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BIODIVERSITY OF THE ALTAI REGION IN THE CONTEXT OF SUSTAINABLE TOURISM DEVELOPMENT: EXPERIENCE OF TRANSBOUNDARY COOPERATION

Annotation. The article analyzes the current state of biodiversity in the Altai region, as well as the role of tourism and key research directions in its conservation. Particular attention is paid to the impacts of ecotourism, nature-based tourism, and other forms of tourism on natural ecosystems. The study emphasizes effective practices of transboundary cooperation among Kazakhstan, Russia, China, and Mongolia, highlighting the importance of initiatives aimed at protecting international tourist destinations and implementing joint programs. The authors substantiate that the introduction of sustainable tourism principles makes it possible not only to conserve natural resources but also to ensure the socio-economic development of local communities. In addition, the application of integrated management approaches, the implementation of scientific monitoring, and the strengthening of international partnerships are identified as key conditions for the long-term conservation of biodiversity in the Altai region. The research findings have practical significance for the management of transboundary natural areas and the development of sustainable tourism strategies.

Keywords: Altai region; biodiversity; sustainable development; tourism; ecotourism; transboundary cooperation; natural heritage; environmental protection; international partnership; global warming; ecosystem.

Introduction

The Altai Mountains represent one of the largest mountain systems in Eurasia and form a unique transboundary region extending across the territories of China, Kazakhstan, Russia, and Mongolia. This region is characterized by a high diversity of natural complexes, including glaciers, permafrost zones, steppe and taiga landscapes, as well as subalpine and alpine meadows. Such natural and geographical features make the Altai region an area of significant ecological, scientific, and tourism importance at the international level.

Figure 1 - Map of the Altai Mountains [The Altai Mountains Biodiversity Conservation Strategy]7https://panorama.solutions/sites/default/files/Altai_Mountains_Biodiversity_Conservation_Strategy_English_-_Small.pdf

The natural potential of the Altai region provides broad opportunities for the development of ecotourism, mountain and adventure tourism, scientific and educational tourism, hiking and mountaineering routes, ethnocultural tourism, as well as health and recreational activities. Specially protected natural areas, national parks, and biosphere reserves form the core of tourism resources, creating favorable conditions for the implementation of sustainable tourism principles that integrate nature conservation with recreational use. However, the intensification of tourism activities is accompanied by an increasing anthropogenic load on ecosystems, which necessitates a scientifically grounded assessment of the stability of natural complexes (E. V. Selezneva, I. N. Rotanova; N. Zhensikbayeva [1; 3]).

In recent decades, significant reductions in the volume and area of Altai glaciers have been observed as a result of global warming. Glacier retreat directly affects river

flow regimes, moisture availability, and the overall stability of mountain ecosystems. These processes alter the structure of plant communities in alpine and subalpine zones, leading to a contraction of the distribution ranges of certain endemic and rare species. In addition, glacier degradation influences the seasonal accessibility and attractiveness of tourism resources in mountainous areas.

The vegetation cover of the Altai region performs essential ecological functions within the Earth system, including the regulation of surface albedo, atmospheric composition, the global carbon cycle, and water balance. In this context, glacier retreat not only increases the risk of biodiversity loss but also poses a threat to the sustainability of natural and tourism systems (Alieva, 2021). Therefore, investigating the formation history of vegetation cover during the Holocene provides an opportunity to model future ecosystem and tourism transformations under ongoing climate change.

Paleoecological studies indicate that the Altai region is located within a key climatic boundary zone of Central Asia. Vegetation dynamics and climate variability in this area are closely linked to its geographical position, atmospheric circulation patterns, and altitudinal zonation. Studies conducted in the Chinese Altai (Xinjiang region), particularly at Hoton-Nur and Kanas lakes, have demonstrated a strong relationship between vegetation cover, precipitation regimes, and fluctuations in both monsoonal and westerly circulation systems [2; 3].

In the Kazakh Altai, forest-steppe and mountain-meadow ecosystems play a dominant role, contributing to the formation of water resources of the Irtysh and Bukhtarma rivers and thereby ensuring a stable water supply for downstream plains and oasis areas. In contrast, lacustrine natural archives in the Russian Altai, such as Lake Teletskoye and Lake Karakol, represent unique sources of information reflecting long-term climatic changes [4; 5].

Thus, although the Altai region is divided by political borders, it functions as an integrated ecosystem interconnected through climatic, hydrological, and biogeographical processes. This interconnectedness underscores the scientific and practical significance of conducting joint research and coordinated management at the transboundary level, particularly with regard to the development of tourism routes and the conservation of natural complexes.

Research Materials and Methods

Research Directions on Biodiversity of the Altai Region in the Context of Sustainable Tourism Development

The development of sustainable tourism requires a comprehensive consideration of the interconnections between natural and socio-economic systems. The biodiversity of the Altai region is increasingly addressed in scientific research as a strategic core for balancing tourism development and nature conservation. Studies in this field aim to consolidate the principles of sustainable development through the integration of ecological, geographical, social, and economic perspectives.

A number of Kazakhstani and international researchers have conducted comprehensive analyses of the interactions between biodiversity and tourism in the Altai region. For example, studies by [6] (2019) focus on the effective management of specially protected natural areas in the Kazakh Altai, as well as strategies for harmonizing

biodiversity conservation and ecotourism development. These works assess the impacts of sustainable tourism on ecosystems and emphasize the importance of incorporating environmental protection requirements into the development of ecotourism infrastructure.

Paleoecological and ecological studies conducted in the Altai region examine the historical formation of biodiversity and ecosystem resilience in response to climatic changes, thereby identifying indicators of ecosystem stability. In particular, research focused on the ecosystems of Hoton-Nur and Kanas lakes in the Chinese Altai highlights the relationships between climatic factors and vegetation dynamics, providing a basis for assessing the seasonal and ecological constraints of sustainable tourism.

The works of Russian scholars (e.g., *Golden Mountains of Altai* [7]; Dunets, 2016; Baryshnikova, 2015) analyze natural landscape features and biodiversity conservation measures within a transboundary context and propose management models aimed at ensuring the ecological stability of national parks and nature reserves. These studies formulate practical recommendations for maintaining a balance between the conservation and development of the Altai region's high biological diversity and its recreational resources.

From the perspective of sustainable tourism development, Mongolian studies (focusing on Altai Tavan Bogd National Park and the petroglyph complex) emphasize enhancing tourism attractiveness through the integration of natural and cultural components, conserving biodiversity, and improving the socio-economic conditions of local communities. These studies demonstrate planning approaches that incorporate ecological constraints into the design of tourist routes.

Global and regional initiatives, particularly the CAREC–2030 Tourism Strategy, outline prospects for developing the Altai region as a transboundary tourism cluster and propose mechanisms for interregional cooperation aimed at ensuring harmony between sustainable tourism development and biodiversity conservation.

Overall, the existing literature highlights the need for an integrated examination of the biological, landscape, economic, and social dimensions of sustainable tourism development, the strengthening of transboundary cooperation, and the application of comprehensive approaches to balancing tourism and nature conservation. Research in this area provides both theoretical and practical foundations for developing long-term tourism strategies while preserving the natural resources of the Altai region.

The Need for International Cooperation

The study and conservation of Altai ecosystems extend beyond the national boundaries of individual states and possess a distinctly transboundary character. As the Altai Mountains form a unified natural system spanning the territories of China, Kazakhstan, Russia, and Mongolia, climatic, hydrological, and biogeographical processes within the region are closely interconnected. Consequently, biodiversity conservation, the maintenance of ecosystem stability, and the mitigation of climate change impacts require coordinated international scientific and institutional cooperation.

The Chinese Altai provides important data for investigating cryosphere dynamics and their influence on the flow regime of the Irtysh River. Key sites within this area—such as Lake Kanas, Hemu Village, the Koktokay National Geopark, and the Burqin Beaver Nature Reserve—are distinguished by their high levels of natural, cultural, and

biological diversity and play a significant role in ecotourism development and nature conservation efforts [8].

The Kazakh Altai encompasses the western part of the Altai Mountains and holds strategic importance in terms of natural resource conservation, biodiversity protection, and the development of sustainable tourism. Its role in the formation of the Irtysh River basin enhances the region's significance for transboundary water resources. Katon-Karagay State National Nature Park represents a complete spectrum of altitudinal zones and is characterized by a high concentration of endemic and rare species (Samarkanov, Alieva, 2019). Within the park, the Rakhman Springs constitute a valuable site for ecological and health-related tourism. Markakol State Nature Reserve and Lake Zaysan are of particular importance for climatic and paleoecological monitoring, serving as representative examples of high-mountain and lowland aquatic ecosystems.

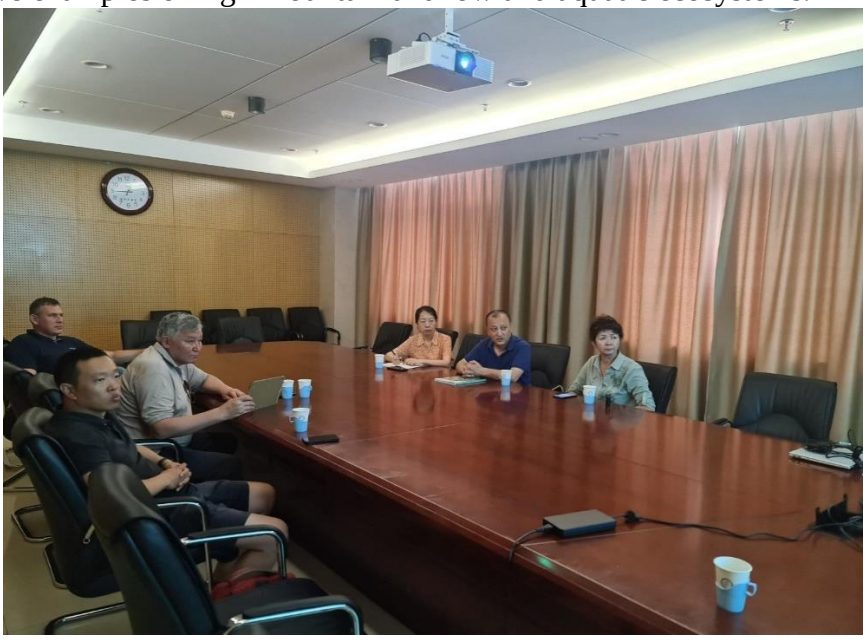

Figure 2 - Institute of Geography and Ecology, Academy of Tourism of the PRC. Professor Han Fang (China), Professor A. N. Dunets (Russia), O. B. Mazbayev, Aday Sekenuly, and R. K. Kyrykbaeva (Kazakhstan). Discussion on the future development of the "Greater Altai" Biosphere Reserve, 2024, Urumqi, People's Republic of China

Overall, the presented data indicate that the Altai region constitutes an integrated system in which natural, cultural, and ecosystem components are closely interconnected. Therefore, issues related to the study, conservation, and sustainable use of the Altai require internationally coordinated scientific research, joint governance mechanisms, and transboundary cooperation.

In the Kazakh Altai, Katon-Karagay National Park, the Rakhman Springs, the Markakol State Nature Reserve, and Lake Zaysan represent key natural sites that define the ecological integrity of the Altai region. These areas clearly demonstrate the necessity of international cooperation in biodiversity conservation, the management of transboundary water resources, and the development of sustainable tourism.

The Russian Altai is distinguished by the UNESCO World Natural Heritage site *Golden Mountains of Altai*. This territory encompasses a complete sequence of altitudinal vegetation belts and serves as an important model for the conservation and management of transboundary natural complexes (Dunets, 2016; Baryshnikova, 2015).

The Russian Altai preserves unique natural complexes inscribed on the UNESCO World Natural Heritage List. The *Golden Mountains of Altai* site was included in the UNESCO List in 1998 and consists of three main components: the Altai Nature Reserve and the Lake Teletskoye area, the Katun Nature Reserve and the buffer zone of Mount Belukha, as well as the Ukok Plateau Quiet Zone. The total area of this site is approximately 1,611,457 hectares and includes a full range of altitudinal vegetation zones characteristic of Central Siberia [10]. In 2004, bilateral cooperation was initiated between the Katun Biosphere Reserve in the Russian Federation and Katon-Karagay National Park in the Republic of Kazakhstan. Numerous joint practical activities carried out across various aspects of protected area management subsequently led, after seven years, to the signing in 2011 of an agreement between the Governments of the Russian Federation and the Republic of Kazakhstan on the establishment of the Altai Transboundary Reserve based on these two protected areas [11].

The Mongolian Altai is characterized by a unique combination of natural and cultural heritage. The petroglyph complexes and Altai Tavan Bogd National Park enhance the cultural-historical and ecological value of the region. According to the CAREC–2030 Strategy, the Altai mountain range has been identified as one of the priority tourist clusters for the development of transboundary ecotourism involving Kazakhstan, Russia, and Mongolia [9].

The petroglyph complexes located in the Mongolian Altai (Tsagaan Salaa–Baga Oigor, Upper Tsagaan Gol, and Aral Tolgoi) were inscribed on the UNESCO World Cultural Heritage List in 2011. Approximately 10,000 rock carvings have been preserved within an area of about 15 km² in the Tsagaan Salaa Valley. These petroglyphs depict the transition from hunting to nomadic pastoralism during the Neolithic and Bronze Ages. In accordance with the Central Asia Regional Economic Cooperation (CAREC–2030) Program, the Altai mountain range has been designated as one of the principal tourist clusters for the development of transboundary ecotourism among Kazakhstan, Russia, and Mongolia (ADB, *CAREC Tourism Strategy 2030*. Manila: ADB, 2020).

Altai Tavan Bogd National Park (approximately 6,362 km²) is one of the largest protected areas in the Mongolian Altai. It includes the Mongolian sector of the Tavan Bogd massif, Lakes Khoton and Khurgan, major glaciers including the Potanin Glacier, and habitats of rare species such as the snow leopard, argali sheep, Altai snowcock, and golden eagle.

Moreover, the Mongolian Altai represents the largest mountain system in the country, containing more than 20 peaks exceeding 4,000 m in elevation, among which Khüiten Peak (4,374 m), Mönkh Khairkhan (4,204 m), and Tsambagarav Khairkhan (4,195 m) are particularly prominent (Lkhagvasuren Ch., 2017, pp. 45–100).

Taken together, these data confirm that the Altai region functions as a unified system with strong interconnections between its natural, cultural, and ecological components. Consequently, the study, conservation, and sustainable use of the Altai

require internationally coordinated scientific research, joint management mechanisms, and strengthened transboundary cooperation.

The findings of this study demonstrate that the Altai region functions as an integrated natural, cultural, and ecological system, despite being divided by political borders. Climatic, hydrological, and biogeographical processes interconnect the territories of Kazakhstan, Russia, China, and Mongolia, forming a single transboundary ecosystem. Consequently, the study, conservation, and sustainable use of the Altai require internationally coordinated scientific research, joint governance mechanisms, and strengthened transboundary cooperation.

Key natural sites in the Kazakh Altai—including Katon-Karagay National Park, the Rakhman Springs, the Markakol State Nature Reserve, and Lake Zaysan—play a crucial role in maintaining ecosystem integrity, conserving biodiversity, managing transboundary water resources, and promoting sustainable tourism. In the Russian Altai, the UNESCO World Natural Heritage site *Golden Mountains of Altai* represents a comprehensive model for protecting transboundary natural complexes, encompassing a full range of altitudinal vegetation belts and demonstrating effective long-term conservation practices. Similarly, the Mongolian Altai combines exceptional natural and cultural heritage, including the Altai Tavan Bogd National Park and UNESCO-listed petroglyph complexes, which enhance both ecological value and tourism attractiveness.

International initiatives and regional frameworks, particularly the CAREC–2030 Tourism Strategy, highlight the Altai mountain system as a priority transboundary ecotourism cluster. These frameworks emphasize the importance of harmonizing biodiversity conservation with tourism development and socio-economic benefits for local communities. Overall, sustainable tourism in the Altai region can serve as an effective tool for biodiversity conservation only if supported by integrated management approaches, scientific monitoring, and long-term international cooperation. Such coordinated efforts provide a solid foundation for preserving the unique natural and cultural heritage of the Altai while ensuring its sustainable use for future generations.

The results of the study

Beijing Consensus on the Establishment of a Transboundary Conservation Alliance of the Altai Mountains *(Beijing, China, August 1, 2024)*

The Altai Mountains, located within the border regions of China, Russia, Kazakhstan, and Mongolia, form part of the Altai–Sayan Ecoregion, one of the Global 200 ecoregions of exceptional importance for biodiversity conservation. The natural and geographical characteristics of the eastern and western parts of the Altai Mountains, as well as their southern and northern slopes, together with mountain ecosystems and natural landscapes, constitute a single, integrated mountain ecosystem.

Transboundary ecological conservation of the Altai Mountains is of great and long-term significance for preserving biodiversity and ecosystem integrity, maintaining ecosystem services, and addressing the challenges posed by global climate change and ecological security. To this end, scientists and experts from the four countries, along with administrators of nature reserves and protected areas, engaged in in-depth discussions and reached the following shared consensus on transboundary conservation of the Altai Mountains.

I. Shared Vision

We are committed to protecting “Our Shared Home — the Altai.” Guided by the philosophy of building a shared future for all life on Earth, and adhering to the principles of openness, inclusiveness, and mutually beneficial cooperation, we seek to strengthen collaboration in scientific research, academic exchange, planning, and policy coordination. Our common goal is to preserve the integrity of the natural ecosystems of the Altai Mountains and to protect the authenticity of their natural and cultural landscapes. Through these efforts, we aim to contribute to a harmonious coexistence between humans and nature and to the creation of a sustainable and prosperous future.

II. Objectives of Cooperation

- To deepen transboundary biodiversity conservation in the Altai Mountains, preserve ecosystem integrity, and ensure connectivity and integrated protection of habitats for transboundary migratory species;
- To comprehensively enhance the functional capacity of Altai Mountain ecosystems, strengthen their resilience and adaptive capacity to climate change, improve resistance to natural disasters, and reinforce the ability to address ecological security threats such as the spread of transboundary invasive species;
- To conserve the natural and cultural landscapes of the Altai Mountains, promote cultural exchange, enhance mutual understanding among peoples, and jointly improve the shared well-being of humanity.

Figure 3 - Beijing. Cultural Heritage: National Natural Parks.Doctor of Geographical Sciences, Professor O. B. Mazbayev, Han Fang, and Aday Sekenuly. 2024.

III. Areas of Cooperation

Transboundary Protected Natural Areas

To explore opportunities for establishing various forms of transboundary protected areas in the Altai Mountains, including transboundary World Natural Heritage

sites, World Biosphere Reserves, national parks, and nature reserves. Through equal dialogue and joint scientific research, the Parties aim to build a community of shared responsibility in transboundary conservation and enhance the effectiveness of protecting ecosystem integrity in the Altai region.

Transboundary Ecological Corridors

To explore new models of joint biodiversity conservation in transboundary areas, focusing on the protection of migratory species, habitat connectivity, wildlife migration corridors, and transboundary ecological conservation networks. This includes promoting academic exchange and technical cooperation, as well as developing and implementing policies and standards conducive to transboundary biodiversity conservation.

Ecological Security Framework

To investigate joint approaches to managing the natural ecological environment and socio-economic space of the Altai Mountains. Through collaborative scientific research on ecosystem services and human well-being, global climate change and ecological risk management, the prevention and integrated control of invasive alien species, a scientific foundation will be established for harmonizing human–nature relationships.

Transboundary Ecotourism

To jointly develop transboundary ecotourism routes and products that comprehensively showcase the scenic landscapes, biodiversity, and interdependence between humans and nature in the Altai Mountains. By strengthening mutual understanding among different countries and cultures, and promoting cultural integration and people-to-people exchanges, transboundary conservation cooperation in the Altai region will be further advanced.

IV. Cooperation Mechanisms

- To establish platforms for exchange and joint action based on the “Our Shared Home — the Altai” International Coordination Council and the Biodiversity Conservation Alliance of Arid Areas (BCAA), and to promote the establishment of a Transboundary Conservation Alliance of the Altai Mountains;
- To organize regular international conferences to facilitate the exchange of scientific research results and best practices;
- To establish expert centers (think tanks) through resource integration, conduct joint scientific research based on bilateral or multilateral common interests, promote the exchange of resources and technologies, submit applications for international cooperation projects, and develop mutual visits and capacity-building programs;
- To create effective communication mechanisms among protected area management authorities to ensure continuous information exchange on conservation measures, risks, and opportunities;
- To promote the signing of bilateral or multilateral agreements on transboundary conservation and to reduce the negative impact of policy differences on cooperation through policy coordination and harmonized planning.
- The Altai Mountains represent a unique mountain system that is ecologically, naturally, and culturally integrated, yet politically divided among China, Kazakhstan, Russia, and Mongolia. The conducted research confirms that the biodiversity, ecosystem

stability, and natural resources of the Altai region constitute a natural heritage of global significance. Accordingly, contemporary approaches to the conservation and sustainable use of the Altai should not be confined to national frameworks but must be addressed through transboundary and international cooperation.

- The Beijing Consensus on the Establishment of a Transboundary Conservation Alliance of the Altai Mountains represents an important institutional step in this direction. The initiative to establish the Greater Altai Biosphere Reserve, proposed within the framework of the Consensus, requires shared responsibility, scientific collaboration, and coordinated governance mechanisms among the four countries. The creation of the biosphere reserve is regarded as a comprehensive solution aimed at preserving ecosystem integrity, conserving biodiversity, and enhancing the adaptive capacity of natural systems under conditions of climate change.
- The research findings clearly demonstrate the ecological interconnectedness of specially protected natural areas across the Altai region, including Katon-Karagay National Park, Markakol State Nature Reserve, Altai Tavan Bogd National Park, and the UNESCO-listed *Golden Mountains of Altai*. These areas are characterized by diverse natural landscapes, high concentrations of endemic and rare species, and heightened sensitivity to climatic processes. Therefore, managing them as isolated units is scientifically unjustified; instead, they should be considered as components of a single biospheric space requiring integrated management.
- Within the context of sustainable tourism development, the Altai region possesses exceptional potential. The development of ecotourism, scientific and educational tourism, ethnocultural tourism, and mountain tourism can stimulate socio-economic development if aligned with environmental protection requirements. However, the study reveals that increasing tourism pressure imposes additional stress on ecosystems. Consequently, tourism route planning, infrastructure development, and recreational use must be regulated based on scientifically grounded assessments of ecosystem carrying capacity.
- International Altai expeditions conducted between 2022 and 2024 enabled comprehensive field research, data collection, photographic documentation, and comparative analyses of the region's natural systems. The joint participation of scientists from Kazakhstan, China, Russia, and Mongolia demonstrated the effectiveness of transboundary scientific cooperation. The results were discussed at international forums, including symposia held in Beijing, further reinforcing the necessity of treating the Altai as a single, integrated ecosystem.
- The analysis of paleoecological data provided insights into the long-term responses of the Altai region to climatic changes. Glacier degradation, shifts in hydrological regimes, and transformations in vegetation cover are expected to directly affect both biodiversity and the accessibility of tourism resources in the future. These findings underscore the importance of developing climate-adaptive strategies for sustainable tourism in the region.
- Based on the research results, it can be concluded that the future sustainable development of the Altai region must be grounded in scientific evidence, supported by transboundary governance mechanisms, and reinforced through international agreements. The establishment of the Greater Altai Biosphere Reserve represents an effective

instrument for balancing biodiversity conservation, the maintenance of ecosystem services, and the long-term sustainable use of natural and tourism resources.

- Looking ahead, a comprehensive monograph is planned for publication in 2026, drawing upon accumulated field, cartographic, paleoecological, and socio-economic materials. This work is expected to provide a robust scientific and methodological foundation for the study, conservation, and sustainable development of the Altai region and to serve as a shared scientific legacy guiding future research across the four countries.

Conclusion

The Altai Mountains represent a unique mountain system that spans the territories of China, Kazakhstan, Russia, and Mongolia and is integrated in natural, ecological, and cultural terms, while remaining politically divided. The conducted research confirms that the biodiversity, ecosystem stability, and natural resources of the Altai region constitute a natural heritage of global significance. Accordingly, modern approaches to the conservation and rational use of Altai should not be limited to national frameworks but must be addressed within the context of transboundary and international cooperation.

The Beijing Consensus on the establishment of a transboundary conservation alliance of the Altai Mountains constitutes an important institutional step in this direction. Within the framework of the Consensus, the initiative to establish the **Greater Altai Biosphere** requires shared responsibility among the four states, scientific partnership, and coordinated governance mechanisms. The formation of the biosphere reserve is regarded as a comprehensive solution aimed at preserving ecosystem integrity, conserving biodiversity, and enhancing the adaptive capacity of natural systems under conditions of climate change.

The research findings clearly demonstrate the ecological interconnectedness of specially protected natural areas located in different parts of the Altai region, including Katon-Karagay National Park, the Markakol State Nature Reserve, Altai Tavan Bogd National Park, and the *Golden Mountains of Altai*. These areas are characterized by a diversity of natural landscapes, high concentrations of endemic and rare species, and heightened sensitivity to climatic processes. Therefore, their management as isolated units is scientifically unjustified; instead, they should be considered and managed as a single biospheric space through an integrated approach.

In the context of sustainable tourism development, the Altai region possesses exceptional potential. The development of ecotourism, scientific and educational tourism, ethnocultural tourism, and mountain tourism, when aligned with environmental protection requirements, can stimulate the socio-economic development of the region. However, the study reveals that increasing tourist pressure imposes additional stress on ecosystems. Consequently, tourism route planning, infrastructure development, and the regulation of recreational use should be carried out with due consideration of the ecological carrying capacity of ecosystems.

International Altai expeditions conducted between 2022 and 2024 enabled comprehensive investigations of the region’s natural systems, the collection of field data, photographic documentation, and comparative analyses. The joint participation of scientists from Kazakhstan, China, Russia, and Mongolia demonstrated the effectiveness of transboundary scientific cooperation. The results were discussed at the international

level, including symposia held in Beijing, once again confirming the necessity of considering the Altai as a single, integrated ecosystem.

The analysis of paleoecological data made it possible to identify the long-term response of the Altai region to climatic change. Glacier degradation, changes in hydrological regimes, and transformations of vegetation cover are expected to have a direct impact on both biodiversity and the accessibility of tourism resources in the future. This highlights the importance of developing strategies to adapt sustainable tourism to climatic risks.

Based on the results of this study, it is concluded that the future sustainable development of the Altai region should be grounded in scientific evidence, supported by transboundary governance mechanisms, and reinforced through international agreements. The establishment of the **Greater Altai Biosphere Reserve** represents an effective instrument for ensuring a balance between biodiversity conservation, the maintenance of ecosystem services, and the long-term sustainable use of natural and tourism potential.

In 2026, a comprehensive monograph is planned, drawing upon accumulated field, cartographic, paleoecological, and socio-economic materials. This work is expected to provide a solid scientific and methodological foundation for the study, conservation, and sustainable development of the Altai region and to serve as shared scientific legacy guiding future research across the four countries.

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ТҰРАҚТЫ ТУРИЗМДІ ДАМЫТУ КОНТЕКСІНДЕГІ АЛТАЙ АЙМАҒЫНЫҢ БИОАЛУАНТҮРЛІЛІГІ: ТРАНСШЕКАРАЛЫҚ ЫНТЫМАҚТАСТЫҚ ТӘЖІРИБЕСІ

Аннотация. Мақалада Алтай аймағындағы биоалуантүрліліктің қазіргі жағдайы мен оны сақтаудағы туризмнің рөлі және зерттеу бағыттары талданады. Әсіресе экотуризм, табиғи-танымдық туризм және басқа бағыттарының табиғи экожүйелерге әсері қарастырылады. Зерттеу барысында трансшекаралық ынтымақтастықтың ҚР,РФ,Қытай,Монголия тарапынан тиімді тәжірибелерге, халықаралық туристік дестинацияларды қорғау бастамалары мен бірлескен бағдарламалардың маңызына назар аударылады. Авторлар тұрақты туризм қағидаттарын енгізу арқылы табиғи ресурстарды сақтаумен қатар, жергілікті қауымдастықтардың әлеуметтік-экономикалық дамуын қамтамасыз етуге болатынын негіздейді. Сонымен қатар, басқарудың кешенді тәсілдерін қолдану, ғылыми мониторинг жүргізу және халықаралық серіктестікті күшейту Алтай аймағының биоалуантүрлілігін ұзақ мерзімді сақтаудың негізгі шарттары ретінде айқындалады. Зерттеу нәтижелері трансшекаралық табиғи аумақтарды басқару және тұрақты туризм стратегияларын әзірлеу барысында практикалық маңызға ие.

Кілт сөздер: Алтай аймағы; биоалуантүрлілік; тұрақты даму; туризм; экотуризм; трансшекаралық ынтымақтастық; табиғи мұра; қоршаған ортаны қорғау; халықаралық серіктестік; жаһандық жылыну; экожүйе

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БИОРАЗНООБРАЗИЕ АЛТАЙСКОГО РЕГИОНА В КОНТЕКСТЕ РАЗВИТИЯ УСТОЙЧИВОГО ТУРИЗМА: ОПЫТ ТРАНСГРАНИЧНОГО СОТРУДНИЧЕСТВА

Аннотация. В статье анализируется современное состояние биоразнообразия Алтайского региона, а также роль туризма и основные направления исследований в его сохранении. Особое внимание уделяется воздействию экотуризма, природно-познавательного туризма и других форм туристской деятельности на природные экосистемы. В ходе исследования рассматривается эффективный опыт трансграничного сотрудничества со стороны Республики Казахстан, Российской Федерации, Китая и Монголии, подчеркивается значение инициатив по охране международных туристских дестинаций и реализации совместных программ. Авторы обосновывают, что внедрение принципов устойчивого туризма позволяет не только сохранять природные ресурсы, но и обеспечивать социально-экономическое развитие местных сообществ. Кроме того, применение комплексных подходов к управлению, проведение научного мониторинга и укрепление международного партнерства определяются как ключевые условия долгосрочного сохранения биоразнообразия Алтайского региона. Результаты исследования имеют практическое значение для управления трансграничными природными территориями и разработки стратегий устойчивого туризма.

Ключевые слова: Алтайский край; биоразнообразие; устойчивое развитие; туризм; экотуризм; трансграничное сотрудничество; природное наследие; охрана окружающей среды; международное партнерство; глобальное потепление; экосистема.