THE ECONOMIC AND SOCIAL CONSEQUENCES OF ENVIRONMENTAL MIGRATION IN THE CENTRAL ASIAN COUNTRIES

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ABSTRACT

Nowadays, increasing attention is paid to the impact of environmental change on society and the economies of countries because of the growing frequency and intensity of various adverse natural and man-made phenomena. In addition to their destructive effect on economic and social processes, they lead to the formation of specific migration flows, characterized by suddenness and complexity of forecasting. The article discusses the role of climatic and technological factors in economic, social, and migration processes in the countries of Central Asia. The study proved that, as a result of a steady increase in the population of Central Asian countries, anthropogenic pressure on the environment has significantly increased. The rise in average annual temperatures, which has accelerated with global warming, has an additional negative impact on the environmental situation. The study revealed that adverse environmental changes affect the living standards and working conditions of the rural population to a greater extent than those of urban dwellers. This fact is of particular importance because of the historically established patterns of settlement in the countries of Central Asia, where about half of the population lives in rural areas. For the region, the main negative consequences of global climate change are droughts, floods, desertification, and soil degradation. These processes make it impossible to cultivate crops in certain areas, and this, given the large share of the agricultural sector, leads to additional risks in the form of a slowdown in economic growth and, consequently, a decline in the population's quality of life. At the same time, the adaptive capacity to counter these risks is quite low on account of social instability, conflicts, difficulties in socio-economic development, and institutional problems in emergency response systems. In recent years, the Central Asian countries have undertaken more and more initiatives in the field of ecology and climate change: projects to preserve mountain ecosystems in Kyrgyzstan, development of solar energy in Uzbekistan and wind energy in Kazakhstan, the establishment of an Ashghabad-based Regional Center for Climate Change Technologies for Central Asia, etc.[1]

However, currently there are no specific national or international programs for managing environmental migration, whereas they could significantly reduce the social, economic, and environmental risks caused by population movements under the influence of negative environmental changes.

[1] "Turkmenistan initsiiruet sozdanie Regionalnogo Tsentra po tekhnologiiam, sviazannym s izmeneniem klimata," Official website UN News, 16 March, 2015, available at [https://news.un.org/ru/story/2015/03/1259881], 20 February, 2020.

KEYWORDS: *climate change, ecology, environment, migration, Central Asia, Russian Federation, climate risks, security, adaptation.*

Introduction

Central Asia (CA) is a region exposed to various environmental hazards, both natural and man-made: droughts and floods, mudflows and avalanches, desertification and salinization of soils, dam failures and industrial disasters. For several decades now, environmental catastrophes in the region, such as the shrinking of the Aral Sea or radioactive contamination following nuclear tests at the Semi-

palatinsk Test Site, have attracted public attention throughout the world. All these problems, regardless of magnitude or frequency of occurrence, cause serious damage to the Central Asian economies and pose a real threat to stability in the region. A number of major studies that have appeared in recent years explore the impact of climate change on regional security[2] and socio-economic development in CA countries,[3] the risks of natural disasters in Central Asia and ways to overcome them.[4] But human migration is yet another important consequence of the worsening environmental situation.

Negative changes in the habitual human environment may be sudden and catastrophic or may develop slowly over many years, but in both cases they worsen people's living and economic conditions, inducing them to change their place of residence or to consider such a step. Migration is an integral part of life in any society and is always a complex process with multiple causes and complicated consequences. Migration flows triggered by changes in the environment have their specific features. It is particularly interesting and important to consider these in the context of the Central Asian region, with its specific natural and climatic conditions, uneven distribution of natural resources, polyethnic population, and socio-economic development problems. As of today, there are still no comprehensive studies on environmental migration covering the whole region. The purpose of this study is to make a general assessment of the trends in such migration processes and to outline the problems that are particularly relevant in this context from the perspective of ensuring sustainable development of the Central Asian countries.

Theoretical-Methodological and Statistical Issues in Environmental Migration Research

The very concept of environmental human migration has yet to take firm hold in Russian-language scientific discourse. We understand it as all human migrations (temporary and permanent, regular and irregular, forced and voluntary) directly or indirectly caused by adverse environmental conditions (such as natural and man-made disasters, as well as a gradual worsening of natural-climatic conditions or slow environmental degradation). One specific subtype of environmental migration is climate migration, that is, migration induced by climate change (changing temperature and precipitation patterns) and resulting natural cataclysms (droughts, floods, storms, landslides, etc.).

As for theoretical-methodological issues in studying migrations caused by environmental change, most scientific disputes revolve around the issue of how forced should a migration be to enable us to classify it as a special type of migration: climate and environmental, in contrast to labor migration. Even Norman Myers[5] and Richard Black,[6] who pioneered research in this area, differed in their views on this issue. Some current works on this problem, such as a 2011 study conducted for the European Parliament, say that people who decide to leave the affected area because of worsening living conditions under the impact of climate change while migration is not the only way for them to

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[2] V. Novikov, C. Kelly *et al*., *Climate Change and Security in Central Asia*, Organization for Security and Co-operation in Europe, 2017, available at [https://www.osce.org/secretariat/355471?download=true], 13 December, 2019.

[3] *Reaching Tipping Point? Climate Change and Poverty in Tajikistan*, ed. by A. Swarup, J. Magrath, R. English, Oxfam International, December 2009, p. 7.

[4] Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI). Risk Assessment for Central Asia and Caucasus: Desk Study Review, available at [https://www.preventionweb.net/files/11641_CentralAsiaCaucasusDRManagementInit.pdf], 28 November, 2019.

[5] J. Myers, J. Kent, *Environmental Exodus: An Emergent Crisis in the Global Arena*, Climate Institute, Washington D.C., 1995, 214 pp.

[6] R. Black, *Refugees, Environment and Development*, Longman, London, 1998, 229 pp.

sustain their livelihoods should not be classified as environmental migrants.[7] But most of the recent studies are based on a different approach, which recognizes that migration induced by environmental factors can be both forced and voluntary.

In our opinion, the second point of view is more balanced and reasonable, because such an approach makes it possible to study environmental changes and their impact on socio-economic and socio-demographic processes while capturing their natural relationship in its entirety, which significantly increases the predictive capacity of such studies, providing wider opportunities for the practical use of their results. In reality, the mechanisms whereby environmental changes indirectly affect an individual's decision to migrate are extremely diverse and can manifest themselves in different areas of society's life: demographic processes (morbidity, mortality, changes in population size and density); economic situation (urbanization, decline in agricultural productivity) and socio-economic situation (changes in employment); social conditions (such as changes in the traditional roles of men and women in rural households); political situation (legislation, migration policy, relations with neighboring states); security of the state and society (threats to food security, scarcity of resources, conflicts, and rising crime); cultural norms (such as people's attitudes to the environment, issues of poverty, and migrants), and human psychology (diminished sense of security, loss of confidence in the future, other risk perceptions, etc.).

However, with this approach the researcher is bound to encounter difficulties in obtaining statistical data. At present, there is only one open resource that provides information on the number of persons displaced within a country (internally displaced persons) because of natural disasters: the Internal Displacement Monitoring Center (IDMC). Statistical accounting of environmental migrants in the broad sense of the term is very difficult for a number of reasons. First of all, there is no single definition of environmental migrants for statistical purposes in international practice. Moreover, it the case of irregular, voluntary displacements, information about their causes can only be collected if the migrants themselves report them to registration agencies. But if people change their place of residence because they can no longer engage in their usual economic activities in view of environmental changes, they will probably cite job seeking as the reason for migration instead of environmental factors.

Thus, existing empirical data are very scarce and do not allow us to present an exhaustive picture of environmental migration flows, which is why in our study we mainly relied on indirect data and aimed to outline the general trends in migration processes induced by climate change and environmental degradation. Central Asia is an extremely vulnerable region in this respect because, owing to its specific natural and geographical conditions, it is highly exposed to the negative consequences of environmental deterioration and has a low capacity to adapt to them owing to socio-economic development problems in most countries of the region.

Environmental and Climate Changes in the Central Asian Countries and Their Impact on Migration Flows

Most of the territory of all Central Asian countries is covered by desert and semi-desert plains, highlands, and plateaus. Climate varies from dry continental (Kazakhstan, Kyrgyzstan, Uzbekistan, and Tajikistan) to subtropical and semi-desert (southern Tajikistan and Turkmenistan). The difference

[7] G.F. Renaud *et al*., "A Decision Framework for Environmentally Induced Migration," *International Migration*, Vol. 49, 2011, pp. 5-29.

between the mean temperatures of January (from –10 °C to –25 °C) and July (from 20°C to 25°C) is very significant. The region's flora and fauna are poor in species composition. Such ecosystems in themselves are just as functional as any other, but their objective specific features make them more vulnerable to climate change and anthropogenic impacts. An active fight against desertification in the Central Asian republics was carried on in the U.S.S.R. from the mid-20th century.[8]

Today, anthropogenic pressure on the natural environment has multiplied because of a steady increase in the size of the population, while global climate change caused by rising global temperatures has already had a noticeable effect on people's daily life. For example, annual mean temperature in Central Asia in the past 30 years has been rising at an average rate of 0.5°C per decade.[9] At the same time, the total population of the five CA countries has doubled or tripled in the past 50 years and continues to grow, which leads to an increase in anthropogenic pressure on the environment.

Central Asia's specific natural and climatic conditions leave an imprint on the socio-economic development of the CA countries, creating a number of specific risks. For example, according to the World Bank, average population density in these countries is 39.0 people per sq. km of land area,[10] which is about two-thirds of the world average. However, the population of CA countries is distributed most unevenly across their territory, since vast areas are virtually uninhabited and are unfit for human habitation (high mountains, gorges, and deserts). In the first place, such population density patterns make densely populated areas particularly vulnerable to natural and man-made disasters and significantly limit the choice of areas suitable for the settlement of potential migrants obliged to leave their permanent place of residence because of adverse climatic or anthropogenic events.

In *Kazakhstan*, 21% of the total population is concentrated in three large cities: Nur-Sultan, Almaty, and Shymkent, with population densities of 1,353.1, 2,715.5 and 867.7 people per sq. km, respectively.[11] There is a similar situation in most other Central Asian republics. In Dushanbe, the capital of *Tajikistan*, population density is as high as 8,314 people per sq. km, while in the Gorno-Badakhshan Autonomous Region it is 3.5 people per sq. km.[12] In *Uzbekistan*, 7% of the population lives in the city of Tashkent, with a density of 7,380 people per sq. km. At the same time, densities in the country's provinces (regions) do not exceed 700 people per sq. km, while the figure for Navoiy Region is only 8.6 people per sq. km.[13] In *Kyrgyzstan*, the situation is somewhat better. Although 16% of the population lives in its capital, Bishkek, population densities are also significant in the Chuy and Osh regions: 47 and 46 people per sq. km, respectively. The only sparsely populated region in the country is Naryn Region, with a density of 6 people per sq. km.[14] As for *Turkmenistan*, there are no publicly available exact data on the territorial distribution of the population. The most densely populated provinces are the Dashoguz Welayat (with more than 19 people per sq. km) and the Mary Welayat (about 17.5 people per sq. km), while the lowest density is in the Balkan Welayat (about 4 people per sq. km).[15]

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[8] I.S. Zonn, V.N. Nikolayev, N.S. Orlovsky, I.P. Svintsov, *Opyt borby s opustynivaniem v SSSR*, ed. by A.G. Babayev, Corresponding Member of the U.S.S.R. Academy of Sciences, Nauka Publishers, Moscow, 1981, 115 pp.

[9] Calculated using data from [https://climateknowledgeportal.worldbank.org/].

[10] Calculated using World Bank Open Data, available at [https://data.worldbank.org/], 4 December, 2019.

[11] *Demograficheski yezhegodnik Kazakhstana 2019,* Statistical Yearbook, available at [www.stat.gov.kz], 10 December, 2019.

[12] *Demograficheski yezhegodnik Respubliki Tadzhikistan 2018*, Agency on Statistics under the President of the Republic of Tajikistan, available at [http://stat.ww.tj/publications/June2019/demographic-yearbook-2018.pdf], 10 December, 2019.

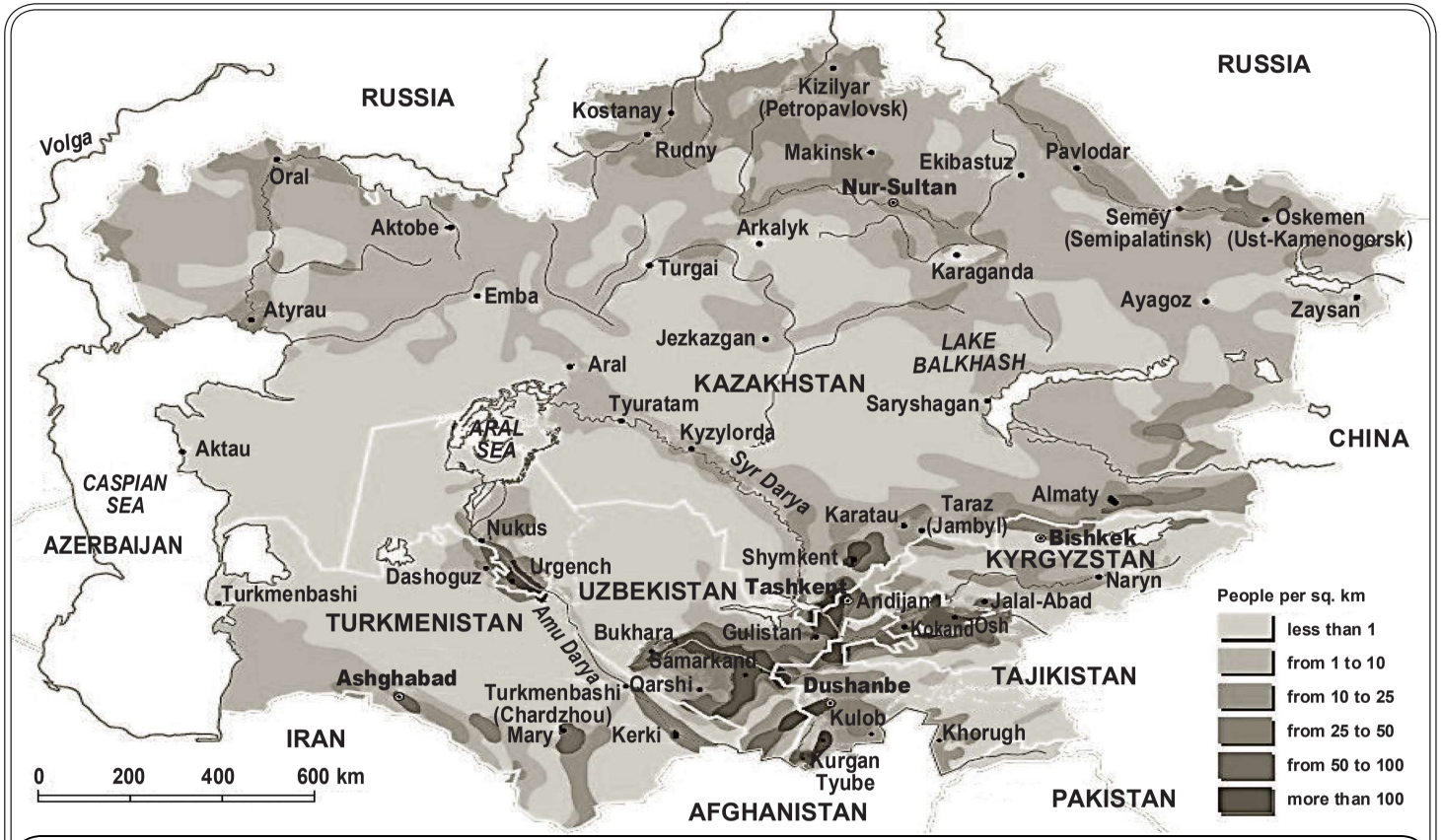
[13] *Statistika yestestvennogo dvizheniia naseleniia*, State Committee of the Republic of Uzbekistan on Statistics, available at [https://stat.uz/ru/164-ofytsyalnaia-statystyka-ru/6569-demografiya2], 10 December, 2019.

[14] *Demograficheski yezhegodnik Kyrgyzskoi Respubliki 2014-2018*, available in Russian at [http://www.stat.kg/ru/publications/demograficheskij-ezhegodnik-kyrgyzskoj-respubliki/], 10 December, 2019.

[15] Official website of the Academy of Sciences of Turkmenistan, available at [https://science.gov.tm/turkmenistan], 10 December, 2019.

Figure 1

Population Density in the Central Asian Countries



Source: Yu. Solozobov, M. Shibutov, "Konflikty i riski v Srednei Azii: novyi vzgliad 2016," available at [https://regnum.ru/news/polit/2132817.html], 10 December, 2019.

In such conditions, the relationship between human migration and the environmental situation is reversed: a concentration of people in areas least exposed to natural disasters and less affected by environmental degradation regardless of their ecological capacity leads to ineffective environmental management, excessive anthropogenic pressure, and ultimately to deterioration of living conditions in these areas.

Adverse environmental changes have a greater impact on working and living conditions in rural areas compared to urban ones, which is why migration of rural dwellers will increase faster with environmental degradation and climate change. Overall, the Central Asian countries have a relatively low (below the world average) level of urbanization. In Tajikistan, the percentages of the population living in rural areas (72.9%) and those employed in agriculture (50.8%) are particularly large. In Kyrgyzstan, more than half of the population (63.7%) also lives in rural areas, but employment in the agricultural sector is relatively low (26.3%). In Turkmenistan and Uzbekistan, about half of the population (48.4% and 49.5%, respectively) lives in rural areas, and the figure for Kazakhstan is 42.6%, with only 14.9% of the population actually engaged in crop and livestock production.[16]

Climate change and resulting natural disasters pose a particular threat to agricultural areas, because they not only compel people to leave their habitual place of residence, but often make it necessary for them to abandon their normal economic activities. For example, droughts and floods, desertification and soil degradation eventually make it impossible to cultivate crops in some areas. In the case of the Central Asian countries, global warming only exacerbates these processes, which were already underway in the region owing to its specific natural features.

Thus, a decline in agricultural productivity threatens the livelihoods of a significant part of the population of Central Asia. High-risk zones in this respect include the northern part of Kazakhstan (the main grain-producing area) and the Ferghana Valley (the most fertile lands in the region). A decline in agricultural productivity in these areas will threaten food security in Central Asia. The situation is compounded by the narrow range of crops in the CA countries. Tajikistan, for example, has traditionally been a cotton-growing area. This system emerged in the Soviet period, but in the event of a crisis it will be unstable without the distribution system that was supported by the centrally planned economy of the U.S.S.R.

Another serious risk for the population is water scarcity, which will increase as annual mean temperatures rise. According to the forecasts of the Intergovernmental Panel on Climate Change (IPCC),[17] Central Asia will see continued melting of mountain glaciers that feed the region's major rivers, Amu Darya and Syr Darya, as well as numerous small rivers, accounting for up to 70% of their flow in dry periods. For example, the Fedchenko Glacier, a major glacier in the Pamir Mountains, is retreating at a rate of 16-20 meters a year, and this, according to some estimates, could reduce the Amu Darya flow by 40% in the near future.[18]

The shortage of fresh water is in itself a driver of migration. In addition, it has a harmful effect on the productivity of irrigated lands and pastures, which may trigger a massive food crisis. Ultimately it may cause ethnic and even interstate conflicts and armed clashes, when people will be obliged to move in order to escape the violence. Such events have already taken place in Central Asia. For example, there were serious clashes over water distribution between Tajiks and Kyrgyz in the villages of Vorukh-Tangi (1982), in Match Aktatyr (1988), and in the Batken District (1998).[19]

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[16] World Bank Open Data, available at [https://data.worldbank.org/], 4 December, 2019.

[17] IPCC Fifth Assessment Report, *Climate Change: The Physical Science Basis*, available at [https://www.ipcc.ch/report/ar5/wg1/], 12 February, 2020.

[18] *Reaching Tipping Point? Climate Change and Poverty in Tajikistan*, p. 7.

[19] A.G. Bolshakov, "The Foreign Policy of Kirghizstan in the Context of Conflicts' Change in the Post-Soviet States," *Russia and the Muslim World. Science-Information Bulletin*, INION RAN, Center of Scientific Information Studies in Humanities, Moscow, No. 6, 2011, pp. 58-71.

Apart from that, reductions and sharp increases in river flow, which become more frequent as mountain glaciers melt and the number of droughts and floods increases, pose a serious threat to the energy security of countries that depend on hydropower resources. Hydropower accounts for more than 98% of total power generation in Tajikistan and 85% in Kyrgyzstan. If hydropower plants stop supplying electricity, people in these countries will be forced to cut down forests, and this will lead to further environmental degradation. The seriousness of these threats is illustrated by the crisis that occurred in Tajikistan in 2007 and 2008, when there was a long drought in the summer followed by the coldest winter in decades. The exceptionally cold weather destroyed agricultural crops and livestock; energy systems failed; the total damage to the economy was close to $850 million; about 2.2 million citizens were short of food; electricity in the cities was supplied for only a few hours a day, while some rural areas were without electricity for weeks.[20] There are no data on the number of people who decided to change their place of residence under the impact of these factors, but it is obvious that compound socio-economic crises always increase migration flows from the affected areas.

Another serious complex problem in the region is the catastrophe of the Aral and Caspian seas. Their rapid shrinking has sharply reduced species diversity, dealing a serious blow to fisheries, and has led to desertification and salinization of soils. According to U.N. data, particularly severe droughts in the Aral Sea area in the early 1990s and then in the early 2000s led to the migration of thousands of people, some of whom have never returned to their previous place of residence.[21] Former ports and health resorts are disappearing. For example, the settlement of Qozoqdaryo in northwest Uzbekistan shrank from 14 thousand to 4 thousand people from 1975 to 2005.[22] In 1994-1995, about 20 thousand people annually left the Aral Kzyl-Orda (now Kyzylorda) Region of Kazakhstan, with about half of them going to other countries.[23] In recent years, grant assistance to people living around the Aral Sea has been provided not only by the local authorities, but also by international organizations and distant countries. In 2018, the United Nations established a Multi-Partner Human Security Trust Fund[24] for the Aral Sea Region, and contributions have already been made by the European Union ($5.57 million) and Norway ($1.12 million)[25]; a contribution of $3.2 million is expected from Japan.[26]

People living in mountain areas are also under threat, since climate change increases the risk of avalanches and mudflows. In Soviet times, many of them were forcibly resettled from the mountains to the lowlands as a source of labor for the development of agriculture, but after the breakup of the U.S.S.R. and the attainment of independence by the Central Asian republics they began to return to their native lands.[27] At present, the government of Tajikistan provides assistance to the inhabitants of

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[20] *Reaching Tipping Point? Climate Change and Poverty in Tajikistan*, p. 9.

[21] *Appraisal Reports on Priority Ecological Problems in Central Asia. United Nations Environment Programme for Asia and the Pacific, and Interstate Commission on Sustainable Development*, 2006, available at [http://cawater-info.net/library/eng/icsd2-en.pdf], 20 February 2020.

[22] "Ubitoye more," RBC Newspaper website, available at [https://www.rbc.ru/society/25/10/2012/5703fe819a7947fcbd441c88], 20 February, 2020.

[23] N.F. Glazovsky, N.V. Kudinova, L.Yu. Odinokova, V.N. Streletsky, A.S. Shestakov, *Migratsii naseleniia v stranakh SNG, sviazannye s opustynivaniem i zasukhoi,* Moscow, 2000, pp. 83-84.

[24] "UN Launches New Fund to Advance Sustainable Development in Aral Sea Region," UN News, 27 November, 2018, available at [https://news.un.org/en/story/2018/11/1026701], 25 February, 2020.

[25] "UN MPTF Human Security Trust Fund for the Aral Sea Region in Uzbekistan," Trust Fund Factsheet, MPTF UNDP, available at [http://mptf.undp.org/factsheet/fund/ARL00], 25 February, 2020.

[26] "Yaponiia vydelit $3.2 mln na pomoshch zhiteliam Priaralia," REGNUM News Agency website, available at [https://regnum.ru/news/2813691.html], 25 February, 2020.

[27] *Sustainable Mountain Development. From Rio 1992 to 2012 and Beyond. Central Asia Mountains*, ed. by. G. Hughes, University of Central Asia, Zoï Environment Network, Mountain Partnership, GRID-Arendal, 2012, available at [https://www.ucentralasia.org/Content/Downloads/web-CAF-Central-Asia-Mountains.pdf], 18 February, 2020.

the most threatened areas, allocating funds for their resettlement to safer areas as "environmental migrants."[28]

Radioactive contamination remains a serious problem for areas in eastern Kazakhstan around the Semipalatinsk Test Site, where numerous nuclear tests were conducted starting from 1949. In 1991, the site was closed entirely by decree of the President of the Kazakh S.S.R.; the adjacent areas were declared to be an environmental disaster zone, and a program was launched to clean up and restore these areas. Since then, a total of 1.3 million people have been officially recognized as victims of radioactive contamination.[29] The exact number of migrants who have left the areas around the test site for fear of radiation is unknown because of the classified nature of the information on its work.

Environmental Migration as a Strategy for Adapting to Environmental Change and as a New Threat to National Security

Thus, the environmental situation in Central Asia carries numerous risks for the population and the economy of the CA countries, while their adaptive capacity to counter these risks is quite low. In terms of vulnerability to climate change, according to an index compiled by the World Bank (see Fig. 2 on p. 153), Tajikistan ranks first, Kyrgyzstan third, Uzbekistan sixth, and Turkmenistan seventh among all Eastern European and Central Asian countries. Although their actual exposure to the impacts of climate change is not very high (significantly lower, for example, than Russia's), their socio-economic systems and infrastructures are very sensitive to such impacts. Moreover, all these countries have lower adaptive capacity to the negative effects of climate change because of their low economic development level and living standards, as well as social instability, potential for conflict, and poorly organized work of the complex of measures and specialized agencies designed to combat natural disasters and eliminate their consequences.

World Bank statistics on the number of people affected by natural disasters caused by climate change in the Central Asian countries for 1990-2018 confirm that Tajikistan and Kyrgyzstan are indeed the most affected countries in this respect. Most of the damage is caused by floods, droughts, and extreme (extremely high or extremely low) temperatures (see Table 1).

Table 1

Number of People Affected by Natural Disasters (Climatological, Hydrological, and Meteorological) in the Central Asian Countries in 1990-2017

Year	People Affected	Disaster Type	Country
1990	280	Flood	Tajikistan
1992	63,500	Flood	Tajikistan

[28] Law of the Republic of Tajikistan on Migration, available in Russian at [http://tajmigration.ru/zakon-respubliki-tadzhikistan-o-migracii.html], 18 February, 2020.

[29] "Medvedev zaveril, chto Semipalatinski iadernyi poligon bolee ne opasen," RIA Novosti news agency website, available at [https://ria.ru/20180829/1527283626.html], 25 February, 2020.

Table 1 (continued)

Year	People Affected	Disaster Type	Country
1993	30,420	Flood	Kazakhstan, Turkmenistan
	75,357	Landslide	Tajikistan
1994	6,051	Flood	Tajikistan
	58,500	Landslide	Kyrgyzstan
1996	180,000	Flood	Tajikistan
1997	600,000	Extreme temperature	Kazakhstan
	8,000	Fire	Kazakhstan
1998	49,618	Flood	Kyrgyzstan, Tajikistan
1999	9,392	Flood	Tajikistan
	1,500	Storm	Tajikistan
2000	2,500	Flood	Kazakhstan
	3,600,000	Drought	Tajikistan, Uzbekistan
2001	5,858	Flood	Kazakhstan, Tajikistan
	12	Extreme temperature	Kazakhstan
	165	Landslide	Tajikistan
	830	Storm	Tajikistan
2002	4,251	Flood	Tajikistan
	1,002	Landslide	Kyrgyzstan
2003	1,755	Flood	Tajikistan
	6,392	Landslide	Kyrgyzstan, Tajikistan
2004	400,000	Flood	Tajikistan
	98	Landslide	Kyrgyzstan
2005	33,662	Flood	Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan
	1,953	Landslide	Tajikistan
2006	13,728	Landslide	Tajikistan
	9,075	Storm	Kyrgyzstan
2007	18,154	Flood	Kyrgyzstan, Tajikistan
2008	13,000	Flood	Kazakhstan
	800,000	Drought	Tajikistan
	2,000,000	Extreme temperature	Tajikistan
2009	15,000	Flood	Tajikistan

Table 1 (continued)

Year	People Affected	Disaster Type	Country
2010	37,822	Flood	Kazakhstan, Tajikistan
	8,350	Landslide	Kyrgyzstan
2011	18,130	Flood	Kazakhstan, Tajikistan
2012	25,956	Flood	Kazakhstan, Kyrgyzstan, Tajikistan
	5,000	Extreme temperature	Kazakhstan
2013	2,500	Extreme temperature	Tajikistan
2014	15,932	Flood	Kazakhstan, Tajikistan
2015	23,472	Flood	Kazakhstan, Tajikistan
2016	12,750	Flood	Tajikistan
2017	7,700	Flood	Kazakhstan, Tajikistan
	55	Landslide	Kyrgyzstan

Source: Compiled using data from: World Bank Climate Change Knowledge Portal [https://climateknowledgeportal.worldbank.org/], 1 March, 2020.

In such conditions, migration becomes one of the main strategies for adapting to adverse climate changes and the resulting decline in living standards. Recent studies by the U.N. Human Rights Council show that climate change exacerbates existing poverty and inequality both between and within countries.[30] At the same time, low living standards reduce people's capacity to adapt to changing environmental conditions.[31] Poverty is a traditional problem in most Central Asian countries (except Kazakhstan). According to the latest data, the percentage of the population living on less than $5.5 a day (in 2011 PPP terms) is 96% in Uzbekistan, 93% in Turkmenistan, 66% in Kyrgyzstan, and 54% in Tajikistan.[32] The poverty rate among the rural population is even higher. For many families, temporary labor migration has become one of the main sources of livelihood.[33] In 2018, migrant remittances from abroad amounted to 33.2% of GDP in Kyrgyzstan, 29% in Tajikistan, and 15.1% in Uzbekistan.[34]

In the event of further environmental degradation, which, according to the latest estimates of climatologists, is almost inevitable,[35] migration flows will intensify. In 2008-2018, according to the IDMC, the number of people obliged to leave their homes without crossing international borders (internally displaced persons) because of sudden-onset natural disasters was 46,930 persons in Ka-

[30] Climate Change and Poverty. Report of the Special Rapporteur on Extreme Poverty and Human Rights. United Nations Human Rights Council, 24 June-12 July, 2019, available at [https://www.ohchr.org/Documents/Issues/Poverty/A_HRC_41_39.pdf], 25 February, 2020.

[31] M. Fay, R.I. Block, J. Ebinger, op. cit.

[32] World Bank Open Data, available at [https://data.worldbank.org/], 10 December, 2019.

[33] S.V. Ryazantsev, N. Khoriye, *Modelirovaniie potokov trudovoi migratsii iz stran Tsentralnoi Azii v Rossiiu" ekonomiko-sotsiologicheskoie issledovaniie*, Russian Academy of Sciences, Institute of Socio-Political Research *et al*, Nauchnyi mir, Moscow, 2011, 189 pp.

[34] World Bank Open Data, 10 December, 2019.

[35] IPCC Fifth Assessment Report. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects, available at [https://www.ipcc.ch/report/ar5/wg1/], 2 February, 2020.

Figure 2

Index of Vulnerability to Climate Change for Eastern European and Central Asian Countries

Source: M. Fay, R.I. Block, J. Ebinger, *Adapting to Climate Change in Eastern Europe and Central Asia*, 2010, The International Bank for Reconstruction and Development / The World Bank, p. 21.

zakhstan, 33,020 persons in Tajikistan, and 15,039 persons in Kyrgyzstan.[36] Our research has shown, however, that these data do not fully reflect the actual scale of environmental migration because, in the case of slow negative environmental changes, environmental factors driving migration act in combination with a complex set of socio-economic factors. As a result, they generate much larger migration flows than sudden-onset natural disasters, but statistical accounting of such migrants is extremely difficult, because they themselves often do not see environmental problems as the main reason for their resettlement.[37] This is also confirmed by opinion surveys conducted in Tajikistan by the International Organization for Migration (IOM) in 2011-2012: migration caused by slow environmental degradation (in this case, soil degradation in the Isfara District, Sughd Province) is rarely understood as "environmental migration" either by the local authorities in charge of resettlement or by the migrants themselves.[38] Nevertheless, the scale of such migration could be vast: by 2050, according to World Bank projections, the number of internal climate migrants alone in only three regions of the world—Sub-Saharan Africa, South Asia, and Latin America—could reach 150 million.[39]

As already noted, migration often becomes the only livelihood strategy for the population of affected areas. When it comes to sudden-onset natural disasters, this kind of migration, as a rule, is temporary, but case studies show that some of the migrants leaving their homes never return, especially if natural disasters in this area are a regular occurrence.[40] In the event of gradual environmental degradation, labor migration, on the contrary, keeps people from leaving their place of residence by allowing the families of labor migrants to stay home and to continue working in agriculture despite its declining productivity. Most researchers believe that additional barriers to migration designed to protect the labor markets of neighboring countries (particularly Russia) from an influx of migrants from Central Asia will have an adverse effect on regional security and stability.[41] Other constraints on environmental migration can include extreme poverty of the population, which makes it impossible to save enough money for moving, and in the case of multiethnic countries, the ethnic factor. For example, the population of the Aral Republic of Karakalpakstan (part of Uzbekistan) has continued to grow over the past few decades despite the ongoing disaster of the Aral Sea.[42] On the other hand, excessive migration in itself threatens both the region's socio-economic development and its environmental well-being.[43] Since the environmental situation in most cases acts as an additional push factor for labor migrants, its deterioration will exacerbate all problems associated with labor migration: hyper-urbanization and pseudo-urbanization in the case of internal migration; and a brain drain, a drain of people of working age in general, and dependence on remittances from abroad in the case of international migration. Along with this, excessive migration involving a concentration of people in population centers with a high level of environmental well-being or business activity will compound the specific problems and risks associated with the state of the environment. First of all, a sharp

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[36] Internal Displacement Monitoring Centre Database, available at [https://www.internal-displacement.org/database], 2 March, 2020.

[37] A.S. Lukyanets, S.V. Ryazantsev, A.S. Maksimova, E.M. Moiseeva, R.V. Manshin, "Theoretical, Methodological and Statistical Problems of Studying Environmental Migration," *Amazonia Investiga*, Vol. 8, No. 19, 2019, pp. 227-236.

[38] Environmental Degradation, Migration, Internal Displacement, and Rural Vulnerabilities in Tajikistan, International Organization for Migration, 2012, available at [http://iom.tj/pubs/eco-eng.pdf], 15 December, 2019.

[39] K.K. Rigaud, Alex de Sherbinin, R.R. Jones *et al*. Groundswell: Preparing for Internal Climate Migration, World Bank Group, Washington, D.C., 2018, available at [http://documents.worldbank.org/curated/en/846391522306665751/Main-report], 28 September, 2019.

[40] *Ecological Migration and its Effects on Social Policies in Kyzylorda Province of Kazakhstan*, ed. by V. Nee, A. Tonkobaeva, A. Ilyasova, United Nations Educational, Scientific and Cultural Organization (UNESCO), Central Asia Office, 2013.

[41] V. Novikov, C. Kelly *et al*., op. cit.

[42] *Demograficheski yezhegodnik Kazakhstana* 2019, Statistical Yearbook.

[43] A.S. Lukyanets, S.V. Ryazantsev, "Economic and Socio-Demographic Effects of Global Climate Change," *International Journal of Economics and Financial Issues*, No. 6 (8S), 2016, p. 268-273.

increase in anthropogenic pressure may exceed the natural self-regeneration capacity of the host ecosystem. In addition, densely populated areas are more vulnerable to natural disasters because of inevitable difficulties in evacuating people and providing the necessary medical and material assistance.[44]

In light of the mixed role of migration in the adaptation of countries in the region to environmental and climate change, it is obviously necessary to develop science-based programs that would be consistently implemented at the state level. First of all, it is necessary to identify the areas that are most exposed to the negative consequences of these processes and to assess their vulnerability, followed by a decision on the need for the planned relocation of their inhabitants. Particular attention should be paid to the state of rural areas. An important condition of successful agricultural development in a situation of climate change is the adoption of new technologies for rational environmental management. But poverty and a low level of environmental awareness among rural residents do not allow them to respond appropriately and in good time to soil degradation, water shortages or declining water quality, which is why the state should support agricultural production in areas where its continuation appears to be rational.

Today, the concept of "environmental migrant" is enacted in law in the Republic of Tajikistan[45] and the Kyrgyz Republic,[46] but in both cases it only applies to persons obliged to leave their place of residence because of "environmental disasters" or a "sudden sharp deterioration of the environment." All Central Asian countries have their own ministries that deal with emergencies (in Turkmenistan, this service is subordinate to the Ministry of Defense). All countries have been implementing various projects designed to improve the environmental situation. Kyrgyzstan is the leader in research on protecting mountain ecosystems; Uzbekistan has achieved significant successes in developing solar energy and other "clean development" projects; Kazakhstan is making progress in the use of wind energy; and Turkmenistan is to host an Ashghabad-based Regional Center for Climate Change Technologies for Central Asia under the auspices of the United Nations. However, there are no large-scale environmental migration programs being implemented in the region. Considering the cross-border nature of many natural disasters and adverse environmental changes in Central Asia, international cooperation in this area could help to coordinate the actions and efforts to overcome them. Such joint regional projects to combat water scarcity and improve soil fertility could also help to reduce ethnic tensions in border areas and stabilize the overall situation in the region.

Conclusion

Our general assessment of environmental threats and their impact on migration processes in the Central Asian countries shows that the following areas are particularly vulnerable and carry the greatest risk: densely populated areas, mountain areas, floodplains, border areas, lands around the Aral Sea and the Semipalatinsk Test Site, and the main agricultural areas. Natural disasters such as floods, droughts, and extreme temperatures account for the greatest damage and the largest number of affected people. Organized relocation of people is practiced, as a rule, in the event of major riverine floods, as well as mudflows and landslides in the mountains. But people living in areas exposed to

[44] A.S. Lukyanets, Toan Khanh Nguen, S.V. Ryazantsev, V.S. Tikunov, Hai Hoang Pham, "Influence of Climatic Changes on Population Migration in Vietnam," *Geography and Natural Resources*, Vol. 36, Issue 3, July 2015, pp. 313-317 [DOI: 10.1134/S1875372815030129].

[45] Law of the Republic of Tajikistan "On Migration," available in Russian at [http://tajmigration.ru/zakon-respubliki-tadzhikistan-o-migracii.html], 3 March, 2020.

[46] Law of the Kyrgyz Republic "On Internal Migration" (as amended by KR Law No. 144 of 16 October, 2002), available in Russian at [http://www.demoscope.ru/weekly/knigi/zakon/zakon092.html], 3 March, 2020.

desertification and soil degradation and suffering from water scarcity or heavy water pollution often leave these areas on their own. These are usually migrations of the rural population faced with a decline in agricultural productivity. This tendency, which will increase as the environmental situation worsens, is a serious threat to the Central Asian countries, where the level of urbanization is low and the share of the agricultural sector in the economy is high. It creates risks for food security and increases social tension. The resulting conflicts over water and land distribution could develop into serious ethnic clashes.

For the Central Asian countries, the role of migration in adapting to climate change and environmental problems is ambivalent. On the one hand, it enhances the security of the people leaving affected areas and allows them to improve their living standards by finding new employment opportunities. In the long term, however, migration can only increase environmental vulnerability, leading to an excessive concentration of people in certain cities and in areas where natural disasters are particularly rare. Since environmental factors accelerate labor migration, the drain of skilled and other labor will increase as well.

In light of these problems, we think it is necessary to develop comprehensive national programs and international projects for adapting to climate change and addressing environmental problems with due attention to the regulation of migration flows, that is, their promotion, deterrence or redirection depending on the economic and environmental situation in certain countries and their districts. This task is particularly important for the Central Asian region, which is multiethnic but has common problems and development goals.