11. Mongolia with special reference to the Tuul River Basin

Mongolia has an annual precipitation of 361 km^3, about 90 percent of which is lost to evapotranspiration. Of the remaining 10 percent, 37 percent infiltrates into the soil while 63 percent turns into surface runoff. Almost 95 percent of the surface runoff component flows out of the country (Box 14.8). Consequently, only 6 percent of Mongolia's annual precipitation is transformed into available water resources in surface water bodies (Altansukh, 1995). The total surface water resource of Mongolia is estimated as 599 km^3/year and is composed of water stored in lakes (500 km^3/year), glaciers (63 km^3/year) and rivers (36 km^3/year) (Myagmarjav and Davaa, 1999). The amount of renewable groundwater resources has been estimated at 10.8 km^3/year. Groundwater resources continue to be a major source of water, especially during winter when many surface water resources are frozen.

There are approximately 3,500 lakes in Mongolia with a total surface area of about 15,600 km^2, about 54 percent of which is located in the Gobi region, mainly in the form of small shallow or salty lakes. As a consequence of human activities, many of these lakes are now severely depleted or dry (Altansukh, 1995).

Large rivers originate in the country's mountainous northern and western areas, while very few surface streams are found in the south. The country's largest watershed is the Selenge River Basin in the north with its major sub-basins the E'Gyin, Ider, Orhon and Tuul Rivers.

The height of the Tuul River Basin varies from 1,200 to 2,700 m.a.s.l. The Tuul River, the main river in the basin, is formed by the confluence of the Namiya and Nergui streams at the southwestern slope of the Khentei Mountain, which is a world watershed divide that separates the Arctic and Pacific ocean basins and the internal drainage basin in Central Asia. The Tuul River is 704 km long, with a catchment area of 49,840 km^2. It drains into one of the main tributaries of the Selenge River, which is the main artery of the Lake Baikal, the world's largest freshwater lake by volume.

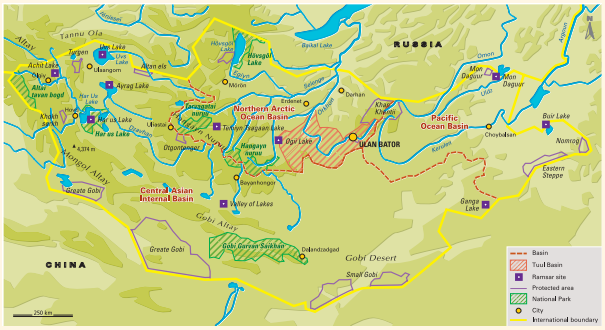
The Tuul River Basin covers only 3.19 percent of the country's territory, but is home to more than half of the country's population.

Current contexts

Administratively, the country is divided into provinces (*aimags*), each of which is divided into *sum* (territorial administrative unit subordinate to district) and *bag* (the smallest administrative unit in rural district).

The capital city Ulan Bator is located in the Tuul River Basin and is home to 772,000 inhabitants, or about 32 percent of the country's population. About 60 percent of the nation's population is classified as urban, and more than half of this urban population lives in the capital city Ulan Bator.

Forty percent of the population lacks access to safe water resources and only 25 percent of the population has adequate access to sanitation facilities. Clearly, poverty is one of the main reasons. Official figures suggest that almost one-third of the population lives below the national poverty level, defined as the inability to afford a basket of basic food and non-food items. Urban poverty is on the rise due to increased migration from rural



Map 14.12: Overview of the river basins in Mongolia

Source: Prepared for the World Water Assessment Programme by AFDEC, 2006.

areas; almost half of the poor live in urban areas and one-quarter of the urban poor is located in Ulan Bator. Recent statistics show that the depth of poverty and disparity has increased following several calamities in 1999, which caused a loss of livestock and a sharp decline in agricultural production in 2000 and 2001. If this trend is not reversed, the MDG target of halving the poverty headcount by 2015 will not be met (MFA, 2004).

Water and ecosystems

Growing urbanization and the mining industry have significantly polluted surface and underground water resources, which has had a significant impact on associated ecosystems. Furthermore, overuse of groundwater resources has led to lowering of the groundwater table, which has consequently caused some springs, lakes and their associated ecosystems to dry up. Increasing numbers of livestock and uncontrolled grazing practices are also affecting the balance of ecosystems.

Currently, there are forty protected areas, twelve of which include lacustrine ecosystems. The Government has declared its intention to raise the surface area of protected areas. The National Development Plan, adopted by the Mongolian Parliament in 1994, assigned a high priority to ecosystem protection. The basic guidelines for environmental protection were further identified in the Ecological Policy of the Mongolian State directive in 1997. These initial steps were followed by more than twenty laws on conservation. Practically speaking, the legal basis for sound environmental management is in place. Furthermore, the Ministry of Education, Culture and Science has included an environmental education

BOX 14.8: TRANSBOUNDARY WATER RESOURCES IN MONGOLIA

There are about 210 rivers flowing through Mongolia into Russia and China. Mongolia aims for international cooperation concerning the equitable utilization of transboundary waters with its neighbours. The first international agreement on transboundary water resources was between the governments of Mongolia and the USSR in 1974 on the use of water and protection of the Selenge River Basin, which plays an important role for the economic and industrial development of both countries. The agreement made between the governments of Mongolia and the Russian Federation in 1995 on the protection of transboundary water resources focuses on over 100 small rivers and streams located in the western part of the country. In general, the drainage basins of transboundary rivers between Mongolia and the Russian Federation cover about 31.4 percent of the Mongolia's territory.

In 1994, an agreement was signed between China and Mongolia on the protection of transboundary water resources concerning Lake Buir, the Kherlen, Bulgan, Khalkh rivers, and eighty-seven small lakes and rivers located near the border. Transboundary water resources shared with China include surface water bodies in Dornod, Khovd, and Bayan-Ulgii provinces and groundwater resources in Gobi-Altai, Umnugobi, Bayankhongor, Sukhbaatar and Dornogobi provinces.

programme into the secondary school curriculum. However, due to the competing interests of different sectors and a lack of incentives for environmental protection, the rate of implementation of rules and regulations has been weak (MFA, 2004).

Challenges to well-being and development

Average per capita water consumption in Mongolia is very low. The average water consumption of populations living in yurt (the traditional tent-like structures used by nomads) districts of big settlements is around 10 litres per person per day, far from being enough to meet sanitary requirements. There are 10,000 cases of diarrhoea every year in Mongolia and almost 70 percent of these cases occur in Ulan Bator. Dysentery and hepatitis are also common. These infections stem from a lack of access to safe water and sanitation infrastructure.

Water for food

Nomadic livestock husbandry has long been the dominant economic activity in Mongolia. This sector employs 47 percent of the total population, produces 34.6 percent of agricultural gross production and accounts for 30 percent of the country's exports. Until recently, crop production was not considered a significant economic activity in Mongolia. Intensive land cultivation only began in 1958. Currently, about 130 million ha of land is used for agriculture. Almost 98 percent of this surface area is utilized as pastureland whereas farmland occupies less than 1 percent (806,000 ha) of this land (UNEP, 2002). As of 2000, agriculture employed 48 percent of the total work force, made up about 35 percent of Mongolia's GDP and 30 percent of total export products. Until 1990, crop production was sufficient to surpass the total domestic demand for flour, and surpluses of flour, potatoes and vegetables were exported. However, after the collapse of Soviet Union, both cropping area and yield have declined, due to a lack of funding and technical and managerial problems. Today, wheat production satisfies only 50 percent of domestic demand, and potato and vegetable production barely meets 40 percent of demand. Yet irrigation continues to be the most water-demanding sector. Approximately 43 percent of annual water abstraction is used for agriculture.

In recent years, climate changes have caused groundwater levels to fall, which has resulted in the drying up of some wells and springs (NSO, 2000). This has a great impact on animal herders living in remote areas of Mongolia. Consequently, the risk of livestock losses during the dry periods has increased enormously, and pastures near abundant water sources have become overused. The increasing number of livestock (from 25 million in 1990 to 30 million in 2000) clearly indicates that the problem is likely to get worse.

Water and industry

The mining industry contributes approximately 20 percent of national GDP and accounts for over 50 percent of overall exports. While mining is the largest industry in Mongolia, traditional industries such as fur and leather processing have also caused water pollution and affected ecosystems. Industrial water demand corresponds to 26 percent of annual supply. This rate of utilization is expected to increase in parallel to economic growth: since the 1990s, many new enterprises have been established, but environmental problems have increased due to lack of adequate environmental precautions.

Water and energy

Mongolia experiences an extremely cold climate for eight months of the year, making energy for heat generation crucial for survival. The large geographical area of the country and its low population density makes the provision of energy services a very difficult task. Wood and coal are commonly used for heating and cooking purposes. During the last decade, however, deforestation caused by firewood production has become one of the most serious and urgent environmental concerns in the country. Currently, only about 8 percent of Mongolia's territory (mostly in the north) is covered by forest. Using coal and wood for heat generation leads to serious air pollution.

People living in steppe, Gobi and desert areas face serious fuel shortages. The government of Mongolia has given top priority to developing the energy sector as the main electricity grid covers only 30 percent of the total land area, supplying power to about 1 million people.

Mongolia's hydropower potential is stagnant, due to a lack of funds for the implementation of large-scale hydropower projects. Currently, hydroelectricity is produced at five small hydropower plants in the western region of Mongolia.

Risk management and responses

The central and northern parts of the country are prone to floods during the periods of heavy rain. The inhabitants of yurt settlements are the most affected, as they are usually located in flood-prone areas. Floods cause greater economic damages when they take place in densely populated areas. For example, in July 1966, the water level of the Tuul River increased by 3 m. This flooded the industrial region of Ulan Bator, claiming the lives of 130 people and causing US $7.5 million in economic damages (UNEP, 2002).

Due to low average rainfall, drought is very common, especially in the desert-steppe zone of country, where droughts up to three consecutive years have been recorded. The biggest impact of drought is definitely on the agriculture sector, including animal husbandry. For example, in the central and southern regions of the country, droughts are frequently observed during the first stage of the growing period (UNEP, 2002). As a result, crop cultivation is becoming more and more dependent on large-scale irrigation schemes.

Unfortunately, neither flood nor drought prevention measures are organized in a systematic manner. In the case of floods, communities lack the advantage of early warning systems. Furthermore, there is a definite lack of public awareness.

Water resources management

The Government recognizes that conservation of water resources is of primary importance for the long-term development of the economy. This is reflected in the terms of reference of the National Water Programme, which aims to ensure sustainable development of the country by the efficient use and protection of water resources. In 2000, the National Water Committee (NWC) was established with the purpose of coordinating and monitoring the National Water Programme's implementation. It serves as the coordinating body of a number of ministries and local governments. However, there are no resources allocated for the realization of the National Water Programme. Furthermore, no specific milestones were identified. As a result, the NWC struggles to coordinate the actions of several ministries within the fragmented management scheme of water sector.

The legislative and regulatory framework for the use of water resources is in place and updated when necessary. For example, the Water Law, which was adopted in 1995, was amended in 2004 to integrate river basin management practices (including the establishment of enhanced water resources information systems, the development of river basins management plans and the establishment of river basin organizations) with the goal of better utilizing water resources while protecting ecosystems. The Water Law also recognizes the economic value of water, requires capacity-building in the water sector, focuses on the decentralization of water management, puts forward the need for environmental impact assessments and sets new penalties for violating water legislation. However, the provisions of the law are vague and open to interpretations by different sectors. Furthermore, although the newly amended law foresees provisions for IWRM, public involvement at the local level is missing. Therefore, developed policies and programmes lack any public ownership. Facilitating the involvement of water users and stakeholders in managing the allocation of water resources remains a challenge.

Water-related policies and programmes developed at the national level often do not reach the local level. Policy implementation and monitoring mechanisms are also strained. At the institutional level, financial and human resource capacity is limited. The coordination of numerous institutions at national and local levels is missing, and the division of responsibility is not clear. Due to financial limits, laws and regulations are not adequately enforced.

Ulan Bator and the surrounding settlements located upstream of the Tuul River Basin are the biggest water users. However, no management plan currently exists for the water resources of the Tuul River Basin.

Mongolia's pricing policy is decentralized; local authorities are entitled to set up and revise the water tariffs. Although in theory, the Mongolian Government gives priority to the interests and water needs of the poor and marginalized, in practice, the current pricing scheme has become pro-industry and pro-wealthy due to weak regulations. Water tariffs for the mining industry are about US $0.006 per 1,000 L, whereas small businesses pay about US $0.48 per 1,000 L (eighty times more). For metered apartment users, a fixed rate of between US $1.5 and $7.5 per month is charged per inhabitant. The rate for yurt consumers, similar to small businesses, is eighty-four times higher than for industries and mining companies. As a result, those with the lowest income pay the highest and consume the least.

Conclusion

After the fall of the Soviet Union, Mongolia has been going through a profound economic and political transition period. Poverty is on the rise, only a limited portion of the population has access to safe water, sanitation facilities are poor, the quality of water resources are decaying, water-related diseases are common, and health services are out of reach for the poor. These problems are further accentuated by water scarcity, a

very cold climate and recent disasters. The Government of Mongolia is committed to implementing reforms in water resources management and environmental protection, but due to lack of financial resources and the limited number of trained personnel, policies cannot be implemented, and laws and regulations cannot be enforced. Improving the implementation of legal frameworks and policy coordination in the water sector are dire necessities. Sectoral interests have prevented the adequate protection of water resources and the environment. The decentralization of water pricing has promoted economic growth by providing low-cost water to business and industry but has disregarded the needs of the poor.

12. La Plata River Basin

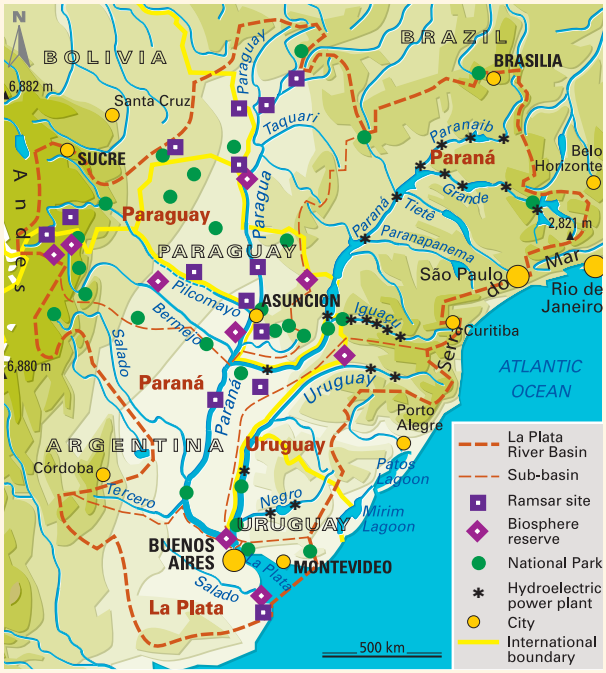
The La Plata River Basin is the fifth largest river basin in the world, extending over 3.1 million km², and its surface area is second only to the Amazon River Basin in South America. It covers an extensive part of central and northern Argentina, southeast Bolivia, almost all the southern part of Brazil, the whole of Paraguay and a large part of Uruguay (see Map 14.12).

With over 100 million inhabitants, close to fifty major cities, seventy-five large dams and an economy that represents 70 percent of the per capita GDP of five countries, the basin has enormous economic and social importance for the region overall.

The La Plata River Basin has four main sub-basins: the Paraná, Paraguay and Uruguay River systems and the La Plata River sub-basin itself. The Paraná River system is the biggest of the three, constituting 48.7 percent of the basin's overall surface area. The Paraguay and Uruguay River systems respectively comprise 35.3 percent and 11.8 percent of the basin. The remaining 4.2 percent corresponds to the La Plata River sub-basin itself.

In terms of discharge, the Paraná River System is the most important in the basin, with a mean annual flow of about 17,100 cubic metres per second (m^3/s) at Corrientes.[8] The Uruguay River system has a mean annual flow of about 4,300 m^3/s, while the Paraguay River System has the lowest capacity with a mean annual flow of approximately 3,800 m^3/s at Puerto Pilcomayo.[9]

Long-term measurements over a large part of the La Plata Basin show certain trends in climate and rainfall patterns. For example, annual minimum temperatures are increasing by about 1°C per century. Furthermore, hydrological records show evidence of an increase both in rainfall and runoff in the La Plata Basin after 1970. El Niño has also had an impact on stream flows in the basin. For example, in the middle section of the Paraná River, the four largest discharges on record followed the four El Niño events of 1905, 1982–1983, 1992 and 1998. In 1982 and 1983, more than 40,000 people were affected in more than seventy towns along the reach of the Uruguay River within the Brazilian state of Rio Grande do Sul. Severe flooding, with extensive damage to infrastructure and economic production, are frequent occurrences, especially in the Paraná and Uruguay sub-basins. The Paraná River and its tributaries have many riverside towns that are frequently flooded. This is the case in the Argentinean cities of Resistencia, Corrientes, Rosario, and Santa Fe. In the La Plata Basin as a whole, losses associated with El Niño events were estimated at more than US $1 billion.



Map 14.13: Overview of La Plata River Basin

Source: Prepared for the World Water Assessment Programme by AFDEC, 2006.

Water and environment

Thanks to climatic conditions, rainfed agriculture is common in the basin. In fact, the proportion of irrigated land to the overall agricultural area is relatively low, varying between 0.3 percent (in Paraguay) to 16.8 percent (in Uruguay). Soybean, maize and wheat are widely produced in the basin, and animal husbandry and fisheries are other important sources of food and income.

However, soil loss from agricultural areas and organic and chemical contamination stemming from agriculture and animal husbandry are also

8. Located on the left bank of the Paraná River (Argentina), after its confluence with the Paraguay River.
9. Located on the right bank of the Paraguay River (Argentina), after its confluence with the Pilcomayo River.