Climate change in Central Asia:Tienshan – trends and future

Ysmail Dairov,
Regional Mountain Centre of Central Asia

23 October 2012, Eger, Hungary

The Regional Mountain Centre of Central Asia was established at 2008 by the Ministers of Environment of all five Central Asia countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan with support of UNEP/AP.

Aim: provide cooperation between Central Asian countries on mountain environment: water, biodiversity, forests, climate change, mountain livelihoods.

Central Asian countries

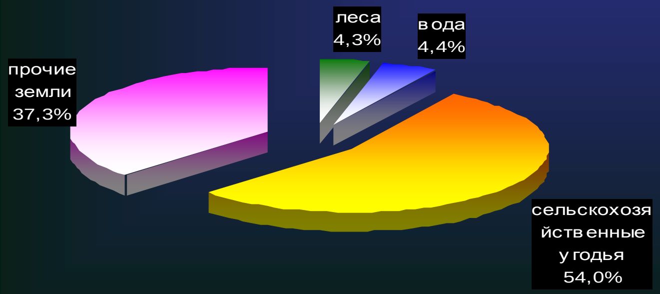
Kyrgyzstan: general information

Def: Mountainous country

- •94% above 1500 m a.s.l
- •Headwater country
- •The Highest point: Peak Pobeda at 7439 m

Ecosystems:

- •Forests 4.3%
- •Glaciers: 4%
- •Pasture:
- •Agricultural land: 54%



What does it mean for 5.1 million population?

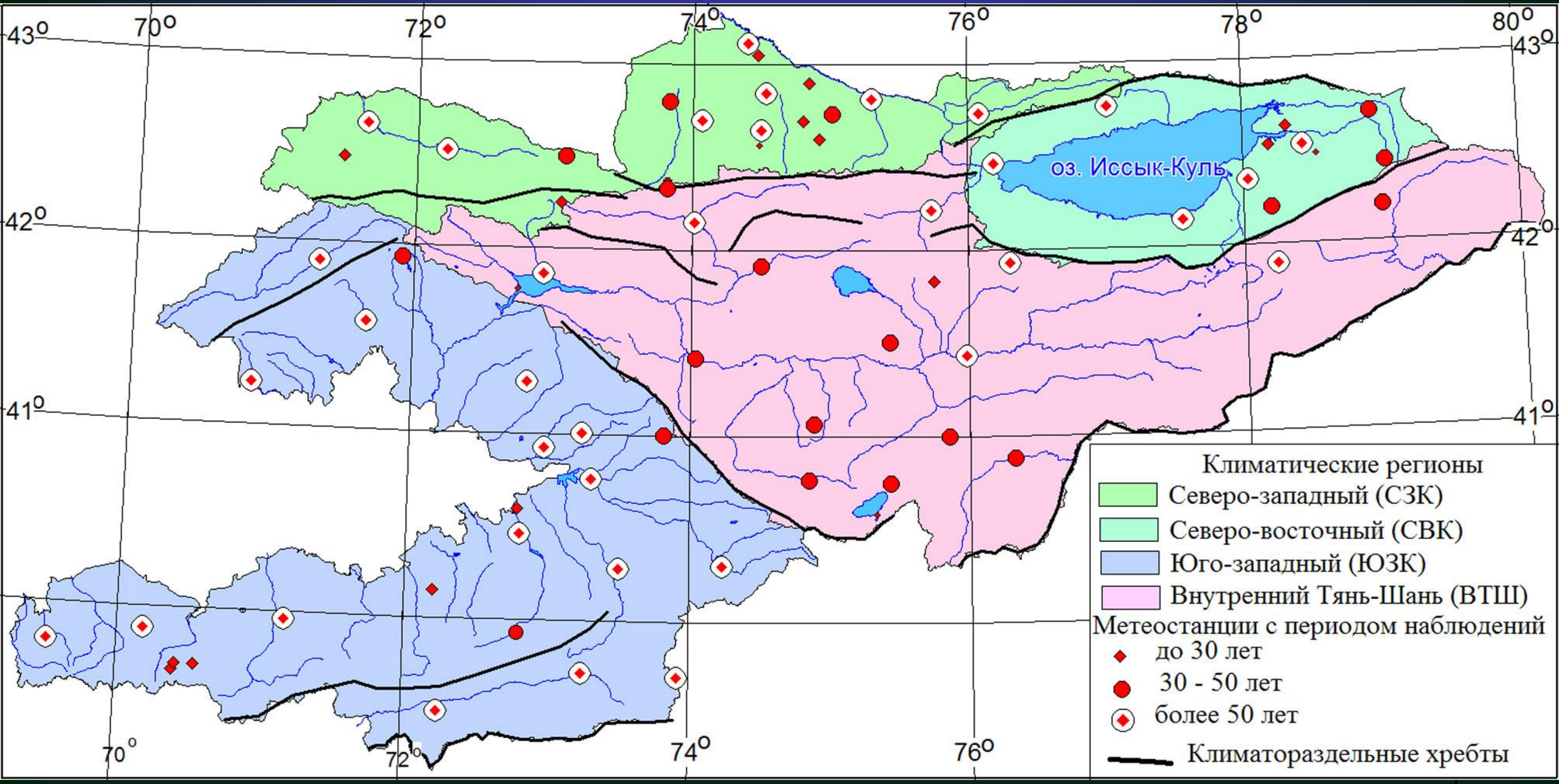
- •60% living in rural, remote areas
- •High poverty rate in mountains
- •Energy spent: 2 times more than in plains
- •Every year: flashfloods washing off roads

RMCCA
Regional Mountain Centre of Central Asia

What are the mountain concerns?

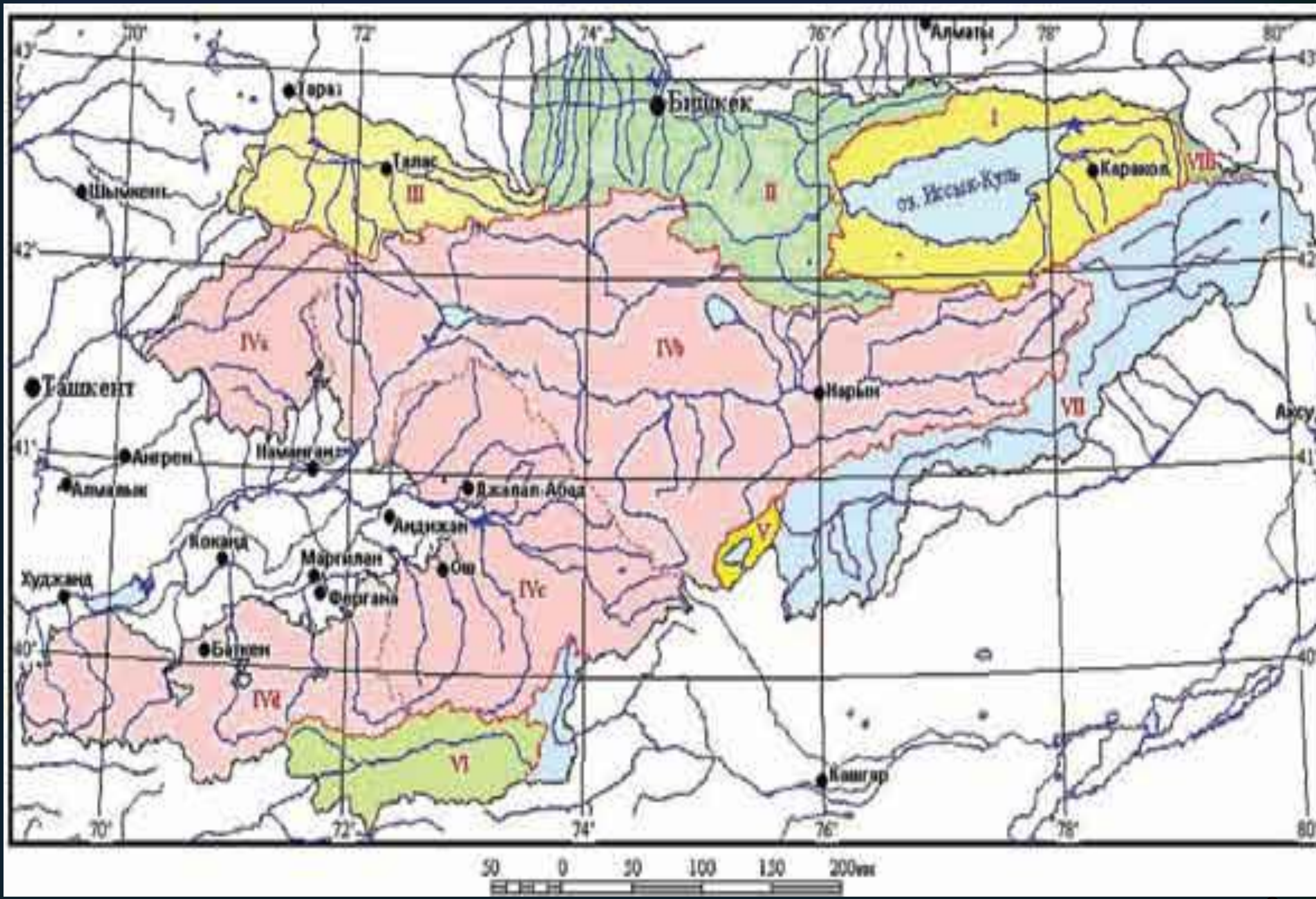
- **Glaciers as early indicators of changing climate**
- **Too much, too little water phenomena**
- **High vulnerability to disasters**
- **Population emigration and migration**
- **Feminization of agriculture**

Climatic area in the Kyrgyz Republic (Tienshan)

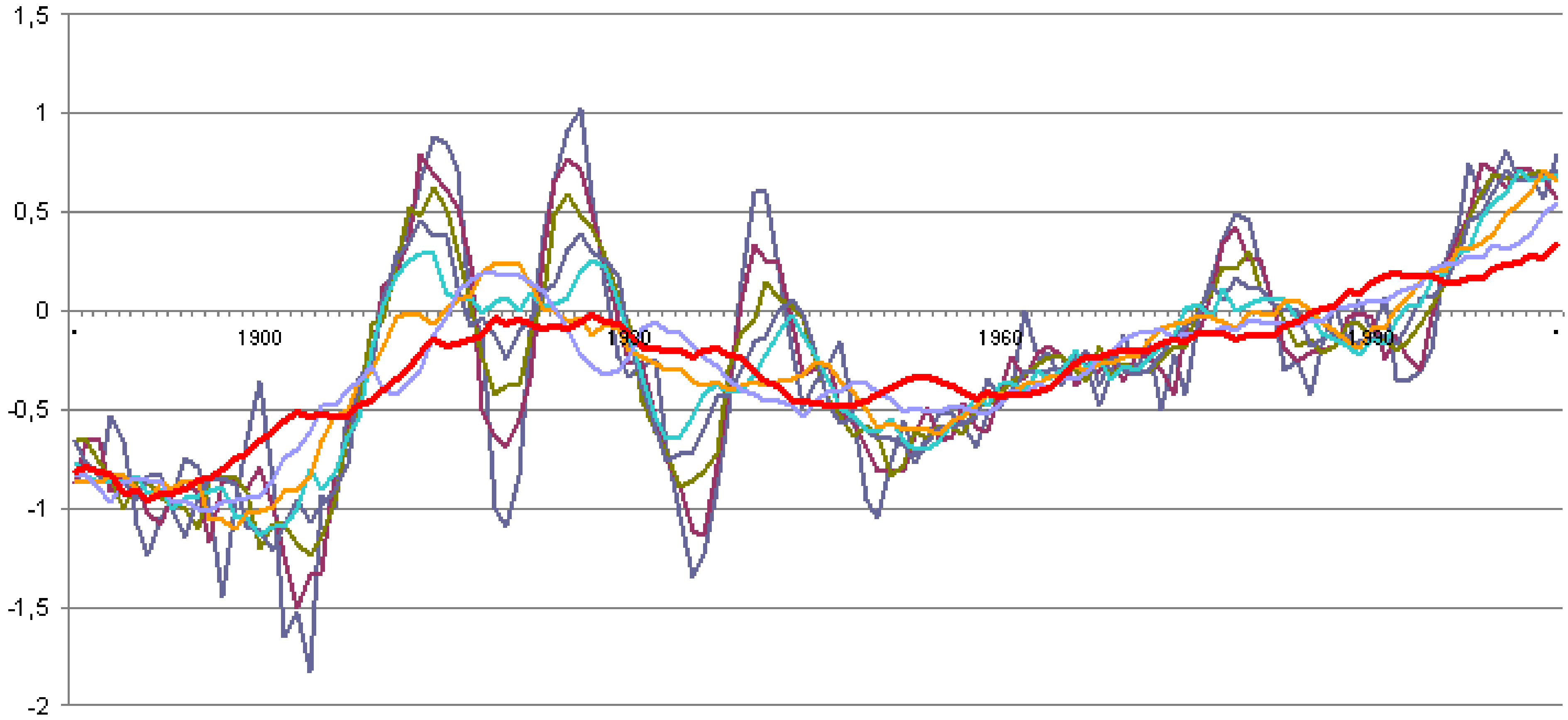


RMCCA
Regional Mountain Centre of Central Asia

River basins of Kyrgyzstan

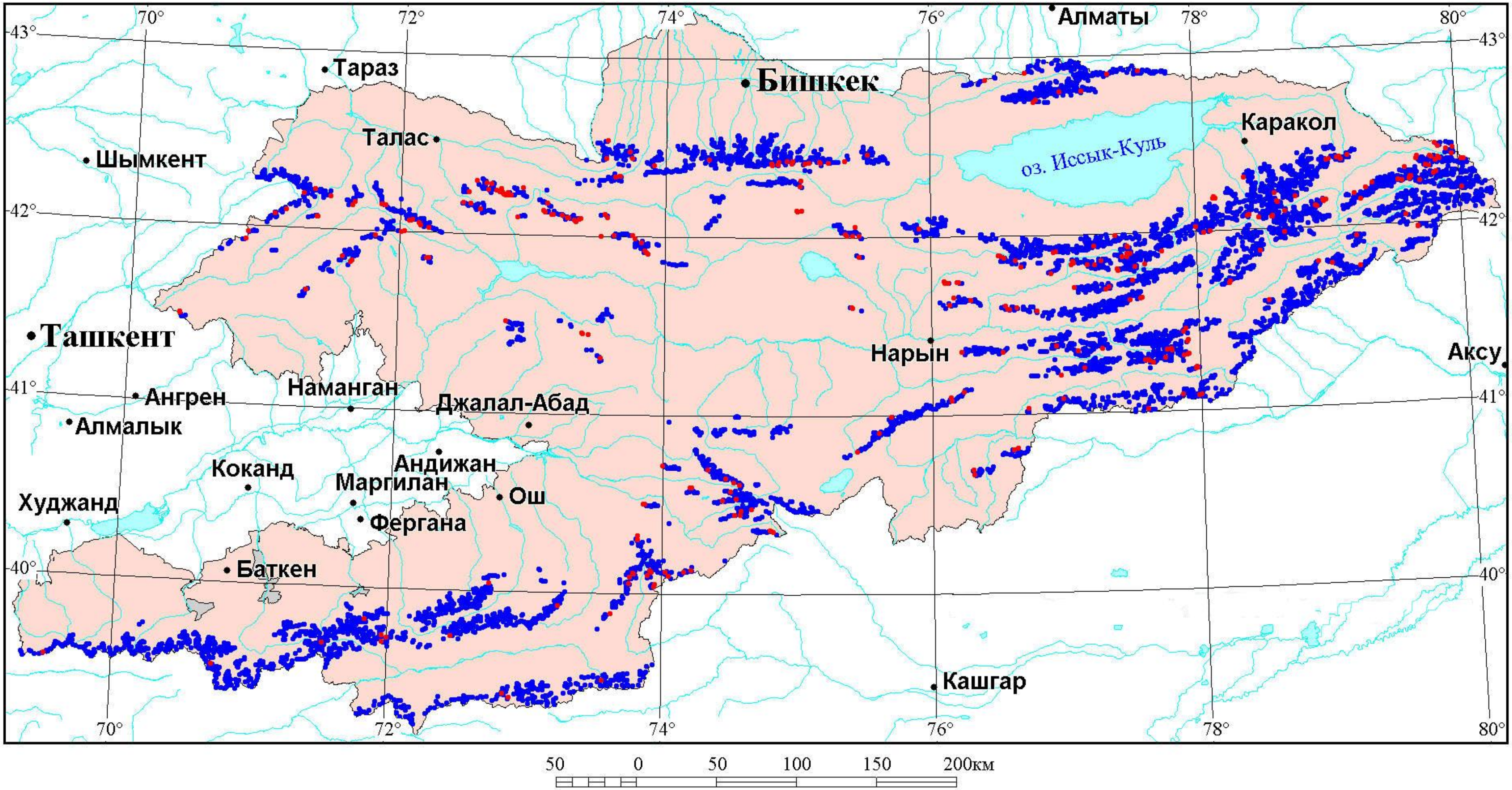


Rough trends of change average annual temperature (1885 - 2005 гг.)



Almost all meteorological stations have recorded rising temperatures since the 1970s. According to the IPCC Fourth Assessment Report AR4 (ref. 29), observed temperature changes in Central Asia (30–50° N, 40–75° E) reveal decadal trend coefficients between +0.1 and +0.2 °C. Warming is particularly pronounced during winter, probably reflecting a weakening of the Siberian anticyclone. Air temperatures in the melting season (June to August) have increased only slightly, but a remarkable temperature increase has been detected for the month of September throughout Central Asia, thus resulting in a prolonged melting season for Tien Shan glaciers.

Glaciation in 2000



Both summer and winter air temperatures are expected to increase further through to the 2050s (+3.1 to +4.4 °C and +2.6 to +3.9 °C, respectively) and beyond. Although these projections reflect the current state of knowledge, changes in precipitation remain highly uncertain, and the level of temperature increase, especially at high altitudes and during summer, suffers from considerable disagreement between existing data.

In regions with little summer precipitation, glaciers play an important role in streamflow regimes, as meltwater from the ice is released when other sources such as snowmelt are depleted. This situation is well reflected in the Tien Shan, where glaciers contribute considerably to freshwater supply during summer in the densely populated, arid lowlands in Kyrgyzstan, Kazakhstan, Uzbekistan, Turkmenistan and Xinjiang/China.

Glaciation in 2000

(in brackets changing regarding to 60th years)

Basin	Glaciers	Area, км^2	Volume, км^3	Average thickness, м
I	614 (97,3%)	538,11 (84,6%)	24,224 (83,1%)	45,02
II	715 (94,8%)	582,12 (82,3%)	26,377 (80,4%)	45,31
III	177 (88,5%)	112,91 (72,7%)	4,643 (71,5%)	41,13
IV	2965 (95,2%)	1982,34 (84,1%)	100,973 (83,2%)	50,94
V	3 (100,0%)	2,61 (93,4%)	0,099 (92,6%)	37,75
VI	277 (99,6%)	604,36 (94,0%)	42,158 (93,5%)	69,76
VII	1693 (94,6%)	2991,83 (85,3%)	219,055 (84,8%)	73,22
VIII	1 (100,0%)	0,25 (82,3%)	0,008 (80,4%)	33,69
BK	6445 (95,2%)	6814,53 (85,1%)	417,537 (84,6%)	61,27
IVa	107 (89,9%)	39,41 (77,3%)	1,460 (76,1%)	37,04
IVb	1661 (94,2%)	1098,08 (81,2%)	55,657 (79,7%)	50,69
IVc	269 (91,2%)	74,18 (68,4%)	2,735 (67,1%)	36,87
IVd	928 (99,0%)	770,67 (91,0%)	41,122 (90,1%)	53,36

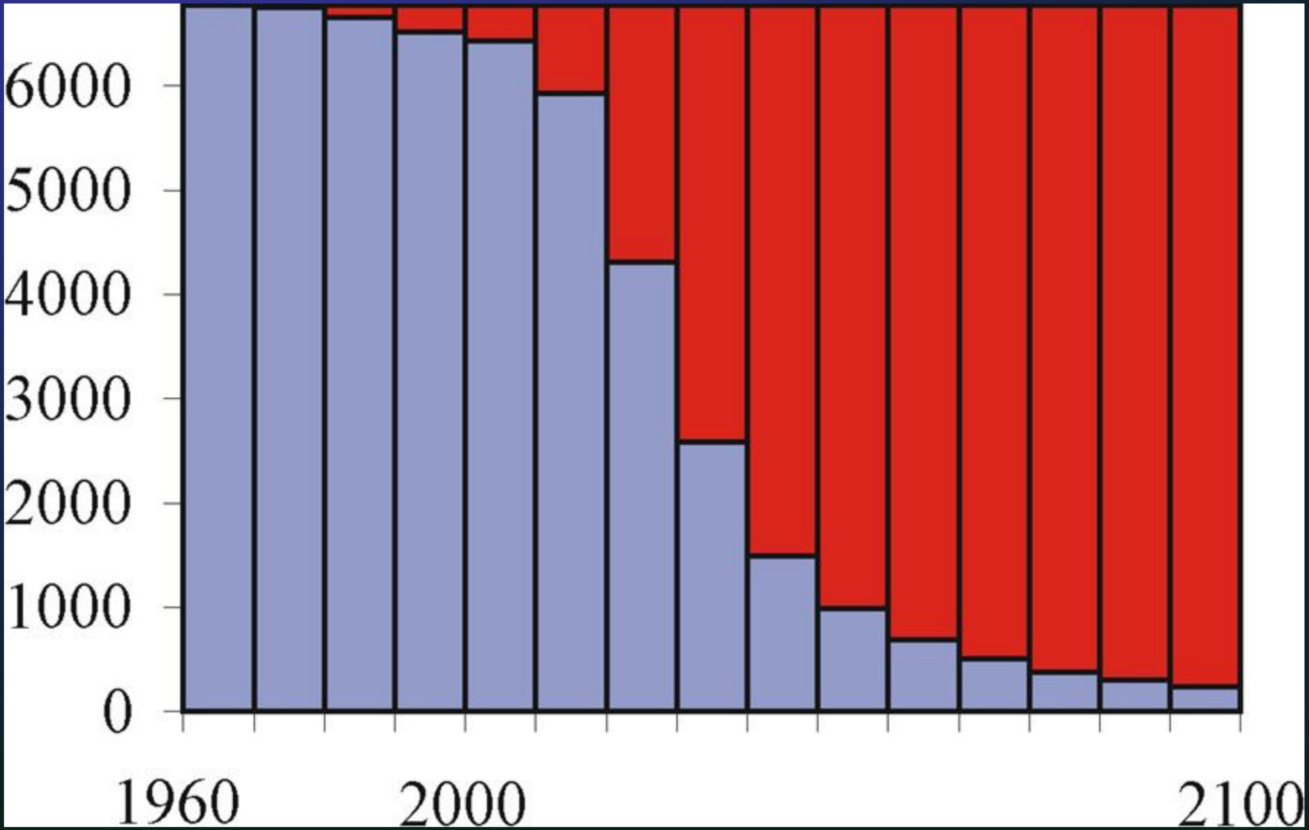
Probability options of climate change

m\dT	2°C	3°C	4°C	5°C	6°C	7°C	8°C	9°C	10°C
Scenario A2-ASF									
1,6	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
1,5	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
1,4	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
1,3	0,0000	0,0000	0,0001	0,0007	0,0009	0,0002	0,0000	0,0000	0,0000
1,2	0,0000	0,0000	0,0011	0,0066	0,0090	0,0028	0,0002	0,0000	0,0000
1,1	0,0000	0,0001	0,0045	**0,0304**	**0,0467**	0,0164	0,0013	0,0000	0,0000
1,0	0,0000	0,0003	0,0091	**0,0701**	**0,1212**	**0,0481**	0,0042	0,0001	0,0000
0,9	0,0000	0,0002	0,0094	**0,0813**	**0,1581**	**0,0706**	0,0070	0,0001	0,0000
0,8	0,0000	0,0001	0,0049	**0,0474**	**0,1038**	**0,0521**	0,0059	0,0001	0,0000
0,7	0,0000	0,0000	0,0013	0,0139	**0,0343**	0,0194	0,0025	0,0001	0,0000
0,6	0,0000	0,0000	0,0002	0,0020	0,0057	0,0036	0,0005	0,0000	0,0000
0,5	0,0000	0,0000	0,0000	0,0001	0,0005	0,0003	0,0001	0,0000	0,0000
0,4	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

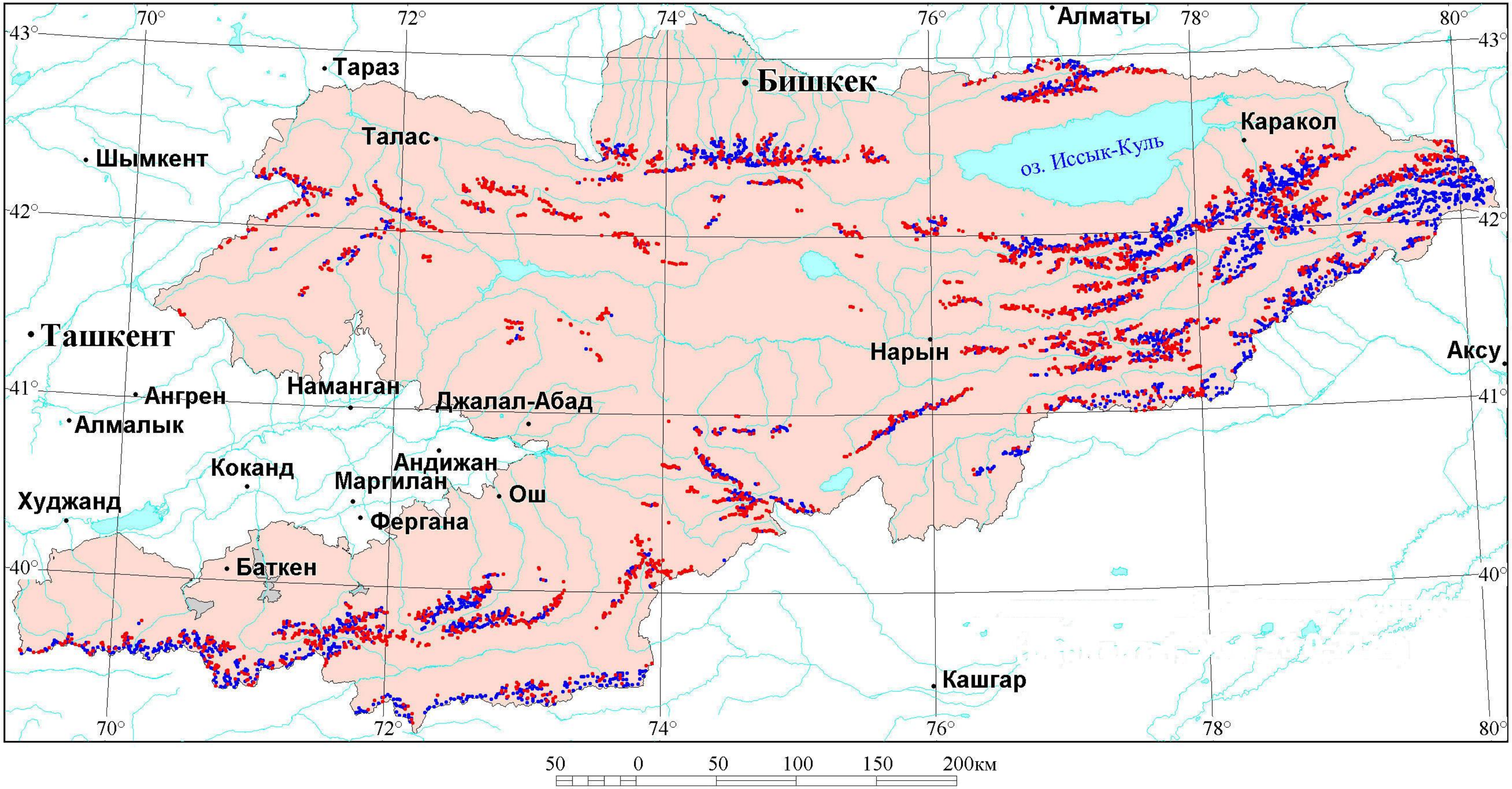
Probability options of climate change

m\dT	2°C	3°C	4°C	5°C	6°C	7°C	8°C	9°C	10°C
Scenario B2-MESSAGE									
1,6	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
1,5	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
1,4	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
1,3	0,0000	0,0001	0,0004	0,0002	0,0000	0,0000	0,0000	0,0000	0,0000
1,2	0,0000	0,0007	0,0092	0,0071	0,0003	0,0000	0,0000	0,0000	0,0000
1,1	0,0000	0,0030	**0,0610**	**0,0682**	0,0043	0,0000	0,0000	0,0000	0,0000
1,0	0,0000	0,0043	**0,1323**	**0,2133**	0,0203	0,0001	0,0000	0,0000	0,0000
0,9	0,0000	0,0020	**0,0946**	**0,2204**	0,0311	0,0002	0,0000	0,0000	0,0000
0,8	0,0000	0,0003	0,0222	**0,0753**	0,0156	0,0001	0,0000	0,0000	0,0000
0,7	0,0000	0,0000	0,0017	0,0084	0,0026	0,0000	0,0000	0,0000	0,0000
0,6	0,0000	0,0000	0,0000	0,0003	0,0001	0,0000	0,0000	0,0000	0,0000
0,5	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
0,4	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

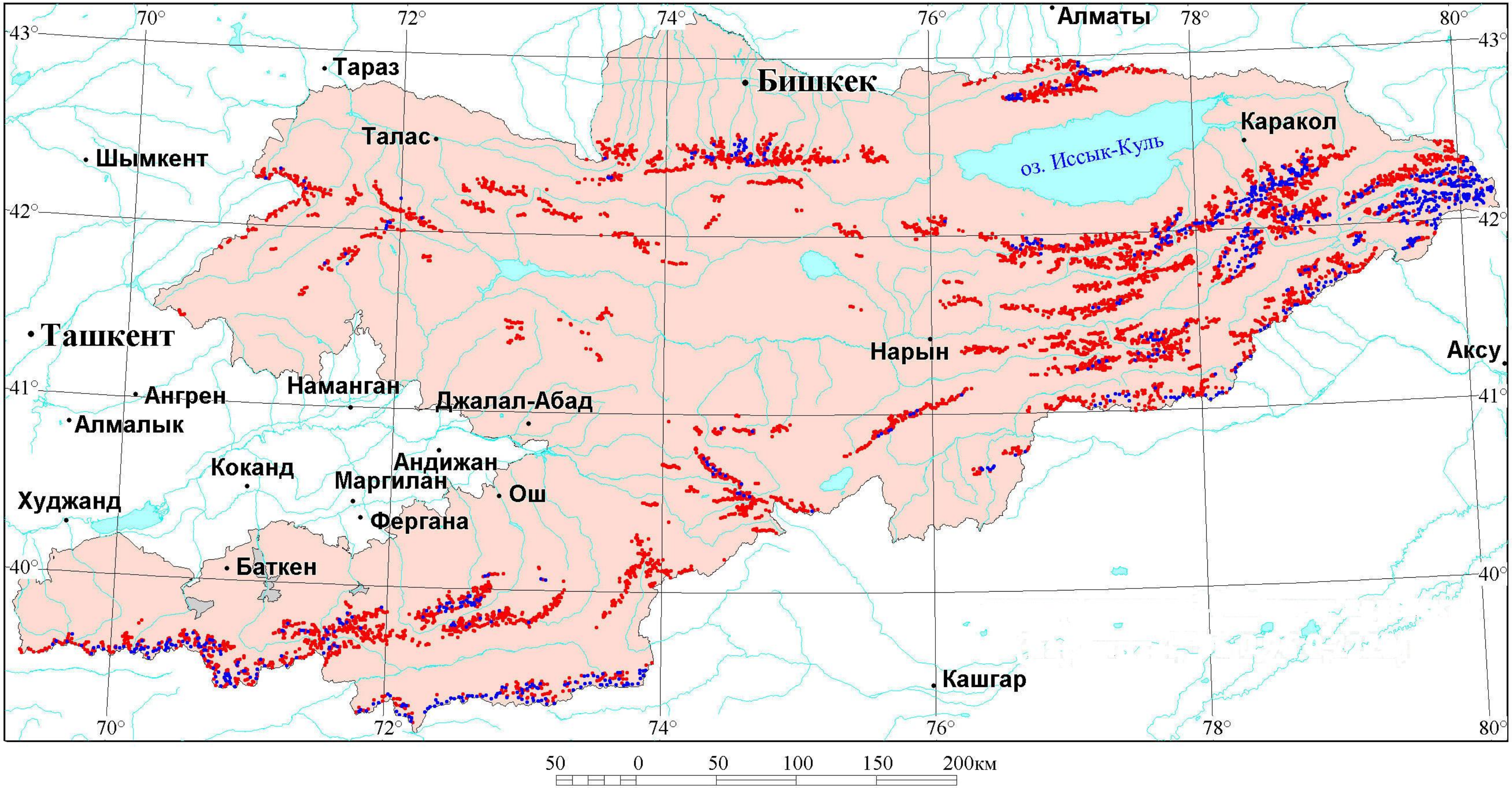
Correlation of existing and disappearing glaciers



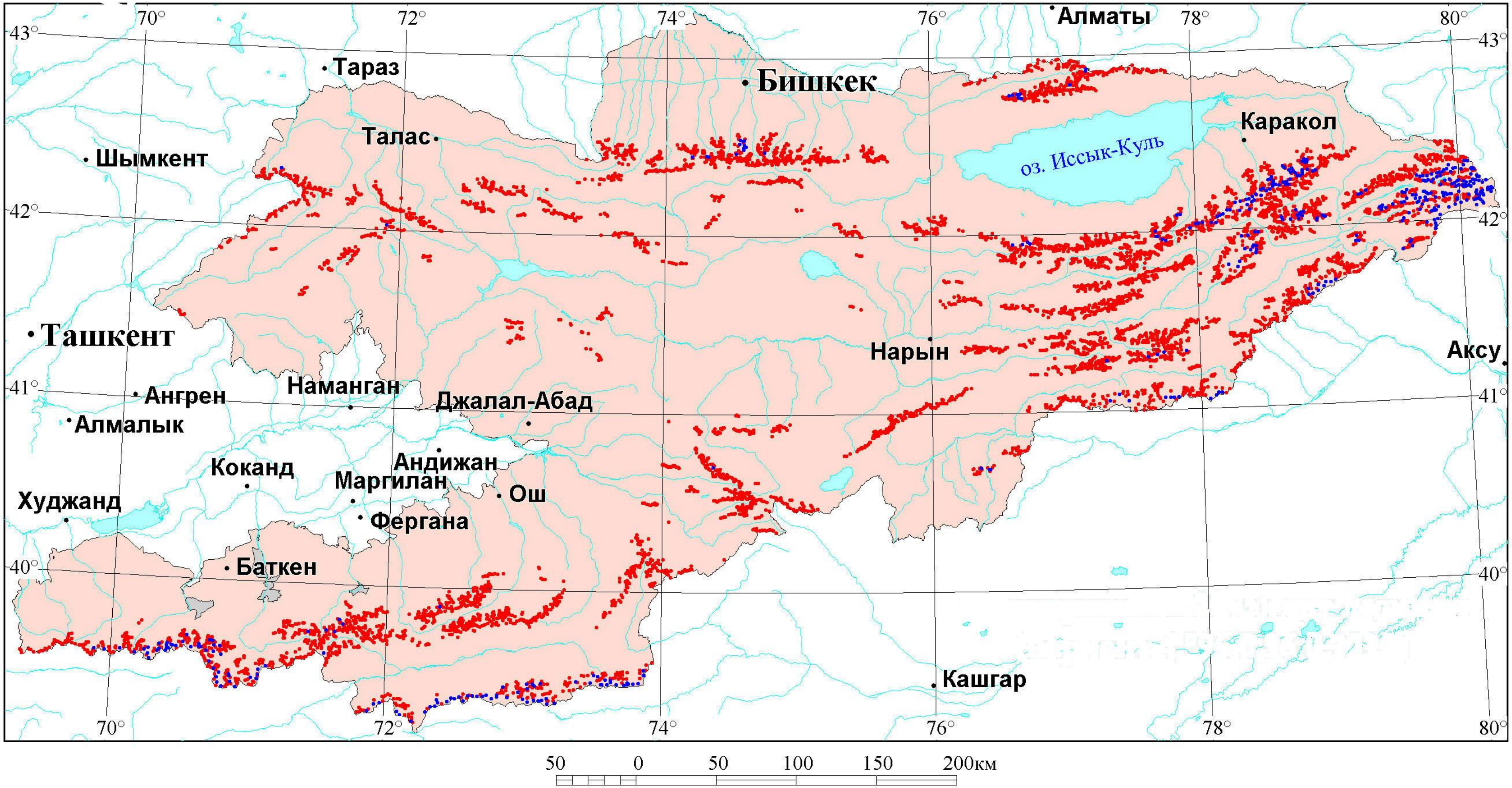
Forecast of glaciation in 2025



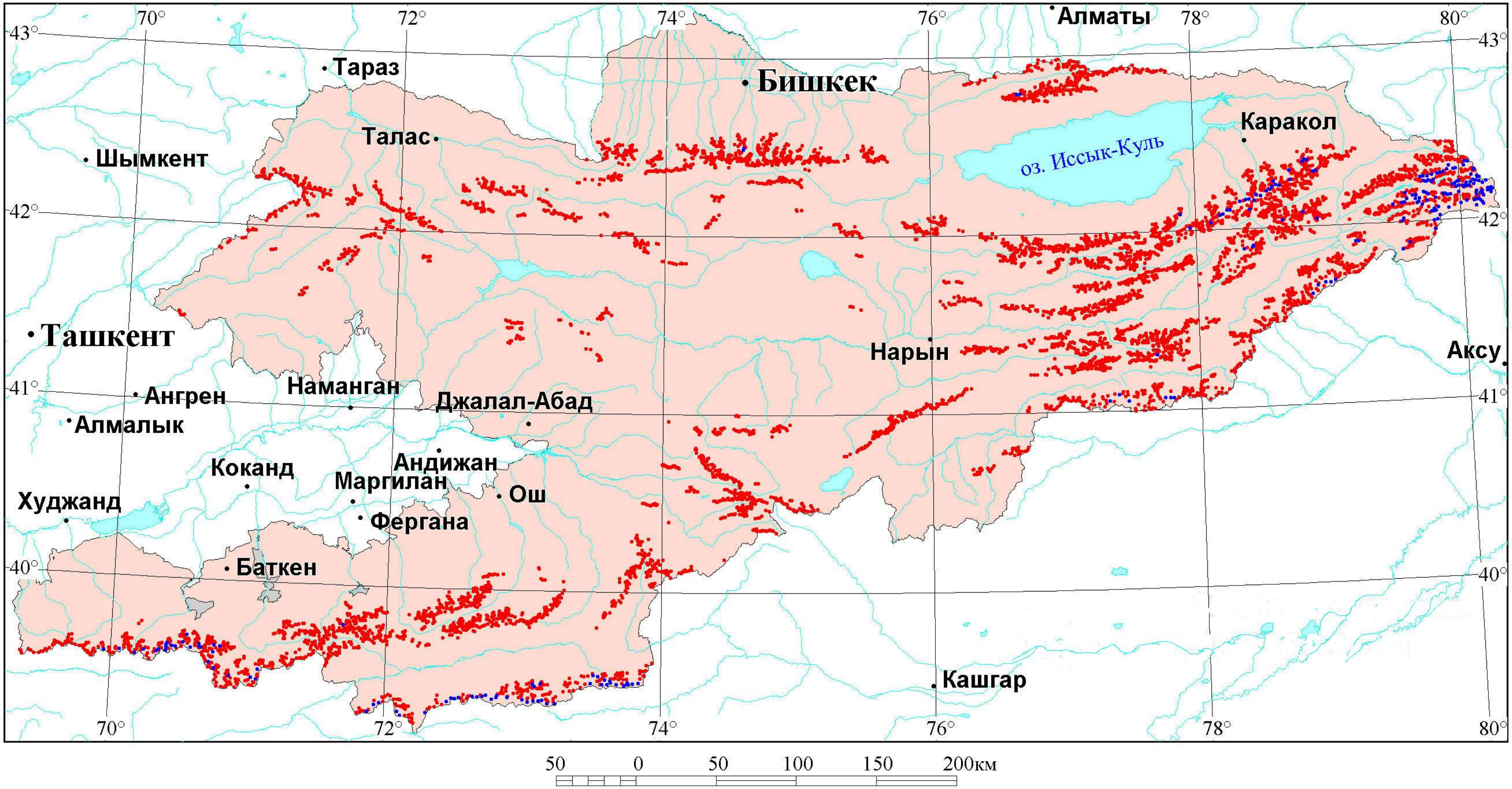
Forecast of glaciation in 2050



Forecast of glaciation in 2075



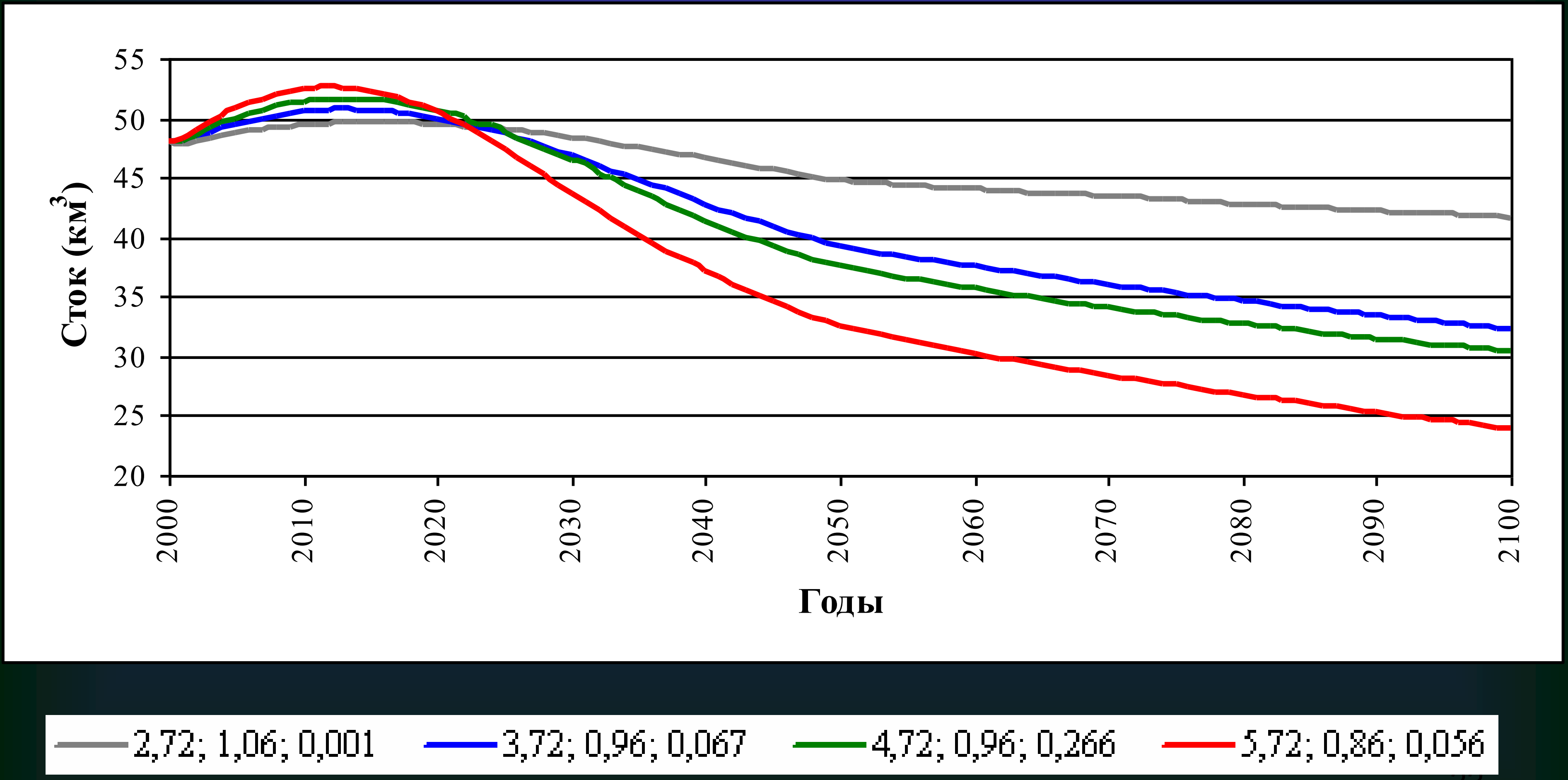
Forecast of glaciation in 2100



Assessment expected runoff on different scenarios of climate change, км^3

dT (°C)	2,72		3,72		4,72		5,72	
m	2050	2100	2050	2100	2050	2100	2050	2100
1.16					43,776	42,421		
1,06	43,679	41,311	41,671	38,436	39,860	36,170		
0,96			37,739	32,187	36,149	30,453	34,753	29,036
0,86					32,650	25,221	31,449	24,099
0,76					29,357	20,434		

Results of forecasted runoff



In long-term prospect essential decrease of runoff for all most probable climatic scripts is expected. Thus the increase runoff till to 2020-2025 is expected due to increase deglaciation, and to 2100 reduction up to 43,6- 88,4% from volume of runoff in 2000. The consequences of so significant reduction of runoff undoubtedly should affect conditions of residing and economic activities in the Kyrgyzstan, and also in the neighbouring downstream countries.

Thank you for your attention

and

we invite you to cooperation

Ismaild@mail.ru