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Protection of the natural and cultural heritage of the Mongolian Altai¹

U. Beket & H.D. Knapp

Abstract

The Altai-Sayan Ecoregion is known as a hotspot of biodiversity with large wilderness landscapes and a high rate of endemism in Central Asia and Siberia. There are many large and important protected areas of different categories. Parts of the Russian Altai, the “Golden Mountains of Altai”, are inscribed as World Natural Heritage. Also the neighbouring countries contain pristine landscapes, which could be a potential for an extension to a transnational serial World Heritage Site.

The Mongolian part of the ecoregion is characterized by very diverse landscapes and vegetation complexes: Deserts, semi-deserts and desert steppes in arid basins, river floodplains, salt and freshwater lakes and wetlands, mountain steppes in different types, isolated coniferous forests of *Larix sibirica*, subalpine shrubs of *Betula rotundifolia*, alpine grassland and mires, golets terraces, rocks, glaciers and moraines.

There are primeval landscapes as well as extensive pasture areas, which are influenced by traditional landuse for thousands of years. It is also documented by an extraordinary richness of pre-historic monuments of ancient cultures (the petroglyphic complexes indicate as World Natural Heritage three important periods of cultural development and relations between humans and nature about 12,000 years).

The most important parts of the Mongolian Altai are protected as national parks and nature reserves, e.g. Altai Tavan Bogd, Tsambagarav, Silkhem, Khuk Serkh. The establishment of an extensive biosphere reserve, which should include the existing protected areas, is proposed as integrated approach for the management of the natural and cultural heritage. It could improve also opportunities for transboundary cooperation in protected area management and sustainable regional development.

Key words: Mongolian Altai, mountain vegetation, protected areas, natural and cultural heritage

Introduction

The Altai Mountains are situated in the heart of Asia on the state borders between Mongolia, Russian Federation, China, Kazakhstan and have for many years fascinated generations of researchers because of the outstanding natural and cultural heritage. Although this region has been populated and altered by various tribesmen over the centuries and large tracts of mountain landscape remain undisturbed as wilderness. For several millennia the Altai Mountains have provided the local nomadic communities with all the necessary services and provisions for existence including fresh water from glaciers, fodder for horses, yaks, sheep and other livestock, wood from forests and material for yurts and winter houses. Innumerable rock paintings, stone graves, circles and sculptures are evidence for the deep dependency of the people on the mountains but also of the spiritual value attached to this region. The continued relationship between people and mountains has created a rich and diverse landscape that is home to a unique collection of species and habitats.

The rich diversity of cultural landscapes and wilderness has focused efforts in conservation to plan towards large scale, transboundary protection of the Altai Mountains using an international convention framework. The global significance of this region is recognized in the UNESCO World Natural Heritage List for 1998 under the inscription, “Golden Mountains of Altai”. In more recent

¹ Results of the Mongolian-German Biological Expeditions since 1962, No. 319.

years there have intensive discussions between politicians and scientists from neighbouring countries in attempts to extend the boundaries of the trans-boundary biosphere reserve.

Rather little is known about the ecology of this region although in the last 30 years a detailed survey of the vegetation structure, geographical distribution of plants and fodder resources in the Mongolian Altai was carried out by Ulikpan Beket and published in the Mongolian language (BEKET 2009). Following the presentation at the International Symposium „Biodiversity Research in Mongolia“, March 2012 in Halle/Saale (BEKET & KNAPP 2012), a short summary and conclusions for the protection of the rich natural and cultural heritage were published.

The natural conditions

The Altai Mountains form the western part of the “Altai-Sayan Ecoregion”, which is one of the “Global 200” priority ecoregions for nature conservation (OLSON & DINERSTEIN 2002, WWF 2000). The whole ecoregion covers more than 1 Mio km², 62% are located in Russian Federation, 29 % in Mongolia, 5 % in Kazakhstan, and 4 % in China (see fig. 1).

The Altai Mountains are characterized by spectacular mountain glaciers, rugged high mountain ridges as well “golets” terraces and rounded mountain tops and slopes all of which are interlaced by narrow gorges and wide valleys shaped by glacier rivers, floodplains and numerous lakes. The ecosystems and associated plant life are very diverse and include extreme contrasts between deserts, steppes, wetlands, coniferous forests, shrubs, rock vegetation and alpine tundra.

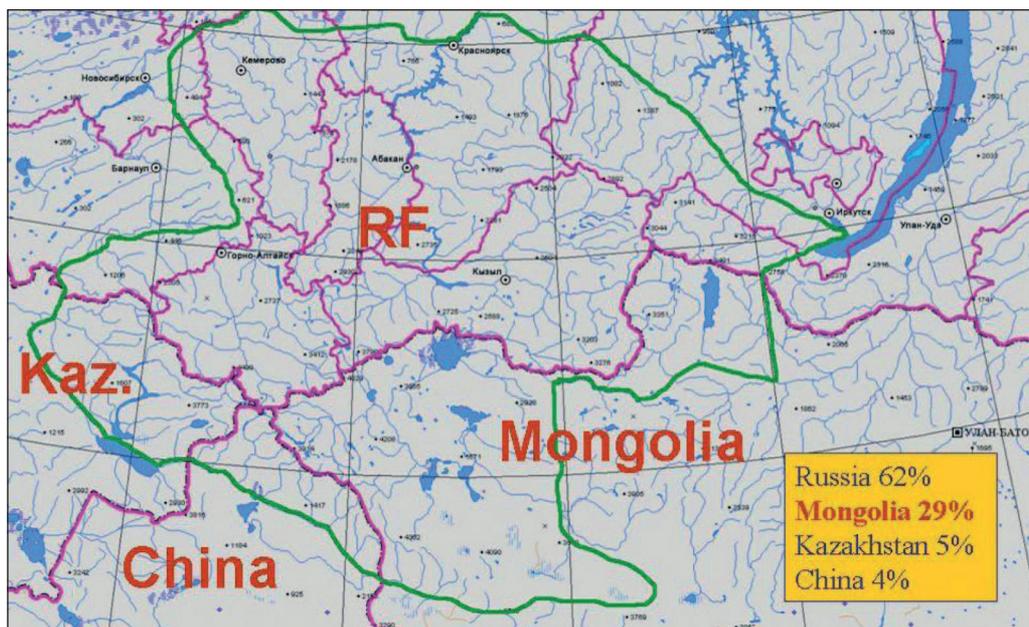


Fig. 1: Map of the Altai-Sayan Ecoregion (<http://bioaltai-sayan.ru/regnum/eng/mapasgs.htm>).

On the Russian side, the Altai Mountains are dominated by Siberian coniferous forests unlike the Mongolian Altai, which is characterised by Central Asian steppe and desert vegetation in complex relationship with extra-zonal taiga forests and alpine tundra.

The climate of the Altai Mountains is strongly continental but varied depending on the topography and altitudinal differences across the region (see climate diagrams, WALTER 1974, p. 342). The western and northern parts of the mountains receive moisture from the eastward Atlantic winds whilst the Eastern parts are in the rain shadow of the high mountain barrier and are unable to

support little more than semi-arid and arid Central Asian vegetation. Typically, the local climate is influenced by very low precipitation, constant winds and sharp daily and seasonal temperature fluctuations. The Mongolian Altai is characterized by widely-contrasting climates from very cold and humid areas in the high mountains to very dry and warm regions in the depressions between the mountains. The annual precipitation in the high mountain areas is 300- 400 mm, and in the depressions between the mountains less than 100-150 mm (BEKET 2009).

The Altai Mountains are shaped by strong hydrological features and form the continental watershed between the Arctic Ocean and the internal-drainage area of Central Asia. On the Russian side the Katun River is the main tributary to the Ob, one of the largest rivers of Eurasia, flowing into the Arctic Ocean. The rivers and lakes of the Mongolian Altai (apart from the Songint River and Elt River which flow into the Black Irtysh – Irtysh – Ob) belong to the closed catchment of Central Asia. The major River Khovd, which flows to the Black Lake “Khar us-nuur”, gets its water from the Tavan Bogd-uul mountain and many small rivers (Sagsai-gol, Bayant-gol, Uigar-gol). The largest of the lakes is the “Achit-nuur.” Many of the lakes are located in the inter-mountain tectonic depressions (Khoton, Khurgan, Tolbo and other), which also belong to the Khovd river catchment.

Hotspot of landscape and plant diversity

Plant-geographical position

The combination of geographical position (fig.2), and altitudinal differences are responsible for the range of Arctic tundra, Boreal taiga, and (Middle and) Central Asian steppe, semi-desert and desert plants. The species list for plants in the Altai Mountain region numbers over 2,800 species of vascular plants of which 288 species and subspecies are endemics (182) and sub-endemics (106). Of these, 132 of them occur in the Mongolian part (PYAK et al. 2008).

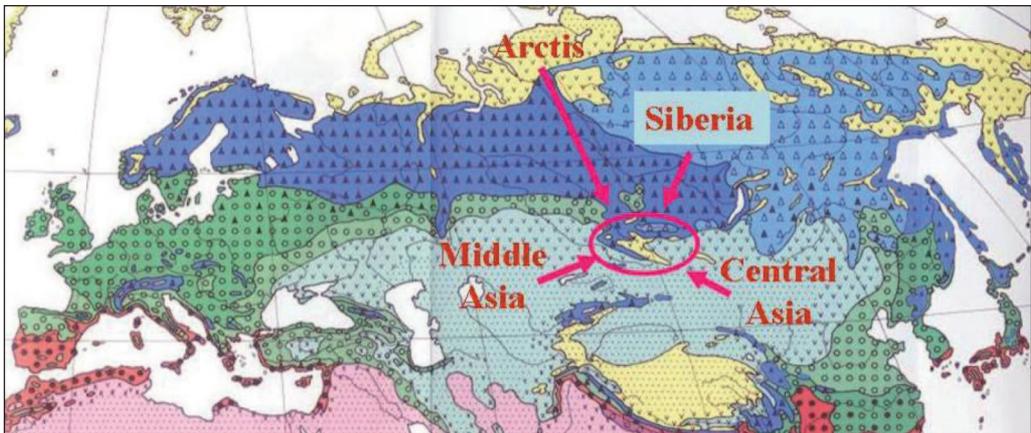


Fig. 2: Vegetation of Eurasia (SCHROEDER 1998, map attachment, section) with location of Altai Mountains and the main plant-geographical influences

The “Botanico-Geographic Regions” of the Mongolian Altai and Khobdo have been described in detail by GRUBOV (1982). The flora of the Mongolian Altai (incl. Khobdo) contains 1,501 species of vascular plants including 50 endemic and 82 sub-endemic species of the Mongolian Altai (BEKET 2009). Based on the distribution of endemic species the Altai Mountains are divided in to three floristic districts: the Altai-Western-Sayan district in the North, the Altai-Saur-Tarbagatai district in the North-West, and the Altai-Western-Mongolian district in the East (and South) (PYAK et al. 2008). Based on the vegetation and floristic composition four geo-botanical sub-districts can be distinguished in the Mongolian Altai (see fig. 3, BEKET 2009).

Table 1: Altitudinal belts of the vegetation in the Mongolian Altai (BEKET 2009, p. 53 ff.)

| Altitudinal belt | Altitude [m a.s.l.] | Vegetation type / typical plant species |
|--|--------------------------|--|
| I. High mountain belt 1. nival | (3,000)-3,500 – 4,362 | Without vascular plants |
| I. High mountain belt 2. subnival | 2,900 – 3,500 | lichen communities, fragments of rock and rubble vegetation (<i>Rhodiola quadrifida</i> , <i>Potentilla nivea</i> , <i>Valeriana petrophila</i> , <i>Dryadanthe tetrandra</i>), cryophyte meadows and swamps (<i>Lagotis integrifolia</i> , <i>Saxifraga hirculus</i> , <i>Primula nivalis</i> , <i>Saxifraga macrocalyx</i>) |
| I. High mountain belt 3. alpine-subalpine | (2,100)-2,700 – 3,300 | alpine grassland (<i>Kobresia bellardii</i> , <i>Carex rupestris</i> , <i>C. stenocarpa</i> , <i>C. melanantha</i> , <i>Bistorta vivipara</i> , <i>Thalictrum alpinum</i> , <i>Dryas oxyodonta</i> , <i>Saussurea schanginiana</i>) subalpine shrubs (<i>Betula rotundifolia</i> , <i>Lonicera altaica</i> , <i>Spiraea alpine</i> , <i>Arctous erythrocarpa</i>) |
| II. 4. Mountain forest belt (mainly northern slopes) | 1,700 – 2,200 | (1) “semi-goltsy” (sub-alpine open woodland, <i>Larix sibirica</i> , <i>Picea obovata</i> in complex with subalpine shrubs (2) “pseudo-taiga”, mountain coniferous forests (<i>Larix sibirica</i> , <i>Picea obovata</i> , <i>Betula rotundifolia</i> , <i>Arctous erythrocarpa</i> , <i>Vaccinium vitis-idaea</i> , <i>Dasiphora fruticosa</i> , <i>Pyrola incarnate</i> , <i>Calamagrostis obtusata</i>) (3) forest-steppe complex in combination of forests with shrubs and meadow-steppe (<i>Larix sibirica</i> , <i>Cotoneaster melanocarpa</i> , <i>Berberis sibirica</i> , <i>Aster alpinus</i> , <i>Silene jennisseeensis</i> , <i>Helictotrichon altaicum</i> , <i>Artemisia frigida</i>) |
| III. 5. Mountain steppe belt | 1,600 – 3,200 | Mountain steppes (<i>Festuca lenensis</i> , <i>Poa attenuate</i> , <i>Agropyron cristatum</i> , <i>Stipa krylovii</i> , <i>Artemisia frigida</i> , <i>Allium mongolicum</i> , <i>Koeleria macrantha</i> , <i>Goniolimon speciosum</i> , <i>Stipa glareosa</i> , <i>Allium polyrhizum</i>) |
| IV. 6. “Kettle hole” desert belt | 1,100 – 2,100 | Semi-desert and desert (<i>Stipa glareosa</i> , <i>Convolvulus amanii</i> , <i>Kraschennikovia ceratoides</i> , <i>Kochia prostrate</i> , <i>Convolvulus gortschakovii</i> , <i>Caragana bungei</i> , <i>Gypsophila desertorum</i> , <i>Ajania achilleoides</i> , <i>Anabasis brevifolia</i> , <i>Reaumuria soongorica</i> , <i>Sympegma regelii</i>) |

The flora of the Altai is influenced by different floristic elements (see fig.2, description, maps and lists of types see HILBIG & KNAPP 1983):

- 1) Elements of the boreal coniferous forest region (types of *Pinus sibirica*, *Cacalia hastate*, *Trifolium lupinaster*, *Populus tremula*, *Linnaea borealis*, *Goodyera repens*) are mainly distributed in the Altai-Western-Sayan district, but also occur in the forest areas of the Mongolian Altai,
- 2) Elements of continental mountain regions characterize the upper mountain belts of the Altai and involve types with wide extension in to the Arctic tundra (*Kobresia myosuroides*-typ, *Woodsia ilvensis*-typ), as well as specific types of Siberian-Central Asian mountain ranges (*Rhodiola quadrifida*-type, *Ribes altissimum*-type, *Orostachys spinosa*-type),
- 3) Elements of (Middle)-Central-Asian steppe and desert steppe regions are common in the steppe belts of Altai Mountains (*Thermopsis lanceolata*-typ, *Kochia prostrate*-typ), but typical Mongolian steppe plants (*Cymbaria dahurica*-typ) do not normally extend to the Altai, and where they do they occur only rarely.
- 4) Eurasian Westside elements like *Geranium pratense*-typ are mainly distributed in western parts of Altai but also occur in Mongolian Altai.
- 5) Few of the Asian Eastside elements like *Rhododendron dauricum*-typ occur on the western borders in northern parts of the Altai Mountains.

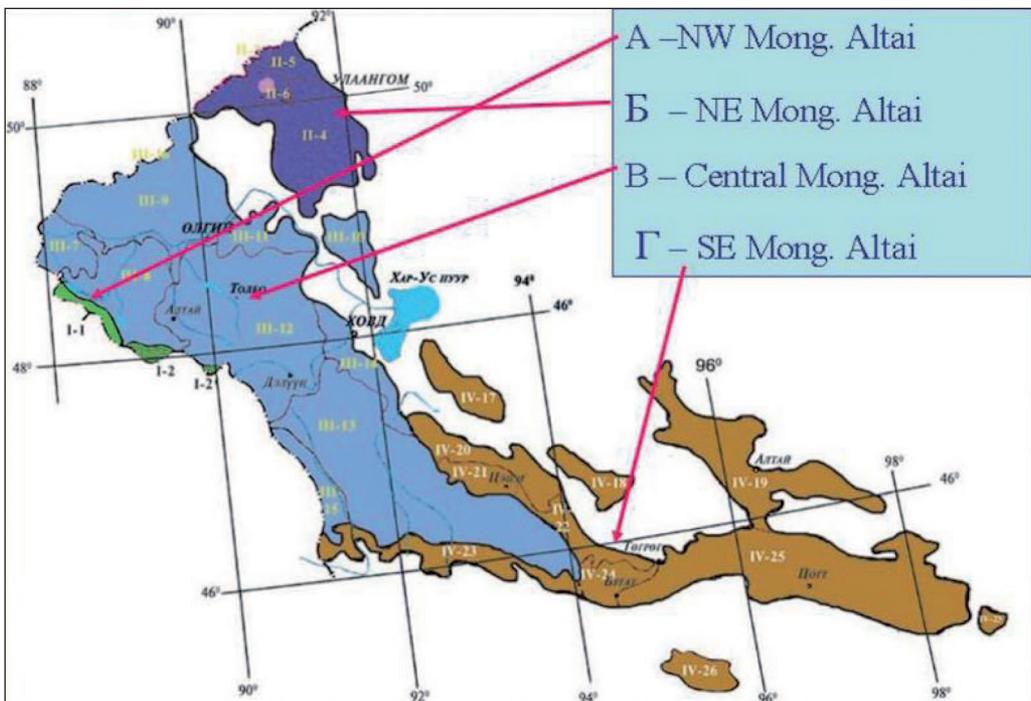


Fig. 3: Geo-botanical division of the Mongolian Altai (BEKET 2009, p. 176).

The original vegetation map of the Mongolian Altai contains 261 basic mapping units in 93 “formations” on the basis of dominating species and summarized in 14 vegetation types. Mountain steppes and alpine cryophytic grassland in different sub-types are the most extensive vegetation formation in the region (BEKET 2009, p. 65).

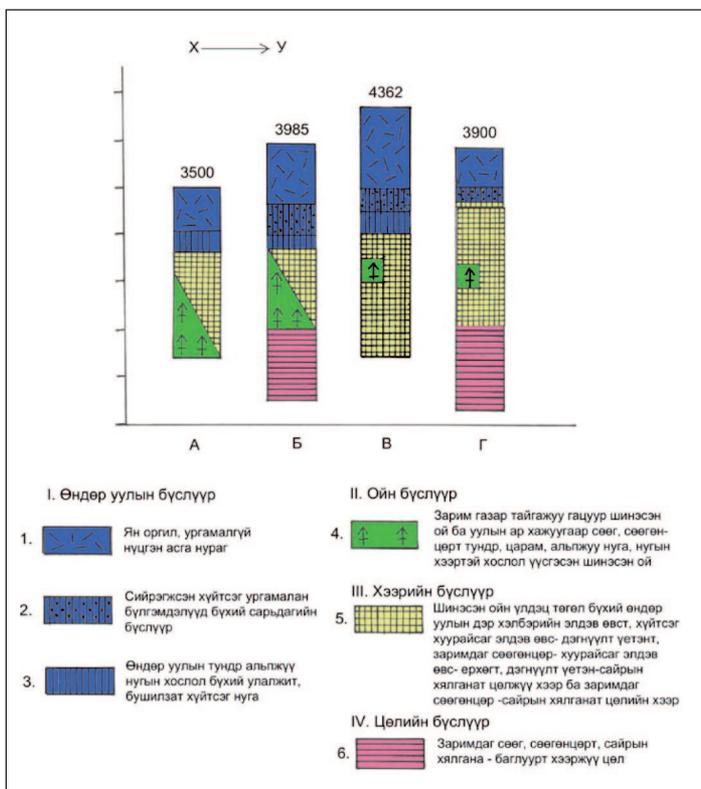


Fig. 4:
Comparison of the altitudinal belts in the Mongolian Altai.
A: NW Mongolian Altai (Baruun khoit),
Б: NE Mongolian Altai,
В: Central Mongolian Altai,
Г: SE Mongolian Altai

I (blue):
high mountain vegetation,
II (green):
mountain forests,
III (yellow):
mountain steppes,
IV (red): deserts;
X – North, Y - South

(BEKET 2009, fig. 19, p. 52)

Altitudinal belts

The main factor for the differentiation of the plant cover in mountains is the elevation above sea level. The Mongolian Altai includes altitudes from 1,150m up to 4,362 m at the highest peak in Altai Tavan Bogd. The vegetation differentiates in to four main altitudinal belts (see fig. 4, table 1).

I. High mountain zone/belt (see fig.5-7):

1. **nival**; Regular snow cover prevents any colonization by higher vascular plants.
2. **subnival**; lichen communities exist together with fragments of petrophytes, cryophyte meadows and swamps,
3. **alpine**; high mountains *Kobresia*- and *Carex*-cryophyte grassland (high mountain tundra).

The main mountain zone occurs in the highest parts of the Central Mongolian Altai (III) and NE Mongolian Altai (II). HILBIG (1995) describes in detail the types of alpine vegetation in Mongolia.

II. Mountain forest zone/belt (see fig.8-9):

4. The **forest zone/belt** comprises of larch, spruce-larch and sometimes spruce forest (*Picea obovata*, *Larix sibirica*). It is divided into three sub zones: (1) “semi-goltsy” (sub-alpine open woodland); (2) “pseudo-taiga”, coniferous forests with spruce and larch; (3) forest-steppe complex in combination of forests with shrubs and meadow-steppe.

It occurs mainly in the NW Mongolian Altai close to the Chinese border, but also in isolated remaining stocks in the Central and NE Mongolian Altai. However, the forest belt is missing in most parts of the Mongolian Altai, and the current stock is fragmented and does not form a closed forest belt.



Fig. 5: Tavan Bogd with the Aleksandryn (left) and Potanin glaciers (right). I 1-2 nival and sub-nival belt, in front I 3 cryophytic alpine grassland of *Kobresia bellardii*, ca. 3,000 m.



Fig. 6: Tavan Bogd, vegetation complex of alpine *Kobresia bellardii*-grassland (brown) and sub-alpine *Betula rotundifolia*-shrubland (red), ca. 2,500 m (I 3), in the background the nival belt with peaks and glaciers.



Fig. 7: Tavan Bogd National Park between Tavan Bogd and Tsagaan Khairchan-uul, typical “goltsy” with cryophytic alpine *Kobresia*-grassland, rocks and boulders (I 3), ca. 2,900 m.



Fig. 8: Mountain range at the upper Khovd-gol SW Tsengel, complex of mountain taiga (II 4, *Larix sibirica*, green), *Betula rotundifolia*-shrubs (red) and overgrazed mountain steppe (grey), ca. 1,900 m.



Fig. 9: Tavan Bogd National Park, Khurgan-nuur basin, main ridge at the Chinese border, mountain steppe in the valley (brown, III 5), closed mountain forest belt on the lower slopes (green, II 4), forest line to the subalpine *Betula rotundifolia*-shrubland (red, I 3), alpine grassland and rocks (I 3), in front a stone-men ("baba") from Turk period.

III. Mountain steppe zone/belt (see fig. 10):

5. This vegetation zone is characterized by a complex of high mountain cushion herb vegetation, cryo-xerophytic grassland, xerophytic shrubs and grass steppes in combination with small patches of larch forests. The mountain steppe zone occupies the largest areas of the Mongolian Altai. It is divided into several sub-zones, corresponding to subtypes of steppe vegetation. There are no distinctive boundaries between the sub-zones or between the steppe vegetation and alpine grassland. The transition from mountain steppes to alpine grassland is continuous. The mountain steppes of Mongolia including the Mongolian Altai are described as *Hedysarum pumili-Stipetum krylovii* (HILBIG 1995).

IV. "Kettle hole" desert zone/belt (see fig. 11):

6. The desert vegetation types in the Mongolian Altai only occur in depressions, and their appearance depends on the climatic "kettle hole effect". This micro-climatic phenomenon describes very warm and dry climate conditions in intra-mountain basins in the rain shadow of surrounding high mountains.

It is possible to determine the geo-botanical subdivisions of the Mongolian Altai from the altitudinal zoning (see fig. 4). Usually, the altitudinal zoning of the vegetation on the northern sides of the mountain range differs from the zoning on the southern sides of mountain ridges. The altitudinal belts are asymmetric in relation to the exposition.

Within the altitudinal vegetation belts there are also several types of azonal vegetation. There are water plant communities in the numerous lakes of the area, pioneer vegetation and shrubs (*Myricaria germanica*, *Hippophae rhamnoides*) associated with gravel banks in river valleys, and floodplain grassland and remnants of floodplain *Salix*-shrubs and *Populus laurifolia*-forests along the flood plains of the larger rivers (see fig. 12-14)



Fig. 10: Mountain steppes (III 5), which are typical for large areas of the Central Mongolian Altai, foothills of Siilkhemiin Nuruu, upper Sogoog-gol.



Fig. 11: Depression of the Sogoog-gol NW Ulaankhus, semi-desert with *Anabasis brevifolia*, *Stipa glareosa*, *Kraschennikovia ceratoides*, *Reaumuria soongorica* (IV 6).



Fig. 12: Tavan Bogd National Park, basin of the Khoton-nuur, submerse and riparian vegetation as azonal complex.



Fig.13: Valley of the upper Sogoog-gol, river floodplain as example for an azonal vegetation complex.



Fig. 14: Khovd-gol between Khovd and Bayannuur, *Lasiagrostis splendens* steppe (degraded) and river floodplain with floodplain forest of *Populus laurifolia* and *Salix* as azonal vegetation, in the background the snow covered Tsambagarav-uul.

Cradle of ancient cultures (fig. 15-18)

Thousands of archaeological sites document the great importance of the Altai Mountains as a “cradle of ancient cultures”. The region was part of the emerging and collapsing tribal unions, and the empires of the Skythians, Turks, Uigurs and Mongols. Mt. Belukha, Altai Tavan Bogd and numerous other mountain peaks, sources and rivers continue to have spiritual importance for the local communities. The outstanding universal cultural value of this region is acknowledged in the inscription of the “Petroglyphic Complexes of the Mongolian Altai” in the World Heritage List of UNESCO 2011. The numerous rock carvings and funerary monuments illustrate the cultural history in this part of Mongolia over a period of 12,000 years. They also provide an important source of documentation of the lasting relationship between humans and nature.

A chronological summary of cultural development in this part of the World reads as follows:

- the period of Palaeolithic hunters (11,000-6,000 BC), documented by thousands of petroglyphes in numerous places,
- the transition to herding as the dominant way of life, also documented by numerous rock carvings,
- the development of horse-dependent nomadic lifestyle in the early 1st millennium BC (Skythian period), documented by graves and findings,
- the Turk period (7th-8th century AD) is documented by deer stones, stone sculptures (“babas”) and funerary monuments.

Kazakh cemeteries are remarkable historical monuments from the 19th century.



Fig. 15: Valley of upper Tsagaan-gol, petroglyphs document hunters and horses as well wild animals, part of the outstanding rich cultural heritage of the Mongolian Altai.

The impact of nomadic people and livestock changed the character of the landscape and vegetation in the lower and middle altitudes. Extensive clearance of the forest along the flood plains and in mountain taiga zones using a combination of extraction and fire made way for grazing land. The nomadic lifestyle and traditional system of pastoralism was based on common property of land and seasonal circulation of pasture. Livestock herders restricted grazing to avoid the germination periods, which allowed grass species to establish and regenerate. The rather crude but effective seasonal management of grasslands maintained the vegetation communities that form the distinctive cultural landscape of today.

The mixture of cultural and wilderness landscapes so typical of the Mongolian Altai is undergoing a period of rapid change that is threatening the biodiversity and cultural heritage of the region.

Challenge and chance for sustainable development

Problems and threats

Recent studies on the vegetation of the Mongolian Altai mountain system have revealed that almost all areas exhibit a degree of anthropogenic disturbance in one way or another. The vegetation cover in the mountains as well as in the canyons and valleys of large and small rivers is dependent not only on the topography and natural factors but also on the type of pasture and the kind of landuse in former and recent times. Alteration to the landscape that is attributed to sudden social and economic changes in Western Mongolia has been described by JANZEN & BAZARGUR (1999). In a separate study by SCHICKHOFF & KRETSCHMER (2008) the pressures of economic change on the ecology of pastures is analysed in detail. Both studies remark on the dramatic degradation of vegetation as a result of overgrazing by livestock.



Fig. 16: Sul-uul, North of Khurgan-nuur, mountain steppe with prehistoric graves.



Fig. 17: Stone-man from Turk period in the valley of the great lakes.



Fig. 18: Kazakh cemetery with wooden graves from 19th century represents the youngest parts of the cultural heritage.

Degradation processes develop rapidly in places where there has been a change in the economic fortunes of the local people. Socio-economic changes manifests itself in several forms including increased tree felling, overgrazing, haymaking and using plants for economic purpose, e.g. willow, poplar, birch, *Caragana* for building fences; the shrubs *Betula rotundifolia*, *Juniperus sabina*, *Oxytropis tragacanthoides* and some species of the genus *Artemisia* for firewood.

During the 1990s in the transition period from a socialist to a market-oriented economy, there was little or no control or supervision of the use of vegetation resources and natural fodder. At the same time there was no strategy or government legislation to enforce nature conservation in the region. During this time, technological developments led to rapid degradation of the landscape, particularly through the mining of gold and coal. Much of the vegetation surrounding extraction sites were either stripped or degraded.

The main current threat to the integrity of the landscape and to the unique biodiversity is overgrazing by livestock. Large tracts of landscape including areas within existing protected land have succumbed to erosion from the loss of vegetation cover. In the Altai Tavan Bogd National Park, established in 1996 and covering an area of 636,161 ha, live nearly 8,000 residents with 220,000 heads of livestock. The traditional system of pastoralism that had survived in the area for centuries has been lost in the last two decades to more intensive, market-driven practices. Increased globalisation of the livestock industry has also led to tensions and conflicts between the herders as they compete for limited pasture lands. Specifically, the international demand for Kashmir wool has encouraged herders to increase the size of goat herds but not without ecological costs to the landscape. Within the Altai Tavan Bogd National Park 181,000 ha of pasture land are classified as profoundly degraded by overgrazing. This area represents 28 % of the total park area. A further 362,000 ha (57 % of the park) are classified as overgrazed (MANTAI & BEKET 2012). These figures illustrate the scale of the problem in this region.

Other current threats to the integrity of the landscape and the biodiversity of the Mongolian Altai include rising demand for firewood with the consequence of illegal cutting, poaching of wildlife, and inclining mining activities.

Protected area system

The first protected area of Mongolian Altai was established in 1974 as Chöch-serchijn-nuruu (72,300 ha) for the protection of Argali (*Ovis ammon*) and Ibex (*Capra sibirica*). Tavan Bogd was listed 1985 as a natural monument (HILBIG & TSCHULUUNBAATAR 1989). The development of the landscape ecology-based system of large protected areas is described by KNAPP (1992), The Ministry for Nature and Environment (1996), KNAPP & CHIMED-OCHIR (1999, 2012), and WWF (2010). The Mongolian Altai contributes five protected areas to the protected area system for Mongolia. The five mountain sites are described as follows:

1) The Altai Tavan Bogd National Park (established in 1996), covers 636,200 ha within the corner region of two other neighbouring countries, Kazakhstan and Russia, and stretching in a SSE direction for about 180 km along the Chinese border. It includes the glaciated massive of Tavan Bogd (it means the “five sacred peaks”) with the highest peak in Mongolia (Chuyten-uul, 4374 m); the main ridge of the Mongolian Altai with the watershed between Central Asia and Arctic Ocean; the valley of lakes (Khoton-nuur, Khurgan-nuur, Dajan-nuur); and adjacent mountains. The total area is divided in to three zones of management. The “special conservation zone” (protection level II, see WWF 2010), covers a core zone of 122,000 ha (19 % of the park), and includes the Tavan Bogd-uul and the main ridge along the Chinese border with the largest stock of remaining coniferous forests. There aren't allowed any landuse activities. The “tourism zone” (protection level III) covers the largest part, 365,800 ha (58 % of the park), and is used for grazing although there are yurts and winter cottages as well as tourism activities. The “limited use zone” (protection level IV) covers 20 % of the national park and it is reserved for traditional land use. However, in practice tourism is unregulated and illegal hunting is practiced in the limited use zone (MANTAI & BEKET 2012).

2) The Siilkhemijn-nuruu National Park (established in 2000), covers 140,000 ha in two parts along the Russian border. It is sparsely populated and is characterized by a treeless high mountain landscape with extensive upper mountain steppes and alpine grassland. The main conservation goal is the protection of threatened mammals like Argali (*Ovis ammon*), Ibex (*Capra sibirica*), Snow leopard (*Uncia uncia*), and Wolf (*Canis lupus*).

3) The Tsambagarav-uul National Park (established in 2000), is a separated high mountain massive arising from the semi-desert of the Khovd-gol valley on the eastern border of the Mongolian Altai. The mountain peaks climb to 4,208m and are covered by glaciers and permanent snow. The total extent of the park is 111,000 ha and includes important examples of alpine grassland and mountain steppes. On the northern slopes there are remnants of forest. The rich prehistoric heritage (petroglyphs, kurganes, stone-graves, stone-men) at the foothills provide evidence for the outstanding cultural importance of this mountain range.

4) The **Develijn Aral Nature Reserve** (established in 2000, protection level V), is located south of the intra-mountain depression of the Achit Lake. It covers 10,300 ha and includes riparian and floodplain vegetation of the Khovd river as well as semi-deserts. It is important habitat to threatened animals like Beaver (*Castor fiber birulai*) and Wild pheasant (*Phasianus colchicus*), and also an important resting place for migratory birds.

5) The **Khukh Serkhijn-nuuru Strictly Protected Area** (established in 1974/1977), covers 65,920 ha of the mountain massif on the eastern border of Altai to the desert basin of the great lakes. It is characterized by mountain steppes and alpine grassland. The park was established for the protection of mountain wildlife and birds. The core area is managed as “pristine zone” (protection level I) and is surrounded by conservation (protection level II) and limited use zones (protection level III, WWF 2010).

The three national parks and the nature reserve are jointly managed by staff based at an office in Bayan-Ölgii, far from the protected areas. The Khukh Serkhijn-nuuru has its own administration centre in Deluun. Both administration centres are poorly staffed and resourced to effectively manage the extensive areas and to police against the cutting of trees, poaching of wildlife, overgrazing by livestock and other illegal activities.

Nomination for the UNESCO-World Heritage List

Following the inscription of the Golden Mountains of Altai in 1998 the World Heritage Committee recommended to develop the transboundary cooperation between the state parties of the Russian Federation, Kazakhstan, China and Mongolia to cover a substantially larger area of Altai region. Russia agreed to continue with the nomination process for a transboundary extension of the World Heritage Property that would include territory within the neighbouring countries. During several meetings and discussions in 2009 in Kosh-Agach, and again in 2012 in St. Petersburg and Urumqi, it was agreed to extend the existing “Golden Mountains of Altai” to form a larger transnational serial site. With support by the German Federal Agency for Nature Conservation (BfN), for its part, the Mongolian officials have planned for a workshop in summer 2013 in Ulaanbaatar to begin the process of building a transnational park for Altai. It is suggested that the new boundaries for the reserve include areas of outstanding cultural values but in order to safeguard biodiversity, Tavan Bogd, Tsambagarav and Siikhemijn national parks are to be designated core zones.

Development of a transboundary biosphere reserve

Since the late 19th discussions about a transboundary biosphere reserve in the Altai region have been in progress. In 1998 the “2nd Conference for Strategic Development of Central Asia” in Urumqi (China) agreed on a protocol with the recommendation to develop an Altai Convention for sustainable development. The establishment of a transboundary biosphere reserve should be the first step in such a process. On the Russian side the Katunskij Zapovednik, including buffer and transition zones, with a total area of nearly seven thousand square kilometres, was accepted in 2000 by UNESCO as the “Katunskij Biosphere Reserve”.

With support from the German government the German Association for Economic Cooperation (GTZ) elaborated a feasibility study for a transboundary biosphere reserve, which was presented to the “International Concurrence on the Establishment of a Biosphere Territory in the Altai” 2004 in Urumqi. In 2005 the governments of the Russian Federation, Mongolia, Kazakhstan and China

agreed a Memorandum of Understanding on cooperation for the development and management of biosphere territories in the Altai region.

The Katon-Karagaj National Park in Kazakhstan and the Altai Tavan Bogd National Park in Mongolia have several park zonations each with different management programmes. However, suitable transition zones have not yet been defined. Following the evidence produced for the study on vegetation in the Mongolian Altai, BEKET (2009), recommended a governmental decision to establish a transboundary biosphere reserve with participation from Mongolia, China, Kazakhstan and Russia. The IUCN/WCPA International Conference in Ust Koksa (Republic Altai, RF), in July 2010 passed a resolution to give international support to the Altai states for the establishment of a four-lateral biosphere reserve as a model for adaptation to climate change and as a platform for communication in the transboundary cooperation process.

In 2011 the presidents for the Russian Federation and Kazakhstan signed an agreement for the establishment of a bilateral biosphere reserve "Altai" as a step towards a four-way -lateral cooperation. In the frame of the German-Russian environmental cooperation the German Federal Agency for Nature Conservation (BfN) supports the management planning for the start of a bilateral biosphere reserve.

The Mongolian Altai has great potential and good prerequisites for the development of a large biosphere territory. Mongolia has a solid base for participation in the four-way lateral cooperation, and has been actively involved over a number of years in measures and projects leading to the designation of a transboundary Biosphere Reserve. The development and management of the Biosphere Reserve "Altai" should be a suitable approach to solve the ecological, social and economic problems of the region, and to connect the protection of natural heritage with the maintenance of cultural values. It would be a chance to realize the challenges of sustainable regional development in the heart of Asia.

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