

The Economic Value of the Upper Tuul Ecosystem, Mongolia

L. Emerton, N. Erdenesaikhan, B. de Veen, D. Tsogoo, L. Janchivdorj, P. Suvd, B. Enkhtsetseg, G. Gandolgor, Ch. Dorjsuren, D. Sainbayar and A. Enkhbaatar



EXECUTIVE SUMMARY

This document reports on a study carried out under the auspices of the World Bank and the Government of Mongolia. The goal of the study was to improve understanding about the economic value of the Upper Tuul ecosystem for Ulaanbaatar's water supplies, and how this might be affected by different land and resource management options in the future.

At the same time the study aimed to develop and apply ecosystem valuation methods which could be used more widely in the country, to generate information about the contribution of the environment to the Mongolian economy, and to make the case for improved budget allocations for the conservation of the Upper Tuul.

Integrating eco-hydrological and economic valuation techniques, the study traces through the biophysical effects and socioeconomic impacts of future land and resource degradation, and ecosystem conservation, in the upper watershed.

The study found that the land and resources of the Upper Tuul currently contribute income and marketed products worth around Tug 28 billion a year in tourism, herding and forest-based sectors. Meanwhile, the current value of water use in Ulaanbaatar is estimated to be worth Tug 90 billion a year at the very minimum.

Conservation of the two protected areas that cover most of the upper watershed of the Tuul River, Gorkhi-Terelj National Park and Khan Khentii Strictly Protected Area, has a high economic value because it helps to safeguard downstream water supplies to Ulaanbaatar. Overall, improved conservation of the Upper Tuul ecosystem is estimated by the study to be worth some Tug 1,370 billion in Present Value terms, through the provision of water, tourism, herding and forest products.

In contrast, continuing ecosystem degradation and biodiversity loss will prove extremely costly in terms of water and other services lost. Even taking into account the costs of the additional protected area budgets and the losses in value that would be required to bring land and resource uses to ecologically sustainable levels, conservation would give rise to substantial economic gains over a situation where the ecosystem is further degraded.

Conservation is estimated to generate an additional Tug 76 billion Net Present Value over 25 years as compared to continuing gradual degradation of the watershed, and Tug 125 billion over and above a situation of no protection. As compared to the current situation, the study findings suggest that every Tug 1 invested in the conservation of the Upper Tuul ecosystem has the potential to generate an additional Tug 15 in water, land and resource use benefits over the next 25 years.

Water security is key to Ulaanbaatar's economic future

More than a million people, twenty thousand industries and businesses, four hundred hectares of irrigated farms, three hundred and thirty thousand livestock and three power plants in Ulaanbaatar depend on water supplied from the Upper Tuul. Annual demand for water is in excess of 77 million cubic metres, most of which is supplied by the Ulaanbaatar Water Supply and Sewerage Company. The total value of water use is estimated at almost Tug 90 billion a year. Around two thirds of this value accrues to domestic consumers.

Groundwater tables in Ulaanbaatar have been showing a marked decline over the last 50 years. Water is being abstracted faster than the rate of recharge. As the city grows, and water demand increases, this problem is intensifying. According to government figures, water use is currently estimated at 212 thousand cubic metres a day, and is predicted to reach 286 thousand cubic metres in 2010, 438 thousand cubic metres in 2020, and 708 thousand cubic metres by 2050.

Yet existing wells, even at full capacity, are designed to supply only around 300 thousand cubic metres a day. Demand for water is beginning to outstrip the supply of existing wells. Seasonal water shortages are growing ever more common, and various studies warn that sometime within the next 10 years the city will be facing a critical shortfall in water availability.

In response, measures are being set in place to manage water demand, improve water use efficiency, and deal with problems of leakage in the system. On the supply side, the options that are being considered include plans to tap into new groundwater supplies, develop surface water storage reservoirs, increase wastewater treatment and re-use, and apply artificial borehole recharge techniques.

Downstream water availability is linked to the status of the upper catchment ecosystem

The planned actions to improve Ulaanbaatar's water supplies also emphasise the importance of protecting the city's watershed, and developing integrated water resource management in the Tuul River Basin. Watershed conservation, alone, is neither going to ensure future water security nor abrogate the need to develop additional water supplies. The sustainable management of the Upper Tuul is however an essential (and economic) part of any water sector investment plan, whether it is based on groundwater, surface water or both.

The Tuul River and its main tributary the Terelj, as well as around 40 other smaller rivers, streams and lakes, are fed by rainfall, snowmelt and groundwater, and drain the southern slopes of the Baga Khentii to the north east of Ulaanbaatar. The Upper Tuul Basin, where these rivers rise, covers a total area of just over 5,000 square kilometres.

Ulaanbaatar's current and future water supply options depend wholly on the Tuul River. To date the city has been supplied via deep wells which draw on groundwater sourced from an unconfined aquifer that runs along the bed of the river. Future possibilities for augmenting these supplies depend either on tapping the surface water of the river, or on exploiting additional alluvial-proluvial deposits from the Tuul's tributaries.

Ecological conditions in the upper watershed have a direct link to the availability of surface water and groundwater downstream. Natural vegetation is particularly critical, as it influences interception, runoff and discharge over the course of the year. The extent and quality of forests, grasslands and soils affect the Tuul River's mean flow and flow duration, influence the timing and intensity of peak and low flows, and determine the extent and rate of groundwater recharge. They also impact on the silt and sediment loads which are carried downstream.

Most basically, a healthy upstream ecosystem helps to ensure clean, regular and adequate riverflow and groundwater resources for Ulaanbaatar.

Lands and resources in the Upper Tuul are subject to intense and growing pressures

More than three quarters of the Upper Tuul basin has been gazetted as two conservation areas: Khan Khentii Strictly Protected Area and Gorkhi-Terelj National Park. Although, at least in principle, a variety of environmental regulations and land and resource use restrictions govern the protected areas and the upper basin, in reality large parts are utilised heavily by humans. Around 2,600 people and 50,000 livestock live permanently in the Upper Tuul, and each year more than 130,000 domestic and overseas tourists visit the 180 camps and hotels which are located in the area. All depend, and impact, heavily on the natural ecosystem. Every year, almost a million tourist bednights are spent in the Upper Tuul, around 170 thousand hectares of land are used for grazing, just under 8,500 cubic metres of firewood and 3,300 cubic metres of timber are felled, and almost 20,000 kg of fruits, berries, wild vegetables, pine nuts and medicinal plants are harvested.

Unsurprisingly, the value of these land and resource uses is immense: it is estimated to generate gross income in excess of Tug 28 billion a year. The bulk of this value, 80% or more, accrues to the companies and entrepreneurs who operate tourist establishments or who are engaged in the timber and non-timber forest products trade. The Upper Tuul's land and resources generate income and subsistence products

worth about Tug 4 billion a year for local communities, and contribute around Tug 500 million in revenues to the Erdene Soum and Nalaikh District Administration, and to the protected area authorities.

Human influence is extending into the Upper Tuul, transforming the landscape and exerting severe pressure on the natural ecosystem – and thus on the water services it provides. As each wave of land use change expands into the upper watershed, it is opening up the area (and displacing prior land uses) for further changes. Permanent housing and dense areas of settlement are spreading towards the southern buffers of the National Park from the direction of Gachuurt, Ulaanbaatar and Nalaikh. This, in turn, is pushing tourist development further and further towards the north of Gorkhi-Terelj National Park and into southern parts of Khan Khentii Strictly Protected Area. Herders, losing their permanent pastures to settlements and tourist developments, are increasingly moving northwards along the Tuul and Terelj Rivers into Khan Khentii Strictly Protected Area. The spread of humans into the upper watershed is, in turn, being accompanied by ever greater exploitation of timber and non-timber products, as previously unused areas become more accessible and as resource demands grow.

There are substantial economic values to be gained from conserving the Upper Tuul for downstream water supplies

The study modelled the hydrological effects of ecosystem change. Three scenarios, based on different rates and trajectories in the expansion of human influence into the Upper Tuul, were projected for the next 25 years: gradual ecosystem deterioration (a continuation of the status quo), rapid resource depletion and land degradation, and conservation and sustainable use.

Results show that as the Upper Tuul ecosystem is degraded and land cover is lost, average runoff will increase and the river's mean annual maximum and low flows will be intensified. Diminished discharge will lead to a further lowering of the groundwater table. Daily water losses would be registered in Ulaanbaatar over time. In contrast, under a scenario of conservation and sustainable use there would be no appreciable distortion of the Tuul River's base flow, and groundwater levels would not be affected significantly.

Weighing up the gains (sustained water values in Ulaanbaatar) and losses (reductions in the value of land and resource use in the upper watershed, and increased investments in protected area management in the upper watershed) implied by conserving and sustainably using the Upper Tuul shows that this is the most economically beneficial of the three future management scenarios.

The conservation and sustainable use scenario is estimated to yield a Present Value, over 25 years, of Tug 1,370 billion. This is appreciably higher than the Present Values generated under either a continuation of the status quo (Tug 1,293 billion) or a scenario of rapid ecosystem degradation (Tug 1,243 billion). Looking at the additional water values generated, the study findings suggest that every Tug 1 invested in conserving the Upper Tuul ecosystem would generate economic benefits of more than Tug 15.

Clearly, ecosystem conservation generates the greatest economic gains for the Upper Tuul Basin as a whole – the value of water benefits generated outweighs the costs of any reduction in land and resource uses or additional management expenditures that are required to maintain the ecosystem in a healthy state.

Financing watershed conservation remains a key challenge to be addressed

While the study underlines the substantial economic values that the Upper Tuul ecosystem generates for downstream water supplies, and provides a strong economic rationale for its conservation and sustainable use, this is not the end of the story. There are costs to conservation, and these must be covered.

One element of these conservation costs is the additional direct expenditures that government must make on running Khan Khentii Strictly Protected Area and Gorkhi-Terelj National Park. These have a Present Value of just under Tug 1 billion and Tug 3 billion respectively under the scenarios of continuation of the status quo and no protection.

Another element is the opportunity costs that local land and resource users must bear through limiting their activities to ecologically sustainable levels. The study shows that there is a gap in land and resource use values of an estimated Tug 4.5 billion Present Value between the scenario of conservation and a continuation of the status quo, and a difference of almost Tug 9 billion as compared to a scenario of no protection.

Although it is clearly in the broader public interest to conserve the Upper Tuul ecosystem, and to the benefit of water users in Ulaanbaatar, it is not in the immediate financial interests of the people who use its land and resources. It is neither realistic nor equitable to expect people in the upper watershed to subsidise the provision of water benefits for the inhabitants of Ulaanbaatar.

This, then, becomes a key challenge: to generate the funds to ensure that there is adequate public investment in ecosystem conservation and protected area management, and to set in place sufficient financial incentives to persuade land and resource users in the Upper Tuul to limit their land and resource uses to sustainable levels.

Summary of management recommendations and key messages

Recognise the strong economic rationale to investing in the Upper Tuul ecosystem as a productive and cost-effective part of Ulaanbaatar's water infrastructure.

Alongside measures to construct and operate the physical infrastructure that is required to manage water demand and supplement water supply in Ulaanbaatar, the study makes it clear that there is an urgent need – and a strong economic justification – to invest in conserving and maintaining the “natural” water infrastructure that is the Upper Tuul ecosystem. To not do so would be extremely short-sighted, and may ultimately undermine the urban water security goals that so much time, effort and funding are currently being given to achieving.

Pay attention to increasing awareness and understanding of ecosystem values among planners and decision-makers in both conservation and development sectors.

Ecosystem conservation is persistently accorded a lower priority in policies, planning and budgets as compared to other sectors which are perceived to be more valuable in economic terms, or to yield more immediate development benefits. This study has presented important information to show that ecosystem conservation is not just a biological or ecological concern, but also yields high economic and development returns. There is a need to ensure that this information, and broader understanding about ecosystem values, is shared with and understood by the planners and policy-makers who control budgets and make decisions about future land and resource use, water infrastructure and urban development in the Upper Tuul Basin.

Ensure sufficient public budget allocations to enable effective protected area management in the upper watershed.

Khan Khentii Strictly Protected Area and Gorkhi-Terelj National Park currently receive budget allocations that are far too low to enable even basic conservation and management activities, and which are disproportionately small when compared with the benefits that they generate. There is a need to carry out a realistic budgeting and financial planning exercise for these two protected areas, which should form the basis of future budget allocations to upper watershed conservation.

Identify and implement measures to cover the local opportunity costs of conservation, and provide financial incentives for sustainable land and resource use in the Upper Tuul.

At least over the short term, most land and resource users in the Upper Tuul can generate more income from continuing their activities as is, even if they are unsustainable in ecological terms. Action is required

to address the economic causes of ecosystem degradation in the Upper Tuul and to balance the opportunity costs of conservation, alongside measures to enforce more strictly the penalties and restrictions against illegal activities. There is a need to ensure sufficient financial incentives for land and resource users in the Upper Tuul to carry out their activities in an ecologically sustainable manner.

Identify, scope and pilot new and additional ways of generating funding which make a direct link between water services in Ulaanbaatar and ecosystem conservation in the Upper Tuul.

The additional funding required to cover the direct and opportunity costs of conserving the Upper Tuul will no doubt be substantial – although the economic benefits of doing so are also immense. There is a need to investigate extra-budgetary mechanisms for raising funds. The high value of water benefits generated, and the fact that water use in Ulaanbaatar is already priced, paid for and generates revenues, provides opportunities for capturing these values. A variety of methods have been used successfully in other parts of the world which are based on some form of payment being made by water users to the groups who manage natural ecosystems. There is undoubtedly potential to raise significant and substantial funding for upper watershed conservation by transferring a portion of water revenues earned, or other water-related charges and levies, to the conservation of the Upper Tuul, as a compensation or reward for the economic services generated