



Influence of climate change on water resources in Belarus

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Introduction

The total number of rivers in Belarus is about 20.8 thousand.

The last fundamental researches on water resources in Belarus were published in 1996, Pluzhnikov et al. (1996). The research period ended in the second half of the 1980's, and that work did not include the modern period of climate change.

Over the years, the water resources in Belarus were subjected to transformation due to the effects of natural and anthropogenic factors.



The aim of the research

The aim of our research was a modern quantitative assessment of surface water resources in the Republic of Belarus.

The initial data from more than 100 hydrological stations are uniformly located on the territory of Belarus.

We selected a single 50-years period since 1962 to 2011. The time series were tested for homogeneity, and the missing values were recovered by standard methods to assess their validity.

Table 1. Runoff of the main river basins in 1962-2011 years (numerator), and its changes to 1996 year (denominator)

River basin	River runoff, km ³ /year									
	Local					General				
	Probability, %					Probability, %				
	5	25	50	75	95	5	25	50	75	95
West Dvina	<u>10.6</u>	<u>7.8</u>	<u>6.9</u>	<u>5.5</u>	<u>4.4</u>	<u>22.3</u>	<u>16.4</u>	<u>14.1</u>	<u>11.6</u>	<u>9.0</u>
	0.1	0.1	0.1	0.0	0.1	0.4	0.2	0.2	0.3	0.4
Neman	<u>8.0</u>	<u>6.7</u>	<u>6.2</u>	<u>5.4</u>	<u>4.9</u>	<u>8.1</u>	<u>6.8</u>	<u>6.3</u>	<u>5.5</u>	<u>5.0</u>
	-0.5	-0.4	-0.4	-0.5	-0.3	-0.5	-0.4	-0.4	-0.5	-0.3
Vilia	<u>2.9</u>	<u>2.4</u>	<u>2.1</u>	<u>1.8</u>	<u>1.4</u>	<u>2.9</u>	<u>2.4</u>	<u>2.1</u>	<u>1.8</u>	<u>1.4</u>
	-0.3	-0.3	-0.2	-0.2	-0.4	-0.3	-0.3	-0.2	-0.2	-0.4
Bug	<u>2.8</u>	<u>1.6</u>	<u>1.3</u>	<u>0.9</u>	<u>0.7</u>	<u>2.8</u>	<u>1.6</u>	<u>1.3</u>	<u>0.9</u>	<u>0.7</u>
	-0.2	-0.2	-0.1	-0.2	-0.1	-0.2	-0.2	-0.1	-0.2	-0.1
Pripyat	<u>11.2</u>	<u>7.6</u>	<u>6.6</u>	<u>5.0</u>	<u>3.5</u>	<u>23.9</u>	<u>16.8</u>	<u>14.4</u>	<u>11.0</u>	<u>8.3</u>
	1.3	1.1	1.0	0.6	0.4	1.7	1.5	1.4	0.9	1.3
Dnieper	<u>16.3</u>	<u>11.8</u>	<u>11.0</u>	<u>9.5</u>	<u>7.8</u>	<u>28.2</u>	<u>20.3</u>	<u>18.7</u>	<u>15.6</u>	<u>13.1</u>
	-0.1	0.1	-0.3	0.1	0.2	0.0	0.1	-0.2	-0.1	0.3
Total area	<u>51.8</u>	<u>37.9</u>	<u>34.1</u>	<u>28.1</u>	<u>22.7</u>	<u>88.2</u>	<u>64.3</u>	<u>56.9</u>	<u>46.4</u>	<u>37.5</u>
	0.3	0.4	0.1	-0.2	-0.1	1.1	0.9	0.7	0.2	1.2

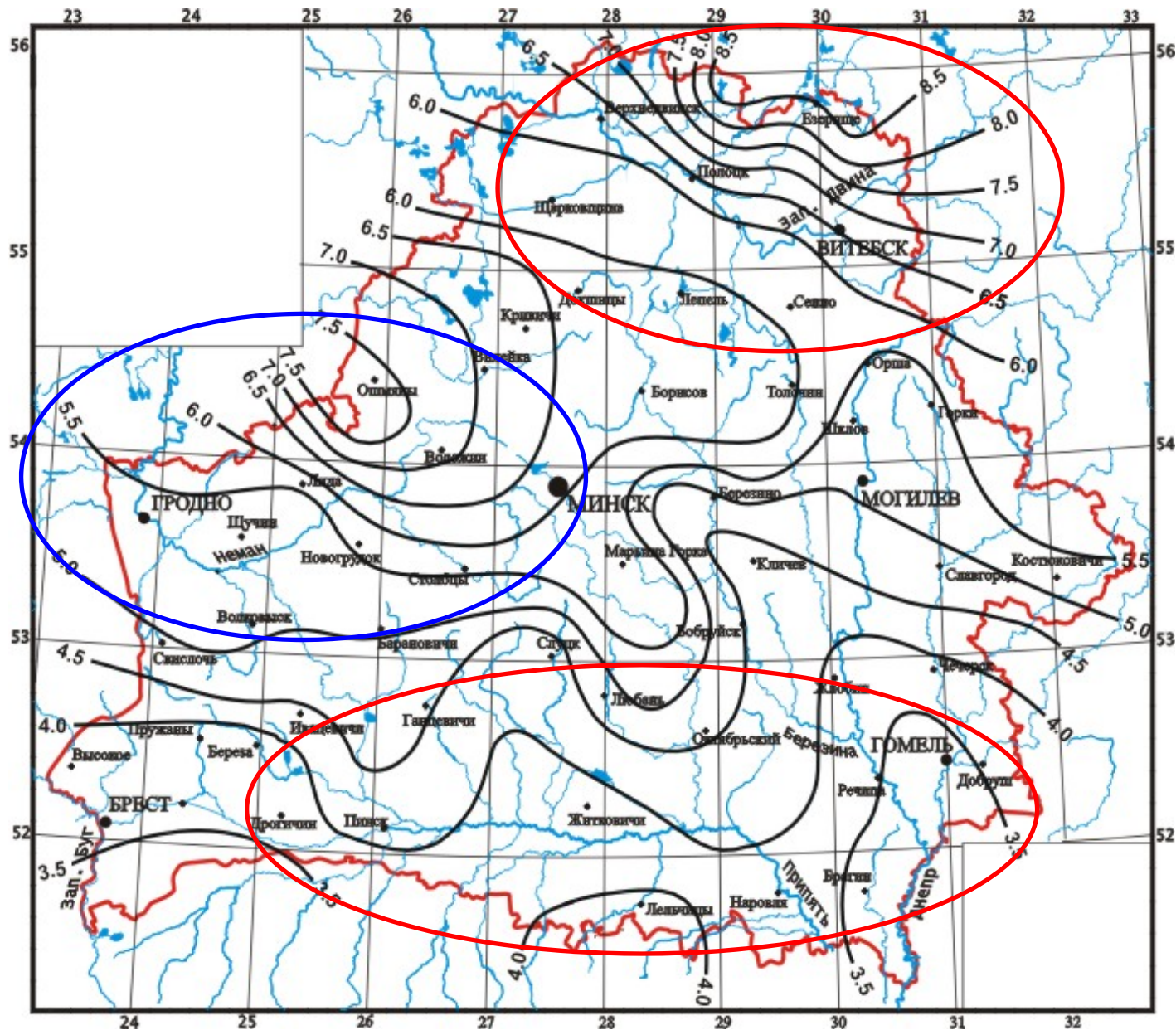
Table 2. Runoff of the administrative regions in 1962-2011 years (numerator), and its changes to 1996 year (denominator)

Administrative region	River runoff, km ³ /year				
	Probability, %				
	5	25	50	75	95
Brest	<u>7.5</u>	<u>4.8</u>	<u>4.2</u>	<u>3.3</u>	<u>2.4</u>
	0.3	0.2	0.2	0.1	0.0
Vitebsk	<u>12.4</u>	<u>9.0</u>	<u>8.1</u>	<u>6.6</u>	<u>5.2</u>
	0.1	0.0	0.1	0.0	0.0
Gomel	<u>9.3</u>	<u>6.6</u>	<u>5.9</u>	<u>4.9</u>	<u>3.7</u>
	0.4	0.3	0.3	0.3	0.2
Grodno	<u>5.6</u>	<u>4.7</u>	<u>4.4</u>	<u>3.8</u>	<u>3.6</u>
	-0.4	-0.3	-0.3	-0.4	-0.2
Minsk	<u>9.9</u>	<u>7.6</u>	<u>6.7</u>	<u>5.4</u>	<u>4.5</u>
	-0.1	0.1	0.0	-0.2	-0.1
Mogilev	<u>7.1</u>	<u>5.2</u>	<u>4.8</u>	<u>4.1</u>	<u>3.3</u>
	0.0	0.1	-0.2	0.0	0.0
Total area	<u>51.8</u>	<u>37.9</u>	<u>34.1</u>	<u>28.1</u>	<u>22.7</u>
	0.3	0.4	0.1	-0.2	-0.1

Table 3. Natural water resources in Belarus taking into account asynchrony of the river runoff

River basin	River runoff, km ³ /year							
	Local				General			
	Probability, %				Probability, %			
	5	25	75	95	5	25	75	95
West Dvina	10.2	7.6	5.7	4.8	21.4	16.1	11.9	9.8
Neman	7.6	6.6	5.6	5.2	7.7	6.7	5.7	5.3
Vilia	2.7	2.4	1.9	1.6	2.7	2.4	1.9	1.6
Bug	2.7	1.6	0.9	0.8	2.7	1.6	0.9	0.8
Pripyat	10.5	7.4	5.2	3.8	22.5	16.5	11.4	9.0
Dnieper	15.5	11.6	9.9	8.4	26.8	19.9	16.2	14.1
including:								
Berezina	6.0	4.9	4.1	3.6	6.0	4.9	4.1	3.6
Sozh	4.7	3.3	2.5	1.9	10.1	7.4	5.6	4.8
Total area	47.7	37.1	29.8	25.2	81.1	63.0	49.2	41.6

The new map of the annual runoff of Belarus





Conclusion

1. A quantitative assessment of water resources in Belarus was made.
2. The total natural water resources have not changed.
3. The redistribution runoff of the main river basins and administrative regions was investigated.
4. The new map of the annual runoff of Belarus was made.



Thanks for your attention!