KARSHI STATE TECHNICAL UNIVERSITY

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

UNIVERSITY OF ARKANSAS

UNIVERSITÄT HOHENHEIM

EKOLOGIYA, ATROF MUHITNI ASRASH VA YASHIL MAKON: MUAMMO, YECHIMLAR VA NATIJALAR MAVZUSIDAGI XALQARO ILMIY-TEXNIK ANJUMAN

TO‘PLAMI

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suv omborlari qurildi (umumiy loyihaviy suv sig`imi 2542,0 $m^3$) va ularning suv zahiralari hozirgi paytda sug`orishda unumli foydalanilmoqda. Hozirgi sharoilarda bevosita Qashqadaryo havzasi doirasida shakllanadigan suv resurslari faqat sug‘orish uchun suvga bo‘lgan ehtiyojning atigi 34% inigina qondira olishi mumkin. Shu sababli suvga bo‘lgan ehtiyojni qondirish maqsadlarida qo‘shni Zarafshon (Eski Anhor kanali orqali) va Amudaryo havzalarining (Qarshi bosh kanali orqali) suv resurslaridan foydalanish imkoniyatlari yaratilgan. Viloyatning suv resurslarining katta qismi sug‘orma dehqonchilikda foydalanilmoqda. Qashqadaryo viloyatida sug‘oriladigan yerlarning maydoni 532,8 ming ga bo‘lib, bu yelarni sug‘orish uchun vegetatasiya davrida jami 4222,3 ming m^3 yoki har 1 ga maydonga 10 m^3 ga yaqin miqdorda suv sarflangan.

Xulosa. Qashqadaryo viloyati qishloq va suv xo`jaligi boshqarmasining ma`lumotlariga ko`ra, havza bo`yicha suv limiti hozirgi sharoitlarda 5,6-5,7 km^3 bo`lib, shundan 5,4-5,5 km miqdordagi suv sug`orishga sarflanadi. Sug`orishga sarflanadigan suvlarning 0,1-0,3 $km^3$ ini qayta foydalaniladigan suvlar tashkil etadi. Sug`orish kanallari muhandislik inshootlari sifati tabiiy landshaftlarning o`zgarishida va antropogen landshaftlarining shakllanishida muhim ahamiyatga ega.

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CLIMATE CONDITIONS AFFECTING THE FLOW OF RIVERS IN THE SURKHANDARYA BASIN

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Abstract: Nowadays, the need for rivers, lakes, glaciers, and groundwater is increasing day by day. They are considered sources of fresh water not only in Central Asia but also on Earth. The quantitative study of river waters is of course a key task in order to expand the sectors of the national economy, eliminate water-related problems that are waiting for solutions, and sustainably develop the economy.

Key words: Central Asia, climate, Surkhandarya, basin, rivers, freshwater, lakes, national economy.

Annotatsiya. Bugungi kunda nafaqat O‘rta Osiyoda, balki yer yuzida chuchuk suv manbai hisoblangan daryolar, ko‘llar, muzliklar hamda yer osti suviga bo‘lgan ehtiyoj kun sayin ortib borishi barobarida, xalq xo‘jaligi tarmoqlarini kengaytirish, suvga bog‘liq bo‘lgan, yechimini kutayotgan muammolarni bartaraf etish, iqtisodiyotni barqaror rivojlantirish uchun albatta daryo suvlarining miqdor jihatdan o‘rganishni asosiy vazifa qilib ko‘rsatmoqda.

Kalit so‘zlar: O‘rta Osiyo, iqlim, Surxondaryo, havza, daryolar, chuchuk suv, ko‘llar, xalq xo‘jaligi.

Аннотация: Сегодня не толко в сентралный Азии, но и в мире, так как потребност в реках, озерах, ледниках и подземных водах, являющихся источниками пресной воды, с каждым днем возрастает, расширание отраслей народного хозайства, водозависимых для решения задач, которые ждут своего решения, для устойчивого развития экономики количественное изучение речных вод, безусловно, является основной задачей.

Ключевые слово: Центральная Азия, климат, Сурхандарья, бассейн, реки, пресная вода, озера, народное хозяйство.

Introduction: Currently, as a result of global climate change, the shortage of water resources on our planet is becoming more and more acute every year. Since the second half of the 20th century, climate change, or rather, climate change, has led to an increase in air temperature worldwide. This situation is leading to a decrease in the effectiveness of atmospheric precipitation. This process also applies to the Central Asian region, including the Surkhandarya basin. Therefore, the issues of statistical assessment of the relationship between water consumption of the rivers of the Surkhandarya basin and meteorological factors are of great importance in the hydrology of mountainous regions. It should be noted that 80-85% of the annual flow of the mountain rivers of Central Asia, including the Surkhandarya basin, falls on the high water period. The high water period in the river begins in April-May and lasts until October. Studying the relationship between the volume of runoff during the flood period and atmospheric precipitation and air temperature is one of the **urgent** issues related to the effective organization of the use of water resources in the Surkhandarya basin.

River flow is formed due to rainfall and melting of snow and glaciers in the mountains. In both cases, part of the water formed is absorbed underground, part evaporates, and only the remaining part participates in the formation of the stream. A stream is formed only when the rate of rainfall or melting of snow and glaciers is greater than the combined rate of absorption and evaporation.

After the above condition is met, the stream formed is called a surface stream or slope stream. In this case, the stream takes the form of very small rivulets. These small rivulets merge to form temporary flowing waters, which in turn merge to form permanent streams. A river flow is formed from the merging of stream water. Groundwater also enters the river flow. Therefore, a river flow consists of the sum of surface and groundwater.

The process of river flow formation was described in a very simple way

above. However, in fact, the formation of a river flow is a very complex natural process. Its formation is influenced by the following natural and geographical factors: geographical location of the basin, climatic conditions, geological structure, relief, soil conditions, vegetation cover, hydrographic conditions (glacier, lake, swamp), etc.

In addition to the above-mentioned set of natural and geographical factors, human economic activity in the river basin also has a significant impact on the formation of the flow.

As is known, climatic factors include atmospheric precipitation, evaporation, air temperature, air humidity, wind and others. To find out which of these factors has a decisive and direct effect on the flow, let us turn to the water balance equation of the river basin. As is known, it is expressed in the following form:

$$X_0 = Y_0 + Z_0 \quad \text{or} \quad Y_0 = X_0 - Z_0,$$

Here: X_0 - average annual precipitation in the basin; Z_0 - average annual evaporation from the basin; Y_0 - the average multi-year flow of a river.

Under the same natural conditions, the more precipitation falls on a river basin, the more runoff is generated. The relationship between them can be expressed analytically as follows:

$$Y_0 = f(X_0)$$

However, this relationship is not always observed. Because the amount of runoff is affected not only by the amount of precipitation, but also by the nature of its distribution throughout the year.

From this point of view, the issue of the influence of climatic factors on the flow of rivers was considered in the studies of E.M. Oldekop, V.L. Schulz, O.P. Sheglova, M.N. Bolshakov and others. In particular, M.N. Bolshakov, taking into account the main climatic factors determining the interannual fluctuations of the flow of the rivers of the Western Tien Shan, divided them into the following three groups:

1) rivers whose interannual changes in the flow are mainly associated with seasonal atmospheric precipitation and changes in their annual sums;

2) rivers whose annual fluctuations in flow are influenced by the combined effect of the sum of annual atmospheric precipitation and heat, i.e. changes in the air temperature regime;

3) rivers whose annual fluctuations in flow are mainly associated with the heat balance, i.e. changes in air temperature, during the cold season of the year in the river basin and the melting of glaciers in the mountains.

These groups were distinguished by M.N. Balshakov based on the analysis of the results of statistical assessments of the relationship between river water consumption and climatic factors.

In the course of our research, we used data on the average monthly and annual water consumption of the rivers mentioned above. In addition to them, data on air temperatures and atmospheric precipitation measured at the Seversev Glacier and Kul meteorological stations also serve as the basis for our statistical calculations carried out within the framework of the topic.

Initially, the average monthly and annual water discharge data of the studied

rivers were analyzed. As a result of the analysis, it was found that there were interruptions in water discharge observations at the Zarchob hydrological post of the Topalangdarya in May-July 2013, in April-December 2015, and in May-December 2019. These interruptions were restored based on the corresponding hydrometeorological connection graphs. An example of these graphs is given for July and August (Figures 1.1, 1.2).

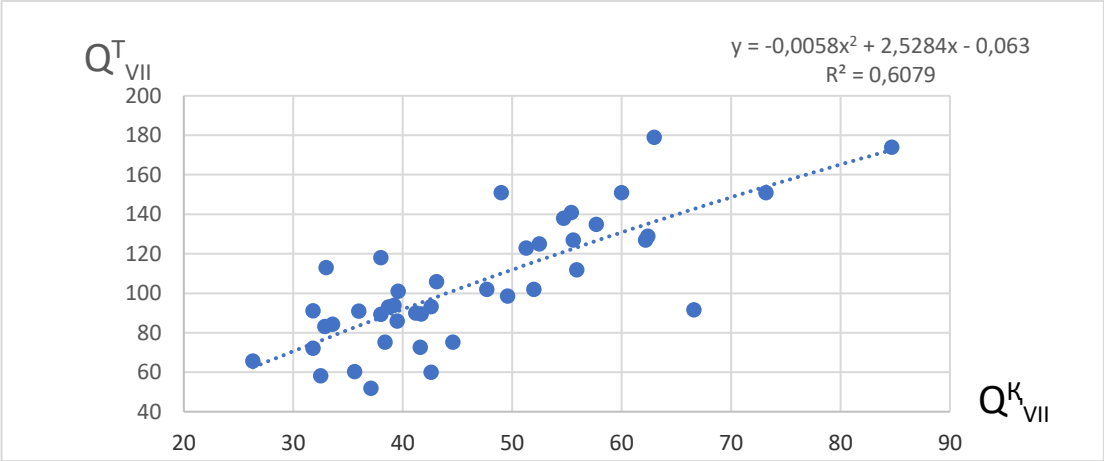

Figure 1.1. Correlation between average water discharge of the Tupalang (Q_VII^T) River in July and August (2018-2022)

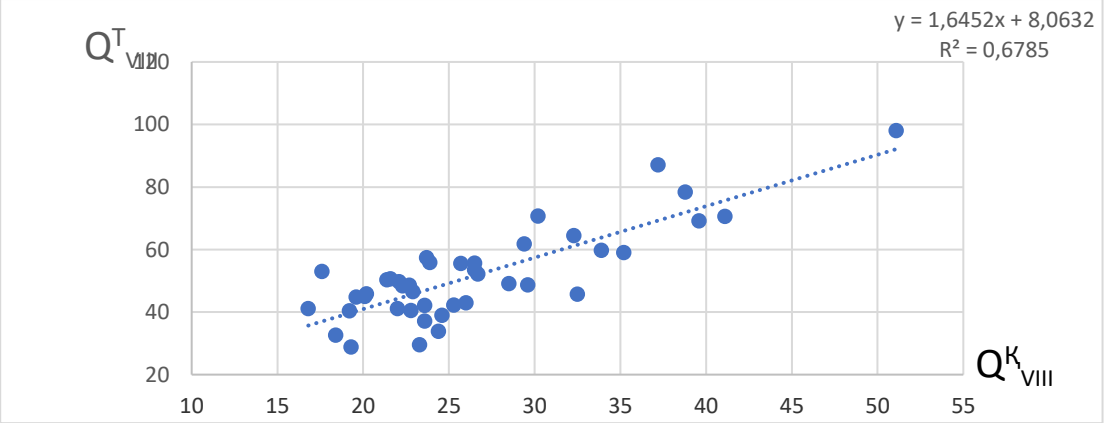

Figure 1.2. Correlation between average water discharges of the Karatogh(Q_VII^Q) River in July and August (2018-2022)

Regression equations were constructed to represent the relationships between the average monthly and annual water discharges of the Topalang and Karatag rivers. Correlation coefficients, which represent the density of these relationships, and their accuracy were statistically evaluated (Table 1.1).

Table 1.1

Statistical indicators of the relationship between the average monthly water consumption of the Tupalang and Karatogh rivers

№	Months	n	Regression equation	Correlation coefficient(τ) and its mistake(σ_τ)
1	March	43	$y = 0{,}080x^2 - 0{,}173x + 19{,}634$	$0{,}853 \pm 0{,}028$
2	April	43	$y = 1{,}828x + 24{,}182$	$0{,}770 \pm 0{,}042$
3	May	43	$y = 0{,}784x + 90{,}345$	$0{,}573 \pm 0{,}080$
4	June	43	$y = 2{,}011x + 35{,}24$	$0{,}754 \pm 0{,}044$
5	July	43	$y = -0{,}006x^2 + 2{,}528x - 0{,}063$	$0{,}780 \pm 0{,}040$
6	August	43	$y = 1{,}645x + 8{,}063$	$0{,}824 \pm 0{,}033$

7	September	43	$y = 0{,}999x + 12{,}375$	$0{,}600 \pm 0{,}065$
8	Annual	43	y = 1,2746x + 24,526	$0{,}550 \pm 0{,}071$

Definition: n – number of observation years.

As can be seen from this table, the values of the correlation coefficients, which express the accuracy of the regression equations, are greater than 0.70 in all months, except for May and September. Taking this into account, the average monthly and annual water consumption of the Tupalang River was restored based on the regression equation presented in Table 1.2 above

Table1.2

Restored average monthly and annual water consumption of the Tupalang river (Zarchob)

Year	Months												
	I		I		I		I		I		I		I
2013	11	1963	11	2013	11	2013	11	2013	11	2013	11	2013	11
2015	11,5	2015	11,5	2015	11,5	2015	11,5	2015	11,5	2015	11,5	2015	11,5
2019	12,7	2019	12,7	2019	12,7	2019	12,7	2019	12,7	2019	12,7	2019	12,7

Definition: (128) - recovered water consumption.*

As noted above, water consumption observations were not conducted in the Topalangdarya in May-July 2013, April-December 2015, and May-December 2019. Therefore, we used the regression equations above to restore the interruptions in these months.

Conclusion: The formation of a river flow is a very complex natural process. In addition to the above-mentioned set of natural and geographical factors, human economic activity in the river basin also has a significant impact on the formation of a flow. These factors also affect the distribution of river flow throughout the year and across regions;

In the course of our research, we used data on the average monthly and annual water consumption of the rivers mentioned above. In addition, data on air temperatures and atmospheric precipitation measured at the “Seversiv muzligi” and “Ko‘l” meteorological stations also served as the basis for our statistical calculations within the framework of the topic;

The correlation coefficients and their errors, which allow assessing the accuracy of the regression equations of the dependence of the flow of the Tupalang and Karatagh rivers on atmospheric precipitation, meet the requirements of the criteria set in hydrological calculations, more precisely, the values of the correlation coefficients varied in the range of 0.588±0.081÷0.724±0.058. The dependence of the average annual water consumption of rivers on annual and seasonal atmospheric precipitation was studied. The correlation coefficients expressing these relationships varied in the range of 0.588±0.081÷0.724±0.058.

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OROL DENGIZI QURIGAN TUBI TABIIY SHAROITINI TADQIQ QILISHGA UYUSHTIRILGAN EKSPEDISIYA

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Annotatsiya: *Mazkur maqolada Orol dengizining qurigan tubida shakllangan yangi landshaft turlarining tabiiy geografik va geoekologik xususiyatlarini o‘rganishga bag‘ishlangan. Ekspeditsiya davomida tuproq va suv namunalari olinib, ularning fizik-kimyoviy tarkibi tahlil qilindi. Tadqiqot natijalari sho‘rlanish darajasi, o‘simliklar suksessiyasi va tuproq unumdorligi bo‘yicha muhim ilmiy ma’lumotlarni tahlil qildik. Ushbu ma’lumotlar hududning ekologik holatini baholash va qishloq xo‘jaligiga yaroqli yerlarni aniqlashda muhim ahamiyatga ega.*

Kalit so‘zlar: *Orol dengizi, qurigan tub, geoekologiya, sho‘rlanish, tuproq tahlili, o‘simlik suksessiyasi, deflyatsiya, cho‘llanish, landshaft, ekspeditsiya.*

Аннотация: *Данная статья посвящена изучению природно-географических и геоэкологических особенностей новых типов ландшафтов, сформировавшихся на высохшем дне Аральского моря. В ходе экспедиции были отобраны образцы почвы и воды, проанализированы их физико-химические свойства. Результаты исследования включают анализ степени засоленности, сукцессии растительности и плодородия почв. Полученные данные имеют важное значение для оценки экологического состояния региона и определения пригодных для сельскохозяйственного использования территорий.*

Ключевые слова: *Аральское море, высохшее дно, геоэкология, засоление, анализ почвы, сукцессия растительности, дефляция, опустынивание, ландшафт, экспедиция.*

Abstract: *This article is devoted to the study of the physical-geographical and geoecological characteristics of new types of landscapes formed on the dried bottom of the Aral Sea. During the expedition, soil and water samples were collected and their physicochemical properties were analyzed. The research*