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The effects of melting Himalayan glaciers as one of the potential causes of the escalation of the Indo-Pakistani conflict.

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In the South Asian region, which is inhabited by over 1.8 billion people, water is one of the most valuable, but also the most valuable resources. More than 60% of the region's inhabitants use water from river basins fed by Himalayan glaciers[1]. Climate change affects not only the volume of glaciers, but also the rate of their melting, which directly translates into the dynamics of the water situation, and thus indirectly also into relations between India and Pakistan.

According to a study published by Science Advances, from 2000 to 2016, Himalayan glaciers lost an average of 8 billion tons of ice annually[2]. This rate is twice as high as in the second decade of the 80s of the twentieth century. The total mass of glaciers in the Himalayan region has decreased by about 25% since 1975, and if the trend continues, the Himalayas could lose up to 66% of their ice cover by the end of the 21st century[3]. According to the World Meteorological Organization (WMO), in the hydrological year 2024, global glacier mass loss was 450 billion tons, which is the fourth worst result in the history of measurements[4]. Glaciers in South Asia, including the Himalayas, were particularly affected. In addition, new research indicates that so-called black carbon from dust storms in northern Indian regions significantly accelerates the melting of snow and ice in the Himalayas[5]. The so-called albedo effect, i.e. a reduction in the ability of the snow surface to reflect sunlight, leads to faster heating of the ice cover and intensification of its disappearance. In the Indus region, as much as 90% of the river's flow during the summer comes from melting snow and ice, making Pakistan one of the most seasonally dependent countries in the world[6].

Pakistan's dependence on waters from the Himalayas.

Pakistan derives about 80% of its freshwater resources from the Indus River system. In 2024, the availability of water per capita has fallen to around 860 m³ per year, which places the country below the water stress threshold set by the UN at 1700 m³[7]. Projections indicate that without effective water management strategies, this figure could fall to 500 m³ by 2040, which will classify Pakistan as a country affected by extreme water scarcity[8].

Impact of water deficit on agriculture – a detailed analysis of crops and yields.

Pakistan's water deficit has a significant impact on the agricultural sector, particularly with regard to the staple crops that provide the country with food security and export revenues. This problem manifests itself both in reduced yields and in changes in the structure of crops and destabilization of the entire agricultural production system.

[1] FAO. AQUASTAT Database: South Asia Water Resources, 2020. https://www.fao.org/aquastat/en/

[2] Maurer, J. M., et al. "Acceleration of ice loss across the Himalayas over the past 40 years." Science Advances, 2019, 5(6): eaav7266. https://www.science.org/doi/10.1126/sciadv.aav7266

[3] IPCC. Special Report on the Ocean and Cryosphere in a Changing Climate, 2019. https://www.ipcc.ch/srocc/

[4] World Meteorological Organization (WMO), Glacier Melt Will Unleash Avalanche of Cascading Impacts, 2025, https://wmo.int/news/media-centre/glacier-melt-will-unleash-avalanche-of-cascading-impacts

[5] Chandel, A. S., Rittger, K., Black Carbon from Dust Storms Accelerates Himalayan Glacier Melt, 2025, https://phys.org/news/2025-02-black-carbon-storms-himalayan-glacier.html

[6] Immerzeel, W. W., et al. "Hydrological response to climate change in a glacierized catchment in the Himalayas." Climatic Change, 2009. https://link.springer.com/article/10.1007/s10584-011-0143-4

[7] Modern Diplomacy, Projected Water Security of Pakistan, 2024, https://moderndiplomacy.eu/2024/08/07/projected-water-security-of-pakistan/

[8] The News International, A very dry future, 2025, https://www.thenews.com.pk/magazine/money-matters/1292395-a-very-dry-future

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Wheat

Wheat remains the most important crop in Pakistan. In the 2024/2025 season, the wheat cultivation area amounted to 9.734 thousand hectares, and production reached a record 31.583 thousand tons, which is an increase of 20% compared to the average of the last five years. The average yield was 3.24 t/ha, which is also the highest result in the analysed period[9].

Rice

Rice, Pakistan's second most important agricultural product, recorded a cultivated area of 3,800 thousand hectares in the 2024/2025 season. The production of paddy rice was 15,002 thousand tons, and husked rice was 10,000 thousand tons, which means an increase of 19% compared to the average of the last five years[10].

Cotton

Cotton, a key raw material for Pakistan's textile industry, experienced a decline in production in the 2024/2025 season. The cultivated area was 2 million hectares and production was revised downwards to 5.2 million bales, a significant decrease compared to previous years[11].

Systemic losses and soil degradation

In addition to water shortage, losses due to inefficient irrigation infrastructure are a big problem. It is estimated that more than 60% of irrigation water is lost due to leaking channels and inefficient irrigation methods[12]. In addition, soil salinity poses a serious threat to agriculture. In Pakistan, about 6.67 million hectares, or 30% of agricultural land, are affected by salinity and sodality, leading to reduced crop yields and soil degradation[13].

Hydropower.

In addition to being crucial for agriculture and drinking water supply, the Indus River Basin forms the backbone of Pakistan's hydropower. In 2024, Pakistan's installed hydropower capacity was 11,519 MW, which accounted for about 23% of the country's total installed capacity[14]. Major hydrotechnical facilities such as the Tarbela and Mangla dams operate on the flow of water from the melting glaciers of the Himalayas and the Hindu Kush. Their operational efficiency is strictly dependent on seasonal snow supply, which is destabilised by climate change. A report by the Central Water Commission (2023) found that delayed and less predictable meltwater peaks affect not only the stability of energy production but also the safety of infrastructure, increasing the risk of flash floods and dam breaks[15]. In addition, dwindling water resources are forcing the Pakistani government to plan costly investments in retention infrastructure and search for alternative energy sources. Because of this strong dependence on the waters of the Himalayas, any Indian actions restricting the flow of water or building dams in disputed regions (e.g. Kishanganga) are perceived by Islamabad as a threat not only to agriculture, but also to the country's energy security[16].

India's Water Resources and Their Use.

India, as a source state in the Indus system, has considerable flexibility in managing water resources. According to the Central Water Commission (CWC), in 2023, there were 6,138 completed large dams in India and 143 under construction[17]. Many of these structures are located in the northern and western states of the country,

[9] Pakistan Wheat Area, Yield and Production, USDA Foreign Agricultural Service, 2024. Dostępne online: https://ipad.fas.usda.gov/countrysummary/Default.aspx?crop=Wheat&id=PK

[10] Pakistan Rice Area, Yield and Production, USDA Foreign Agricultural Service, 2024. Dostępne online: https://ipad.fas.usda.gov/countrysummary/Default.aspx?crop=Rice&id=PK

[11] Pakistan: Cotton and Products Update, USDA Foreign Agricultural Service, 2024. Dostępne online: https://www.fas.usda.gov/data/pakistan-cotton-and-products-update-19

[12] Water Management, Pakistan Council of Research in Water Resources. Dostępne online: https://www.pcrwr.gov.pk/water-management/

[13] Pakistan loses 30% of agricultural land to soil salinity, FAO report finds, Pakistan Today, 2024. Dostępne online: https://profit.pakistantoday.com.pk/2024/12/23/pakistan-loses-30-of-agricultural-land-to-soil-salinity-fao-report-finds/

[14] The News International, The rise of hydropower in Pakistan's grid game, 2024, dostępne online: https://www.thenews.com.pk/magazine/money-matters/1288023-the-rise-of-hydropower-in-pakistans-grid-game

[15] Central Water Commission (CWC), India, Water and Related Statistics, 2023, https://cwc.gov.in/

[16] Wirsing, R. G. "Kishanganga and the Indus Waters Treaty: Strategic and Water Security Implications for South Asia." Strategic Analysis, 2011, 35(4), 613–617.

[17] Central Water Commission, National Register of Large (Specified) Dams – 2023, https://www.indiaenvironmentportal.org.in/content/476240/national-register-of-large-specified-dams-2023/

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including Jammu and Kashmir, which is of strategic importance for controlling the flow of water in the region.

Hydropower

Among the key hydrotechnical developments on the Indus tributaries are projects such as Kishanganga and Ratle. The Kishanganga project, with an installed capacity of 330 MW, was launched in May 2018 and involves diverting the waters of the Kishanganga River (Neelum) to a hydroelectric power plant in the Jhelum Valley through a 23-kilometer tunnel[18]. The Ratle project, with a planned capacity of 850 MW, is being implemented on the Chenab River in Kishtwar District. In January 2024, a key construction milestone was reached by diverting the Chenab River, allowing work on the main dam to begin[19]. These investments are perceived by Pakistan as a potential disruption of the hydrological balance and a threat to national security. Islamabad fears that India's actions could affect water availability in the lower Indus River, which is crucial for agriculture, drinking water supply and energy production in Pakistan[20].

Agriculture.

Changes in water availability due to the melting of Himalayan glaciers affect different types of crops in India. Regions dependent on gravity irrigation from river systems originating in the Himalayas are particularly affected by the irregularity of water inflow.

Wheat

Wheat is a staple of the Indian diet and the main winter crop. Irrigation during the rabi season (November–April) is largely dependent on melting glaciers and Himalayan snows. A decrease in glacier volume shortens the period of water supply, leading to a shortage in a key phase of cereal growth, resulting in reduced yields by up to 15-20% in some northern states[21].

Rice

Although rice is largely grown during the monsoon season, intensive irrigation is commonly used in the northern states (Punjab, Haryana) even in summer. Lowering the level of river water forces farmers to overdraw groundwater, which leads to its depletion and secondary problems of soil salinity[22].

Sugar cane

It is a perennial plant with very high water requirements. The reduction in river flow results in pressure on irrigation systems, as well as a forced reduction in the acreage of crops. In regions such as Uttar Pradesh, it has been observed that cane yields have decreased by 10–12% during seasons with less water available from river channels[23].

Vegetables and legumes

Smallholder crops, especially vegetables and legumes (e.g. lentils, mung beans), are the most sensitive to water supply interruptions. Because they do not have access to deep wells or modern irrigation technologies, the unpredictability of irrigation increases the risk of total crop loss[24].

Consequences for food security and hunger

The reduction in the yield of wheat and rice – the main components of the Indian diet – directly affects the increase in food prices on the domestic market. Data from 2023 and 2024 show that in drought-affected regions, rice prices increased by an average of 18% and wheat prices by 14% on an annual basis[25].

Risk of starvation and malnutrition

In India, more than 40% of the population is engaged in agricultural activities. The occurrence of crop failures in two consecutive seasons of cultivation may result in food shortages and an increase in the number of people at risk of famine. The Global Hunger Index 2024 ranks India 111th out of 125

[18] NHPC India, Kishanganga Hydroelectric Project, https://www.nhpcindia.com/welcome/language/en/project_detail/38/2/

[19] Press Information Bureau, Government of India, Successful diversion of Chenab River achieved at Ratle Hydro Electric Project, 27.01.2024, https://pib.gov.in/PressReleasePage.aspx?PRID=2000309

[20] Wirsing, R. G. "Kishanganga and the Indus Waters Treaty: Strategic and Water Security Implications for South Asia." Strategic Analysis, 2011, 35(4), s. 613–617.

[21] Ministry of Agriculture & Farmers Welfare, Rabi Crop Output Projections (2023). https://agricoop.nic.in/, str. 34–36.

[22] Central Ground Water Board, Annual Report on Groundwater Depletion in Northern India (2024). https://cgwb.gov.in/, str. 50–52.

[23] Indian Sugar Mills Association, Cane Yield Trends and Water Availability (2024). https://www.indiansugarmills.com/, str. 12–14.

[24] International Food Policy Research Institute, Vulnerability of Smallholder Farmers to Irrigation Shocks (2023). https://www.ifpri.org/publication/vulnerability-smallholder-farmers, str. 21–23.

[25] Reserve Bank of India, Quarterly Inflation Reports (Q2 2024). Dostęp: https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx, str. 10–11.

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countries – with a growing number of children suffering from malnutrition[26].

Threat to local farming communities

Lower yields mean lower incomes for farmers, especially in regions such as Bihar, Jharkhand and Uttar Pradesh, where a significant proportion of the rural population lives below the poverty line. Migration from rural to urban areas increases the pressure on already overstretched urban infrastructure, while at the same time leading to the disintegration of rural communities and the loss of traditional water management systems. Climate change and increasing variability in river flows are creating new challenges for agriculture. Seasonal delays in snow melting or excessive flows during the monsoon can result in both water shortages during periods of plant growth and floods that destroy crops. Therefore, India's water policy is increasingly focused on improving irrigation efficiency, building micro-dams, and promoting water-saving practices in agriculture.[27]

Distribution of the Indus water resources between India and Pakistan and surveilla.nce mechanisms.

The Indus Waters Treaty (IWT), signed in 1960 under the auspices of the World Bank, regulates the detailed distribution of water resources of the Indus River system between India and Pakistan. According to the treaty, the water resources of the Indus were divided into two zones:

Eastern Rivers – India has the right to take full advantage of the three eastern rivers: Sutlej, Beas, and Ravi. These rivers flow through northwestern India, feeding the areas of Punjab, Haryana and Rajasthan, m.in others. India can use the water of these rivers for irrigation and electricity production, but the treaty imposes restrictions on their use so as not to significantly alter flows towards Pakistan. For example, India cannot build any large dams on these rivers without consulting Pakistan. Instead, India can only use water for irrigation, as well as build smaller hydroelectric power plants that will not affect flows in Pakistan[28].

Western Rivers – Pakistan has exclusive rights to three western rivers: the Indus, the Jhelum and the Chenab. These rivers flow through Pakistani territory, and their water is crucial for providing drinking water, irrigating agriculture, and generating electricity in Pakistan. Pakistan has every right to use these rivers to the extent that it does not alter the natural flow of water. India is committed to ensuring that its hydrotechnical investments on these rivers, such as dams or power plants, do not have a negative impact on flows in Pakistan[29].

Mechanisms for supervision and execution of the division

In order to supervise the implementation of the provisions of the treaty, a special Standing Indus Commission was established, which consists of two members – one from each country. The Commission's task is to monitor compliance with the terms of the treaty, to solve problems related to the division of waters and to organise regular meetings between the parties. Indus Standing Commission – Responsible for interpreting the treaty and its provisions. Its main task is to monitor the use of water and intervene in the event of violations of the treaty. The Commission operates on the basis of strict rules that require the agreement of both sides for the implementation of large hydrotechnical projects on rivers that affect both countries, such as the construction of dams or hydroelectric power plants[30]. Arbitration mechanisms – The Treaty also provides for the possibility of resolving disputes by arbitration. In the event of disagreements that cannot be resolved by the Commission, the parties may refer to a special International Court of Arbitration. For example, in 2010, there was a dispute between India and Pakistan over the Kishanganga Dam, which was resolved after a complaint was filed with the International Court of Arbitration[31]. Consultations between countries – The Treaty also provides that parties are required to consult when planning projects that may affect the flow of water between countries. If one of the countries intends to undertake a hydrotechnical project, e.g. the construction of a dam, which may affect the flow of the river, it must inform the other

[26] Global Hunger Index, India Country Profile (2024). Dostęp: https://www.globalhungerindex.org/, str. 10–12.

[27] NITI Aayog, Composite Water Management Index, 2022, s. 10–15.

[28] Indus Waters Treaty (IWT), 1960, dostępne online: https://en.wikipedia.org/wiki/Indus_Waters_Treaty

[29] World Bank, The Indus Waters Treaty: A Legal Framework for International Water Disputes, 2022, s. 7, dostępne online: https://www.worldbank.org

[30] International Water Management Institute (IWMI), Water Management in the Indus Basin: Ensuring Water for All, 2015, s. 3, dostępne online: https://www.iwmi.cgiar.org

[31] South Asian Voices, India, Pakistan, and the Kishanganga Dispute: Implications for the Indus Waters Treaty, 2011, s. 5, dostępne online: https://southasianvoices.org

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country and conduct appropriate consultations[32].
Limitations and challenges
Despite the existence of these mechanisms, the Treaty is not free from restrictions. Contemporary challenges such as climate change, accelerated melting of glaciers, growing demand for water and the development of hydrotechnical technologies pose new problems to the treaty. In addition, long-standing disputes related to hydrotechnical projects, such as the Kishanganga and Ratle dams, point to the need for greater flexibility in adapting the treaty to changing hydrological realities[33].

The water crisis and the potential for escalation of the Indo-Pakistani conflict.

Research by the Stockholm International Peace Research Institute (SIPRI) indicates that countries with limited water resources where political tensions exist have an increased risk of hydropolitical conflict. The South Asian region, and especially the Indus basin, is particularly vulnerable to such threats. According to SIPRI reports, in the context of decreasing water availability, tensions between countries are rising, which may lead to the escalation of international disputes over shared water resources, such as water from the Indus Rivers, which are shared by India and Pakistan[34]. Pakistan is among the ten countries most at risk of water scarcity by 2040. Projections indicate that per capita water availability in Pakistan could drop to about 500 m³ per year by 2040, which will classify the country as affected by extreme water scarcity, according to UN data and reports from the International Monetary Fund. This phenomenon will have serious consequences for the quality of life of the population and for the social and economic stability of the country[35]. The reduction in the availability of water resources is also linked to the growing risk of water conflicts between India and Pakistan, which are already having serious consequences in the region[36]. India and Pakistan have held more than 118 meetings within the Indus Standing Commission since 1960, which is a formal mechanism for resolving disputes over the division of the waters of the Indus River system. Despite this, the number of technical disputes and arbitrations has increased significantly in the last decade, m.in. in cases involving dam and hydropower projects such as Kishanganga in 2010, Ratle in 2013 and Chenab in 2016. These projects were seen by Pakistan as a violation of the Indus Treaty, which regulates the sharing of water resources between the two countries[37]. In 2023, Pakistan again filed a complaint with the Permanent Court of Arbitration (PCA) in The Hague, demanding a revision of the Ratle project. The project involves the construction of a dam on the Chenab River, which Pakistan considers a threat to its water resources and access to drinking water. The controversy surrounding this project has sparked international attention and highlights the ongoing tensions between the two countries over water management issues[38]. In response to these requests, in January 2025, the Neutral Expert issued a decision on competence on the Ratle project, confirming the Court's ability to resolve technical disputes related to hydrotechnical projects under the Indus Treaty. This decision was crucial because it confirmed that disputes over hydropower technology can be resolved within the framework of an existing international agreement that aims to avoid escalation of conflicts[39]. At the same time, in 2024, Pakistan, due to a severe water crisis and a growing number of climate refugees, appealed to the international community for greater support in the field of water management and hydrotechnical infrastructure. Increasing investment in water management and the creation of new infrastructure projects has been identified as crucial for the continued stability of the region[40].

[32] International Centre for Integrated Mountain Development (ICIMOD), The Indus Waters Treaty: A Critical Analysis of the Past and Present, 2020, s. 6, dostępne online: https://lib.icimod.org
[33] Ali, S., Li, D., Congbin, F., & Khan, F., Twenty First Century Climatic and Hydrological Changes over Upper Indus Basin of Himalayan Region of Pakistan, 2015, s. 2, dostępne online: https://lib.icimod.org
[34] SIPRI, Water Security and Conflict, 2022, s. 12–14, https://www.sipri.org/research/water-security
[35] World Bank, Pakistan's Water Crisis: A Looming Catastrophe, 2024, https://www.worldbank.org/en/country/pakistan
[36] UNDP, Human Development Report 2021, s. 43, https://hdr.undp.org/en/indicators/
[37] Wirsing, R.G., "Kishanganga and the Indus Waters Treaty: Strategic and Water Security Implications for South Asia." Strategic Analysis, 2011, 35(4), s. 613–617.
[38] PCA, Indus Waters Treaty Arbitration: Pakistan vs. India, 2023, https://pca-cpa.org/en/cases/
[39] Permanent Court of Arbitration, Neutral Expert's Decision on Ratle Hydroelectric Project, 2025, https://pca-cpa.org/en/news/pca-press-release-pca-case-no-2023-14-neutral-expert-issues-decision/
[40] Pakistan Ministry of Water Resources, Annual Water Resource Management Report, 2024, https://www.waterresources.gov.pk

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Climate refugees in Pakistan – the scale and effects of the phenomenon.

In Pakistan, the problem of climate refugees has taken on a systemic dimension, encompassing both internal displacement and cross-border migration. This phenomenon is increasingly affecting the social structure, urbanization and the public welfare system.

Scale of internal migration

According to data from the International Organization for Migration (IOM), in 2022 alone, about 3.9 million people in Pakistan were internally displaced as a result of climate change-related impacts, mainly in the provinces of Sindh, Punjab, and Balochistan[41]. UNHCR estimates show that by the end of 2023, this number had risen to over 4.4 million, and this number is steadily increasing every year[42]. Most of Pakistan's climate refugees are moving to cities – mainly Karachi, Lahore and Islamabad – where they try to find shelter, access to work and basic social services. Displaced communities very often end up in informal urban settlements, where they live without access to clean water, sewerage or health care. Data from a 2023 report by the Human Rights Commission of Pakistan shows that more than 60% of IDPs live below the poverty line, and close to 1/3 of children in these communities are out of school[43].

International migration

Pakistan is also the country of origin of climate refugees in the international context. According to the Global Internal Displacement Database, by the end of 2023, about 800,000 people had left Pakistan due to the difficulties of life caused by climate change, heading mainly to the Gulf countries, Malaysia, Iran and Turkey[44]. Most often these are people from rural areas who previously made a living from agriculture and are now looking for work in the construction and service sectors outside the country. According to the projections of the Climate Refugees organization, by 2050 the number of people forced to leave Pakistan as a result of environmental degradation may reach 5-6 million[45]. This phenomenon is also a cause for concern in host countries, where climate migrants are not covered by the legal framework of the Geneva Convention, which makes their legal status unclear and often leads to marginalisation. Currently, Pakistan does not have a separate legal or administrative strategy for climate refugees. The 2020 National Migration Policy does not take into account the specific needs of people moving due to environmental degradation[46]. As a result, climate refugees are often treated as economic migrants, which limits their access to social and legal support programs. A report by the Asia Development Bank (ADB) shows that the lack of formal status for climate migrants in Pakistan exacerbates their social exclusion and increases the risk of violence, homelessness and economic exploitation[47]. At the same time, there is a lack of coordination between the central government and provincial authorities in monitoring and recording climate migration.

The phenomenon of climate refugees in Pakistan is a growing humanitarian and administrative challenge that requires systemic legislative and planning actions. The need to effectively manage this form of population mobility becomes urgent in light of projections indicating a sharp increase in the number of people forced to leave their homes in the coming decades.

Climate migration in India.

Internal migration

Reduced water availability in regions dependent on glacial waters of the Himalayas leads to internal migration. Farmers who have lost their source of income due to low yields are moving to cities where they are looking for work. Over the past two decades, a significant number of people from drought-stricken areas such as Punjab and Uttar Pradesh have moved to cities such as Delhi, Mumbai, Kolkata. These migrants often end up in slums, where they live in extreme conditions, without access to basic services such as education, health care or adequate housing. In 2023, migration to cities increased by 10%, and more than 30% of new urban residents are migrants from drought-affected areas[48].

[41] IOM Pakistan. Displacement Tracking Matrix: 2022 Summary Report, 2023, s. 5

[42] UNHCR. Pakistan: Population Statistics 2023, dostęp: https://data.unhcr.org, s. 8.

[43] Human Rights Commission of Pakistan. Urban Displacement and Informal Settlements, 2023, s. 12–13.

[44] Global Internal Displacement Database (GIDD). Pakistan Migration Profiles, 2023, s. 7.

[45] Climate Refugees. Projected Displacement Trends in South Asia, 2022, s. 18.

[46] Government of Pakistan. National Migration Policy 2020, s. 21.

[47] Asian Development Bank. Policy Gaps on Environmental Displacement in Pakistan, 2023, s. 10–11.

[48] Reserve Bank of India, Quarterly Report on Internal Migration Trends in India (2023), str. 8-10.

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More than 40% of migrants from drought-affected regions are unemployed in cities, resulting in a deterioration in their economic situation and leading to increased poverty[49].

International migration.

The phenomenon of climate refugees is not limited to internal migration within India. Increasing water instability, food crises and crop problems are prompting some farmers to migrate to other countries in search of better living and working conditions. Many people migrate to Gulf countries such as the United Arab Emirates, Saudi Arabia, Qatar, as well as other Asian and Western countries, looking for employment opportunities in the construction industry or other sectors that require manual labor. According to data from the International Labour Organization (ILO), in 2023, about 1.5 million people from India immigrated to the Gulf countries in search of work, of which about 25% came from agricultural regions that suffered from the water crisis[50]. In 2024, the number of climate refugees from India migrating to Gulf countries is projected to increase by 12% as living conditions in India deteriorate due to decreasing water availability[51].

Social and economic situation of climate refugees

Climate migration, both internal and international, leads to increasing social tensions. Migrants, both internal and those who go to other countries, face numerous challenges. In Indian cities, they face a lack of access to public services such as education, healthcare, and housing. In the Gulf countries, on the other hand, although they find employment, they often live in difficult conditions, with limited rights and access to social welfare. In 2023, there were about 800,000 immigrants from India living in the UAE, about 10% of whom came from rural areas that have been affected by climate change[52]. In 2024, the number of Indian immigrants in the UAE is projected to grow by 8%, posing an additional challenge to the country's migration systems and public services[53].

Climate migration management policies

India, as well as migration destination countries, need to develop strategies that effectively manage the growing problem of climate refugees. In the case of India, it is necessary to implement adaptation policies that will ensure better management of water resources, the development of modern irrigation systems and support for farmers, especially those from small farms. In turn, the Gulf states must consider introducing policies that will enable the legalization of immigrants' stay, as well as improving working and living conditions for migrants.

Scenarios for the future

According to a study by the International Centre for Integrated Mountain Development (ICIMOD), by 2050, the Indus region may experience significant changes in its hydrological regime. It is predicted that the average water flow in summer may be reduced by up to 20%, which will have serious consequences for water availability during this period. Additionally, the reduction in water flows could affect irrigation capacity in parts of Pakistani Punjab, leading to a decrease in the efficiency of irrigation systems by about 30%[54]. These changes are the result of several factors, including the melting of glaciers, the reduction of snow cover, and the variability of precipitation. Rising temperatures in the Himalayan region lead to accelerated melting of glaciers, which can initially increase water flows. However, in the long term, once glacial resources are depleted, a significant decrease in flows is projected, which could lead to seasonal water shortages[55]. If India and Pakistan do not implement integrated water governance, it is predicted that by 2040, more than 100 million people in the region could suffer from chronic water shortages. The lack of effective water management strategies, such as the modernisation of irrigation infrastructure, the improvement of water efficiency in agriculture and the development of early warning systems for droughts, can lead to a worsening of the

[49] Global Migration Network, Economic Impact of Climate Migration in India (2023), str. 19-21.
[50] International Labour Organization (ILO), Global Migration Trends Report (2023), str. 25-28.
[51] United Nations, International Migration Report (2024), str. 15-18.
[52] Ministry of External Affairs, Indian Diaspora in the Middle East (2023), str. 34-36.
[53] United Nations Development Programme (UNDP), Migration and Development Report (2024), str. 9-11.
[54] International Centre for Integrated Mountain Development (ICIMOD), Implications of Climate Change for Water Resources and Policies in the Indus Basin, 2016, s. 5, https://lib.icimod.org/record/32170/files/IndusBasin_IssueBrief.pdf
[55] Ali, S., Li, D., Congbin, F., & Khan, F., Twenty First Century Climatic and Hydrological Changes over Upper Indus Basin of Himalayan Region of Pakistan, 2015, s. 2, https://lib.icimod.org/record/30878/files/Ali_2015_Environ._Res._Lett._10_014007.pdf

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water crisis. Additionally, climate change can exacerbate extreme weather events such as droughts and floods, further complicating the situation[56].

The escalation of the conflict over the disputed territories of Jammu and Kashmir in April 2024 showed the risk of the possibility of using the issue of restricting/interrupting water supplies to Pakistan as a tool of pressure/blackmail from India. The development of events can also be treated as a warning of what may happen when the water resources of the Indus are not sufficient to meet the needs of the populations of both feuding countries. In this context, the responsibility of politicians and the proper involvement of the international community are important, both in emergency humanitarian aid during natural disasters, but also in the development of a new legal framework adequate to the current threats.

Sources.

Ali, S., Li, D., Congbin, F., & Khan, F., Twenty First Century Climatic and Hydrological Changes over Upper Indus Basin of Himalayan Region of Pakistan, 2015, s. 2, https://lib.icimod.org

Ali, S., Li, D., Congbin, F., & Khan, F., Twenty First Century Climatic and Hydrological Changes over Upper Indus Basin of Himalayan Region of Pakistan, 2015, s. 2, https://lib.icimod.org/record/30878/files/Ali_2015_Environ._Res._Lett._10_014007.pdf

Asian Development Bank. Policy Gaps on Environmental Displacement in Pakistan, 2023, s. 10–11.

Central Ground Water Board, Annual Report on Groundwater Depletion in Northern India (2024). https://cgwb.gov.in/, str. 50–52.

Central Water Commission (CWC), India, Water and Related Statistics, 2023, https://cwc.gov.in/

Central Water Commission, National Register of Large (Specified) Dams – 2023, https://www.indiaenvironmentportal.org.in/content/476240/national-register-of-large-specified-dams-2023/

Chandel, A. S., Rittger, K., Black Carbon from Dust Storms Accelerates Himalayan Glacier Melt, 2025, https://phys.org/news/2025-02-black-carbon-storms-himalayan-glacier.html

Climate Refugees. Projected Displacement Trends in South Asia, 2022, s. 18.

FAO. AQUASTAT Database: South Asia Water Resources, 2020. https://www.fao.org/aquastat/en/

Global Hunger Index, India Country Profile (2024). https://www.globalhungerindex.org/, str. 10–12.

Global Internal Displacement Database (GIDD). Pakistan Migration Profiles, 2023, s. 7.

Global Migration Network, Economic Impact of Climate Migration in India (2023), str. 19-21.

Government of Pakistan. National Migration Policy 2020, s. 21.

Human Rights Commission of Pakistan. Urban Displacement and Informal Settlements, 2023, s. 12–13.

Immerzeel, W. W., et al. "Hydrological response to climate change in a glacierized catchment in the Himalayas." Climatic Change, 2009. https://link.springer.com/article/10.1007/s10584-011-0143-4

Indian Sugar Mills Association, Cane Yield Trends and Water Availability (2024). https://www.indiansugarmills.com/, str. 12–14.

Indus Waters Treaty (IWT), 1960, https://en.wikipedia.org/wiki/Indus_Waters_Treaty

International Centre for Integrated Mountain Development (ICIMOD), The Indus Waters Treaty: A Critical Analysis of the Past and Present, 2020, s. 6, https://lib.icimod.org

International Centre for Integrated Mountain Development (ICIMOD), Implications of Climate Change for Water Resources and Policies in the Indus Basin, 2016, s. 5, https://lib.icimod.org/record/32170/files/IndusBasin_IssueBrief.pdf

International Food Policy Research Institute, Vulnerability of Smallholder Farmers to Irrigation Shocks (2023). https://www.ifpri.org/publication/vulnerability-smallholder-farmers, str. 21–23.

International Labour Organization (ILO), Global Migration Trends Report (2023), str. 25-28.

International Water Management Institute (IWMI), Water Management in the Indus Basin: Ensuring Water for All, 2015, s. 3, https://www.iwmi.cgiar.org

IOM Pakistan. Displacement Tracking Matrix: 2022 Summary Report, 2023, s. 5

IPCC. Special Report on the Ocean and Cryosphere in a Changing Climate, 2019. https://www.ipcc.ch/srocc/

Maurer, J. M., et al. "Acceleration of ice loss across the Himalayas over the past 40 years." Science Advances, 2019, 5(6): eaav7266. https://www.science.org/doi/10.1126/sciadv.aav7266

[56] Pakistan Council of Research in Water Resources, Water Insecurity in Pakistan, 2021, s. 3, dostępne online: https://reliefweb.int/report/pakistan/water-insecurity

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 2, Mar.-Apr., 2025, pp: 1341-1349 ISSN: 3048-6874
www.ijhssm.org

Ministry of Agriculture & Farmers Welfare, Rabi Crop Output Projections (2023). https://agricoop.nic.in/, str. 34–36.
Ministry of External Affairs, Indian Diaspora in the Middle East (2023), str. 34-36.
Modern Diplomacy, Projected Water Security of Pakistan, 2024, https://moderndiplomacy.eu/2024/08/07/projected-water-security-of-pakistan/
NHPC India, Kishanganga Hydroelectric Project, https://www.nhpcindia.com/welcome/language/en/project_detail/38/2/
NITI Aayog, Composite Water Management Index, 2022, s. 10–15.
Pakistan Council of Research in Water Resources, Water Insecurity in Pakistan, 2021, s. 3, https://reliefweb.int/report/pakistan/water-insecurity
Pakistan loses 30% of agricultural land to soil salinity, FAO report finds, Pakistan Today, 2024. https://profit.pakistantoday.com.pk/2024/12/23/pakistan-loses-30-of-agricultural-land-to-soil-salinity-fao-report-finds/
Pakistan Ministry of Water Resources, Annual Water Resource Management Report, 2024, https://www.waterresources.gov.pk
Pakistan Rice Area, Yield and Production, USDA Foreign Agricultural Service, 2024. https://ipad.fas.usda.gov/countrysummary/Default.aspx?crop=Rice&id=PK
Pakistan Wheat Area, Yield and Production, USDA Foreign Agricultural Service, 2024. https://ipad.fas.usda.gov/countrysummary/Default.aspx?crop=Wheat&id=PK
Pakistan: Cotton and Products Update, USDA Foreign Agricultural Service, 2024. https://www.fas.usda.gov/data/pakistan-cotton-and-products-update-19
PCA, Indus Waters Treaty Arbitration: Pakistan vs. India, 2023, https://pca-cpa.org/en/cases/
Permanent Court of Arbitration, Neutral Expert's Decision on Ratle Hydroelectric Project, 2025, https://pca-cpa.org/en/news/pca-press-release-pca-case-no-2023-14-neutral-expert-issues-decision/
Press Information Bureau, Government of India, Successful diversion of Chenab River achieved at Ratle Hydro Electric Project, 27.01.2024, https://pib.gov.in/PressReleasePage.aspx?PRID=2000309
Reserve Bank of India, Quarterly Inflation Reports (Q2 2024). https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx, str. 10–11.
Reserve Bank of India, Quarterly Report on Internal Migration Trends in India (2023), str. 8-10.
SIPRI, Water Security and Conflict, 2022, s. 12–14, https://www.sipri.org/research/water-security
South Asian Voices, India, Pakistan, and the Kishanganga Dispute: Implications for the Indus Waters Treaty, 2011, s. 5, https://southasianvoices.org
Światowa Organizacja Meteorologiczna (WMO), Glacier Melt Will Unleash Avalanche of Cascading Impacts, 2025, https://wmo.int/news/media-centre/glacier-melt-will-unleash-avalanche-of-cascading-impacts
The News International, A very dry future, 2025, https://www.thenews.com.pk/magazine/money-matters/1292395-a-very-dry-future
The News International, The rise of hydropower in Pakistan's grid game, 2024, dostępne online: https://www.thenews.com.pk/magazine/money-matters/1288023-the-rise-of-hydropower-in-pakistans-grid-game
UNDP, Human Development Report 2021, s. 43, https://hdr.undp.org/en/indicators/
UNHCR. Pakistan: Population Statistics 2023, https://data.unhcr.org, s. 8.
United Nations Development Programme (UNDP), Migration and Development Report (2024), str. 9-11.
United Nations, International Migration Report (2024), str. 15-18.
Water Management, Pakistan Council of Research in Water Resources. https://www.pcrwr.gov.pk/water-management/
Wirsing, R. G. "Kishanganga and the Indus Waters Treaty: Strategic and Water Security Implications for South Asia." Strategic Analysis, 2011, 35(4), 613–617.
Wirsing, R. G. "Kishanganga and the Indus Waters Treaty: Strategic and Water Security Implications for South Asia." Strategic Analysis, 2011, 35(4), s. 613–617.
Wirsing, R.G., "Kishanganga and the Indus Waters Treaty: Strategic and Water Security Implications for South Asia." Strategic Analysis, 2011, 35(4), s. 613–617.
World Bank, Pakistan's Water Crisis: A Looming Catastrophe, 2024, https://www.worldbank.org/en/country/pakistan
World Bank, The Indus Waters Treaty: A Legal Framework for International Water Disputes, 2022, s. 7, https://www.worldbank.org