

Rural Sustainability and Management of Natural Resources in Tian Shan Region, Central Asia

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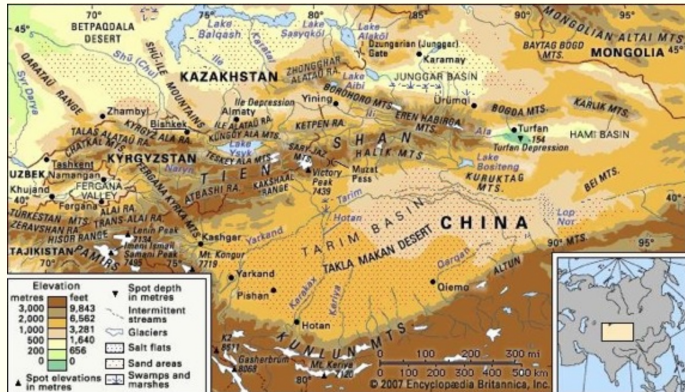
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Geopolitical Location: in the Heart of Central Asia



Heart of Central Asia

Tian Shan has unique geopolitical location in the heart of Central Asia. It crosses five densely populated countries: China, Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan.

Style of Life

The population mostly supports traditional style of life which includes livestock husbandry, intense grazing, farming and other agricultural activities.

Geographic Location



Celestial Mountains

Tian Shan (the 'Celestial Mountains') is one of the largest high mountain systems (800,000 km^2) in the World.

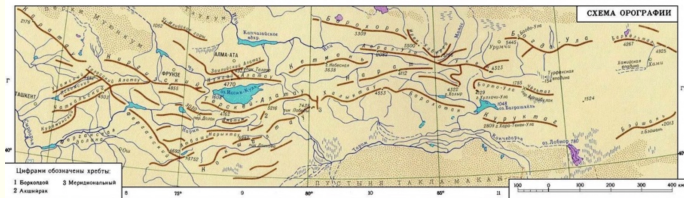
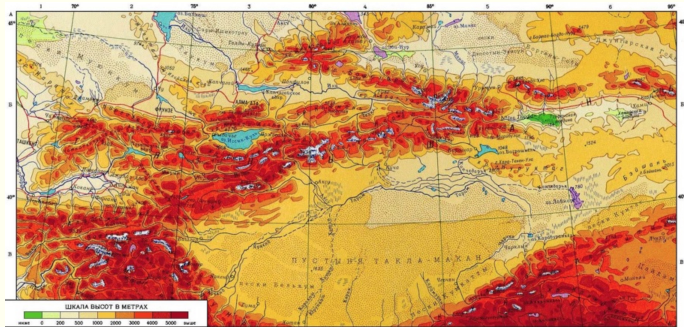
Mountain Extent

Tian Shan is a complex mountain system extending 2,500 km westwards (39-46°N and 69-95°E). Tian Shan is the northernmost existing montane range with elevations reaching > 7.000 m

Examples

Complex Mountain System Geographically, Tian Shan is composed by large, isolated mountains, surrounded by the Tarim desert basin of north-western China, Lake Issyk Kul and deserts of Uzbekistan and Kazakhstan.

Geomorphology



Physical geographic map (above). Orographic geomorphic scheme (below).

Biodiversity

Uniqueness of Tian Shan Nature:

Biodiversity

The Tian Shan region is outstanding for the richness of natural resources, landscapes and ecosystems

Protected Species: Relicts and Endemics

Natural resources of Tian Shan are exceptional: the ecosystems include numerous protected and rare species (> 4000 wild species), relicts and endemics, unique coniferous forests, rich biodiversity

Examples

Rare Species Rare species: ca 70% of species (both animal and plants) have specific south Asian distribution, typical for steppe and desert ecosystems.



Ecosystems

The ecosystems of Tian Shan region has diverse mountainous environment influenced by a combination of Northern (boreal) and Asian climatic factors.

Environment

Unique Ecosystems

Unique, complex and mixed ecosystem structure is formed by long migration and colonization processes of vegetation and animal elements in Pleistocene

Phytogeographical Groups

Species are introduced from several phytogeographical groups: **Middle Asian, Irano-Turanian, Pontic-Siberian, Northern Siberian, Eurasian.**



Unique Biota

Tian Shan region has unique biota structure, divided into two large groups:

1. **humid** ecosystems dominating in the forests on the mountain slopes
2. **arid** ecosystems dominating in the steppe areas and deserts

Examples

Mountainous Topography Favorable conditions for extensive pasture in Tian Shan region are created by specific mountainous topography and climatic settings

Forests

Example of Rare Species

Schrenk's Spruce

The slopes of the mountains at altitudes 2000 to 3000m are mostly covered by precious coniferous forests of Schrenk's Spruce (*Picea schrenkiana*), recorded in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species

Importance

The unique coniferous Shrenk pine forests play important role in the ecosystems of the Tian Shan, being hot spots of biodiversity, rich in species and resources.



Examples

Functionality Shrenk pine forests serve as a buffer belt against flooding and low-water runoff. The lower slopes are covered by mixed forests of wild Persian walnut (*Juglans regia*), wild fruits and apple (*Malus domestica*).

Brief History of the Land Use



- Concentration of numerous mountain ethnic groups with their original cultural and ancient traditions adapted to live in difficult conditions of mountains: Kyrgyz, Kazakhs, Uzbeks, Tajiks, Turkmen.
- Livestock grazing activity has been kept by local population for centuries until middle of 20th century.
- Since 1920s: economic and land use structure was forced to state farms and sedentary lifestyle.
- After 1990s: shift of the Central Asian society back to the traditional style of life (agriculture, pastures).
- Nowadays, private land use and cattle grazing on mountain pastures are the main activities in the common life style of the majority of population.

Current Social Problems

Social Portrait

In general, social portrait of mountainous regions of Central Asia is the following. After the end of the USSR (1990s) the inhabitants of mountain areas have to deal with serious problems creating conditions for social tension and conflicts:

Poverty and Unemployment

Depressed economics: poverty, unemployment and lack of jobs, energy insecurity, lack of economic integration into the overall state system, lack of attention to the people's needs and concerns of the inhabitants.

Population Growth

Significant population growth: the families struggles to deal with poverty by increasing the number of male workers (boys). As a consequence - ineffective ways of cultivating lands (primitive labour) and pastures (lack of resources)

Underdeveloped Transport and Infrastructure

Underdeveloped transport system and social infrastructure, low standards of construction (e.g. non-professional construction of houses directly on the mudflow areas or arable land, without concern of engineering - technical requirements and standards.

Current Social Situation



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- The livestock is increased, and strong grazing pressure become transform to overgrazing.
- This leads to unsustainable agriculture and overgrazing caused by cattle herds, and affects sustainability in mountainous landscapes.

Rangelands of Central Asia

Source: FAOStat, 2009.

COUNTRY	LAND AREA ('000 HECTARES)	RANGELAND (PERMANENT MEADOWS & PASTURES)	RANGELAND AS % OF LAND AREA
Kazakhstan	269,970	185,098	69
Kyrgyz Republic	19,180	9,375	49
Tajikistan	13,996	3,770	27
Turkmenistan	46,993	30,700	65
Uzbekistan	42,540	22,000	52
Region	392,679	250,943	64

Land Use Statistics in Central Asia

Source: FAO, 2006.

COUNTRY	TOTAL LAND AREA (MLN HA)	RAINFED	PASTURES AND RANGELANDS	IRRIGATED
Kazakhstan	269.970	18.994	2.312	185.098
Kyrgyzstan	19.180	0.238	1.072	9.365
Uzbekistan	42.540	0.419	4.281	22.219
Tajikistan	13.996	0.208	0.722	3.198
Turkmenistan	46.993	0.400	1.800	30.700
Total	392.679	20.259	10.187	250.580

Kazakhstan



Grazing Land

Most of the grazing land was abandoned due to degradation, water scarcity and limitations of basic amenities needed for a normal life (electricity, schools & hospitals, roads, shops).

Life Style

Ca 6 million people of Kazakhstan (40% of the population) directly or indirectly dependent on the natural resources for their lives as a livelihood (pastures, meadows, forests, mountains, rivers). Many of them live in poverty.

Market-Based Economic System

During the economic shift in 1990s, many agricultural services, primarily supported by the government, decreased, while population moved very slowly to adjust to new market-based economic system.

Examples

Abandoned areas: unused pastures, rangelands and degraded lands are estimated at ca 100 M ha

Kyrgyzstan (1)



Overgrazing

Overgrazing of cattle on pastures causes:

- destruction of the pasture plants
- destruction of soil structure
- reduced productivity and erosion

Examples

Productivity Average productivity of pastures since 1970 to 1990 decreased by 14%. A considerable area of lands (ca 25%) moderately or severely degraded (spring and autumn pastures are particularly sensitive to degradation).

Livestock Husbandry

Livestock husbandry occupies in total 85% of the total agricultural area (including arable land: legume feed, lucerne, barley, and crop by-products such as hay and straw).

Pasture Degradation

Pasture degradation:

- excessive anthropogenic pressure on pastures recently,
- unsystematic grazing,
- lack of improvements of the natural grassland,
- deterioration of pastures.

Kyrgyzstan (2)

Extinction of the Plant Species

Pasture degradation leads to the extinction of the plant species, sensitive to external pressure (grazing), loss of unique mountain landscapes, decrease of biodiversity.

Pasture Forage

Deterioration of pastures is a danger in terms of the reducing stocks of pasture forage.

Examples

Pasture Degradation Pasture degradation on the mountain slopes contributes to the development of soil erosion, which is an irreversible process for mountains, which can hardly be recovered to to the sensitivity of landscapes.



Damage for Pastures

1. **too large** herds grazing on pastures;
2. **too long** period of cattle staying on the pastures without ensuring their (pastures') recovery.

Nomadism



Geographic Determination

The grazing routes are strongly determined by the geographic location of the pastures: pastures located near the settlements are over-utilized, whereas remotely located ones are often abandoned.

Nomadic Pastoralism

Geographic seasonality of nomadism: very intensive grazing in the summer months at high altitudes and migration downwards during the winter. This leads to the soil depletion by intensive pressure on selected areas in given time period.

Overgrazing

System of Pastures

Due to the destruction of “collective farms” and state farms, and the formation of many new small business entities, the system of pastures in Central Asia changed.

Overgrazing

Almost all livestock is being kept all year on village spring-autumn pastures near villages, because owners are not able to overtake livestock on the remote pasture land due to the lack of transport and funds. Hence, pastures suffer from great pressure and overgrazing. Such imbalanced placing of livestock on the neighboring pastures leads to the degradation of the village grazing land.

Examples

Changes in soil structure: Animals continuously grazing on the same place negatively affect the soil : the soils became more thick and compact in structure, with reduced infiltration. The wrong organized grazing reduces vegetation coverage, bares the soil and accelerates erosion.

Examples

Changes in vegetation structure: changes in dominant plant communities; loss of certain grass species, reduced yields, pasture forages, increased 'bad, non-edible' plants on the pastures: inedible, noxious and poisonous plants, increased growing bushes on pastures (especially thorny bushes, instead of 'edible' plants), increased grazing and water erosion (increase of grazing trails, ravines, gullies, etc.)

Ecological Threats

Unsustainable livestock husbandry and nomadic pastures affect ecosystems:

Overgrazing

Increased livestock numbers cause intensive and strong grazing pressure (overgrazing). In turn, overgrazing cause detrimental effects on landscapes

Deforestation

Deforestation: decrease in forest areas.

Decreased Species Composition

Decreased species composition and structure of plant communities, e.g. relic and endemic species

Examples

Soil depletion on the mountain slopes (e.g. in Tajikistan and Kyrgyzstan)

Examples

Soil erosion leads to desertification and silting of debris from the rivers and lakes

Erosion and Degradation

Sensitive Ecosystems

Anthropogenic pressure and non sustainable grazing pose major threats to the local environment and may have negative impacts on sensitive mountain ecosystems

Land Use

Unsustainable land use caused environmental and anthropogenic impacts on the ecosystems of Tian Shan region.

Overgrazing

Increased overgrazing caused extinction of rare species: some Euro-Siberian and Middle Asian endemic plants are now endangered.

Examples

Erosion and Degradation: Cattle trampling caused soil erosion and degradation of shrubland and vulnerable habitats. Destruction of flora and fauna by locals during engineering and pasturing.

Examples

Lost of Pastures: Unbalanced land use caused loss of ca 50 M hectares of pastures in Kazakhstan, which are now declined and gradually degrading.

Nature Conservation Programs in Tian Shan Region

To support, preserve and protect unique natural ecosystems in Tian Shan environmental region several Natural Research Parks were created.

The most important ones are acknowledged by the UNESCO:

- Issyk-Kul Biosphere Reserve (Kyrgyzstan);
- UNESCO 'Man and the Biosphere' program;
- State Kazakhstan National Natural Park 'Altyn-Emel' (Kazakhstan);
- UNESCO World Heritage object Aksu-Zhabagly National Park (Kazakhstan);
- Sary-Chelek Nature Reserve (Kyrgyzstan), a World Biosphere reserve designated by UNESCO;
- Ugam-Chatkal National Park (Uzbekistan), a UNESCO World Biosphere reserve;

These National reserves maintain thousands of hectares of precious forests, meadows, and other natural reservoirs

Conclusion: Problem Solving

How to effectively deal with land degradation and to prevent further environmental problems ?

Preparing

Preparing an inventory of the arable lands of precious mountain areas: current status, soil fertility, resistance to erosion, compaction;

Developing

Developing land and resource protection methods for all neighboring countries (Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan);

Applying

Applying modern technologies to zoning, monitoring and mapping of agro-ecological areas resisting to anthropogenic pressure: e.g. GIS, remote sensing, territorial soil erosion mapping; creating a data bank on mountain soils;

Creating

Creating modern water management and irrigation technologies to prevent erosion and other forms of degradation of mountain soils;

Teaching

Teaching local people how to deal with soil erosion;

Protecting

Subject of special care should be development of specially protected areas (national parks, nature reserves, wildlife sanctuaries), as sources of ecological stability of the region.

Thanks

Thank you for attention !

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