To the question of water resistance of the Talas Valley

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Abstract. The Talas Valley has the necessary water resource potential for the intensive development of agricultural sectors and the provision of domestic needs and the needs of industrial enterprises with water, subject to compliance with environmental requirements. According to the nature of the water balance in the territory under consideration, two hydrological areas are distinguished - the area of formation and the area of dispersion of runoff. The first is the mountainous part of the territory, where the arrival of moisture prevails and where economic activity has not yet had a significant impact on the river flow. Here an important role in the formation of runoff is the connection. The area of dispersion is located in the valley areas where irrigation is intensively developed, in connection with which the natural regime of large rivers drastically changes. It was revealed that the main source of water pollution with suspended substances is flushing of fine-grained particles from the territory of the catchment area with atmospheric precipitation and irrigation water. The proportion of anthropogenic pollution by suspended substances does not exceed 0.05% of natural pollution.

1. Introduction
Rational use of water resources presupposes a comprehensive geographical study and, first of all, a thorough study of the elements of the water balance – precipitation, evaporation, surface and underground water runoff, which depend on the natural conditions of a particular territory [1, 2].

By the nature of the direction of the water balance in the area under consideration, two hydrological regions are distinguished – the region of formation and the region of runoff dispersion. The first includes the mountainous part of the territory, where the arrival of moisture predominates over its discharge and where economic activities have not yet had a significant impact on river runoff. Here, glaciation plays an important role in the formation of runoff [3]. The area of dispersion is located in valley areas where irrigation is intensively developed, in connection with which the natural regime of large rivers is drastically modified [4].

The water balance of the Talas Valley is characterized by an annual amount of precipitation of 5.9 km$^3$, which is spent mainly for evaporation and transpiration by plants (3.1 km$^3$) and, to a large extent, for the formation of local river runoff waters (2.8 km$^3$).

2. Materials and methods
The materials of the State Service for Hydrometeorology of the Ministry of Emergency Situations of the Kyrgyz Republic used as factual and analytical material in the article. The materials received were analyzed using statistical, meteorological and geographical methods.
3. Results and discussion

To assess the river flow of the administrative regions of the Talas Valley, was used the geographic-hydrological method of zonal water-balance mapping [5]. We have carried out a more detailed division of the river flow of the Talas Valley (table 1, figure 1).

The indicator of the natural water supply of the territory is the amount of river runoff (in thousand m$^3$) per one km$^2$ of the area. For the Talas Valley, it is 246 thousand m$^3$ per one km$^2$ of the area in an average year in terms of water content (table 1).

![Figure 1. Water supply in the administrative districts of the Talas Valley.](image)

Table 1. Distribution of river flow resources in the administrative districts of the Talas valley.

| №  | Administrative district | Area km$^2$ | Population thousand people (1.01.18) | River runoff km$^3$ year | % | At 1 km$^2$ | For 1 life thousand m$^3$ |
|----|------------------------|-------------|--------------------------------------|-------------------------|---|-------------|------------------------|
| 1. | Bakai-Atinsky          | 2662.9      | 45.2                                 | 0.7                     | 26.0 | 262         | 15.4                   |
| 2. | Kara-Buurinsky         | 2607.0      | 59.2                                 | 0.6                     | 21.0 | 230         | 10.1                   |
| 3. | Manas                  | 1044.4      | 33.3                                 | 0.3                     | 11.0 | 287         | 9.0                    |
| 4. | Talas                  | 5118.4      | 94.1                                 | 1.2                     | 42.0 | 234         | 12.7                   |
| Total: |                  | 11432.7     | 231.8                                | 2.8                     | 100 | 246         | 12.1                   |
On average, 1 km$^2$ of the Talas valley area accounts for 246 thousand m$^3$ of water per year, and in the republic there is 258 thousand m$^3$ of water per 1 km$^2$. Despite the overall high natural endowment of river runoff resources, it should be emphasized their uneven distribution over the region. The northern slopes of the Talas Ala-Too are better provided than the southern slopes of the Kyrgyz Ala-Too. Specific water supply in the Talas valley as a whole is 12.1 thousand m$^3$/year, which is slightly more than the average republican indicator. There is a large difference in the specific water availability indicator. Thus, in the Bakai-Ata region, 15.4 thousand m$^3$ of water per year is per inhabitant, in the Manas region, only 9 thousand m$^3$/year.

To date, the groundwater resources of the Talas Valley have been studied quite well. The most complete description of hydrological conditions is given in [6, 7].

Talas hydrogeological region of the second order includes intermontane depressions in the river basin. Talas, the actual valley of this river and the Talas-Assinsky fan. The greatest thickness of the stratum of water-containing rocks reaches 300 - 500 m. The most water-abundant is the upper zone of deposits with an average thickness of up to 50 m. The filtration coefficients of the rocks are 10 - 70 m/day, the water permeability reaches 1000 - 1500 m$^3$/day. Natural groundwater resources reach 75 m$^3$/s with groundwater flow modules equal to 0.6 - 8 l/s per km$^2$. The exploitable groundwater resources are 70, of which 40 m$^3$/s recoverable. The largest modules of natural resources are noted within the Talas-Assinsky fan. The total amount of spring runoff in the foothill zone is 9 m$^3$/s. The overwhelming majority of them (about 90%) are fresh waters. Possible productivity of concentrated water intakes reaches 1 m$^3$/s [7]. A total of 238 wells are in operation with a water withdrawal rate of 1.86 m$^3$/s.

In addition to irrigated agriculture, the main factors of water pollution are untreated domestic and industrial wastewater, cattle breeding waste, mining waste in mountainous areas and uncontrolled waste disposal near settlements. The water quality in the Talas river basin depends on the degree of pollution of its tributaries located in its basin and groundwater, as well as on the pollution of glaciers, the main cause of which is human activity. The main pollutants are ammonium and copper. Near the city of Talas, water pollution is higher due to the increased concentration of iron.

The prospects for the development of the Dzheruy deposit raise many questions. The hydrography of the Dzheruy deposit area is represented by rivers originating high in the mountains and being tributaries of various orders to the Uch-Koshoi River, which flows into the Talas River. The JV Chui Ecological Laboratory carried out the study of the physicochemical parameters of surface watercourses in the area of the field and along the Kara - Oi - Talas highway; microbiological parameters were determined by the laboratory of the State Sanitary and Epidemiological Supervision of the Kyrgyz Republic. Sampling was carried out at 19 points of which: in 1998 - 15 points, in 1999 - 4 points, in 2012 - 7 points. Field and laboratory work took place from 23 August to 30 November 1998, June 1999 and July 2012. The generalized results showed that: the surface runoff everywhere cannot be used as a source of drinking water supply without treatment, since the turbidity exceeds the MPC by 5.7-21.2 times, if the index is 16.7-23.3 times, selenium is 2-6 times ... To bring the indicators to conformity with GOST 2874-82 "Drinking water", preliminary settling and disinfection are required [8].

Determination of the volume of natural pollution of water bodies showed that the removal of suspended solids from arable land is 89.0 million tons/year.

From the rest of the catchment area (excluding the residential area) 28.0 million tons/year. The average concentration of suspended matter from natural washout of lands from the drainage basin by atmospheric precipitation and from irrigation of arable land is 63586 g/m$^3$.

The average concentration of suspended matter from the residential area is 32.6 g/m$^3$, which is 0.05% of the volume of suspended matter washed off naturally.

It was revealed that the main source of water pollution by suspended solids is the washout of fine-earth particles from the catchment area by atmospheric precipitation and irrigation water. The share of the anthropogenic part of pollution with suspended solids does not exceed 0.05% of natural pollution.
Over 70% of fresh water in liquid form in India is rendered unusable. Not only India, but also other countries suffer from the same problem [9, 10, 11, and 12]. Therefore, in comparison with India and other countries, there are no heavily polluted rivers in Kyrgyzstan.

4. Conclusions

Thus, it can be noted that the Talas Valley has the necessary water resource potential for the intensive development of agricultural sectors and the provision of water for household needs and the needs of industrial enterprises, subject to compliance with environmental requirements.

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