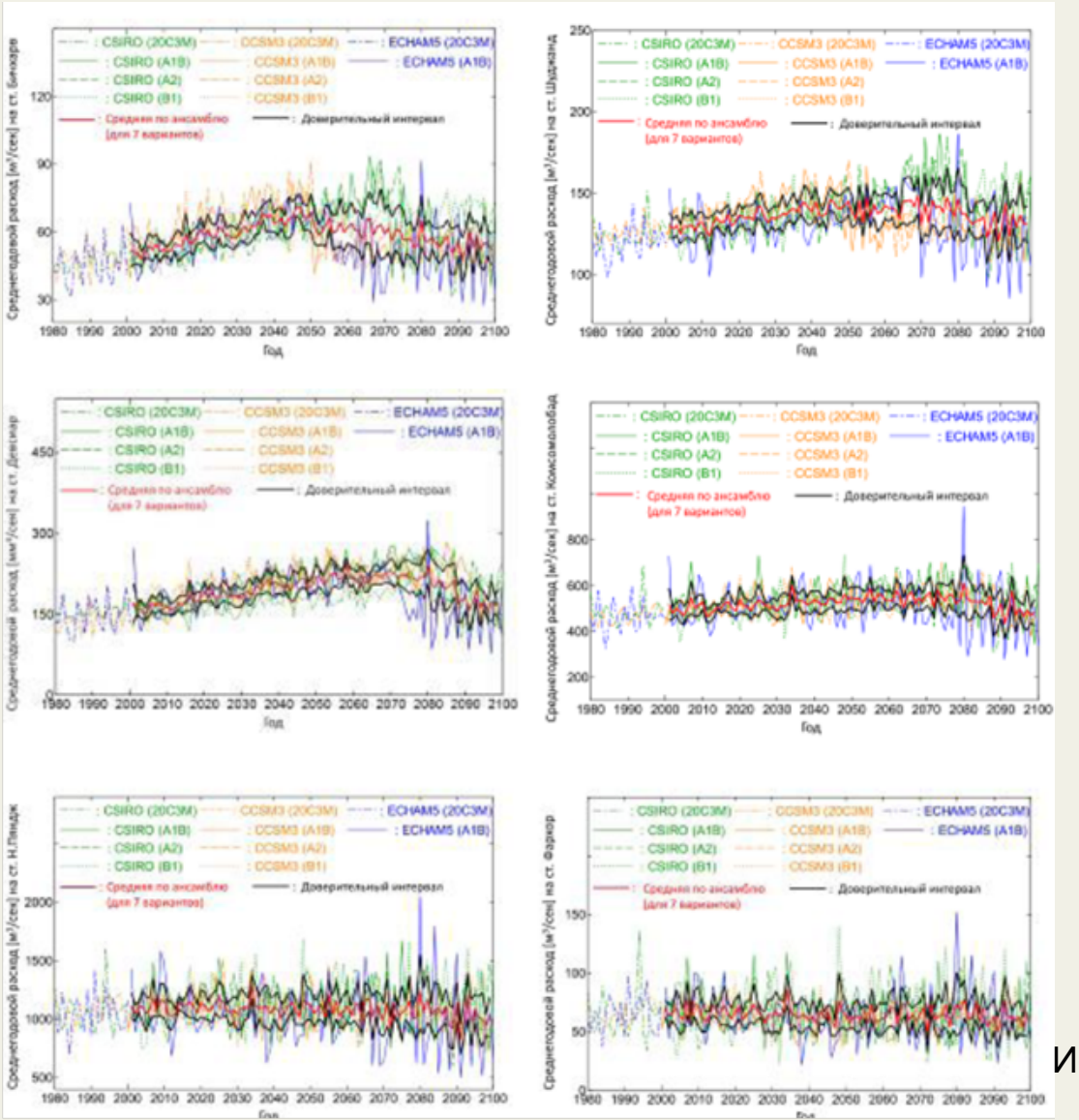






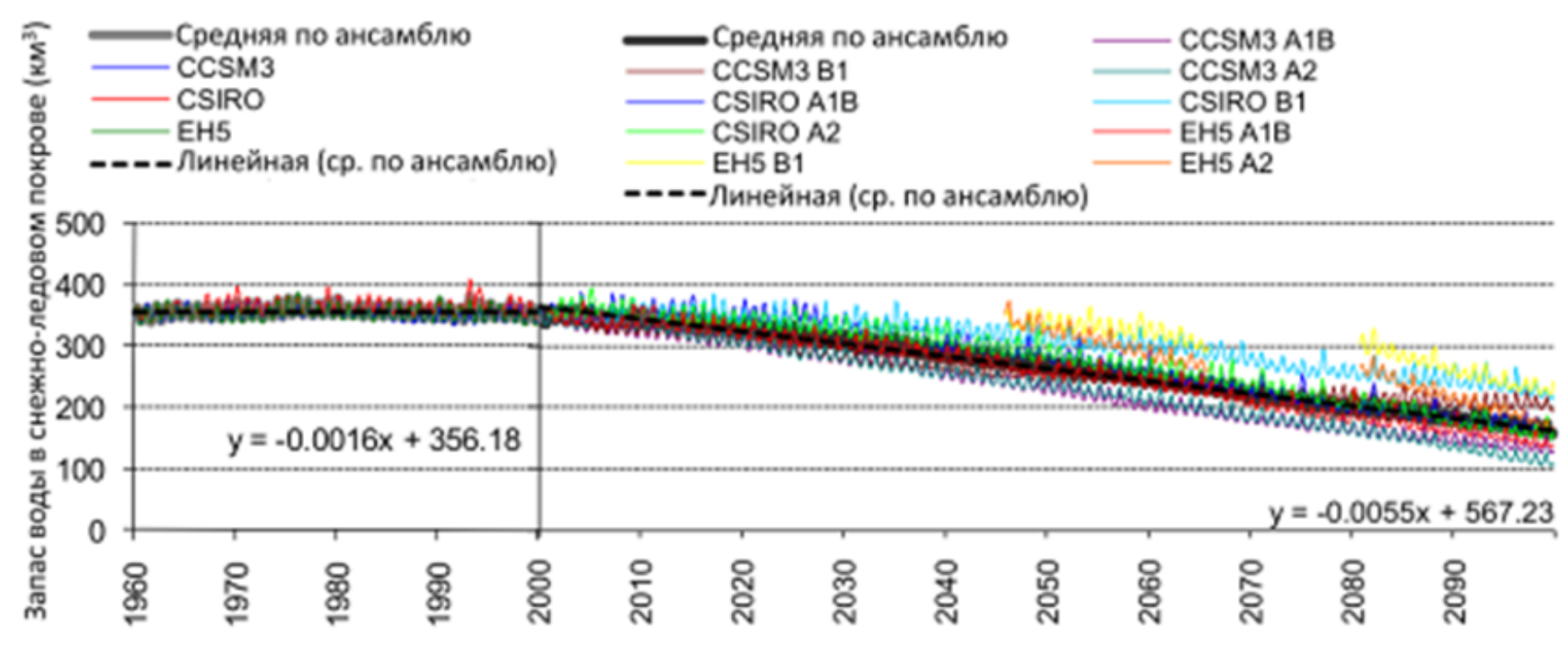
Source: PPCR, ADB, 2012

Historic and future annual average river flow in Vakhsh and Pyanj river basins



Источник: ППАИК, АБР, 2012

Estimated full ice volume of Pamir's glaciation area for the past and future periods



Источник: ППАИК, АБР, 2012

Unidentified implications of climate change on energy production

- Single projections for 2050: Temperature increase (no changes in precipitation level) → Increased level of snow and ice melting → Increased level of water flow → Improving capacity of hydroenergy?

OR

- Other projections for 2050: Temperature increase, decreasing the level of precipitation → rapid melting of snow and ice resources → Decreasing capacity of hydroenergy sector?

Thank you!