

Issues of ecological impact of irrigation works and development of new lands in the steppe region

Mahmud Orziyev^{1*} and Murtoz Usmanov²

¹Bukhara State University, Bukhara, Uzbekistan

²Kharshi State University, Kharshi, Uzbekistan

Abstract: In this article, during the rule of the Russian Empire, the digging of new ditches, the development of new lands, especially desert areas, farming on newly acquired lands, the ecological impact of excavated canals and acquired lands, the issues of erosion of the banks of the "Emperor Nicholas I" canal are analyzed based on the materials of the "Turkestan Collection" done. Keywords: Ecology, newly developed land, irrigation, canal, desert-steppe, dam, errogation, hashar, water capacity, crop types, cotton cultivation, hydrology, soil migration, climate, plant acclimatization

1 Introduction

After the Russian Empire invaded the Turkestan territory and established the Turkestan governorate general (1867-1917 yy.), the Russian-speaking population in the territory began to move the population from the European part of the Empire as a means of increasing, eliminating the problem of land supply of low-land peasants in the interior of Russia. In contrast to the migrating population, crop land as a means of livelihood, irrigation facilities were needed to irrigate crops. And there was a need to carry out such work and, of course, to carry out huge organizational work in the transformation of the desert-steppe area into a prosperous Oasis. In the study of the history of these processes, the "Turkestan collection" ("Turkestansky Sbornik"), created at the time of the existence of the Turkestan governorate general, is considered an important resource. Through the analysis of the data in this resource, it is possible to reveal the topic in content.

2 Materials and Methods

In the content coverage of this article, the materials of the "Turkestan collection", which were created between 1867 and 1917 after the Russian Empire invaded Central Asia and were important in the study of the social, economic, political and cultural progress of the Turkestan governorate general, were widely used. This collection consists of a total of 594

* Corresponding author: m.z.orziyev@buxdu.uz

volumes, using, on the basis of the collected materials, a message, articles and information that will serve to cover the history of the appropriation of the Reserve and wasteland in the historical-chronological period that we are considering. Methods such as comparative analysis, principles of chronological consistency, objectivity, historicism, impartiality and the systematic approach have also been used from a methodological point of view [1-3].

3 Results and Discussion

In the source and historical literature covering the history of the Turkestan region from the late 19th to the early 20th century, the territory of the desert - steppe (Golodnaya Step) is understood as the territory of the Syrdarya and Mirzachul regions of present-day Uzbekistan, that is, the territories in the northeastern part of the Kyzylkum steppe between Tashkent and Samarkand. At the time, these areas were sparsely populated and largely ranching, as there was no way to carry out irrigation work in the desert-steppe region. The development and acclaiming of the desert-steppe territory was also actually carried out by the first Governor-General of Turkestan K.P. fon-Kaufman had begun. The early excavations began near Bekabad in 1872, but work stalled due to lack of funds. In 1874-1878, 16,000 of the 25,000 rubles required for the excavation of the 12.5-versts long canal were allocated by the state. The Labour needed for the construction work, on the other hand, was drawn from local farmers to Hashar for 14 to 28 days. 14,444 people from Tashkent city, 28,600 people from Khujand uyezd, 25,250 people from Qurama uyezd were involved in the recent construction works. However, the construction work was still not carried out up to the end, although the total cost was 125,840 rubles, the construction of the canal was stopped in 1881. On the orders of the first Governor-General of Turkestan K.P. von Kaufman only six versts of the canal were excavated and abandoned due to lack of funds. It was not possible to release water in this channel. The first attempt to develop the steppe territory was unsuccessful. In 1895, a group of experts from the "Land Improvement" department was sent from St. Petersburg, the capital of the Russian Empire, to Turkestan, and they were assigned the task of determining the irrigable lands of the country.

These specialists have studied for a certain period the possibility of future irrigation, transformation of the desert-steppe area into a prosperous oasis. The preliminary conclusions of the commission, which studied the territory, on the construction and farming of irrigational structures in the steppe region were as follows. 1). The southern part of the desert-steppe area can first carry out irrigation of 50 thousand desyatinas of lands. To do this, there were conclusions such as the construction of a dam in Syrdarya and the creation of the necessary canals, 2) the transformation of the northeastern part of the steppe territory into prosperous agricultural settlements, for which the faster completion of the "Emperor Nicholas I" canal and adjacent ditches, for which irrigation is envisaged to reach 45 thousand desyatina. On the basis of the conclusions made by the commission, work was launched on the development of the desert-steppe region. The experiments of local residents were also studied, concluding that the experience of small ditches and their use could not provide enough cotton raw materials to the developing textile industry of the Russian Empire.

The Russian Empire, after the invasion of the Turkestan territory, made a hydrological reconnaissance of the steppe region, identifying it with a geological structure and lands with good soil for the growth of plants. In a number of articles in the "Turkestan collection" we can read the feedback on this issue. The first major modern irrigation facility built by the administrators of the Russian Empire in the Steppe area was considered to be the

“Emperor Nicholas I” canal. Construction of this canal was completed in 1898 and the opening ceremony of the canal took place in December. Having fallen to the state treasury for a total of 400 thousand Russian rubles, at the time of its initial launch, 20 thousand desyatina of lands were designed to irrigate the land, and around its shores were located eight Russian settlements and several local villages (Porcha kanala “Imperatora Nikolaya I” // *Turkestan*skiy sbornik. T. 509. – S. 70.). In a word, the excavation of the canal solved both the migration policy and the problems of turning the desert-steppe area into gardens and greenery.

As per provisions of the information contained in volume 518 of the “Turkestan collection”, the fact that the “Emperor Nicholas I” canal serves to become a prosperous settlement, irrigating more than a decade of Steppe territories, using the state-private entrepreneurial method of digging it, participating in the construction of the canal with its own funds by the representative of the Romanov dynasty, Grand Prince Nikolai Konstantinovich, construction work, the fact that it was not being cleared of reeds, silt and mud (1909), while it was the only Canal irrigating the desert, the lack of State attention was criticized in an article in the “Turkestan collection”. The authorities of the Russian Empire lacked experience in the struggle with the whims of irrigation works in Central Asia, in this regards, the experience of the local population for a thousand years has not been studied. As a result, the “Emperor Nicholas I” canal was overrun by reeds and mud, and the erosion of its banks caused the canal banks to be kissed several times, the water flowing towards Syrdarya and streams, and the population was tormented by dehydration. This caused great difficulties in the cultivation of cotton raw materials, which were especially important for the Russian Empire.

The “Emperor Nicholas I” canal's water intake from Syrdarya was becoming more difficult due to the lack of annual cleanup. One of the main reasons for this was that the canal was originally intended to dig water from the site of the Old Bukharan canal and ditches, known as Farhad rocks. The work, however, was a major challenge due to the difficulty of performing earthworks, and the abundance of stones and harsangs. Therefore, it was decided to remove the canal from the land of Syrdarya, which spreads and flows in the plain near Bekabad as part of the beginning. Here, Syrdarya gave rise to several islets, by blocking the range of islets with fences, dams were formed, and water was released into the channel “Emperor Nicholas I”. Another reason is that after the launch of the canal, the total area of irrigated land in the Steppe area increased every year, increasing from seven thousand desyatina to 11,400 desyatinas of lands. As a result, it is difficult for the water to reach everyone. Near Bekabad, on the land of Syrdarya, which spreads and flows in the flat lands, the river has been meandering as a result of soil washing during the spring floods. The coast of Syrdarya is also variable here, and in 1909 60 million Poods of soil were drained near the Alkakol. In the 1898-1910 history of the “Emperor Nicholas I” canal, Syrdarya damaged its banks four times by washing its banks in Qizil Pichan, Nicholas' settlement and Alkakul locality. All the grounds are enough to conclude that this put not only economic, but also environmental problems on the agenda. Because, in addition to being the only irrigation facility in the desert-steppe area, this canal posed a major threat to 472 households displaced from the European part of Russia following a water washout of the marshy area near Bekabad. The drying up of spring crops increased the likelihood of the outbreak of various diseases in the heat. In 1907, the distance between Syrdarya and the “Imperator Nikolay I” canal was 30-35 sajens, while in 1908, due to erosion, this distance was 13-15 sajens. By autumn in the same year, the distance of 8-10 sajen remained. On 13 June 1909, Syrdarya also washed away the canal banks, and the Russian settlements were without water for a month. On January 1, 1909, 12 thousand rubles were allocated from the Treasury, and the beginning part of the canal was planned to

be used for the new ozani. However, 19 thousand rubles were spent on bringing the intended work to the end.

The lack of water for a month caused great damage to the agricultural work of the population. The main reason for the erosion of the banks of the canal was the different flow of Syrdarya water in different seasons of the year. Scientists who hydrologically studied Syrdarya found that its succulent and overflowing flow was in late spring (may) and early summer (June), as a result of melting snow and ice from the mountains, 250 cubic sajen/second of water flowed in the river, and with the onset of winter, the water finally decreased to 25 cubic sajen/second in December. The “Emperor Nicholas I” canal and ditches, which serves to irrigate the steppe region in the data of the civil engineer Kursish takddim, mainly requires water for irrigation work in April-September, and the canal, which was 15 years since its construction, has been expanded and extended several times, although it could receive 1.2 cubic sajen/second of water. It can be concluded that the coastal erosion in the flood of Syrdarya also caused great damage to the irrigation facilities. However, the spending on the channel also continued to increase.

Hydrographer scientist who visited Central Asian territories in 1907 S.S. Rauner had conducted a hydrological survey and noted the presence of eroded lands near the canal of “Emperor Nicholas I”, informing him that the possibility of an active event was high. But at this time his opinion was ignored as the canal banks were 60 sajen away from the riverside. Two years later, in the spring of 1909, it was 3 sajens long. S.S. Rauner's opinions were known to be correct. The cost of repairs was 11,250 rubles. However, because there was no funding, it was not repaired and the disaster occurred. The result was a canal coastal washout disaster.

The 1909 “Imperator Nikolay I” washed the banks of the canal occurred in the thirty-first mile of the canal. As a result, there was a backflow of canal water into the river. On top of this, the Locust's swarms threatened re-desertification of newly acquired destinations. While topographer Gopper warned a year ago about the dangers of errosia, no one listened to it. The state clerk A. A. Matissen on irrigation works after disaster himself came personally and got acquainted with the scale of the disaster.

It was led by an attempt to restore canal activity, and it was decided to re-dig the canal around the errosian area. The work involved 300 men and 150 horses, and the Treasury invested heavily. Within a month, the prescribed work was carried out (Porcha kanala “Imperatora Nikolaya I” // *Turkestanskiy sbornik*. T. 509. – S. 70). The lack of application of spring and autumn hashar work by local farmers was the main reason for the origin of such disasters. Since the “Imperator Nicholas I” canal was the main irrigation facility in the steppe region up to this time, senior officials of the Russian Empire also came to examine the scale of the danger of seeing this disaster firsthand, the damage caused by it, re-desertification.

In the materials of the “Turkestan collection”, the head of the Department of land use “improving the condition of arable land “Lieutenant General Jilin and Prince V.I. Masalskys, deputy of the hydrological Committee Information related to the arrival and learning of the likes of Engineer S.Yu. Rauner has been preserved. Also, although irrigation works through the canal were carried out in a month, this deposit and the savings made so that the crops of the inhabitants of the steppe region did not completely dry out. In December 1909, in St. Petersburg, he presented to representatives of the government his own project, which bypassed the “Imperator Nicholas I” channel, the head of which was eroded land. The costs of this project amounted to 100 thousand rubles, and government representatives paid for its approval due to lack of funds. The circles of the government of the Russian Empire favored the transportation of raw materials grown in the territory without allocating significant costs to irrigation work. However, the canal situation was

slowly improving as the lands irrigated by the “Emperor Nicholas I” canal were mostly displaced populations from the interior regions of Russia.

The use of the “Imperator Nicholas I” channel and the complex set of ditches required the overcoming of the specific whims of the Central Asian climate. Due to the need to repair and clean the canal, 20,000 desyatinas of the claimed lands irrigated the land during the period of operation, which later reached 45,000 desyatinas of lands. On August 2, 1907, specialists of the hydrological Society arrived in Tashkent. They came to explore the section of the “Imperator Nicholas I” canal, connected with the Syrdarya, which was intended to irrigate 45 thousand desyatina of land in the steppe. The canal had a capacity of five cubic sajens/secons or 50,000 secundoliters of water. To the Treasury, the yearbook from this channel earned 250-300 thousand rubles. Russian settlements to the basin of the canal “Imperator Nicholas I” appeared in 1895-1900 and in 1907-1908. The number of general settlements was eight, including Spassky, Veliko-Alekseevsky, Konnogvardeysky, Nakhalovka, Romanovsky, Nadezhdinsky, Obetovanny, Zaporozhsky, allowing a total of 45,000 desyatinas of land use. In addition to Russian settlements, this canal also irrigated several local villages. However, the use of irrigation facilities in local conditions was only partially cleared in 1908, when it began to be expensive to keep it clean for Russian administrators, who did not take into account the organization of much labor and costs. As a result, the Channel coast erosion of 1909 had led to a particularly large economic, environmental problem. The catastrophe of 1909 was a lesson for the administrators of the Turkestan governorate general, and in 1910 the engineer Dregin was sent to the desert steppe region in order to prevent the Syrdarya from washing the coasts. Its primary function was to prevent the channel banks from being washed away during spring floods and water surges, strengthening the banks. The local people’s experience of cleaning, hashing irrigation facilities was also widely used. However, the volatility of Syrdarya himself showed that these things were not enough. Modern methods, i.e., the performance of cement-concrete work, were carried out only in the head dam sections of the canal, and there were cases of besamar waste of water in the middle and lower sections.

The renovation of the “Imperator Nicholas I” canal and the expansion of its irrigated areas were also carried out in the 1910s. The materials of the “Turkestan Collection” state that after the renovation in 1911, the “Imperator Nicholas I” canal was able to provide water to a total of 57,000 desyatinas of land, providing an additional 12,000 desyatinas of land. Subsequently, the possibility of bringing the total amount of irrigated land to 75-80 thousand desyatinas of land plots by extending the depth, width of this canal began to be considered.

In 1910, the following were cited as tasks that should be done in terms of widening the canal and increasing water capacity in the following year at the end. 1) to allocate 451 thousand rubles for the work of the land and take into account 3% additional costs, 2) to build watersheds from the main canal and repair them, to carry out earthworks in the amount of 1856 thousand rubles, 3) to carry out work on the slope of the canal, drainage holes, the organization of small ditches and other minor work, 128 thousand rubles, 4) 1,675,000 rubles will be allocated for the construction of artificial dams, of which 600,000 will be used for the construction of main dams, and 248,000 for the construction of bridges over canals, 5) up to 124 thousand rubles for construction having civil engineering, 6) it is intended to allocate 72 thousand rubles for the transfer of telephone and telegraph lines had to be constructed as it was required. It is mentioned that the total amount of all amounts is 4306 thousand rubles. It can also be seen that the estimate includes construction work and keeping it under control 205,200 rubles in four years, 32,500 rubles for the trussing of the trunk canal, 20,000 rubles for the costs of the chancellery, 293,000 additional non-foreseen expenses in the estimate. From these comments, it can be seen that the construction and

repair of the “Emperor Nicholas I” canal continued in later periods. Cotton raw materials were mainly planted on the new lands, which were mastered through the channel “Emperor Nicholas I”. In particular, in the area of the Spassky settlement near the desert steppe (Golodnaya Step) station on the Kanal-East Asian Railway, a rich harvest of cotton was obtained. However, it has been argued that the Locust war is a major peasant problem, and it has been criticized that the government pays little attention to the issue. Increasing cotton yields has been encouraged in a variety of ways. During the locust swarms and years when there was not enough water in the canal, farmers were also given certain tax breaks.



Fig. 1. General view of the channel of Emperor Nicholas I

The channel “Emperor Nicholas I” did not meet the need of the administrators of the Russian Empire (fig.1). After that, a plan was developed to dig a new canal again. This was called the “trunk canal”. The person who designed the canal and headed the excavation was engineer S.F. Ostrovsky was. At a meeting with members of the government, the engineer noted that this channel irrigates 81111 desyatinas of land in the north-east of the Golodnaya step, construction work will be carried out in 1910-1916, it will cost 4406897 rubles, the plan for their distribution. The table 1 below lists the spending scheme of funds.

Table 1. The spending scheme of funds.

№	Tasks to be done	Total expenditure
1.	Construction of structures at the beginning of the canal	629592 rubles, 87 kopeyek
2	Performing earthworks	698356 rubles, 43 kopeyek
3	Work performed for the slope of aqueducts, bridges, canal	223008 rubles, 85 kopeyek
4	distribution of water to the ground and performing drainage work for 8111 desyatinas of land	2623439 rubles, 42 kopeyek κ
5	The salary of construction workers in the amount of 37,900 rubles for five years	189500 rubles,
6	Chancellery and small outputs in the amount of 5 thousand rubles per year	2500 rubles,
7	The cost of the construction supervisor per year is 3600 rubles per year	18000 rubles,
Total:		4406897 rubles 57 kopeyek

Also, engineer S.F. Ostrovsky cited what is desirable to plant on 81111 desyatina lands that this “Main canal” can irrigate. He believed that 16,000 desyatinas of land were suitable

for planting cotton, and that if 50 poods were harvested from each desyatinas, 800,000 poods of cotton would be obtained, which would mean 272,000 poods of cotton fiber, the price of which at that time was estimated at 2 million 400,000 rubles. It is estimated that from each desyatinas of the rest of the land, a view is formed as follows if 100 rubles are received for spring crops, and 75 rubles for autumn crops. That is, it is envisaged to earn $16000 \times 15 + 29000 \times 100 + 20000 \times 75 = 68000000$ rubles. This has resulted in the steppe being transformed into a green space with gardens and cultivated oasis. It was calculated that the lands between Samarkand and Tashkent were turned into greenery, and Russian peasants with 150,000 less land could be transplanted.

State tax revenues were also improved, it was noted that 23 thousand desyatinas of claimed lands were taxed from 5 rubles as an average fertile land, 115 thousand rub, 31 thousand desyatinas of lands were taxed from 15 rubles as a high fertile land, 11 thousand desyatinas were considered autumn crops on the land, 7 rubles and 50 kopeyeks were taxed from, and 547,500 rubles were taxed from 662 thousand 500 rubles in total. While the annual cost to the channel is 13 thousand rubles, a net income of 532,500 rubles is cited. This is only an overview of the initial estimates of the canal for which the new construction was intended.

Engineer S. F. Ostrovsky, who went to St. Petersburg to present his project to government representatives and build a new canal, claiming and master new virgin lands, explain the expenses that will be in it and income for the state returned to Tashkent from his journey from St. Petersburg on February 23, 1909. He was hopeful of securing funds after the confirmation of the Duma by presenting his plan for irrigation of the steppe regions to the State Duma. In the early period, the irrigation area was listed as 45,000 desyatinas of land in the canal project. S.F. Ostrovsky also consulted with the agronomist Rukhlov on the construction of the canal and the land to be crossed. In addition the state official agronomist N.A. Dimmo was also in the desert region, knocking down soil and plant samples of the area. The construction of the canal is intended to begin after funding from the Treasury and be completed in 8-9 years. There have been suggestions that the completion of the canal would cause the relocation of Russians to the land and the expansion of cotton cultivation areas. The completion and commissioning of this canal was marked as 1916, making it impossible for it to be fully operational. Because, with the withdrawal of the Russian empire into the first World War in 1914, state funds were not directed to the irrigation works.

In the development of the desert-steppe territory in addition to the main canal, the government of the Russian empire included many projects of canals, one of the largest of which, and the fact that construction work was carried out in part, was considered to be the Romanovsky canal and set of ditches, named in honor of the existing and ruling dynasty. This canal was also intended to irrigate 45,000 desyatinas of land, and as noted above, the outbreak of World War I also caused the construction of this canal to be halted. With the launch of the Romanovsky Canal, many more can be found feedback on the fact that a large part of the Steppe area will allow for its assimilation.

It should be noted that even before the period when the administrators of the Russian Empire invaded the Turkestan territory, irrigation farming was carried out in the Steppe area, and local residents are known to have made a number of canals from Syrdarya, from the Zarafshan River. During the existence of the Turkestan governorate-general, some of them were deepened and some expanded and irrigated. For example, the restoration of the old Tuyatortar ditch was carried out in 1912. It was also during this period that work was carried out to use the old Bukharan ditch, the spring ditch near the village of Koshtegirmon.

4 Conclusion

In conclusion, the development of the steppe region, which is located in the northeastern parts of the desert called Kyzylkum, the development of ditches and canals into a prosperous oasis, was revived after the Russian Empire invaded the Turkestan territory. The geologist, hydrographer, engineer, agronomist of the Russian Empire, having fully studied the geological structure, hydrographic characteristic, nature and world of plants of the lands of the steppe-steppe region, managed to master a large part of it through a series of canals and ditches that took place in Syrdarya. The “Imperator Nicholas I”, “Magistral”, “Romanov” and other canals, as well as the ditches of “Bukhara Arighi”, “Buloq”, “Tuyatortar”, which the locals used from time immemorial, were also expanded and made a great contribution to the improvement of the steppe territory, the transformation into a flowering agricultural oasis.

References

1. R. Kuldoshev, et al., *Mathematical statistical analysis of attainment levels of primary left handed students based on pearson's conformity criteria* E3S Web of Conferences **371**, 05069 (2023)
2. A. Hamroyev, H. Jumayeva, *Effectiveness criteria and experimental results of designing students' creative activities in primary class mother tongue education* E3S Web of Conferences **420**, 10007 (2023)
3. J. Haitov, *Distribution of new varieties of grain crops suitable for the natural climatic conditions of Uzbekistan* E3S Web of Conferences **389**, 03007 (2023)