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Impact And Consequences of Climate Change on Migration in Uzbekistan

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Abstract: The article examines the impact of climate change-related problems on migration processes in Uzbekistan. In particular, migration sectors affecting agriculture, water resources, and economic opportunities are analyzed. Also, proposals and recommendations are made to address the problems arising in the structure of economic sectors and labor resources as a result of climate change.

Keywords: Climate change, population, migration, economic sectors, resources, environmental factors, population settlements.

Introduction: The impact of environmental and climatic conditions on the migration movements of the population and the problems arising from them can be considered a new area for demographic research, since scientists began to pay attention to this topic relatively recently, when humanity began to face the negative consequences of climatic phenomena. The development of theoretical and methodological approaches to the study of migration caused by climatic and ecological factors is still ongoing. The population has been forced to leave their places of residence for many reasons, namely economic, social, political factors, and this continues. Climate change is a powerful force driving internal migration, which is closely related to the income sources of the population and has a sharp impact on the quality of life of the population in the regions where its impact is most felt. The population increases its need for economic opportunities.

Climate change is a process that is often mentioned and much discussed as one of the global problems of the 21st century. In recent years, phenomena resulting from climate change have been observed in almost all parts

of the world.

RESEARCH METHODS

Comparative, comparative geographical, statistical, zoning, cartographic, statistical - mathematical.

RESULTS

Climate change is a process that occurs as a result of changes in air temperature and other meteorological parameters over the years. In recent years, climate change has been occurring much faster than in previous periods. Previously, abrupt processes in climate change occurred much more slowly. Currently, the main cause of climate change is pollutants emitted by factories and enterprises, cars. As a result of the increase in water vapor, methane and soot gases and other pollutants in the air, a “greenhouse effect” appears. When sunlight enters the atmosphere, 70 percent falls on the earth's surface, and the earth, in turn, returns a certain part of the rays falling on the surface to space through the atmosphere. This returned light is trapped by greenhouse gases. This accelerates the warming of the Earth, a process known as the “greenhouse effect” [3].

Climate change is reshaping human mobility across the planet. Climate-related hazards such as floods, storms and wildfires are already major drivers of global human change. Policy advances in the area of climate migration are crucial because they have implications not only globally but also at regional, national and subnational levels. They are particularly important for countries and their populations that are most vulnerable to climate change, in particular the least developed countries and landlocked developing countries, including Uzbekistan.

Figure 1. The map of Uzbekistan

Forced migration has long been proven to have negative impacts on countries and their populations. The country is currently experiencing a difficult period in combating climate change and its consequences, which is hampering efforts to achieve sustainable development and the ability of the population to live in a comfortable environment. Studies show that migration due to climate change and various extreme weather events is increasing year by year, and experts note that these events will have a significant impact on Uzbekistan in the future [9]. As a result, the likelihood of economic problems in the republic is high. Based on the above considerations, the relationship between integrated climate-related migration and environmental change and migration in the country can be explained by the following main theories and factors:

- Climate change theory (Hansen. J, Mann, M. and Solomon, S.): Climate warming, increasing global temperatures lead to changes in climatic conditions such as drought, which forces people to move to safer areas.
- Environmental degradation theory (J. Lovelock, D. Attenborough.): Due to desertification, intensive land use and climate change, the area of deserts is increasing, which forces rural residents to find new lands for agriculture.
- Natural resource depletion theory (J. Rockstrom, K. Raworth.): It is under the influence of this factor

that interregional labor migration occurs.

- Water scarcity factor. Changes in the water balance, such as the drying up of rivers and lakes, make it impossible to conduct agriculture and meet the water needs of the population, leading to migration.
- Soil depletion factor. The decline in soil fertility due to erosion, intensive farming and the use of agrochemicals is forcing farmers to look for new land. Climate change is also having a negative impact on this process.
- Environmental pollution factor. Industrial pollution, accidents at chemical plants create dangerous conditions for life and health, forcing people to leave polluted areas.
- Mineral deposits and toxic waste. These phenomena lead to the destruction of ecosystems and deterioration of living conditions.
- Ecological factors [8].

The impact of climate change on migration may not be directly noticeable, but by influencing these factors, it causes people to move towards a more favorable environment. Below you will find enough information about some of the main factors and problems affecting the migration process.

Recently, the warming process has been accelerating all over the world. After 2015, the air temperature on the planet has increased by 1.2–1.3 degrees Celsius compared to the norm for the last 150 years. This is observed in Uzbekistan at high values, namely, close to 2 degrees Celsius. This frequency provides record seasonal heat almost every year. Given the geographical location of our region, which has always had its own unique climatic conditions and its location between continents, we are experiencing an increase in droughts. This, of course, is caused by climate change and rising air temperatures. Compared to the last century, our annual temperature increase has increased by 1.5–2 degrees [7].

According to archival data, in 1961–1991, the flow of cold air into Uzbekistan was 20–24 percent of the year, and in the summer months, cold currents also entered the republic, slightly moderating the air. The flow of cold air into the republic has decreased by 8 percent over the past 30 years. That is, now the flow of cold air into the region has decreased by 3 times compared to the last century. In recent years, the summer months have been very hot. Winter is also warm. Changes can be observed in other seasons [9].

Also, climate change increases the risk of drought in our region. The air becomes drier due to a decrease in water vapor in the air and atmospheric humidity. This directly leads to the evaporation of a large amount of water from natural and artificial reservoirs into the air. Less snowfall in the mountains, rapid melting of stable glaciers leads to low water content. As a result, changes are observed in the lives of the population living in and around desert areas, their lifestyle becomes more difficult, and climate migrants appear. They begin to look for places with better conditions. By 2050, we may lose 25-50 percent of productivity in the agricultural sector. This will lead to an increase in the cost of food products. In this case, the population will also migrate periodically in order to find agricultural land. There is a shortage of labor in production enterprises in areas with a negative ecological situation, and even if they exist, their monthly salaries will be relatively high. All this is an unnecessary expense. In the economic sectors, the shortage of natural resources (water, land, livestock, animals, etc.) used creates a shortage, which, as a result, leads to an increase in the price of consumer goods. Economic distress is observed.

Scientists conducted scientific research in order to combat the effects of climate change in the agricultural sector of the Government of Uzbekistan. As a result, 4 scenarios of climate change (namely, temperature and precipitation) in the Republic of Karakalpakstan, Kashkadarya and Tashkent regions until 2059 were developed - moderate, hot-dry, warm-humid and dry climate change, with forecasts of the impact of water on the main crops, horticulture, livestock and agricultural irrigation in these regions [7].

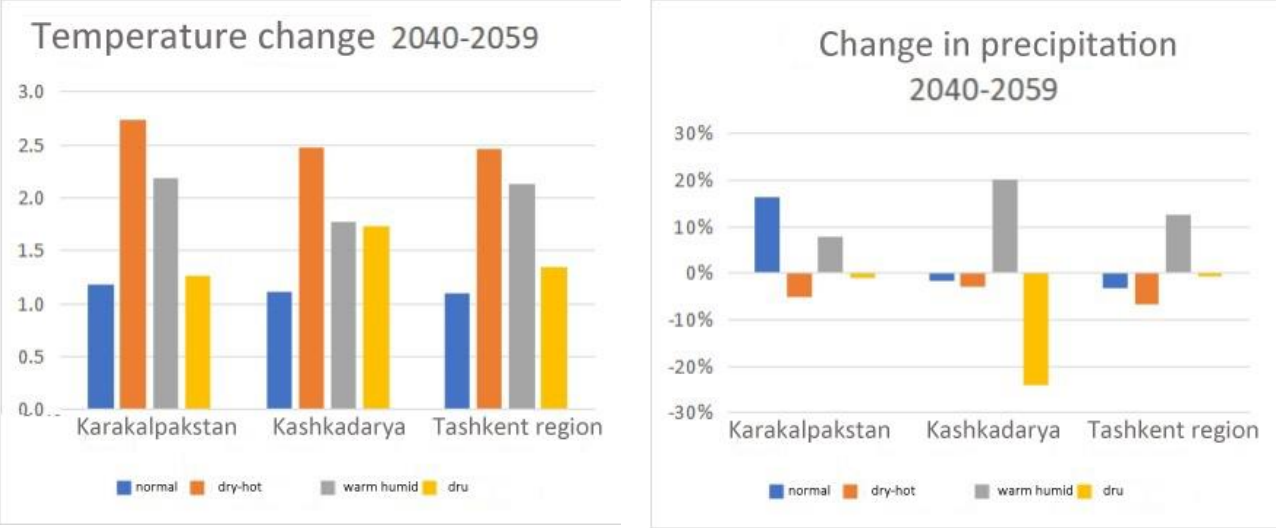

Figure 2. Forecasts of changes in temperature and precipitation

The figures show that while the northern regions are experiencing less climate change than the southern regions, if no practical work is done on climate change adaptation, in the future there is a possibility that water shortages will lead to the loss of viability of crops grown in these regions as well. And this is almost half of the country. This means that the population of lands with low agricultural potential may be forced to climate migration. True, it is noteworthy that Uzbekistan has already begun to solve these problems, and this is a positive step towards reducing global carbon dioxide emissions. But agriculture requires a specific approach, namely drastic practical measures.

Which region will feel climate change the most?

Uzbekistan is located in the subtropical and temperate climate zone. Scenarios show that warming air temperatures will lead to a shift of latitudes by 150-200 kilometers to the north every 30 years. As a result of this displacement, the Surkhandarya and oasis regions will warm up even more. Previously, since the Aral Sea was full, evaporation was constantly observed in its basin, which led to a somewhat higher humidity there. Currently, due to the lack of evaporation, the air in the Aral Sea region has become drier. For this reason, the residents of Karakalpakstan and Khorezm regions feel that it is getting hotter than in Surkhandarya.

Our southern regions mainly consist of pastures. However, due to the increase in continuous warm winter days, pasture areas are decreasing. In the summer months, the decrease in water vapor in the air increases the dryness in the air, which affects the vegetation period. This dryness causes desertification. The residents of the Fergana Valley, which is called Paradise, are also feeling the heat better than in the previous 30-40 years. In many places, farming is becoming more difficult. In the future, climate change will also intensify in the Aral Sea region: Karakalpakstan, Khorezm, Navoi and Surkhandarya regions.

Under the influence of climate change, the area of deserts in the republic is increasing, and arid climatic conditions are increasingly affecting the population living in the plains. Previously, there were many populated points on the Aral Sea, such as Jaslyk and Muynak. Now, if you go there, they are in ruins. Because people were forced to leave their places of residence and move due to the drying up of the Aral Sea and the loss of existing infrastructure there.

Due to improper use of the Aral Sea water, it dried up, leaving salts and other minerals in the soil. They not only polluted the soil, but also rose through the wind and storms and spread to other areas, including cultivated areas and residential areas. This led to an increase in respiratory diseases and cancer. There is no doubt that the shrinking Aral Sea has caused health problems for the local population.


Figure 3. Population settlements in the Aral Sea region

If we look at the statistics, only 0.3% of the world's air pollutants are emitted into the air in Uzbekistan. However, like all countries, we are equally affected by climate change [9].

DISCUSSION AND ANALYSIS

Climate change is becoming increasingly important for human migration. Environmental problems are usually insignificant factors in the migration decisions of the population, and usually lag far behind economic requirements, even in regions strongly affected by climate. That is, they are not the main force driving migration in the regions of the republic. However, this situation is one of the current and future urgent economic problems [2].

Under the influence of climate change, the number of migrants from villages to cities, and from cities to regions with better climatic conditions, is increasing. At the same time, we see that many urban residents are leaving for mountainous regions on weekends. On the one hand, this situation develops domestic tourism. But if the existing infrastructure in each area is not good, people will leave their homes and the number of climate migrants will continue to increase.

Climate change can directly affect both the economy and migration. For example; the economic impacts of climate change are as follows:

- Impact on agriculture: Warmer temperatures and adverse weather conditions can lead to reduced yields and reduced quality of agricultural products. This will harm food security and agricultural exports.

- Resource scarcity: It will negatively affect the distribution of natural resources, especially water resources. On the other hand, the demand for basic resources such as electricity and water supply in rural and urban areas will increase.

- Natural disasters and economic shocks, etc.

And, at the same time, the economic impacts of climate change related to the impact on migration can also be very wide-ranging. For example;

 Unemployment and labor market: Climate change may cause people to move from many areas. Such migration may increase unemployment, especially in rural areas. This, in turn, increases labor market competition in new areas.

 Resource distribution: Climate change may change the distribution of natural resources. This may make living and working conditions more difficult, especially for people involved in agriculture and farming.

 Health system: Climate change and its associated migration may place additional burdens on the health system of the displaced population. For example, an increase in climate-related diseases (e.g., infectious diseases) will increase the demand for health services.

 Infrastructure and resource pressure: As a result of migration, the population arriving in new areas will have to use a lot of infrastructure (housing, roads, energy networks) and services. This can put a lot of pressure on existing infrastructure systems.

All these problems are caused by the anthropogenic factor, due to the irrational use of resources by people.

For example, Tashkent is in the TOP 10 cities in the world in terms of air pollution. The capital's air pollution is caused by a decrease in greenery, chaotic construction, high traffic flow, toxic emissions from coal and fuel oil. The population of the city suffers from this situation. Unfortunately, both natural and anthropogenic factors are responsible for air pollution. Currently, the area of the capital is 330 sq. km. and the number of permanent residents is officially 3,112.8 thousand people (January 1, 2025). However, in reality, the population of the city is much higher than this amount, that is, 1.5-2 times more. This is due to the fact that residents of other regions of the republic are actively migrating to the capital. It is true that although the city's air is not ecologically clean, people moving there prioritize their goals over it. However, it has a negative impact on immigrants (people moving from

other countries). It causes a number of economic losses. The population density is quite high. That is, this situation creates excessive pressure for the city. It is not for nothing that the city's air is one of the world's leaders in terms of pollution levels. As a result, the likelihood of developing various diseases may be high.

If you pay attention, the ecological process in Samarkand, Shakhrisabz and other cities of the republic is not in such a deplorable state. Because in such cities, infrastructure and population are not as densely settled as in the capital within a very narrow territory. To prevent these problems in Tashkent, it is advisable to locate factories and production enterprises outside the city, arrange population settlements in an orderly manner, properly form a transport system, organize chaotic construction objects in an orderly manner and place them as far outside the city as possible. Also, various harmful salts from the bottom of the Aral Sea are flying under the influence of the wind and falling into population settlements. This situation negatively affects human health and causes migration. Also, some of the salts can fly and fall into mountain glaciers in distant distances, causing them to melt much earlier than normal. As a result, during the summer heat wave, it creates a water shortage among the population of the Aral Sea region and the plains of the republic. Examples of environmental impacts that could affect human health as a result of changes in the Aral Sea region include “reduced water levels, pesticides in the environment and food chain, dust storms, and changes in the weather.” In order to avoid such impacts and prevent drought and water shortages in the lowlands of our country, it is necessary to use resources wisely and increase green cover in arid and saline areas.

Migration can be managed in advance if a mechanism to combat the increasing climate change is properly developed. Properly implementing migration can restore hope for people and communities and contribute to the development of these countries. These changes can have significant impacts on ecosystems, agriculture, water resources, and lifestyles, which in turn can affect human populations and their ability to survive in their current locations.

CONCLUSION

Thus, in some regions of our country, due to factors such as the occurrence of unfavorable natural and climatic conditions specific to a particular region, as well as the deterioration of natural climatic conditions as a result of climate change, migration processes can occur and lead to economic losses. In addition, such migrations directly caused by natural and climatic factors can occur in forced and voluntary forms. The area of our republic is limited, and the population is constantly increasing. Therefore, it should be the duty of every citizen to eliminate such urgent problems as soon as possible.

Usually, when agricultural productivity decreases due to climate change or other weather phenomena, people often move to new areas as a means of protecting themselves from food and water insecurity. Some people migrate in search of better opportunities to adapt to the climate. They think that changes will affect their lifestyle, health, or food security.

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