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ILMIY AXBOROTNOMA

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MANAGEMENT OF NATURE UTILIZATION FOR RECREATIONAL PURPOSES

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Abstract. In Uzbekistan, the use of natural resources for recreational purposes requires a thorough study of its unique features and systematic preservation of the ecological sustainability of nature. Nature management is a complex multidisciplinary, multifaceted and problematic process and for this purpose we have conducted research based on the methods of aerospace, system, integrated and geoecological approaches based on its implementation. The article presents the issues of nature management based on the analysis of the use of resources of geosystems with varying degrees of environmental sustainability, as well as the purpose of a comprehensive recreational assessment of landscapes based on specially developed criteria of natural factors, recreational resources and existing infrastructure in order to determine their suitability for recreation, treatment and tourism development.

Keywords: geosystem, recreation, recreationist, recreational resources, environmental sustainability, systems approach, geoecological assessment.

Rekreatsiya maqsadlarida tabiatdan foydalanishni boshqarish

Annotasiya. O‘zbekistonda rekreatsiya maqsadlarida tabiatdan foydalanishda mukammal o‘ziga xos xususiyatlarini o‘rganish va ma'lum tartib asosida ona tabiatning ekologik barqarorligini asrashni taqozo etadi. Tabiatdan foydalanish murakkab ko‘p profilli, qirrali va muammoli jarayon bo‘lganligi uchun uni amalga oshirishda asoslangan aerokosmik, tizimli, majmuali hamda geoekologik yondashuv metodlariga tayangan holda tadqiqot natijalari olingan. Tabiiy omillar, rekreasiya resurslari va mavjud infratuzilma uchun maxsus ishlab chiqilgan mezonlar asosida landshaftlarni kompleks rekreasiya nuqtai nazardan baholash ularning dam olish, davolanish va turizmni rivojlantirish maqsadlari uchun qay darajada qulay ekanligini aniqlash maqsadida tabiatdan foydalanishda ekologik barqarorlik darajalari turlicha bo‘lgan geotizim resurslaridan foydalanish tahlili asosida uni boshqarish masalalari bayon etilgan.

Kalit so‘zlar: geotizim, rekreatsiya, rekreant, rekreatsiya resurslari, ekologik barqarorlik, tizimli yondashuv, geoekologik baholash.

Управление природопользованием в целях рекреации

Аннотация. В Узбекистане использование природных ресурсов в рекреационных целях требует глубокого изучения их уникальных особенностей и систематического сохранения экологической устойчивости природы. Природопользование – сложный междисциплинарный, многоаспектный и проблемный процесс и для этой цели нами проведены исследования на основе методов аэрокосмического, системного, комплексного и

геоэкологического подходов, основанных на его реализации. В статье изложены вопросы природопользования на основе анализа использования ресурсов геосистем с различной степенью экологической устойчивости, а также цели комплексной рекреационной оценки ландшафтов на основе специально разработанных критериев природных факторов, рекреационных ресурсов и существующей инфраструктуры с целью определения их пригодности для отдыха, лечения и развития туризма.

Ключевые слова: геосистема, рекреация, рекреант, рекреационные ресурсы, экологическая устойчивость, системный подход, геоэкологическая оценка.

Introduction. Uzbekistan's natural conditions and resources are extremely diverse, with some areas possessing unique and distinctive characteristics. The combination of plain geosystems with mountainous ones, the presence of intermountain valleys and foothill streams in mountainous regions, as well as enclosed depressions, residual plateaus, hills, and mountains in the plains, significantly complicates the economic use of natural resources. This complexity is primarily due to the mosaic nature of the ecological stability of geosystems. Accordingly, assessing, forecasting, and managing the stability of the country's major geosystems is of significant practical importance. It has become evident that when geosystems exhibit varying degrees of ecological stability, it is necessary to apply differentiated management principles and economic approaches tailored to each type. In other words, the use of natural resources must take into full account the specific local and regional conditions.

Literature Review. Recreation represents a specific form of human activity that encompasses leisure, entertainment, sports, environmental awareness, science, medical treatment, commerce, and many other fields. The resources used in these activities are diverse, and in the literature, recreation is often considered as one type of active leisure. There are various approaches among scholars to the classification of recreational resources. Notable contributions to this field have been made by the English scholar C. Williams, French researcher P. Defferré (2006), Russian experts A.S. Kuskov and others (2006), T.T. Khristov (2007), and A.D. Chudnovsky (2018), who have addressed the issue with a focus on territorial approaches based on the taxonomic units that serve as objects of recreational and tourism research.

In Uzbekistan, geographical scholars such as R. Usmonova (2001), M.R. Usmonov (2003), A. Soliev and M.R. Usmonov (2005), A.N. Nigmatov and N.T. Shamuratova (2007), N.T. Shamuratova (2011), Sh.T. Yakubjonova (2018), B.Kh. Kamolov (2018), and Sh.Gh. Shomurodova (2020) have explored the classification of recreational and tourism resources, with particular emphasis on the utilization of the country's tourism potential.

However, there has been a lack of comprehensive and specialized research in Uzbekistan specifically addressing the use of natural resources for recreational purposes. Overall, differing perspectives and the insufficient number of scientific studies and applied developments in the field of recreational resource use highlight the need for further advancement in this area. Therefore, there is a growing necessity to study the unique characteristics of nature use for recreation within the country and to ensure the protection of ecological stability in a systematic and well-regulated manner.

Research Methodology.

Aerospace Method. The application of aerospace methods in the large-scale study of recreational resources yields highly effective results. Satellite imagery enables clear visualization of reservoirs, various types and forms of relief, their morphological features, surface depressions and elevations, and characteristics of vegetation cover. On large-scale images, the spatial distribution of natural geographic processes and phenomena can be easily identified. Additionally, diverse morphological forms of mountainous relief (e.g., steep or gentle slopes, cuesta formations, etc.) and types of river valleys (e.g., terraced, canyon-like, ravine-type) are distinctly represented, as are erosion, karst, and landslide phenomena.

Depending on the spatial arrangement and specific features of natural components and complexes, human activities such as recreation, travel, and participation in various types of sports become feasible. Moreover, to effectively implement various types of recreational activities in natural

complexes, it is necessary to perform a comprehensive evaluation of these territories to ensure the optimal utilization of recreational resources.

One of the distinct advantages of aerospace imagery is its capacity to fully reflect many characteristics of an area, rendering the relief conditions in a “live” format and allowing for precise identification of hydrological objects (e.g., water bodies, springs, snowfields, glaciers). These features are of practical significance for recreational planning, as they provide a reliable foundation for the development and implementation of effective and sustainable nature-use strategies [1].

Systematic Approach. Due to the complex, multi-profile, multifaceted, and often problematic nature of environmental use, its implementation requires a range of grounded scientific approaches and principles. Among these, the systematic approach stands out as the most dominant and effective. It treats the territory as a system and examines it through the application of systemic methods. The objectivity and reliability of this approach become particularly evident in analyzing the structure of natural complexes, identifying their stratification, studying matter and energy exchange processes, and evaluating resource availability [1].

Integrated Approach. It is essential to fully consider the compatibility of the planned project with the local conditions of natural complexes, particularly their landscape-dynamic characteristics. The interaction, coherence, and balance between human-made objects and the natural complex environment significantly influence the establishment of stable and functionally sound connections over the long term. Only under such conditions can integrated utilization of natural territorial complexes be achieved [1].

Geoecological Approach. While the ecological approach has practical significance in the use of natural resources, it often operates within the conceptual boundaries of ecosystems. The geoecological approach, on the other hand, studies environmental processes within naturally bounded territorial complexes. By analyzing ecological conditions, phenomena, and processes within specific landscapes and their complexes, this method facilitates the development of laws and principles that help identify development trends, predict environmental trajectories, and provide objective assessments [1].

The analysis and results of the research conducted to assess, forecast, and manage the ecological stability of Uzbekistan’s geosystems show that the vulnerability and variability of the Republic's geosystems require their systematic and integrated management. For effective management, we propose dividing them into the following categories: 1) oasis geosystems; 2) pasture geosystems; 3) geotechnical systems; 4) aquatoria geosystems; 5) foothill and mountainous geosystems.

The management of oasis geosystems is considered the most complex, responsible, multifaceted, and large-scale. In the management mechanism, special attention must be paid to the following crucial and decisive issues: a) achieving a stable negative salt balance in all oases; b) gradually reducing irrigation norms of agricultural crops to hydro-module standards; c) introducing traditional crop rotation in all farms; d) establishing soil and water protective shelterbelt plantations on designated areas in all oases (across the republic, their total area should reach 112,000 hectares by 2025, whereas in the late 1980s, this was 40,000 ha).

In irrigated agriculture in Uzbekistan, regulating the salt balance of soils holds top practical importance in the set of meliorative measures. Due to the mineralization of river waters, 9 to 25 tons of salt accumulate annually per hectare of irrigated lands in the lower reaches of the Amu Darya, Zarafshan, and Kashkadarya rivers. These salts must be removed using drainage systems. Additionally, some salts also accumulate via groundwater; in total, 20–50 tons of salt per hectare must be removed. To achieve this, the existing drainage system must function at a high level. In practice, however, most drainage systems in the oases are clogged with sand and silt, blocked with waste, and otherwise fail to meet operational standards; they require both capital and current repairs. In particular, in Karakalpakstan, the drainage system is in a severely neglected state, and about 100,000 hectares lack even a single meter of meliorative canal [2].

Rational use of irrigation water depends largely on irrigation norms. The average volume of water applied to irrigated lands in the Republic is 11.5–12.0 thousand m^3/ha. These figures have significantly decreased compared to the 1980s, but they are still considerably higher than in other countries. Therefore, based on biological norms, it is advisable to reduce the water volume to approximately 7–8 thousand m^3/ha. A decrease in irrigation norms will simultaneously reduce the volume of return water, which will positively affect the lowering of the general groundwater level in the oases.

Among other practical measures, it is necessary in the sustainable management of oasis geosystems to improve soil fertility, enhance water quality, and, in general, ensure a fundamental transformation of the natural environment.

Pasture geosystems, in general, are developing along a trajectory of degradation (digression); a set of urgent measures is necessary to stabilize them and drastically increase their productivity. In this regard, measures aimed at preventing technogenic erosion must be introduced; in general, pastures should be protected from the effects of technogenic factors. We propose strictly prohibiting the movement of automobiles and other vehicles across pastures; transportation should only take place on designated roads—this would help protect pastures from degradation. Pasture vegetation is suffering due to overgrazing and the cutting of trees and shrubs for fuel. Large numbers of trees are cut down annually on mountain slopes and in desert areas. To prevent this negative situation, the population must be adequately provided with fuel (coal, liquefied propane gas, electricity, etc.) [2].

It is proposed to create special agro-phytocenoses in individual farms; additionally, it is advisable to sow valuable forage crops on degraded pastures, and establish soil-protective forest belts at specified densities (for example, every 600 meters). Overall, pasture geosystems must be managed sustainably to prevent the timely emergence of various adverse processes caused by human activity. Moreover, it is necessary to increase the productivity of these geosystems and establish a strong barrier against degradation.

Natural conditions and resources are characterized as a distinct part of recreational resources. People rest in nature, restore their health, and spend much time outdoors. Recreational activities require naturally favorable places (geosystems) where appropriate relaxation is possible—for example, mountainous valleys with unique landscapes and water bodies, lakes or rivers with stable water levels during summer, forests or parks with water reservoirs, and so on. Tourists are most attracted to mountainous valleys, steep slopes, mountain passes, eternal snow and glaciers in high mountains, fast-flowing rivers and streams, and natural monuments (caves, waterfalls, etc.) [3].

In the current market economy conditions, the majority of vacationers are not traveling abroad. Instead, they plan to rest or receive treatment in domestic resorts, sanatoriums, boarding houses, and beautiful natural locations (even though the necessary infrastructure in such places may be underdeveloped). In mountainous areas, the number of informally organized tourist groups and city residents taking short-term vacations is increasing. Under such circumstances, the natural environment in the country’s recreational zones is degrading; ecological balance is disturbed, water bodies become polluted, new paths appear that destroy vegetation, the number of local fires increases, and litter left by tourists contaminates nature.

To ensure the rational use of the natural environment and its resources, the following measures are advisable: first, to develop general rules for the use of natural resources by recreationists; second, to legally regulate the use of the natural environment, introducing a specific “green” tax for visiting recreational areas, and to impose large fines for violating resource use rules, especially for polluting the environment, starting fires, collecting medicinal or Red Book-listed plants, hunting animals, and damaging or destroying other geoecological objects; third, to intensify environmental education and awareness on the use of natural resources in recreational areas; fourth, to publish special recreational maps in appropriate quantities showing rest areas, swimming spots, natural attractions (monuments), forests, hiking routes, convenient slopes for climbing high peaks, springs, locations of unique mountain landscapes, rental points for boats, catamarans, jet skis, and tents, sports grounds, food and leisure facilities, libraries, shops, hotels, campgrounds, WiFi and phone networks, and more.

Uzbekistan is rich in favorable natural conditions and resources for recreation, with world-class resort and sanatorium complexes such as Chartak, Chimgan, “Botanika,” and others. However, the existing recreational potential in the country is not yet capable of accommodating a large number of vacationers. There are significant opportunities to establish new centers for year-round treatment and recreation not only for the domestic population but also for foreign tourists in the regions of Kashkadarya, Surkhandarya, Tashkent, Samarkand, Namangan, Fergana, and others.

To ensure the rational use of recreational resources and the optimal location of resort and sanatorium complexes, boarding houses, holiday homes, children’s camps, tourist bases, and other facilities—based on the suitability of natural conditions and resources, the availability of infrastructure, and the comprehensive development of recreation in the country—it is advisable to map these resources [4]. Thus, compiling a "Map of the Recreational Resources and Their Use in the Republic of Uzbekistan" at a scale of 1:1,000,000 will have practical significance for planning,

organizing, and developing recreational activities in the country. The basis for the map should consist of landscapes providing complete information about land use categories within the natural environment and bounded by natural areas.

A comprehensive assessment of landscapes from a recreational perspective, using specially developed criteria for natural factors, recreational resources, and existing infrastructure, makes it possible to determine how suitable they are for recreation, treatment, and tourism development. As a result of such an assessment, the following landscape suitability levels for organizing and developing recreational activities in the Republic have been identified: 1) very suitable; 2) suitable; 3) moderately suitable; 4) unsuitable; 5) very unsuitable. Grouping landscapes based on relevant comprehensive recreational criteria in this way allows for a differentiated approach to using natural resources according to their complexity and for determining a phased sequence for involving resources in recreational circulation.

From a recreational perspective, the groups of landscapes classified as very suitable are located in the mountainous and foothill regions of the country (such as the middle and upper reaches of the Chirchik, Ohangaron, Kashkadarya rivers, etc.), where natural conditions are highly favorable for the development of all types of recreation, treatment, and tourism (see Table 1).

Table 1

The level of provision of the Tashkent region population with various recreational facilities in 2022.

№	Facilities	Total number of places (capacity)	Number of places per 1,000 people	Standard requirement per 1,000 people	Provision rate, %
1	Sanatoriums	6734	2,1	3	70
2	Rest houses and boarding houses	3930	1,2	8	15
3	Children’s health camps	26200	8,2	40	20,5
4	Tourist bases	500	0,16	5	0,03
5	Fishing bases	85	0,03	2	0,02
6	Departmental short-term recreation facilities	2075	0,65	5	0,13

This area includes all the well-known resorts, sanatoriums, holiday homes, children’s camps, and popular tourist bases in the republic. However, many unused resources still exist here, providing very favorable conditions for establishing treatment facilities, holiday homes, and children’s balneological complexes. Unique mountain landscapes, lakes, caves, waterfalls, and other rare natural features attract tourists.

Landscapes favorable for recreation are characteristic of foothill zones and some river valleys (especially Surkhandarya, Zarafshan, Sokh, Sanzar, and others). These areas have various mineralized underground healing waters with different temperatures and chemical compositions, as well as therapeutic muds. For example, about 50 km northeast of Samarkand, in the Karadarya valley, the “Nagornaya” holiday home offers mineral water containing radon with chloride-sulfate-sodium composition and low mineralization (1.2 g/l), exhibiting properties similar to the well-known Tskaltubo waters in the Caucasus. In the Kashkadarya basin, at an altitude of 850 m above sea level, the “Khojayipok” holiday home’s underground healing waters are hydrogen-sulfate type, moderately mineralized (5–15 g/l), with a temperature of +21°C; these waters closely resemble healing waters found in Pyatigorsk and Goryachiy Klyuch in the North Caucasus.

Less favorable recreational landscape groups are typical of the foothill proluvial plains, alluvial cones, and river valley deltas such as those of the Amu Darya, Syr Darya, and others. Summers in these areas are very hot, with low relative humidity (15–20%). The water levels in rivers and reservoirs are unstable, and the natural riparian forests have significantly degraded or in some places completely disappeared. There are no sheltering tree plantations along irrigation canals, and only small seasonal holiday homes can be found in specially designated areas. In this context, organizing short-term tourist routes in early spring among ephemeral and ephemeroid plants, medicinal herbs, and fresh spring air rich in phytoncides is advisable. The presence of underground healing water wells necessitates the creation of appropriate infrastructure and the establishment of holiday homes. For instance, the "Jayronkhona" holiday home located in the lower reaches of the Surkhandarya features wells with chloride-sulfate-sodium underground waters (mineralization level 30–35 g/l). Similarly, the "Muborak" holiday home is located in the lower reaches of Kashkadarya.

Unfavorable and very unfavorable landscape groups occupy the desert zones of the republic (including the Kyzylkum Desert, Ustyurt Plateau, part of the Karshi Steppe); due to certain natural reasons, these areas are unsuitable for recreational infrastructure development. However, this does not mean that the entire desert zone of the republic is deprived of recreational facilities. The Bukhara, Khorezm, and Karakalpak regions are rich in various architectural, historical, cultural, and spiritual complexes of global significance. These areas include the architectural monuments of Bukhara, Khiva, Vobkent, Tortkul, Karmana, and other cities, attracting a steady flow of domestic and foreign tourists throughout the year.

The map (Figure 1), alongside the above information, should depict all major architectural, historical, spiritual, cultural, and interesting natural landmarks, as well as facilities serving tourists and institutions for entertainment and cultural-educational purposes, using special symbols.

In the map sections of cities such as Tashkent, Samarkand, Bukhara, Khiva, Shahrisabz, Kokand, and others, it is advisable to show key markets, museums, house-museums, theaters, exhibition halls, cultural palaces, zoos, concert halls, libraries, sports facilities, department stores, restaurants, cafes, teahouses, as well as schematic layouts of metro lines, among other relevant objects.

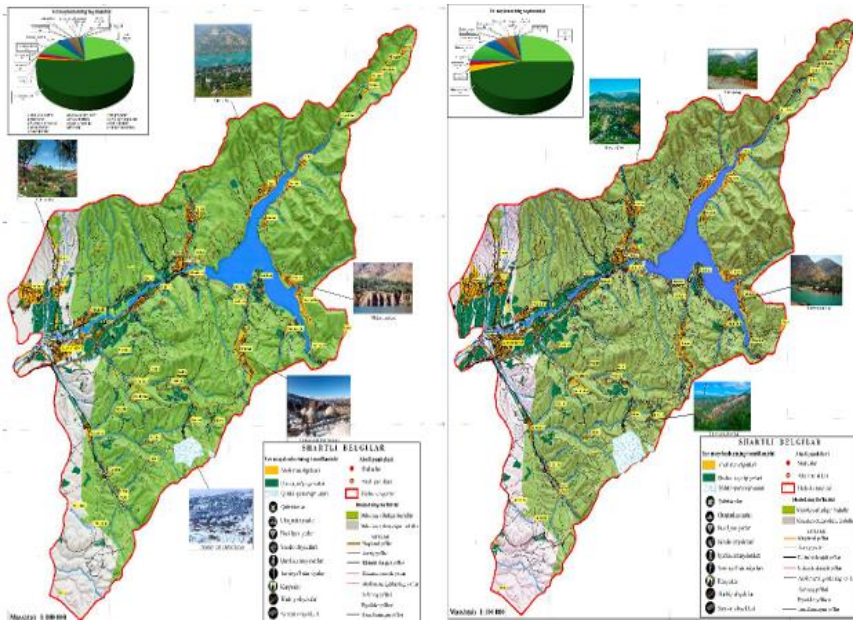


Figure 1. Geophysical space image of the Chirchiq and Ohangaron river basins, 2022

The main map should clearly indicate the primary tourist routes between cities, especially those originating from Tashkent at the national level, as well as local routes leading from regional centers to remote areas. Additionally, airports, bus stations, and railway stations must also be marked (see Figure 2).

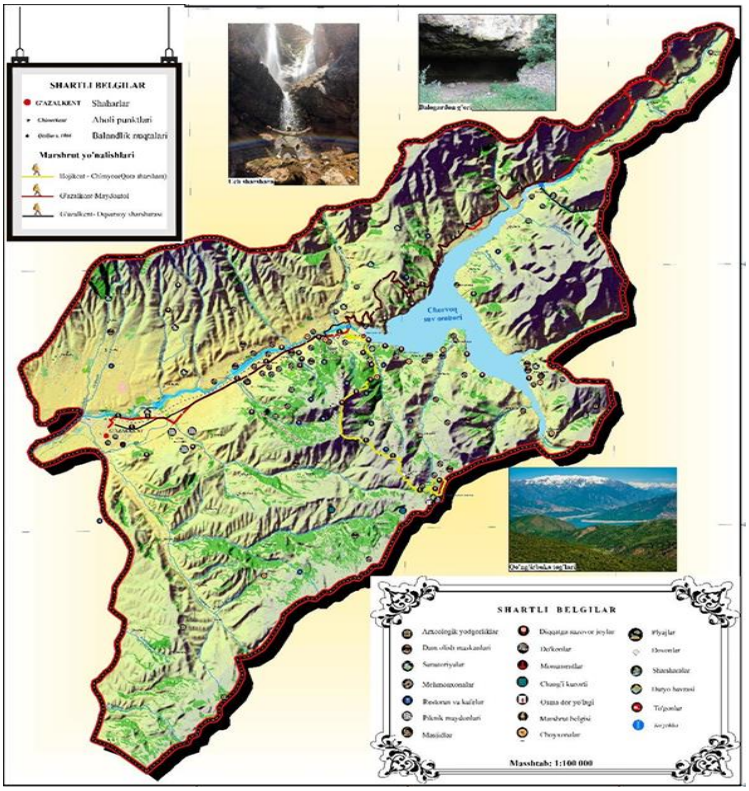


Figure 2. Recreational Features of the Natural Complexes in the Chirchiq and Ohangaron River Basins

The map should reflect tourist flow statistics by region for both domestic and international visitors, at least for the years 1990, 2000, 2010, and 2020. It must also illustrate prospects for tourism development, including the opening of new routes and the establishment of new health and recreational facilities.

This map is intended to serve as a scientific reference guide and should be visually enhanced with attractive color photographs showcasing unique natural sites of the republic as well as architectural monuments of ancient cities, which capture the attention of visitors.

Conclusions and Recommendations. Based on the study of the ecological stability of Uzbekistan's geosystems, the following conclusions have been drawn:

1. In general, mountainous and foothill geosystems are more stable against anthropogenic impacts compared to flatland (desert) zones. This condition is explained by their inherent self-purification and recovery abilities, as well as the presence of dense vegetation cover, which leads to the stability of gravitational and erosion processes and allows for extensive use of natural resources in these areas. In flatland regions, especially oases, natural resource use must be strictly conducted in accordance with local natural conditions. Regular management of soil water-salt balance and efforts to remove salts beyond the area are necessary to prevent their accumulation in the aeration zone.
2. It has been established that assessment, forecasting, and management processes in geosystems with low ecological stability are logically interconnected and influence each other. This integrated approach requires high-quality and continuous scientifically based management of geosystems, which contributes to maintaining their ecological stability.
3. The pasture zones of flatlands occupy large areas and are ecologically very vulnerable. For example, in many flatland areas (such as the Kyzylkum and Karshi deserts), ecological balance has been disturbed due to human economic activities in the late 20th century. Restoration, preservation, and achievement of stability in geosystems can only be realized through regular scientifically grounded management.
4. In areas with low ecological stability, the use of nature for recreational purposes has specific characteristics. For instance, mountainous and foothill regions of the republic are relatively

stable; however, extensive development of recreational activities may lead to local disturbances of natural balance and negative anthropogenic effects. In such cases, rational approaches to using the region's natural resources, considering its ecological stability features, are required.

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