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**«O‘ZBEKISTON — 2030” STRATEGIYASINI  
AMALGA OSHIRISH YO‘NALISHLARI VA  
ISTIQBOLLARI YOSHLAR NIGOHIDA»  
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### III SHUBA

<i>Boboeva M.Sh. Mutaqillikdan keyingi davrda transformatsiyalashuv jarayonlari va uning ahamiyati</i> .....	258
<i>Muxammadjonov J.J. Fuqarolarning tadbirkorlik bilan shug'ullanish huquqini himoya qilishning asosiy shakllari hamda qonunchilik asoslari</i> .....	262
<i>Ismatov Sh.M., O'rinov O'. N. "O'zbekiston-2030" strategiyasida davlat boshqaruvi va sud-huquq tizimidagi islohotlar</i> .....	269
<i>Mamadjanov J.N. Yangi O'zbekistonda ijtimoiy davlat barpo etishda ijtimoiy huquqni ta'minlashning huquqiy asoslari hamda tashkiliy mexanizmlari</i> .....	272
<i>O'tanazarova Y.R. Iqtisodiy jarayonlarni modellashtirish va raqamlashtirishning ilmiy-uslubiy asoslari</i> .....	275
<i>Xomidov M. X. Sanoat korxonalarini va tarmoqlari kooperatsiyasini rivojlantirishning huquqiy asoslari</i> .....	280
<i>Meyliev O.R., Gofurova KX. Ijtimoiy sohani rivojlantirishda davlat byudjetining o'rni</i> .....	283
<i>Mirzamahmudov M.M. Kambag'allikni qisqartirishda davlat siyosatini belgilash va bunda davlat tomonidan infratuzilmaga kiritilgan investisiyaning ahamiyati</i>	287
<i>Isaxonova R.M. O'zbekistonda iqtisodiy islohotlar sharoitida aholi salomatligini ta'minlashni moliyaviy masalalari</i> .....	292
<i>Xalikov U., Kamilova N. Iqtisodiy xavfsizlikni ta'minlashning o'rni va ahamiyati</i> .....	295
<i>Sotvoldiyeva M.G., Turaeva S.T. Assessment of impact of human activity on water resources. Learning on the example of Uzbekistan</i> .....	299
<i>Shirinov A.Q. "O'zbekiston – 2030" strategiyasini amalga oshirish islohotlar tendensiyasi sifatida</i> .....	304
<i>Xoliqov L.M. O'zbekistonning ijtimoiy davlat sifatidagi maqomini yuksaltirishda "O'zbekiston – 2030" strategiyasining o'rni</i> .....	308
<i>Imomova O.J. O'zbekiston iqtisodiyotiga ta'sir ko'rsatuvchi omillar va turizm xizmatlarining mamlakat iqtisodiyotiga tasiri</i> .....	313
<i>Mansurova N.D. "O'zbekiston – 2030" strategiyasida gender tenglik masalalari</i> .....	316
<i>Jalolova Y.M., Zoirova M.Y. O'zbekistonda iqtisodiy, ijtimoiy huquqlarni ta'minlashning tashkiliy mexanizmlari masalalari</i> .....	319

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## ASSESSMENT OF IMPACT OF HUMAN ACTIVITY ON WATER RESOURCES. LEARNING ON THE EXAMPLE OF UZBEKISTAN

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**Abstract.** Human impacts should be adequately considered in water resource use and natural hazard mitigation planning. Meanwhile, water resources in Central Asia are increasingly under stress, as downstream countries are highly dependent on upstream countries. This paper aims to comprehensively assess the impact of human activities on water resources, addressing key aspects such as pollution, over-extraction and habitat degradation.

**Key words:** water resources, region, Uzbekistan, climate, industrialization, crisis, large domestic water, warm water, ecosystem.

Located in the heart of Central Asia, Uzbekistan faces a unique set of problems in water resources management. As a country with a predominantly arid climate, the demand for water is high, and the delicate balance between human needs and environmental sustainability is under constant scrutiny. Human influence affects the environment in several ways (Figure 1).

In addition, according to statistics published by the World Resources Institute,



Uzbekistan ranks 25th among 164 countries in terms of water scarcity.[1] Given that water shortages can cause social and environmental crises in some regions, particularly in Karakalpakstan, water scarcity is a very acute problem for Uzbekistan. Water is insufficient not only for agricultural purposes but also for domestic use.

Uzbekistan struggles with water scarcity due to its arid climate and extensive agricultural practices that dominate its landscape. Once one of the world's largest inland bodies of water, the Aral Sea has shrunk dramatically due to over-mining for irrigation. This stark reality underscores the need to reassess and rethink how water resources are used. Uzbekistan's hydropower resources make up only 4.92% of the total territory of the country.

The total length of water resources is 50-60 km<sup>3</sup> per year, of which only 12.2 km<sup>3</sup> is formed within the republic, the rest of the water comes from other places - from the Tiyan Shan and Pamir-Altay mountains, from melting snow and melting glaciers in summer. . The main part of water resources is used for irrigation of cotton fields. According to forecasts, the population of the republic will reach almost 40 million people by 2030, which will reduce the available water resources by 7-8 km<sup>3</sup>. Under these conditions, the current water shortage will increase from 13-14% to 44-46% in 2030, which will have a negative impact on the development of both agriculture and industry. According to the World Bank, warm water losses in Uzbekistan in 2018 amounted to 469 million cubic meters, that is, 32% of the total volume of produced drinking water.

A number of forces continue to seriously affect our natural water resources. They may include the following.

a) First of all, most of them are the result of human activities, including ecosystem and landscape changes, sedimentation, pollution, over-abstraction and climate change. Destruction or disruption of natural ecosystems is one of the biggest causes of serious impacts on the sustainability of our natural water resources.

b) Sediment in water poses a threat to aquatic ecosystems. Sediment occurs in water bodies both naturally and as a result of various human activities. When they occur in excess, they can dramatically alter our water resources. Sediment occurs in water mainly as a direct response to land-use changes and agricultural practices, but sediment loads are naturally high on poorly vegetated land and often in arid and semi-arid climates. may appear after intense rain.

c) various types of pollution affect water resources. Humans have long used air, land, and water resources as "sinks" where we dispose of the waste we produce. These disposal practices leave most of the waste untreated, thereby causing pollution. This, in turn, affects rainfall, surface water and groundwater, and degraded ecosystems. The sources of pollution affecting our water resources can develop at different scales (local, regional and global), but can generally be classified according

to nine types. Determining the types and levels of pollution sources is a prerequisite for assessing the risk of pollution to water systems and, through the system, to people and the environment. By knowing the main sources of pollution, an appropriate mitigation strategy can be determined to reduce the impact on water resources.

d) impact of acid rain on water resources. Atmospheric pollution from industrial enterprises and automobile emissions leads to dry and wet deposition. This leads to the development of acidic conditions in surface water and underground water sources, and at the same time leads to the destruction of ecosystems. Acid deposition degrades the water quality of lakes and rivers by lowering pH (ie, increasing acidity), reducing acid neutralizing capacity, and increasing aluminum concentrations.

Impact on agriculture: Agriculture is a significant consumer of water in Uzbekistan and accounts for the majority of water use. The total area of irrigated land in Uzbekistan is 4.3 mln. is a hectare. Agriculture is the largest consumer of water resources, accounting for an average of 90-91% of water used. The Ministry of Water Resources is the main manager of water resources. It is a state body that implements a unified policy on water resources management in Uzbekistan. Currently, responsibility for water resources is divided between several government ministries and agencies, resulting in inefficient use of resources. Dependence on inefficient irrigation methods, combined with aging infrastructure, leads to water wastage and increases the strain on available resources. Assessing and improving irrigation practices is critical to sustainable agriculture and water conservation.

Industrial impact: As the industrialization process continues in Uzbekistan, the demand for water in production processes and energy production is increasing. Wastewater from industries introduces pollutants into water sources and further degrades water quality. To mitigate these impacts, comprehensive assessment of industrial water use and implementation of strict environmental standards are essential.

Urban Water Management: Rapid urbanization creates unique challenges in water management. Population growth in urban centers puts pressure on water supply systems, leading to over-extraction from rivers and aquifers. Urban sprawl also contributes to impervious surfaces, affecting natural water filtration processes. Sustainable urban planning and effective water management practices are critical to addressing these challenges.

Infrastructure and Innovation: Aging water infrastructure complicates water resource management in Uzbekistan. Leaks and inefficiencies in water distribution systems lead to unnecessary losses. Investing in infrastructure modernization, promoting water-saving technologies and introducing innovative solutions can improve water efficiency in all sectors.

International cooperation: Considering that Amudarya and Syrdarya, vital water sources for Uzbekistan, are shared with neighboring countries, international cooperation is in the first place. Collaborative efforts in transboundary water management, sharing best practices and technologies, will contribute to more sustainable and equitable use of water.

Community Engagement and Education: Engaging local communities in water conservation efforts and educating them about responsible water use are critical components of a comprehensive strategy. Empowering communities to own their water resources instills a sense of responsibility and contributes to the long-term sustainability of water management practices. Uzbekistan has been training water management personnel at the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIAME) since the Soviet era. Although many pictures have been published, any progress in the field will take a long time. Also, local universities are trying to establish partnerships with universities in Germany and the Netherlands. Co-curricular programs are open to students.

Despite the negative developments, a new generation of irrigation engineers and managers has been slow to arrive. Outdated Soviet-style educational programs and a shortage of qualified educators hinder the production of qualified personnel. Scientific and highly specialized educational centers such as TIAME, Research Institute of Irrigation and Water Problems, State Enterprise "Hydroingeo", National University of Uzbekistan, Tashkent State Agrarian University, UzGIP, Research Institute of Hydrometeorology represented by "Higher education-science-production" system integration is insufficient. The training-laboratory base of educational institutions is materially and theoretically outdated and requires modernization. Innovative and interactive learning tools are underutilized.

Policy and Governance Reforms: . In relation to the average monthly salary (\$240) in Uzbekistan, the average monthly salary of water industry workers (\$150) remains low.[2] Low wages reduce the social status and attractiveness of the plumbing profession, which is a deterrent to retaining highly qualified professionals. Young people with good potential dream of other prestigious fields, while good professionals go to other fields. The lack of a scientific coordination system in the field of research and development, the lack of funds for scientific research and innovation, the fragmentation of such specialized institutions hinders the effective implementation of promising research results and innovative activities in the field of water management. Strong policy frameworks and effective governance are essential to guide human activities towards sustainable water practices. This includes not only setting strict standards for water use, but also encouraging and supporting businesses and individuals to adopt water-saving practices.

In addition to introducing the above-mentioned reforms and innovations, we can offer the following solutions to this problem:

- introduction of a unified water use code for Central Asia, taking into account the interests of individual countries and the future of the region;
- increase in the number of non-governmental non-commercial organizations (Organizations of the Republic of Uzbekistan) in the territory of the Republic of Karakalpakstan on the basis of activity indicators on water issues;
- we need water journalism to increase the efficiency of mass media, i.e. to adequately cover water issues;
- establishment of the Central Asian Institute for joint study of water problems in the region;

- creation of a mobile expert group (humanitarian, engineer, environmentalist, sociologist, psychologist) that constantly writes memoranda to the governments of Central Asian countries on water issues;

- Film production and involvement of regional pop stars in solving environmental problems in the Central Asian region.

Only a generalized approach to solving water problems gives meaningful results. The countries of the region, including Uzbekistan, I think, are interdependent on the water problem. Therefore, the question requires a joint response, that is, countries should consult with each other and coordinate their actions to solve the water problems in Central Asia.

Conclusion: Assessment of human activity in the use of water resources is an important task that requires a multifaceted approach. From technological innovation to community engagement and policy reform, solutions are intertwined. As we strike the delicate balance between human needs and environmental protection, a collective commitment to sustainable water management is emerging as the foundation of a sustainable and water-secure future. Assessment of human activity in the use of water resources in Uzbekistan requires a holistic approach that takes into account the interdependence between agriculture, industry, urbanization and environmental protection. Through strategic planning, investment in infrastructure, international cooperation and public engagement, Uzbekistan can overcome water scarcity and ensure a more sustainable future for its people and environment.

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