



## Climatic risks and food security in the Khatlon Region of Tajikistan

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**Abstract.** This investigation was conducted by support of joint Tajik-China project on “Investigation and study of water resources and utilization in Tajikistan”. Main goal of this Project is hydrological observation, water resources and utilization in Tajikistan. Khatlon Region is an administrative region within the Republic of Tajikistan. One of the three regions of the country, bordered in the north by areas of republican subordination, in the east - with the Gorno-Badakhshon Autonomous Region, in the south - with Afghanistan, in the west - with Uzbekistan. The administrative center is the city of Bokhtar. Khatlon area is 24,600 km<sup>2</sup>, a population of 3,048,200 people (2016 year). The region is located on the southern spurs of Gissaro-Alai, administratively divided into 4 cities and 21 districts. Investigation of climate risks, water resources and food security in the Khatlon Region is very important question. Therefore, authors in this investigation tried to identify climate risks and factors of food security in the Khatlon Region. Investigation shows that for the period 2014-2018, in relation to 2009-2013, the temperature increased in the Khatlon Region to 0.6 °C. the highest temperature increases were observed in the areas of Muminabad, Norak and Dangara. In the mountainous regions of the Khatlon Region, the trend is increasing. For five years (2014-2018 versus 2009-2013), the warming trend in Khatlon Region was 0.7 °C in winter and 1.1 °C in summer.

**Key words:** *Khatlon Region, climate change, climatic risks, water resources, food security, hydrology, social-economic issues*

**Cite this article:** Kodirov A.S., Alizoda U.A., Dorgaev A.A. Climatic risks and food security in the Khatlon Region of Tajikistan. In: Chernomorets S.S., Viskhadzhiyeva K.S. (eds.) Debris Flows: Disasters, Risk, Forecast, Protection. Proceedings of the 6<sup>th</sup> International Conference (Dushanbe–Khorog, Tajikistan). Volume 1. Dushanbe: “Promotion” LLC, 2020, p. 246–250.

## Климатические риски и продовольственная безопасность в Хатлонской области Таджикистана

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**Аннотация.** Данное исследование было проведено при поддержке совместного таджикско-китайского проекта «Исследование и изучение водных ресурсов и их использования в Таджикистане». Его основной целью является гидрологический мониторинг, изучение водных ресурсов и их использование в Таджикистане. Хатлонская область является единицей административно-территориального деления Республики Таджикистан. Это одна из трех областей страны. Она граничит на севере с областями республиканского подчинения, на востоке – с Горно-Бадахшанской автономной областью, на юге – с Афганистаном, а на западе – с Узбекистаном. Административный центр – город Бохтар. Площадь Хатлонской области составляет 24 600 км<sup>2</sup>, население – 3 048 200 человек (на 2016 г.). Область

расположена на южных отрогах Гиссаро-Алая, административно разделена на 4 города и 21 район.

Изучение климатических рисков, водных ресурсов и продовольственной безопасности в Хатлонской области является очень важной задачей. Поэтому авторы данного исследования попытались выявить климатические риски и факторы продовольственной безопасности в Хатлонской области. Исследования показывают, что за период 2014-2018 гг., по сравнению с 2009-2013 гг., температура в Хатлонской области повысилась на 0,6°C. Наибольшее повышение температуры наблюдалось в г. Нурек, а также Муминабадском и Дангаринском районах. В горных районах Хатлонской области тенденция возрастает. В течение пяти лет (2014-2018 гг. по сравнению с 2009-2013 гг.) наблюдалась тенденция потепления в Хатлонской области на 0,7°C зимой и на 1,1°C летом.

**Ключевые слова:** Хатлонская область, изменения климата, климатические риски, водные ресурсы, продовольственная безопасность, гидрология, социально-экономические проблемы

**Ссылка для цитирования:** Кодиров А.С., Ализода У.А., Доргаев А.А. Климатические риски и продовольственная безопасность в Хатлонской области Таджикистана. В сб.: Селевые потоки: катастрофы, риск, прогноз, защита. Труды 6-й Международной конференции (Душанбе–Хорог, Таджикистан). Том 1. – Отв. ред. С.С. Черноморец, К.С. Висхаджиева. – Душанбе: ООО «Промоушн», 2020, с. 246–250.

Food security issues have always been relevant to Tajikistan. Over the past two decades, Tajikistan has experienced a sharp increase in the intensity and frequency of extreme weather events. The expected consequences of melting glaciers can lead to a sharp increase in spring floods and other disasters in the short term, and in the long term to a significant reduction in the quantity and quality of water, which will affect agriculture and public health. These effects can potentially increase poverty and reduce a country's GDP.

According to the statistics compilation [*Статистический...*, 2018] for the period 2013-2017, an average of 2.3606 million people was employed in the economy, of which 1.52 million, or 64.4% of the population, were employed in the agricultural sector on average; Of these, about 75.1% are women and 24.9% are men. About 1 million people are constantly at risk of food insecurity and are subject to repeated climatic shocks (Fig. 1).

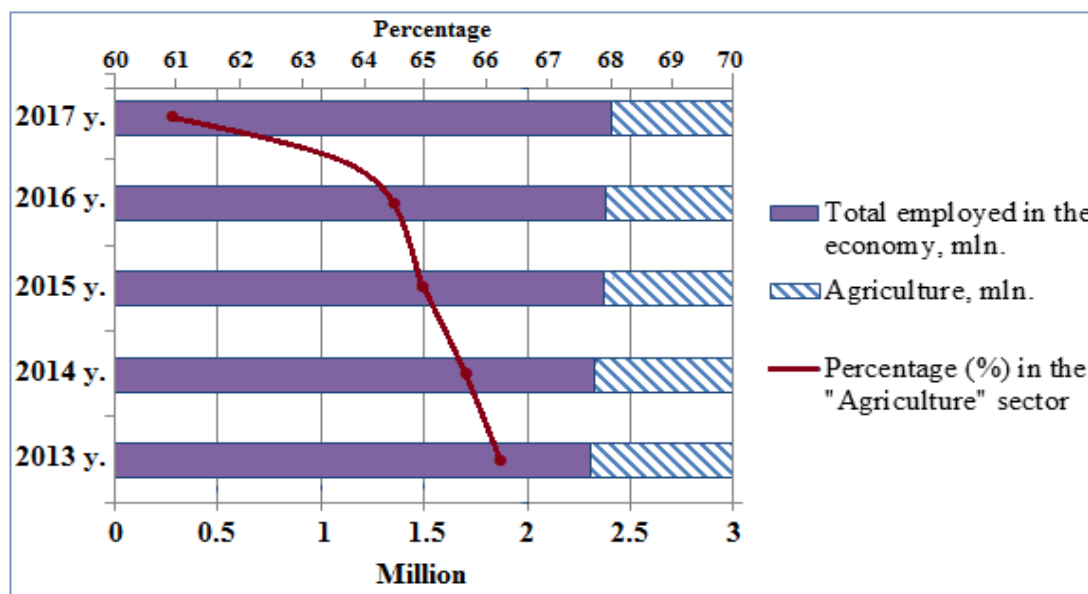


Fig. 1. Statistics of the population employed in the agricultural sector (for the period 2013-2017)

Рис. 1. Статистика населения, работающего в секторе сельского хозяйства (за период 2013-2017 гг.)

There are three main indicators through which it is possible to determine the impact of climate change on people's livelihoods (Fig. 2).

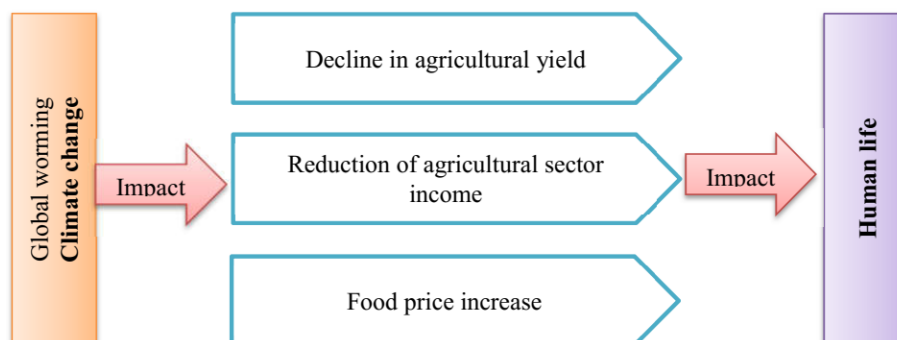


Fig. 2. Main indicators, determining the impact of climate change on people's livelihoods

Рис. 2. Основные индикаторы, определяющие влияние изменения климата на уровень жизни людей

Due to the low socio-economic development, weak mechanisms of the agricultural sector and weak mechanisms of inability to respond quickly to climate change, Khatlon Region is the most vulnerable to regional climate change in the country.

Khatlon Region possesses non-agricultural land such as rocks, talus and other uncomfortable land for use. Soils are almost universally susceptible to erosion processes.

Investigation shows that for the period 2014-2018, in relation to 2009-2013, the temperature increased in the Khatlon Region to 0.6 °C. the highest temperature increases were observed in the areas of Muminabad, Norak and Dangara. In the mountainous regions of the Khatlon Region, the trend is increasing. For five years (2014-2018 versus 2009-2013), the warming trend in Khatlon Region was 0.7 °C in winter and 1.1 °C in summer (Fig. 3).

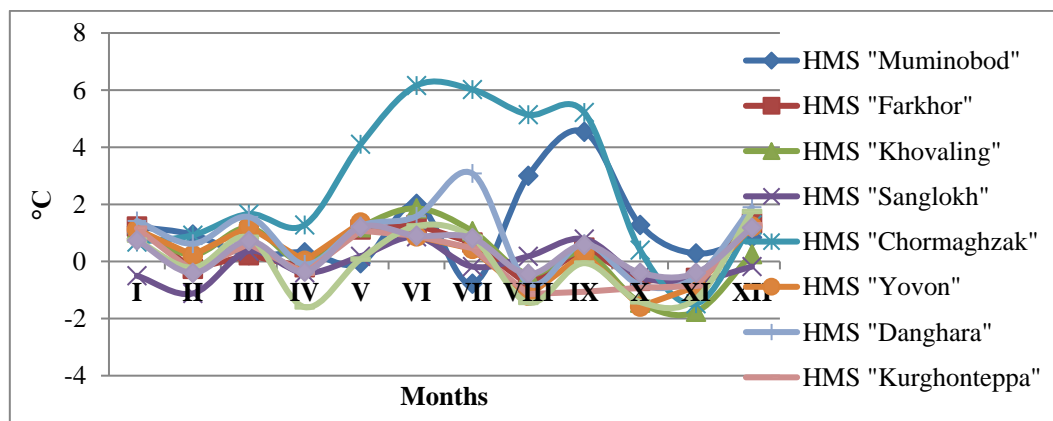


Fig. 3. Changes in air temperature in the Khatlon Region for the period 2014-2018 compared to 2009-2013

Рис. 3. Изменения температуры воздуха в Хатлонской области за период 2014-2018 гг. по сравнению с 2009-2013 гг.

Even today, the agrarian sector of Khatlon Region is facing great difficulties, such as lack of water, low productivity, losses from natural disasters. Unfortunately, this trend in the agricultural sector is increasing. Desertification of land is one of the urgent problems of the Khatlon Region, the reasons for which is a long period of salinization. Also, high air temperatures in the spring and summer led to desertification of the land. The above processes cause an increase in the need for land for irrigation. The traditional (obsolete) irrigation system in the Khatlon Region is one of the greatest challenges to food security.

Natural disasters in Tajikistan over the past 10-15 years have led to the deaths of about 1,200 people, causing damage to over 1 billion somoni [*Третье...*, 2014].

In total, for the month of May 2019, according to the Ministry of Emergency Situations of the republic, the following districts of the Khatlon Region suffered: Panj, Farkhor, Abdurahmoni Jomi, Khuroson and Vakhsh. At the same time, the elements claimed the lives of four people. The damage from mudflow to the Khatlon Region of Tajikistan was estimated at 19 million 540 thousand somoni for May 16-18 only [*Комитет по чрезвычайным...*].

Natural hydrometeorological phenomena caused significant damage to the agricultural sector of the Khatlon Region, and created a threat to the safety of the population.

We analyzed the main types of dangerous weather phenomena (high air temperature, fogs, dust storms, haze, strong winds, heavy rainfall) came to the following conclusions:

- The last twenty years have been characterized by elevated temperatures.
- In 1997, in the Shahritus district of the Khatlon Region, 50 days were observed with a temperature of +40°C.
- in 1997, 2002 and 2002, temperatures in the areas of Jaihun, Panj, Shahritus, Jaloliddini Balkhi, Nosiri Khusrav, Qubodiyon were also noted.
- Fogs, storms and fogs that occurred during 2016-2019 hindered the work of transports, contributed to the corrosion of metals (gates, doors) and land erosion.
- Heavy precipitation caused a sharp rise in water in rivers, floods, mudflow leashes and avalanches.

For example, in the summer (June 2, 2019) as a result of torrential rains caused mudflows to flow from foothill areas - the Khuroson district of the Khatlon Region. As a result of the flood, 18 household plots were flooded, one structure was destroyed and the bridge from the village to the Bokhtar-Dushanbe highway was partially destroyed.

Despite the efforts of the government and international organizations, rescue from natural disasters related to water, food risk, sustainable sources of income in the Khatlon Region remains an urgent problem (Table).

Table. Assessment of food security risks and vulnerability to climate change in Tajikistan [*Climate Risks, 2017*]

Таблиц. Оценка рисков продовольственной безопасности и уязвимости к изменениям климата в Таджикистане [*Climate Risks, 2017*]

№	Regions	Regional profile	Food security risk	Climate vulnerability
1	Regions of Republican Subordination	The temperature increased from +0.5°C to +1°C. The income of the population depends on employment opportunities, including agriculture.	- Zone with medium risk; - High risk area.	- Zone with medium risk; - High risk area.
2	Khatlon Region	The temperature increased from +0.5°C to +1°C. The income of the population depends on employment opportunities, agriculture (including livestock).	- Low risk area; - Zone with medium risk; - High risk area.	- Low risk area; - Zone with medium risk; - High risk area.
3	Soghd region	The temperature increased from 0° C to +0.5° C. The income of the population depends on employment opportunities, agriculture (including livestock).	- Low risk area; - High risk area.	- Low risk area; - Zone with medium risk; - High risk area.
4	Gorno-Badakhshan Autonomous Region	The temperature increased from 0° C to +0.5° C. The income of the population depends on employment opportunities, livestock and crop production.	- Low risk area; - High risk area.	- Zone with medium risk.

According to the UN Framework Convention on Climate Change, the average temperature rises from 1.8° C to 2.9° C by 2050. If the forecast comes true, it will negatively affect the state of water resources, the development of agriculture, transport and infrastructure, as well as the state of public health and the healthcare system in the country.

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