ADB

Regional Flyway Initiative · Site Study

May 2026

RFI Priority Site · Terkhiin Tsagaan Lake

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Asian Development Bank

General Site Information

Country	Mongolia			
RFI Site Name	Terkhiin Tsagaan Lake			ID051
City/ Municipality, Province, Region	Tariat Soum, Arkhangai Aimag			
Geographical coordinates	48.17º N, 99.75º E		Area	98,132 ha
Key species	Pallas's Fish Eagle (EN), Swan Goose (VU) and Northern Lapwing (NT)			
Key habitats (biomes)	Freshwater lake, grassland, steppe-taiga forest, shrubby vegetation			
Key ecosystem services	Provisioning services, regulating services, cultural services (tourism)			
Key drivers of change	Solid waste pollution, livestock overgrazing, tourism			
Conservation status (mark all that applies)		Protected Area		Flyway Network Site
		Ramsar Site		Others _____
IBA/ KBA name (and number) and other designations	Terkhiin Tsagaan Lake			
Management Stakeholders	Ministry of Environment and Climate Change, Arkhangai Aimag government			
With management plan?				
Project concept themes	Rangeland management, nature-based tourism, wetland management			
Length of project	5 years			
Sector/s	Agriculture, tourism			
No. of potential beneficiaries				
Indigenous Peoples		No		Yes, _____
Anticipated Implementation Risks	Potential reduction in income for ecotourism operators			
Estimated Project Budget (US$)	11,900,000			
Potential Source/s of Financing		Loan (to be identified)		Private Sector
		Grant (to be identified)		Public-Private Partnership

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Abbreviations

ADB	Asian Development Bank
AWC	Asian Waterbird Census
CAF	Central Asian Flyway
CSR	Conservation Status Review
DMC	Developing Member Country
EAAFP	East Asian-Australasian Flyway Partnership
EN	Endangered
IBA	Important Bird and Biodiversity Area
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
MECC	Ministry of Environment and Climate Change
MCST	Ministry of Culture, Sports, Tourism, and Youth
MOFALI	Ministry of Food, Agriculture, and Light Industry
NGO	Non-governmental Organization
NP	National Park
NR	Nature Reserve
NUM	National University of Mongolia
RBA	River Basin Authority
RFI	Regional Flyway Initiative
SPA	Strictly Protected Area
TESSA	Toolkit for Ecosystem Services Assessment
USD	United States Dollars
WMBD	World Migratory Bird Day
WSCC	Wildlife Science and Conservation Center Mongolia

Executive Summary

Terkhiin Tsagaan Lake is a moderately large freshwater lake in the Suman River valley in the central Khangai Mountains of central Mongolia. The lake lies at an elevation of 2,060 m a.s.l. in a wide valley orientated north-east to south-west. It is fed by 10 inflow rivers and has a single outlet. Terkhiin Tsagaan is in Tariat *soum* in Arkhangai *aimag* 165 km south-southwest of the town of Moron, and 670 km from Ulaanbaatar. As a result of its geography, the site is located at the confluence of two of Asia's major bird migratory flyways, the East Asian-Australasian Flyway (EAAF) and the Central Asian Flyway (CAF). Terkhiin Tsagaan Lake is important for at least six waterbird species occurring regularly at levels >1% of the flyway population, including Northern Lapwing *Vanellus vanellus* (NT). In addition, it supports smaller numbers of 14 globally threatened or near threatened resident and migratory waterbirds including White-headed Duck *Oxyura leucocephala* (EN), Swan Goose *Anser cygnoid* (EN), Pallas's Fish Eagle *Haliaeetus leucoryphus* (EN), Saker Falcon *Falco cherrug* (EN), Great Bustard *Otis tarda* (EN) and Steppe Eagle *Aquila nipalensis* (EN). Terkhiin Tsagaan also supports a population of the Siberian Ibex *Capra sibirica* and Mongolian Marmot *Marmota sibirica* (EN). The site is recognized as an Important Bird and Biodiversity Area (IBA), a Ramsar site and is legally protected as the Khorgo-Terkhiin Tsagaan Lake National Park, established in 1995, and currently under the jurisdiction of the Ministry of Environment and Climate Change (MECC).

Terkhiin Tsagaan has become a highly popular location for tourism in central Mongolia and has seen a sustained increase in tourist visitors since 2008 (more than 42,000 visitors by 2018), which puts additional pressure on the site. Local communities graze the steppe areas around the lake, whilst the lake itself supports a small commercial fishery and is also used for sport-fishing by tourists. The environmental issues affecting Terkhiin Tsagaan Lake and the surrounding landscapes are multiple although these are primarily the direct result of human activities such as overgrazing and unmanaged mass tourism, though climate change is expected to have long term impacts on the alpine lake ecosystem. Grasslands at the site have been overgrazed whilst lake-edge vegetation such as reedbeds has been overharvested and increasingly degraded as has the vegetation along the various river systems in the lake catchment. The development of tourism camps and the expansion of an unpaved road network across the site, is a major driver of degradation at present.

Key intervention priorities to improve the management of Terkhiin Tsagaan Lake and the surrounding landscape is expected to involve the strengthening of site management and zonation. There is scope to adopt an integrated river basin management approach to maintain ecological function of the wetlands here, while managing the use of water resources from Terkhiin Tsagaan and associated river systems wisely. Other interventions needed for the site include improved grazing (and rangeland) management and strengthening regulation and management of tourism through zonation (including management of unpaved roads due to impact in hastening grassland degradation) and developing guidance and regulation.

1. Background of the Regional Flyway Initiative

In July 2021, the Asian Development Bank made a commitment to develop a long-term Regional Flyway Initiative (RFI) in the East-Asian Australasian Flyway (EAAF) (Sovereign Project 55056-001) to protect and restore priority wetland ecosystems and the associated ecosystem services they provide in the EAAF, the most threatened migratory bird flyway globally. The Initiative is slated for implementation in nine ADB developing member countries (DMCs) in East, South and Southeast Asia: Mongolia, People's Republic of China (PRC), Bangladesh, Viet Nam, Cambodia, Philippines, Thailand, Malaysia and Indonesia. In 2023, the geographic scope of the RFI was further extended to two DMCs in Southeast Asia and the Pacific respectively, Lao PDR and Papua New Guinea.

The primary aim of the RFI is to enhance and expand the existing efforts in conserving and managing wetlands of the highest priority for migratory birds within the EAAF through innovative loan and grant financing, and at scale. Consultations and analyses over the development period help identify key interventions to strengthen the management of wetlands, enabling the implementation of nature-based solutions while strengthening biodiversity protection. Over time, the RFI seeks to leverage collaborative opportunities by developing partnerships among important stakeholders including national governments, civil society organizations, communities, regional organizations like the East Asian-Australasian Flyway Partnership (EAAFP), development agencies, the private sector, and other relevant entities.

Through the RFI Technical Assistance (TA) implemented over the RFI's development phase from 2021 to 2024, BirdLife International takes the lead in providing and coordinating technical support for development of the RFI. This is carried out in collaboration with the EAAFP and a consortium of international non-governmental organizations including Wetlands International and the Paulson Institute, as well as two universities, namely the University of Southampton, UK and the National University of Singapore. Over the development phase, the TA team undertook a site selection analysis to identify priority wetland sites in all 10 countries based on recent bird data benchmarked against internationally accepted criteria under the Convention on Wetlands of International Importance (or Ramsar Convention), EAAFP Flyway Network Sites and Important Bird and Biodiversity Areas (IBAs). The team further developed ecosystem services profiles for prioritized wetlands using a multi-pronged approach used the TESSA ecosystem services assessment tool, and data-driven modelling of water-based ecosystem services and stored carbon.

In Mongolia, a total of 48 wetland sites were initially assessed through published data in the Mongolia IBA Inventory (see Batbayar & Tseevenmyadag 2005), a review of the peer-reviewed literature, and consultations with technical experts. Of these, a total of (12) wetlands were ranked, defined and identified to be RFI priority sites on the basis that they support more than 1% the flyway population of at least one EAAF migratory waterbird species. Four (4) of the RFI wetland sites identified lie with the Amur-Heilongjiang Basin in eastern Mongolia, most notably a cluster of sites around Dornod and Sukhbaatar provinces, including Mongol Daguur SPA, Khurkh-Khuiten, Buir and Tashgain Tavan lakes. Two of the RFI sites, including Terkhiin Tsagaan and Ogii Lakes lie within the catchment of the Yenisey River, with outflows into the Selenge River. The remaining wetlands identified are endorheic lakes in the Altai or Gobi region. At least 48 EAAF species exceeded the 1% threshold at the site level in Mongolia, including nearly the entire breeding and staging population of the Swan Goose (Batbayar et al. 2013; Damba et al. 2021).

2. Site profile of Terkhiin Tsagaan Lake

Location: Terkhiin Tsagaan Lake is a large freshwater wetland in the valley of the Suman River, a tributary of the Selenge River in the central Khangai Mountains (Orkhonselenge et al. 2022). The lake lies in a wide valley heading from north-east to south-west at around 2,060 m a.s.l. It is fed by 10 tributaries, including the Khoid Terkh and Urd Terkh Rivers, and it has a single outlet, the Suman, which eventually drains into the Selenge. It is in Tariat *soum* in Arkhangai *aimag*, 165 km south-southwest of the town of Moron, and 670 km from Ulaanbaatar.

Area: 98,132 ha, with a boundary of 126 km.

Altitude: 2,060-2,703 meters a.s.l.

Geographical coordinates: 48.17º N, 99.75º E

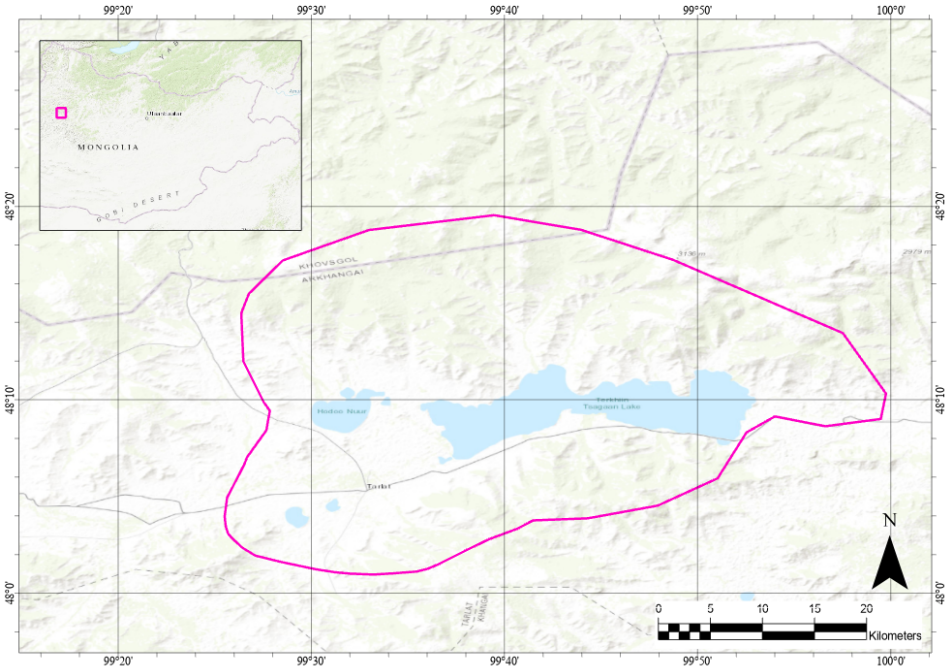

Figure 1. Map of Terkhiin Tsagaan Lake boundaries with inset map showing location of the site in eastern Mongolia (Map: Evelyn Pina Covarrubias).

Description of site: Terkhiin Tsagaan Lake is a large oligotrophic (nutrient poor) freshwater lake which was formed by volcanic activity. It is about 16 km long and four to six km wide, with a surface area of 61 km^2 and a maximum depth of 19.5 m. There are numerous bays and peninsulas along the northern shore of the lake, especially the large Jooroin Bay in the south. The lake has several islands, the largest of which is the Nuuriin Tolgoi. About 20% of the lake supports aquatic plants and in the west of the lake there are extensive marshes with shallow pools. Terkhiin Tsagaan Lake starts freezing from late October and is frozen until mid-May. The short-term changes of the surface area of Terkhiin Tsagaan Lake are linked to the fluctuations of annual precipitation, while long-term changes of the lake area are linked to annual

temperature variation which influences thawing of snow cover and permafrost in the Khangai mountains, a major source of water for the lake (Orkhonselenge et al. 2022). To the west, there are several smaller lakes, the largest being Khodoo Lake. The lakes are surrounded by grassy hills and mountains with patches of larch-dominated steppe-taiga forest and volcanic rocks mixed with shrubby vegetation.

Site administration, management and land tenure: Terkhiin Tsagaan Lake is situated almost at the center of the Khorgo-Terkhiin Tsagaan Lake National Park, which was established in 1995, with its buffer zone designated in 1996. The site is managed by the administration of Khangai Nuruu Natural Park, and a total of 5-6 rangers from the park administration work at the site. At the international level, Terkhiin Tsagaan Lake was designated as a Ramsar site in 1998, as an IBA in 2009 and as an EAAFP Flyway Network Site in 2016. The site falls under the jurisdiction of the Khangai Nuruu Protected Area Administration, Erdenebulgan County of Arkhangai Province and the Ministry of Environment and Climate Change. The present management authority is the local Governor of Tseterleg County, Arkhangai Province in collaboration with the Khorgo-Terkhiin Tsagaan Lake Protected Area.

Social and economic values: The main land use at Terkhiin Tsagaan Lake is livestock grazing, which is causing some habitat degradation in the dry steppe areas surrounding the lake through overgrazing. The lake supports a small commercial fishery and there is some sport-fishing by tourists. Terkhiin Tsagaan Lake has great potential for the development of eco-tourism, as it has a magnificent landscape of volcanic mountains, and it provides the opportunity to experience the nomadic herder lifestyle and traditions. Notably, the numbers of domestic and international tourists have increased there in recent years (see Ulaankhuu 2020), and several scattered, small-scale tourist camps operate to the northeast of the lake. There is concern that this tourism development is weakly managed and could negatively affect the wetlands and migratory birds, particularly the development of a new camp close to the shore at 'Swan Lake', an increase in boats on the lake, including motorboats, the impact of tourist vehicles, and pollution by waste left by domestic tourists. To help address these concerns, a 'tourism zone' boundary has been defined which covers 13.4% of the total areas of the national park and includes Terkhiin Tsagaan Lake and the Khorgo crater and its surrounding area.

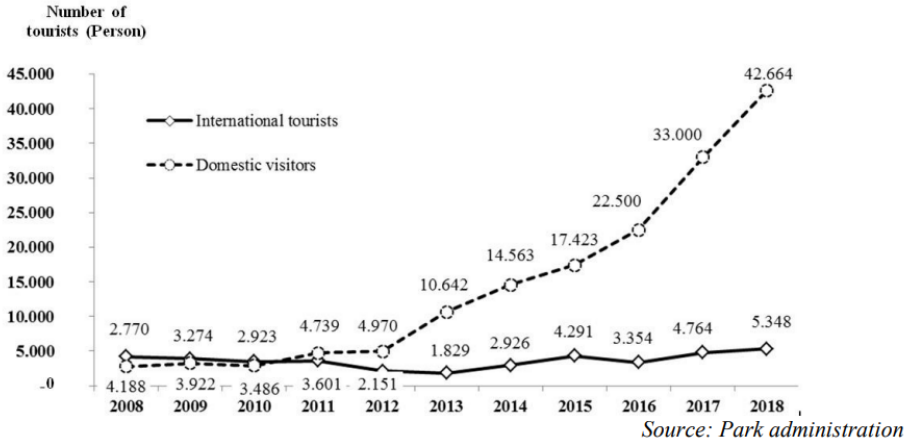

Figure 2. Rise in tourist visitors to Terkhiin Tsagaan from 2008 to 2018 (see Ulaankhuu 2020).

3. Biodiversity value of Terkhiin Tsagaan Lake

3.1. Key habitats

Terkhiin Tsagaan Lake is a large oligotrophic (nutrient poor) freshwater lake which was formed by volcanic activity. The lakes are surrounded by grassy hills and mountains with patches of larch-dominated steppe-taiga forest and volcanic rocks mixed with shrubby vegetation.

3.2. Importance of Terkhiin Tsagaan Lake for migratory waterbird species

Terkhiin Tsagaan Lake was selected as a candidate RFI site for assessment because it has supported internationally important populations of the migratory waterbirds listed in Table x, defined as those species which have exceeded the 1% population estimates from the Conservation Status Review (CSR1) (Mundkur and Langendoen 2022). The data used to assess these species was compiled from Batbayar and Tseveenmyadag (2009), together with the available bird count data from the peer-reviewed literature. A review of the candidate RFI sites was conducted by panels of national and international (EAAFP, Wetlands International and BirdLife) ornithological experts, which shortlisted Terkhiin Tsagaan Lake as one of the 11 prioritised RFI sites in Mongolia.

Table 1. List of migratory species (based on the EAAFP list of species) with globally significant congregations in Terkhiin Tsagaan Lake.

Species name	IUCN	CSR1 score
Great Cormorant *Phalacrocorax carbo*	LC	>1%
Bar-headed Goose *Anser indicus*	LC	>1%
Ruddy Shelduck *Tadorna ferruginea*	LC	>1%
Common Goldeneye *Bucephala clangula*	LC	>1%
Goosander *Mergus merganser*	LC	>1%
Northern Lapwing *Vanellus vanellus*	NT	>1%

In addition, Terkhiin Tsagaan Lake supports populations of the globally threatened and near threatened migratory waterbirds, including Swan Goose *Anser cygnoides* (EN), Common Pochard *Aythya ferina* (VU), Ferruginous Duck *A. nyroca* (NT), Velvet Scoter *Melanitta fusca* (VU), Horned Grebe *Podiceps auritus* (VU), Hooded Crane *Grus monacha* (VU) and White-naped Crane *G. vipio* (VU).

3.3. Other notable biodiversity

Further to the waterbirds, the steppe grasslands at Terkhiin Tsagaan Lake support populations of the globally threatened Pallas's Fish Eagle *Haliaeetus leucoryphus* (EN), Saker Falcon *Falco cherrug* (EN), Great Bustard *Otis tarda* (EN), Bearded Vulture *Gypaetus barbatus* (VU), Cinereous Vulture *Aegypius monachus*

(NT), Steppe Eagle *Aquila nipalensis* (EN), Eastern Imperial Eagle *Aquila heliaca* (VU) and Mongolian Marmot *Marmota sibirica* (EN).

4. Ecosystem services

4.1. Ecosystem services provided by Terkhiin Tsagaan Lake

The Terkhiin Tsagaan Lake landscape encompasses diverse wetland habitats and provides a variety of ecosystem services (Figure 3), including provisioning, regulating, and cultural services that are vital to communities within the site (Table 2). The results from the RFI workshop[1] highlight the top ecosystem services provided by the site, emphasising their essential and non-substitutable nature (Table 2). These provisioning service (fresh water), regulating services (water-flow regulation and flood hazard regulation), and cultural services (recreation and ecotourism, and aesthetic experience) are considered essential or non-substitutable, benefitting the communities within, adjacent to and distant from the site.

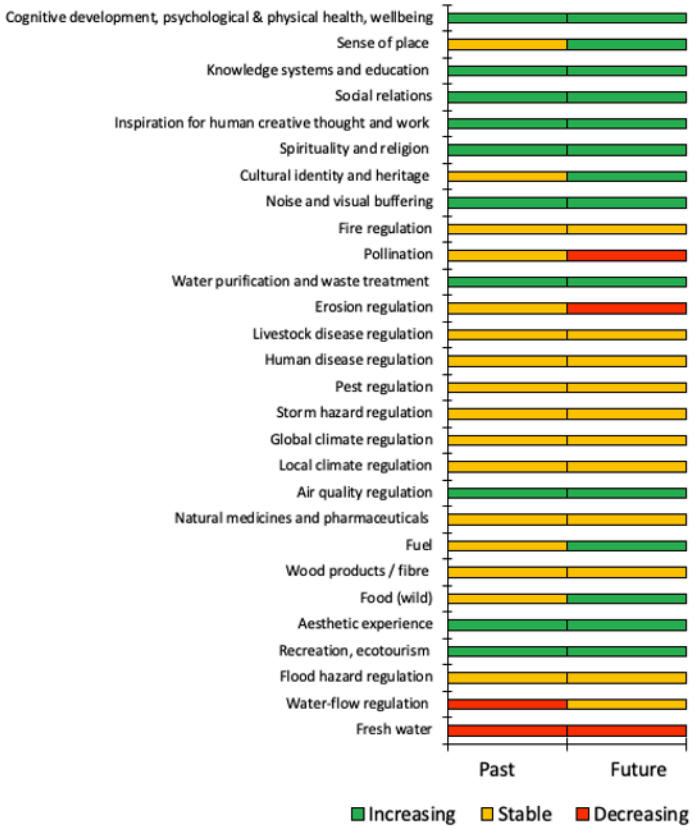

Figure 3. List of ecosystem services provided by Terkhiin Tsagaan Lake, as identified through stakeholder consultation at the Regional Flyway Initiative workshop.

[1] Asian Development Bank. (2024, November 28-29). *Mongolia: Wetland Ecosystem Services Workshop* [Workshop]. Mongolia https://events.development.asia/learning-events/mongolia-wetland-ecosystem-services-workshop

Table 2. List of top ecosystem services provided by Terkhiin Tsagaan Lake.

Ecosystem services	Essential or non-substitutable	Benefits to communities			Change	
		Within the site	Adjacent to the site	Distant to the site	Past	Future
Provisioning services						
Fresh water	Yes	✓	✓	✓	Decrease	Decrease
Regulating services						
Water-flow regulation	Yes	✓	✓	✓	Decrease	No change
Flood hazard regulation	Yes	✓	✓	✓	No change	No change
Cultural services						
Recreation, ecotourism	Yes	✓	✓	✓	Increase	Increase
Aesthetic experience	Yes	✓	✓	✓	Increase	Increase

4.2. Global climate regulating services

The stakeholders at the RFI workshop[2] did not identify global climate regulating services as important benefits provided by Terkhiin Tsagaan Lake. Therefore, these ecosystem services were not assessed.

4.3. Flood mitigation services

The flood mitigation services provided by Terkhiin Tsagaan Lake were assessed using biophysical values only (Table A1 and Annex 1 for details). When compared to the average of the six RFI inland sites in Mongolia for which hydrological data were available (Table A2 in Annex 1), Terkhiin Tsagaan Lake shows some only partly mixed results in terms of benefits and beneficiaries:

1. for the average green storage capacity per sq. km of wetland, Terkhiin Tsagaan Lake is below average (138 vs. 160 Giga Liters of water per km^2);
2. for the average population uniquely benefitting from influential green storage upstream per sq. km of wetland, Terkhiin Tsagaan Lake is also below average (0.54 vs. 1.09 people/km^2); and
3. for the average built-up area uniquely benefitting from influential green storage upstream per sq. km of wetland, Terkhiin Tsagaan Lake is slightly above average (0.219 vs. 0.217 ha/km^2).

[2] Asian Development Bank. (2024, November 28-29). *Mongolia: Wetland Ecosystem Services Workshop* [Workshop]. Mongolia https://events.development.asia/learning-events/mongolia-wetland-ecosystem-services-workshop

5. Drivers of change and their potential impacts on Terkhiin Tsagaan Lake

5.1. Current drivers of change and their level of impact

Stakeholders from the RFI workshop[3] identified 37 drivers of change impacting Terkhiin Tsagaan Lake and their corresponding levels of impact on the wetland site (Table 3). High-impact drivers include garbage and solid waste; and recreational activities and tourism. A medium impact is associated with air-borne pollutants; droughts; housing and settlement; livestock farming and grazing; restoration for conservation; roads and railroads; storm and flooding; and temperature extremes.

Table 3. Drivers of change and their potential impact on the integrity of Terkhiin Tsagaan Lake based on consultations with stakeholders.

Driver of change	Impact
Garbage and solid waste	High
Recreational activities and tourism	
Air-borne pollutants	Medium
Droughts	
Housing and settlement	
Livestock farming and grazing	
Restoration for conservation	
Roads and railroads	
Storm and flooding	
Temperature extremes	
Activities of site managers	Low
Collecting terrestrial plants or plant products (non-timber)	
Commercial and industrial areas	
Desertification	
Drought conditions	
Earthquakes/tsunamis	
Erosion and siltation/deposition	
Fire and fire suppression	
Fishing, killing and harvesting of aquatic resources	
Flight paths	
Habitat clearing	
Habitat shifting and alteration	
Household sewage and urban wastewater from outside the wetland site	
Hunting, killing and collecting of terrestrial animals	
Increased fragmentation within the wetland site	
Isolation from other natural habitats	
Logging and timber harvesting	
Loss of cultural links, traditional knowledge and/or management practices	
Loss of keystone species	
Natural deterioration of important cultural wetland site values	
Other 'edge effects' that degrade the wetland site values	
Pathogens	
Research, education and other work-related activities	
Sewage and wastewater from wetland site facilities	
Tourism and recreation infrastructure	
Utility and service lines	
Vandalism, destructive activities or threats to staff and visitors	

[3] Asian Development Bank. (2024, November 28-29). *Mongolia: Wetland Ecosystem Services Workshop* [Workshop]. Mongolia https://events.development.asia/learning-events/mongolia-wetland-ecosystem-services-workshop

5.2. Potential alternative state of Terkhiin Tsagaan Lake under current drivers of change

Stakeholders at the RFI workshop[4] defined the most plausible future alternative state (scenario) for the site up to 2035 and converted this scenario into a net change in the cover of different wetland habitats within this site (current habitat cover vs. future alternative cover; see Figure 4). This future scenario assumes that the current drivers of change affecting the site and the existing management practices will remain unchanged.

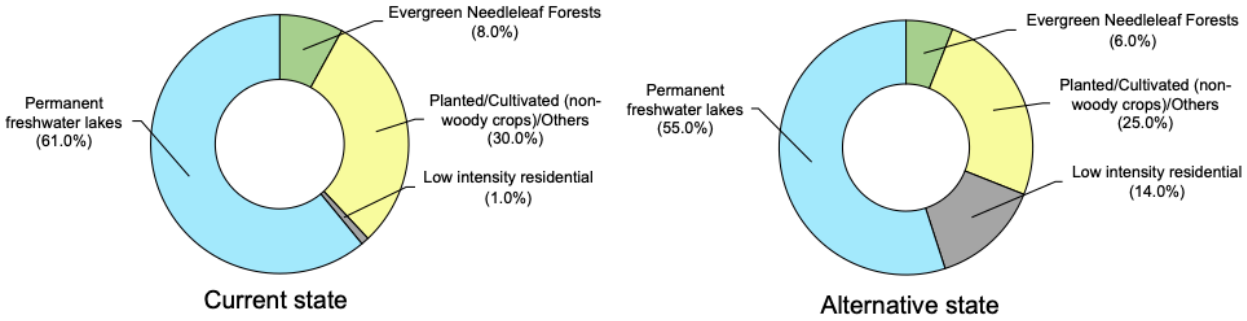

Figure 4. The proportional change in the extent of different habitat types between the current and alternative states of Terkhiin Tsagaan Lake.

5.3. Expected changes in the ecosystem services of Terkhiin Tsagaan Lake

Stakeholders at the RFI workshop[5] assessed future trends in the ecosystem services provided by Terkhiin Tsagaan Lake. Based on their local knowledge, they documented whether these services are expected to increase, decrease, or remain unchanged by 2035, assuming the current drivers of change affecting the site and the current interventions remain unchanged. Figure 3 and Table 2 show that the provisioning of fresh water has decreased in the past and is expected to continue decreasing in the future. Regulating services – water-flow regulation and flood hazard regulation - are expected to remain unchanged in the future, even though the water-flow regulation has decreased in the past. The benefits from recreation/ecotourism and aesthetic experience have increased in the past and are expected to increase consistently over time.

A loss of 6,870 ha of green water habitats including evergreen needleleaf forests and planted/cultivated areas as presented in Table A5, however equivalent to a little over 7.0% of the total land use for the site, is expected to result in roughly 18.4% or 25.4 Giga Liter reduction in green storage capacity per km² of wetland. This may amount to nearly 0.10 people and 0.040 ha of built-up areas losing flood mitigation benefits per km² of wetland.

[4] Asian Development Bank. (2024, November 28-29). *Mongolia: Wetland Ecosystem Services Workshop* [Workshop]. Mongolia https://events.development.asia/learning-events/mongolia-wetland-ecosystem-services-workshop

[5] Asian Development Bank. (2024, November 28-29). *Mongolia: Wetland Ecosystem Services Workshop* [Workshop]. Mongolia https://events.development.asia/learning-events/mongolia-wetland-ecosystem-services-workshop

Mongolia has experienced a 7% drop in rainfall from 1940-2005, and over the same period average temperatures rose by 2.4°C, though anecdotal evidence suggests an increase in thunderstorms and high intensity rain events (World Bank Group 2021). Climate models suggest that under all emissions scenarios that Mongolia will warm more than the global average, and most models agree that there is likely to me a small increase in annual precipitation, with an increase in the intensity of extreme weather events (World Bank Group 2021). There is a strong likelihood of the increase of drought events and in recent history the extent of surface water, nationwide lake area shrank by around 7% over the 2000-2025 period, a trend which has been noticed since at least 1974. Freshwater lakes and rivers in central and western Mongolia are fed by glacial meltwater from the Mongolian Altai. However glacial cover in the Mongolian Altai is estimated to have reduced by 30% between 1940-2011 (World Bank Group 2021). The high population growth rate, increase in livestock, as well as a corresponding increase in energy production and industry has increased the demand for water and these pressures need to be considered for potential project interventions in the Terkhiin Tsagaan Lake systems.

6. Capacity gaps and needs for the management of Terkhiin Tsagaan Lake

Seven stakeholder groups were identified as important to the management of the Terkhiin Tsagaan Lake wetland ecosystems. Of immediate importance are stakeholders in the aimag and soum government administration who have direct jurisdiction over the management of the lake resources, tourism camp operators and local herding communities who directly benefit from the lake.

Table 4. Stakeholder capacity needs in Terkhiin Tsagaan Lake.

Stakeholder group	Current role in wetland management (Positive or Negative)	Possible future role in wetland management	Current capacity for sustainable wetland management	Capacity development needed to improve wetland management	Form of capacity development (e.g. training, organizational strengthening etc.)
MECC	Government policy and coordination	Organize and integrated policymaking	Medium	-	Improve existing human resources for policy planning

Stakeholder group	Current role in wetland management (Positive or Negative)	Possible future role in wetland management	Current capacity for sustainable wetland management	Capacity development needed to improve wetland management	Form of capacity development (e.g. training, organizational strengthening etc.)
Arkhangai Province aimag government	Coordinate policies with other government bodies	Coordinate policies across different government levels	Low	Training on project development and implementation	Training workshops and sessions
Tariat soum government	Coordinate policies with other government bodies	Coordinate policies across different government levels	Low		
Protected Area Administration	PA law enforcement	Adapting protection and management approaches and improving them	Good	Strengthen the implementation of the regulatory framework on-site	Human resources and financing; coordinate and organize training
Herding households	Pastureland overload.	Pastureland management	Good	Awareness of policy advocacy for site management. Collaborate with other stakeholders.	Awareness of wetlands and biodiversity
Tourism Camp Operators (and tourists)	Currently a negative impact on the habitats	Habitat protection	Medium???	Sustainable tourism management plan and code of conduct.	Develop Tourism management body for local oversight. Provide training to tourism operators
Development and conservation projects/programmes	Improve regulatory framework and management	Climate adaptation and mitigation	Good	Support and strengthen implementation of projects and initiatives	Provide training to target groups

7. Opportunities for RFI interventions

7.1. Recommended Interventions

There are various issues affecting Terkhiin Tsagaan Lake and adjacent wetlands, and the surrounding habitat. The steppe and immediate landscape surrounding the lakes are sensitive to degradation, most often caused by human activities, the principal threats being overgrazing, unregulated tourism (which directly drives land degradation through unpaved road network), and water management. Improved and integrated water management (through river basin-based approaches) across the wider Terkhiin Tsagaan landscape will be critical to maintaining ecological function of the wetland system. This can be achieved through protecting inflows from the Khoid Terkh and Urd Terkh Rivers.

The development of tourism in Terkhiin Tsagaan is beneficial as a source of local employment and economic development. However, where poorly management, tourism can have a negative effect on the landscape and wildlife habitat. Tourism camps are a source of waste and the unpaved roads used for access can cause accelerate erosion and land degradation. Furthermore, poorly regulated boat use and fishing can cause disturbance to wildlife. Interventions at the site should focus on regulating human activities to reduce their impact, improving water management across the wider landscape, to protect ecological function and to restore degraded habitat.

Table 5. List of proposed interventions for Terkhiin Tsagaan Lake and possible project indicators

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Component 1. Strengthening site management and protection of the Terkhiin Tsagaan Lake Lakes and the surrounding wetland-steppe landscape					
Undertake scoping study of existing interventions and threats at Terkhiin Tsagaan Lake and surrounding grasslands, including targeted assessment on long-term threats (from climate change, overgrazing, tourism expansion and fisheries).	Assessment and scoping guidance to provide basis for proposed RFI interventions. Threats faced by the lake ecosystem better understood, and potential interventions identified.	Assessment report with key threats identified and recommendations for improved management published and disseminated to key stakeholders. Number of stakeholder meetings conducted in the scoping study. Number of stakeholder groups	100,000	2 years	MECC Arkhangai aimag government Tariat soum government (and up to seven *bags*) WSCC Mongolia ADB

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		engaged in the scoping study, ensuring a participatory assessment of existing interventions and threats.			
Strengthen site management of Terkhiin Tsagaan Lake including the development of a comprehensive management and zonation plan	Terkhiin Tsagaan Lake is better managed through the development of the site management plan, zonation plan, installation of boundary markers for the protected area, and implementation of measures to address and mitigate fire risk during the dry season.	Site management plan with zonation of sensitive areas where grazing activities is excluded or highly regulated over short to medium-term developed, in consultation with key stakeholders, including communities inside the site through participatory mapping. Number of stakeholder consultation meetings organized with local government and herding households seven *bags* around Terkhiin Tsagaan (at least 100 households) to strengthen engagement local stakeholders for participatory mapping for zonation, understand local livelihood needs, and engage national stakeholders.	200,000	3 years	MECC MCST Arkhangai aimag government Tariat soum government (and seven bags) Local community groups

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		Management plan for Terkhiin Tsagaan Lake expanded through participatory processes involving and represented households within site. Establishment and installation of boundary markers of zones under grazing exclusion and managed grazing.			
Component 2. Upscale grassland and vegetation management and restoration (linked to component 1)					
Conduct a comprehensive assessment of grazing pressure, vegetation cutting, road network and degradation at Terkhiin Tsagaan Lake and the landscape immediately surrounding the key lake system. The assessment to include mapping of sensitive areas and hotspots of nutrient pollution (from human / animal waste), to guide downstream management interventions.	Terkhiin Tsagaan Lake is better managed through roadmap and action plan development for roadmap and action plan for grassland restoration activities guided by remote sensing and participatory mapping of overgrazed areas and map of hotspots of overgrazing and water pollution (from animal waste)	Map of grassland / vegetation degradation of Terkhiin Tsagaan RFI site developed. Roadmap and action plan for grassland restoration activities and grazing management drafted, guided by remote sensing, participatory mapping of overgrazed areas, and grassland/ vegetation degradation maps of Terkhiin Tsagaan Lake, and hotspot mapping of overgrazing and water pollution (from animal waste) Number of stakeholder groups engaged, targeting	50,000	1 year	MECC MOFALI Arkhangai aimag government Tariat soum government Local community groups Research institutions Conservation organizations (i.e. WSCC) Tariat soum government Local community groups

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		the local government and herding households (about 200 households) Number of meetings and workshops organized to strengthen engagement local stakeholders for participatory mapping for zonation, understand local livelihood needs, and engage national stakeholders.			
Restore the degraded and overgrazed / eroded / over-exploited areas of grassland / vegetation (see also component 4 on grazing management, and sustainable herding practices)	Degraded areas of steppe grassland / vegetation damaged resulting from overgrazing and off-road driving restored. Area impacted by motorized traffic across the landscape reduced against baselines.	Nurseries for vegetation restoration activities established. At least two pilot plots for grassland restoration established, with grazing exclusion structures and signage in place. At least 1,000 ha of grassland restored over a five-year period. Baselines for area impact from free-for-all offroad driving established. Roadmap to reduce and mitigate the ecological impact from unpaved roads developed with	200,000	5 years	

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		relevant local stakeholders Number of stakeholders engaged in the roadmap development and implementation			
Component 3. Wildlife research, monitoring and management					
Strengthen the wildlife protection and enforcement at Terkhiin Tsagaan Lake.	Improved wildlife protection and enforcement through co-management framework, increased patrol and enforcement efforts for landscape, wildlife protection and encroachment activities, and increased capacity of local rangers	Co-management framework with local communities developed. Number of households (target of at least 50% households in site) engaged and actively participating in co-management activities. Training program and modules on patrol and enforcement and using SMART approaches developed. Number of training activities conducted Number of local rangers trained on patrolling and enforcement.	200,000	5 years	MECC Arkhangai government Tariat soum government WSCC and international conservation organizations Research institutions and universities
Strengthen biodiversity and wetland monitoring, with a focus on waterbird and wildfowl species.	Better monitoring of biodiversity and wetland ecosystems in the landscape through a locally engaged	Monitoring mechanism for the site established Number of monitoring activities conducted using the	100,000	5 years	

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
	biodiversity monitoring program and increased awareness of globally threatened species in the landscape and migratory waterbird conservation amongst local households.	established biodiversity and wetland monitoring scheme. A locally led conservation group organized Number of awareness-raising activities (including workshops and WMBD activities) on importance of nature protection, with a focus on charismatic bird species, implemented. Number of stakeholder groups engaged in the awareness-raising activities.			
Scale up research on biodiversity and ecology to support evidence base for management plan development (see component 1, 2)	Terkhiin Tsagaan Lake is better managed through improved understanding of migratory species movements, improved understanding of carbon and nutrient cycles associated with wetlands and strengthened local research capacity on wetland and lentic ecology.	Number of training programmes (including workshops) on wildlife and grassland ecology, with a focus on charismatic bird and wildlife species. Number of training activities implemented Number of local researchers and stakeholder groups trained Number of published research reflecting	100,000	3 years	MECC Arkhangai government Tariat soum government WSCC and international conservation organizations Research institutions and universities (e.g. NUM)

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
	Long-term data on changes in landscape and wetland quality to guide site management cycle.	improved knowledge of landscape and regional connectivity of migratory bird populations. Number of research infrastructure maintained, including construction of specialized research facilities			
Component 4. Regulate and strengthen tourism infrastructure and local capacity for specialized, nature-based tourism					
Establish licensing and regulations for tourism activities. Develop guidelines for tourism operators including establishing a regulatory system for managing negative impacts of tourism activities. Strengthen local capacities for sustainable tourism activities.	Habitat degradation caused by tourism activities in the landscape reduced through improved local capacity and regulation and best practices for tourism operators developed and widely adopted by tourism stakeholders.	Provincial-level tourism regulations. plans and strategies updated in coordination with MCST, MECC, aimag government and relevant tourism stakeholders, and widely promoted. Number of stakeholder groups engaged in the development of the tourism regulations. Number of compliant stakeholders (i.e., tourism operators) to the developed guidelines for tourism operators. Training programme on sustainable tourism developed.	500,000	3 years	MCST MECC Arkhangai aimag government Tariat soum government Tourism operators Local community groups

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		Number of training activities to strengthen local capacity for sustainable specialized tourism Number of target stakeholders trained on sustainable tourism			
Strengthen the capacity of local communities and businesses for nature-based tourism.	Impact of habitat degradation caused by tourism activities in the landscape reduced through increased local capacity of local communities and businesses for nature-based tourism.	Nature-based tourism strategy and business plans and packages on specialized wildlife/nature tourism developed. Number of piloted business plans with tourism operators (including international bird and wildlife tour companies) Framework for benefits-sharing from nature-based tourism enhanced for households in TTL. Training program on nature-based tourism developed Number of stakeholders trained on tourist management Microfinance schemes to provide	300,000	5 years	

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		loans to small tourism businesses to improve sustainability and reduce impact created. Number of small tourism businesses benefiting from the established microfinancing scheme.			
Upgrade tourism infrastructure to reduce negative impacts.	Impact of habitat degradation caused by tourism activities in the landscape reduced through well-regulated road network, tourism facilities, and solid and liquid waste management activities.	Road network plan developed with local stakeholders. Number of waste management and connectivity facilities developed in with the goal or a well-regulated tourism. Number of stakeholders engaged in tourism-related activities Number of stakeholder groups engaged in the upgrading of tourism infrastructure and local planning Number of people benefiting from the upgraded tourism infrastructure Volume of solid and liquid waste managed.	500,000	3 years	MCST Arkhangai aimag government Tariat soum Tourism operators

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Component 5. Strengthening sustainable, community-based management in Terkhiin Tsagaan Lake and adjacent areas to address over-grazing associated issues (see also Component 2)					
Strengthen the local capacity in sustainable rangeland management, and management of livestock	Improved conditions at Terkhiin Tsagaan Lake against baselines (reduced organic waste pollution from livestock waste) Improved condition of grassland (pasture) in Terkhiin Tsagaan Lake (in zoned areas) and adjacent landscapes against baselines.	Number of stakeholder consultation meetings organized, targeting at least 50 households to engage local people on rangeland management, sustainable grazing practices Training programmes focusing on community-based rangeland management, including livestock grazing regimes (e.g. rotational grazing) developed Training programme(s) on grazing management developed with local governments and MOFALI. At least 100 households at Terkhiin Tsagaan Lake and surrounding landscapes trained with sustainable rangeland management and herding practices. Number of trained stakeholders adopting sustainable rangeland	500,000	5 years	MOFALI WSCC and international conservation organizations Tariat soum government Local community groups

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		management and herding practices			
Scale up of sustainable rangeland use/grazing activities to strengthen the resilience of herding households.	Improved condition of grassland in degraded areas around Terkhiin Tsagaan Lake (in zoned areas) and adjacent landscapes against baselines through microfinance mechanism (for local loans and grants), incentives (and compliance mechanisms) for best practices in grazing and rangeland management, and benchmarking visits.	Number of stakeholder consultation meetings organized targeting 100 households. Number of exchange visits for herding households to other landscapes with good grazing and livestock management in place. 100 households benefiting from small grants and microloans on animal husbandry and livestock management practices. Incentives (and compliance mechanisms) for best practices in grazing and rangeland management created. Number of stakeholders trained and engaged who adopted sustainable rangeland use/ grazing activities	250,000	5 years	
Total investment for five years			11,900,000		

7.2. Potential Financing

The estimated project cost is USD 11,900,000 over a 5-year period. This project supports the development of plans for site management, road network, nature-based tourism strategy, and creation of a co-management framework, training programs on patrol and enforcement, biodiversity monitoring, nature-based tourism, community-based rangeland management, and solid waste management, establishment of infrastructure for tourism and waste management, and creation of microfinance mechanisms.

7.3. Proposed Institutional Arrangements

The proposed project is expected to be implemented over a period of at least five (5) years, with the main project components focusing on improving the management of Terkhiin Tsagaan Lake, enhancing and regulating tourism, biodiversity monitoring, enhancing rangeland and grazing management practices (led by MECC and the soum government) for local grazing households. Conservation and research organizations such as the Wildlife Science and Conservation Center Mongolia can be expected to play a major supporting and technical role in the project.

7.4. Project Beneficiaries

This proposed project is expected to undertake activities to promote gender inclusion and participation in livelihood activities, through capacity building activities for local households.

7.5. Anticipated Implementation Risks

Environment: Nature-based tourism has been identified as a key project concept theme. The proposed interventions include establishing tourism infrastructure to improve the tourism experience at Terkhiin Tsagaan Lake. Building these infrastructures, however, would generate noise that may disturb wildlife. Moreover, increasing tourism activities bring other human-induced impact, such as waste pollution. Planning with stakeholders, particularly tourism operators, is critical before any infrastructure development or tourism management.

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Annex 1. Supplementary information on flood mitigation services

To further validate the identification of the top ecosystem services by means of stakeholder consultation, an expectedly essential or non-substitutable regulating service across all RFI sites, namely coastal protection and flood mitigation (i.e., storm and flood hazard regulation), was assessed based on a combination of globally available datasets supplemented by web-based tool Co$tingNature (Mulligan, 2022). Estimates for flood mitigation were spatially inferred in QGIS from a selection of metrics expressing different biophysical values modelled online by the Water World component of this tool. Equivalent data to assess monetary values similarly to coastal protection were not available for the RFI region.

The key metrics selected for biophysical values (Table A1) were the average green storage capacity, which is the volume of water stored by each square kilometer of wetland itself as well as its soil and vegetation, and the direct influence of this storage capacity on beneficiaries found downstream of the wetland, both as the average number of people and the average built-up area that are uniquely benefitting from the resulting flood mitigation (and not from other green storage found upstream).

Table A1. Contribution of the wetland habitats to flood mitigation in Terkhiin Tsagaan Lake based on site-level (biophysical) values inferred from Mulligan (2022) and expressed as ranges to represent the resulting uncertainty.

Influence of the wetland on flood mitigation (metrics)	**Benefit/Beneficiaries**
Average green storage capacity per sq. km of wetland in million cubic meters (Gigalitres/km^2)	133 – 143
Average population uniquely benefitting from influential green storage upstream per sq. km of wetland (n/km^2)	0.52 – 0.55
Average built-up area uniquely benefitting from influential green storage upstream per sq. km of wetland (ha/km^2)	0.211 – 0.226

Table A2. Biophysical benefits from and beneficiaries of RFI inland wetland sites for which hydrological data (i.e., the Amur and Yenisei River Basins) were available (expressed as ranges to represent the resulting uncertainty)

Site name	**Green storage capacity (Gigalitres/km^2)**	**Downstream population (n /km^2)**	**Downstream built-up area (ha /km^2)**
Buir Lake	119 (±5)	0.92 (±0.04)	0.185 (±0.007)
Khurkh Khuiten	179 (±4)	1.61 (±0.04)	0.260 (±0.006)
Mongol Daguur	150 (±1)	1.25 (±0.04)	0.019 (±0.001)
Ogii Lake	169 (±13)	0.70 (±0.05)	0.316 (±0.024)
Tashgain Tavan Lakes	203 (±4)	1.49 (±0.03)	0.301 (±0.006)
Terkhiin Tsagaan Lake	138 (±5)	0.54 (±0.02)	0.219 (±0.008)

Table A3. Key habitat types in Terkhiin Tsagaan Lake based on stakeholder-based assessment at the Regional Flyway Initiative workshop in November 2024.

Habitat type	Current state		Alternative state (2035)	
	Area (ha)	Cover (%)	Area (ha)	Cover (%)
Evergreen Needleleaf Forests	7851.1	8.0	5888.3	6.0
Planted/Cultivated (non-woody crops)/Others	29441.4	30.0	24534.5	25.0
Low intensity residential	981.4	1.0	13739.3	14.0
Permanent freshwater lakes	59864.3	61.0	53976.0	55.0
Total	98138.2	100.0	98138.2	100.00