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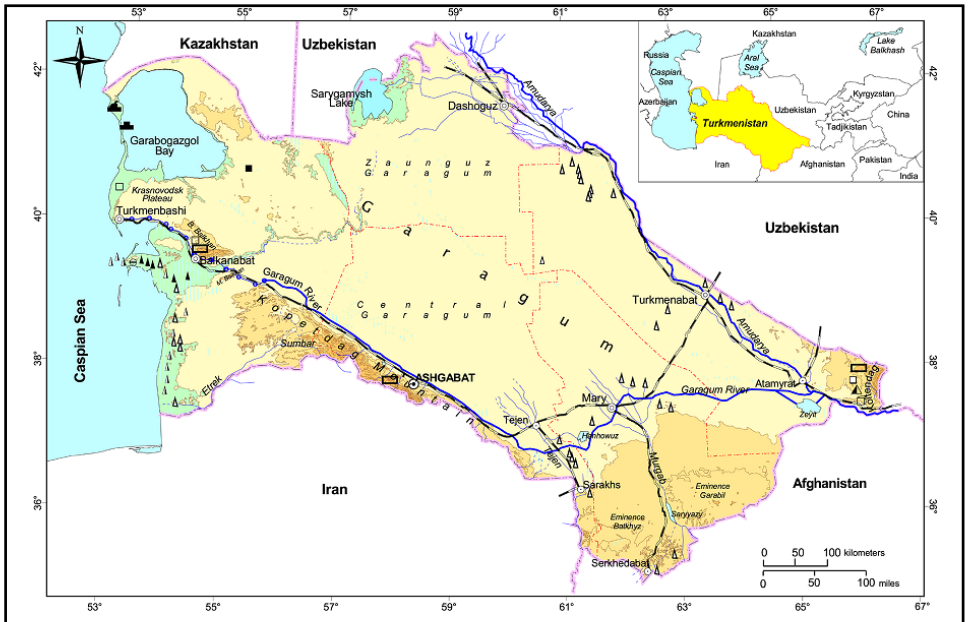
Adaptation costs of "Water facility" sector under adverse climate change impacts in Turkmenistan

Irina Atamuradova
Atamuradova@yandex.ru



- Area – 491.21 thousand.km^2 (49.12 mln.hectares)
- Sandy desert – more 80%, mountains – about 20%

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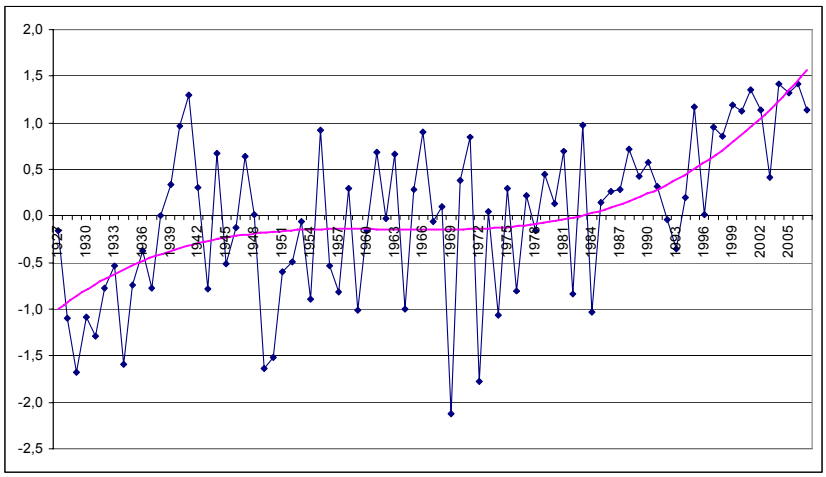
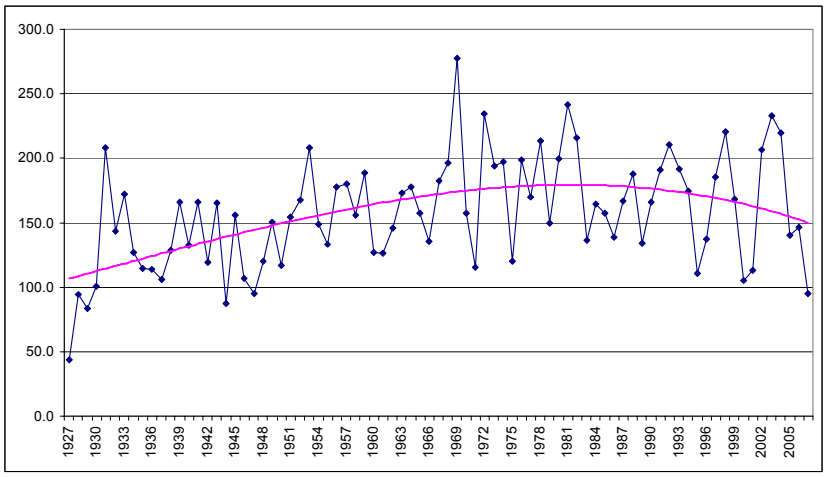
Current climate change

Long-term trend of air temperature changes
compared with long-term average normal temperatures



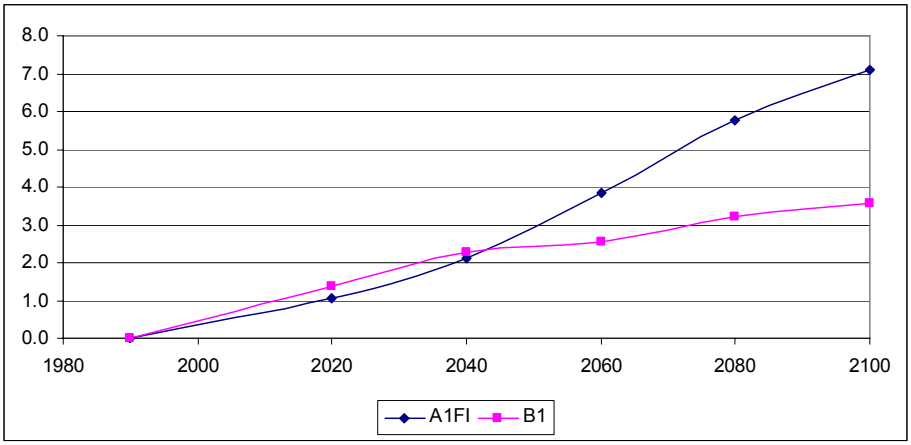
Current climate change

Long-term trend of annual precipitation amounts, mm



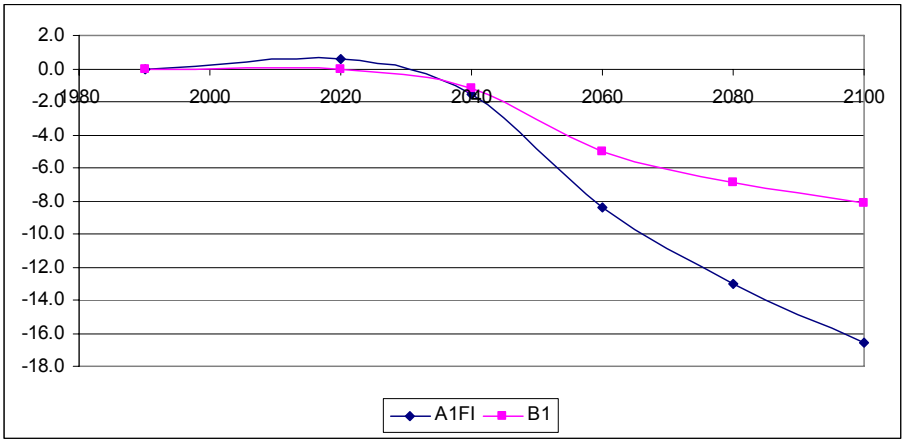
Projected climate change

Projected changes in average annual temperature under A1FI и B1 scenarios



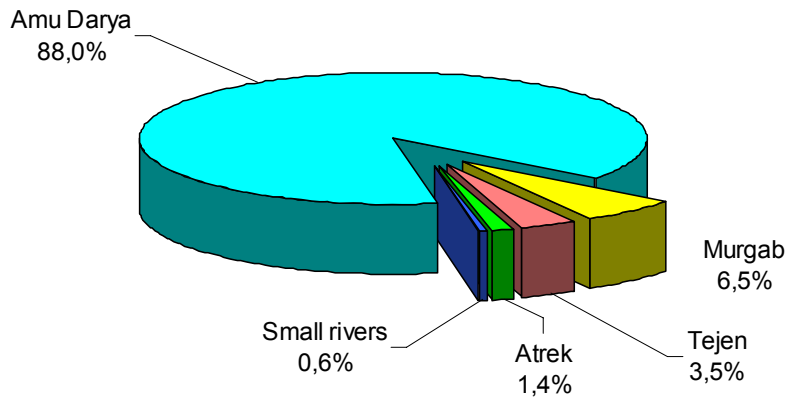
Projected climate change

Projected changes in average annual precipitation amounts under A1FI и B1 scenarios, mm



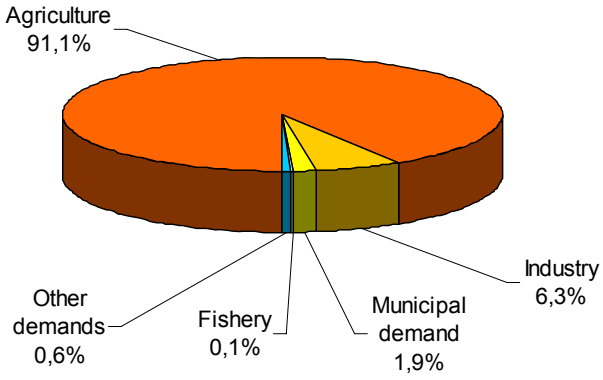
Available surface water resources

Main rivers in Turkmenistan



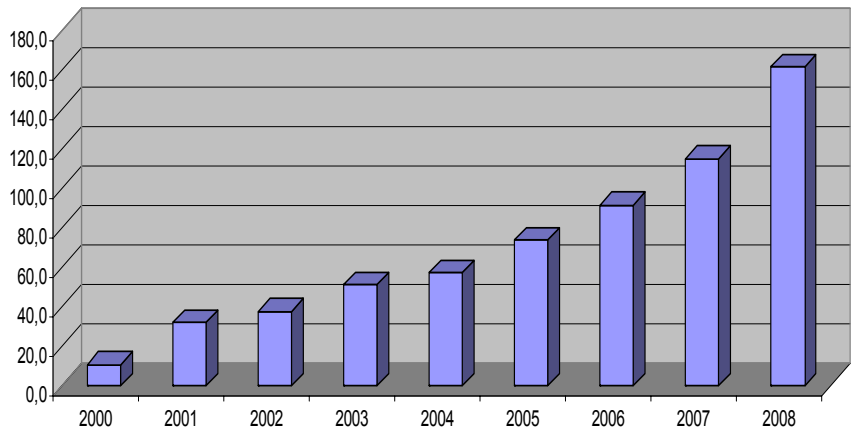
Available surface water resources

Water demand by economy sectors in Turkmenistan



Current cost of water savings in "Water facility" sector

Total cost of water savings measures for 2000-2008 period



Methodological approach to adaptation cost assessment in "Water facility" sector

- Measures aimed at economizing water resources are identified for irrigated agriculture in Water facility development program.
- Cost of water savings is estimeted for 2000-2008 period.
- Water supply deficit due to climate change is estimated untill 2030.
- Main critaria of developing the baseline and adaptation scenarios is decrease in the water supply deficit.
- Measures in both scenarios are similar, however scales and rates of their fulfillment are different.
- Baseline scenario keeps on the tendencies for 2000-2008 period , water supply deficit is supposed to be decreased by 50%.
- Fulfillment of water savings measures under the adaptation scenario will be speeded up, the water supply deficit is almost eliminated by 2030.
- Costs of the baseline and adaptation scenario are assessed.
- Additional cost required to fulfill the adaptation scenarion is assessed.

Baseline scenario of "Water facility" sector development

Main indicators of the Baseline scenario

Measures	Total cost, mln.USD	Amount of water savings, bln.m^3
Improving water management	4,1	2-3
Optimizing agricultural production arrangement	18,5	1,0-1,5
Providing increase in efficiency of irrigating systems, including	6505	
recovering irrigated lands, 143 thsd.ha	1075	0,2-0,3
improving reclamation lands, 214 thsd.ha	4155	0,2-0,3
reconstructing available hydraulic engineering constructions and constructing new ones for reduce in water losses and rational water use	850	0,1-0,2
Introducing new progressive ways of irrigating, including	1775	
improving current traditional ways of irrigating, 385 thsd.ha	6,6	0,3-0,4
drop irrigating, 38 thsd.ha	844	0,1-0,3
overhead irrigating, 69 thsd.ha	924	0,1-0,2
Involving additional water resources	796	
low-mineralized collector-drainage water (up to 650 mln.m^3)	374	0,65
underground water (up to 470 mln.m^3)	243	0,47
waste water (up to 410 mln.m^3)	179	0,41
Constructing water reservoirs and increasing in volumes of available water reservoirs	793	0,5
TOTAL	**10482**	**4,2-5,5**

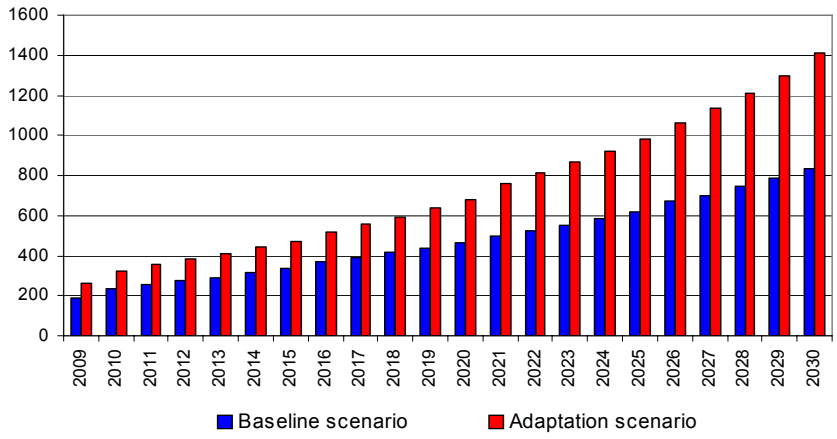
Adaptation scenario of "Water facility" sector development

Main indicators of the Baseline scenario

Measures	Total cost, mln.USD	Amount of water savings, bln.m^3
Improving water management	4,1	0,2-0,3
Optimizing agricultural production arrangement	18,5	1,0-1,5
Providing increase in efficiency of irrigating systems, including	8231	
recovering irrigated lands, 357 thsd.ha	2876	0,4-0,5
improving reclamation lands, 535 thsd.ha	4445	0,4-0,5
reconstructing available hydraulic engineering constructions and constructing new ones for reduce in water losses and rational water use	910	0,2-0,3
Introducing new progressive ways of irrigating, including	4437	
improving current traditional ways of irrigating, 385 thsd.ha	16,4	0,7-0,8
drop irrigating, 96 thsd.ha	2110	0,4-0,5
overhead irrigating, 69 thsd.ha	2310	0,4-0,5
Involving additional water resources	1398	
low-mineralized collector-drainage water (up to 1000 mln.m^3)	577	1,0
underground water (up to 870 mln.m^3)	485	0,9
waste water (up to 670 mln.m^3)	336	0,7
Constructing water reservoirs and increasing in volumes of available water reservoirs	1335	1,0
TOTAL	15424	7,3-8,5

Projected adaptation costs in "Water facility" sector

Adaptation costs by the Baseline and Adaptation scenarios



Lesson learned and difficulties encountered

- As the sectoral development program often updates, there is uncertainty about the baseline scenario. That why the baseline scenario is based on growth rates of the 2000-2008 hystorical period.
- Specific parameters (cost per water unit, cost per reclamation land unit etc.,) have been applied to calculation of investment and financial flows. A part of them is supposed to be updated because introduction of new technologies will have effect on updating operating costs.
- Cost calculations of adaptation measures performed without developing specific projects aimed at realization of each measure.
- There are uncertainties about climate change scenarios. It had effect on assessing projected water supply deficit.
- The government is assumed to be the main investment organization. Other ways of financing adaptation measures should be eloborated futher.

Thank you!

Irina Atamuradova
Atamuradova@yandex.ru