DRAINAGE BASINS OF THE SEA OF OKHOTSK AND SEA OF JAPAN

This chapter deals with major transboundary rivers discharging into the Sea of Okhotsk and the Sea of Japan and their major transboundary tributaries. It also includes lakes located within the basins of these seas.

TRANSBOUNDARY WATERS IN THE BASINS OF THE SEA OF OKHOTSK AND THE SEA OF JAPAN[1]

Basin/sub-basin(s)	Total area (km²)	Recipient	Riparian countries	Lakes in the basin
Amur	1,855,000	Sea of Okhotsk	CN, MN, RU	…
- Argun	164,000	Amur	CN, RU	…
- Ussuri	193,000	Amur	CN, RU	Lake Khanka
Sujfun	*18,300*	*Sea of Japan*	*CN, RU*	…
Tumen	33,800	Sea of Japan	CN, KP, RU	…

[1] The assessment of water bodies in italics was not included in the present publication.

AMUR RIVER BASIN[1]

[1] Based on information provided by the Federal Water Agency, Russian Federation.

China, Mongolia and the Russian Federation share the Amur River basin.

Basin of the Amur River			
Area	**Country**	**Country's share**	
1,855,000 km²	China	820,000 km²	44.2%
	Mongolia	32,000 km²	1.7%
	Russian Federation	1,003,000 km²	54.1%

Source: Information bulletin on the status of surface waters, water management systems and installations in the area of the Amur River Basin Management Authority, 2005, volume I, analytical description.

Hydrology

The Amur River begins at the confluence of the Argun and Shilki rivers next to the village of Pokrova. Its length is 2,824 km (4,444 km from the source of the Argun) and its discharge at mouth is 11,330 m^3/s (357,3 km^3/a).

The most important tributaries include the Argun (transboundary, see assessment below), Shilka, Zeya, Bureya, Ussuri (transboundary, see assessment below) and Amgun rivers. More than 61,000 lakes are in the basin, including the transboundary Lake Xingkai/Khanka, located in the sub-basin of the Ussuri River (see assessment below).

Discharge characteristics of the Amur River		
Discharge characteristics at the Pashkovo station		
Q_{av}	4,440 m^3/s	1896–1980
Q_{max}	21,000 m^3/s	11–13 September 1897
$Q_{min\ in\ winter}$	80.3 m^3/s	5 March 1922
$Q_{min\ ice\text{-}free\ watercourse}$	1,344 m^3/s	7 November 1921
Discharge characteristics at Khabarovsk		
Q_{av}	8,360 m^3/s	1896–2004
Q_{max}	25,500 m^3/s	6 June 2004
Q_{min}	4,360 m^3/s	11 November 2004
Discharge characteristics at the Bogorodsk station*		
Q_{av}	10,100 m^3/s	1896–2004
Q_{max}	26,300 m^3/s	22 June 2004
Q_{min}	938 m^3/s	23 March 2004

Sources: Information bulletin on the status of surface waters, water management systems and installations in the area of the Amur River Basin Management Authority, 2005, volume I, analytical description.
Long-term data on the regime of surface waters, volume I/19, the Amur and Udy basins, Gidrometizdat, 1986.

* Calculated based on measurements at Khabarovsk.

Pressure factors and transboundary impact

Most critical for the status of the Amur River is the pollution load from the Argun, Sungari/Songhua and Ussuri rivers as described below.

Trends

Improving the ecological and chemical status of the Amur strongly depends on pollution control measures in China.

The Russian Federation has already identified a number of measures to achieve good status of the watercourses in the Amur basin. These measures include: stabilization of the riverbed and decreasing negative consequences of the erosion of riverbanks (for the Amur in Amur Oblast), increasing capacities for wastewater treatment, use of low-waste and non-waste technology, legal measures to respect use restriction in water protection zones, and improving sanitary conditions in cities and other human settlements, including collection and treatment of storm water run-off. There is also a need for a bilateral agreement on joint monitoring of the Ussuri and joint action to achieve the required water quality by decreasing human impact in the sub-basin.

ARGUN RIVER

Hydrology

The 1,620 km long Argun River is shared by China and the Russian Federation. It flows for 669 km in China. 951 km above the mouth, it enters the Russian Federation and forms, more downstream, the border between China and Russia.

Sub-basin of the Argun River			
Area	**Country**	**Country's share**	
164,000 km^2	China	114,900 km^2	70%
	Russian Federation	49,100 km^2	30%

Source: Hydrological knowledge, Volume 18, Gidrometizdat, Leningrad, 1966.

At the border between China and the Russian Federation, the Argun River is classified as "polluted" or "very polluted". Apart from regular measurements, field research was carried out in 2005 (April and December), which has shown that for a number of water-quality determinands, the MAC values, which represent the maximum allowable concentration of pollutants for the maintenance of aquatic life, are exceeded by a factor of 2 to 7, and for copper even by a factor of 28.

Regularly, extreme pollution events, mainly caused by industries, occur during wintertime in the section between the villages of Molokanka and Kuti leading to fish kills and the death of animals living close to the river.

Pollution characteristics of the Argun River downstream from the border with China								
Determinands	**MAC in mg/l**	**1995**	**1997**	**1999**	**2001**	**2002**	**2004**	**2005**
Copper	0.001	0.005	0.004	0.003	0.0025	…	0.011	0.006
Zinc	0.01	0.005	0.015	…	0.014	…	0.033	0.002
Phenols	0.001	0.004	0.014	0.002	0.001	0.002	0.002	0.002
Oil products	0.05	0.18	0.21	0.08	0.22	0.07	0.094	2.48

Source: Information by the Zabaikalsk Branch of the Hydrometeorological Service, Russian Federation.

The flood plain of the Argun is relatively large compared to the river's width (10–12 km, sometimes ever larger) and acts as a natural buffer against human impact on the river. So far, this ecosystem is in a good status, however, the planned water transfer from the Chajlar River, a transboundary watercourse in the sub-basin of the Argun, into Lake Dalajnor may destroy the terrestrial ecosystem of the Argun.

In August 2006, during the ordinary session of the permanent Chinese-Russian working group on the ecology of the Argun River, an agreement has been signed on cooperation related to the protection of water quality and the ecological status of the river, and a plan for joint water-quality monitoring, including the ecological status of the river zones, was approved.

IMPACT FROM THE SUNGARI/SONGHUA RIVER[2]

The waters of the Sungari (Songhua) River, which flows entirely on Chinese territory, are the most significant pollution sources in the middle part of the Amur basin. According to Chinese statistics from the last decade, the river ranks among the five most polluted Chinese watercourses, and its quality continues to deteriorate. Frequent industrial accidents, such that of 13 November 2005 at Harbin, add to the pollution load. Furthermore, hazardous substances enter the river during flood events.

There are more than 20,000 chemical production sites in the basin. Russian experts estimate that more than 15 billion tons of substances, including pesticides and herbicides, and various forms of oil products and derivates, enter the Sungari River. Phenols in the river often exceed the MAC values by a factor of 50.

In 2006, joint measurements to investigate the consequences of the 2005 accident on the aquatic ecosystem of the Amur were carried out, based on an agreement between the riparian Chinese and Russian provinces.

USSURI RIVER

The Ussuri (897 km length), shared by China and Russia, has its source in the southern part of the Sikhote-Alin Mountains, forms part of the Chinese-Russian border and confluences with the Amur at Khabarovsk.

Sub-basin of the Ussuri River			
Area	**Country**	**Country's share**	
193,000 km^2	China	57,000 km^2	30%
	Russian Federation	136,000 km^2	70%

Source: Surface water resources of the USSR, Gidrometizdat, 1972.

The river is known for its catastrophic floods. In general, water quality varies between classes 3 and 4.

Water quality of the Ussuri River					
Watercourse	**Water-quality class***				
	2001	**2002**	**2003**	**2004**	**2005**
Ussuri at Novomichailovka	3	3	3	3	4
Ussuri at Kirovkskij	3	3	3	3	5
Ussuri at Lesozavodsk	3	3	3	2	4
Ussuri at Rushino	3	3	2	2	4

Source: Primorskij Service for Hydrometeorology and Environmental Monitoring, Russian Federation.
* There are altogether seven water-quality classes from 1 (clean) to 7 (heavily polluted).

[2] The Sungari/Songhua River is not a transboundary watercourse, but it has been inserted in the assessment due to its impact on the Amur.

LAKE XINGKAI/KHANKA

Lake Xingkai/Khanka is located in the sub-basin of the Ussuri River on the border of China and the Russian Federation. The River Song'acha is the lake's outlet and is connected with the Ussuri River, a transboundary tributary to Amur.

With an area of the lake is 4,190 km^2 (1,160 km^2 in China and 3,030 km^2 in the Russian Federation), the lake is the largest freshwater lake in Northeast Asia. Its recharge basin is 16,890 km^2 (507 km^2 in China and 16,383 km^2 in the Russian Federation).

Lake Xingkai/Khanka is shallow – its mean depth is only 4.5 metres. The total population in the lake basin is 345,000 with a density of more than 20 inhabitants/km^2. The area around the lake is an important wetland habitat and forms a National Nature Reserve on the Chinese side and the Khanka Lake Nature Reserve on the Russian side. It is a remarkable site for nature protection, eco-tourism and scientific research. The Russian Federation has designated the lake as a Ramsar Convention wetland site.

The waters of Lake Xingkai/Khanka are of the carbonate-calcium type. The majority of water input from the Chinese part of the lake basin is from the Muling River floodwater. The overall water quality of the inflow river meets fishery requirements. The Muling River water-quality parameters indicate, however, that the river is suffering from serious organic pollution originating from Mishan City.

In the Russian part, DDT and other groups of pesticides have been found. The data indicate that only the COD value seriously exceeds the accepted standard. Currently, the overall water quality is "suitable for agricultural purposes, tourism and fishing".

During 1985–1992, the overall quality of Lake Xingkai/Khanka's water, based on hydrochemical parameters, improved from "very dirty", "dirty" to "polluted". By 1996–1997, the quality of the lake waters was "moderately polluted" at the Astrakhanka and Sivakovka observation stations (Russian Federation) and "clean" at the Troiskoe and Novoselskoe settlements (Russian Federation).
The average annual concentration of main nutrients indicates that, although nitrogen and phosphorus concentrations decreased during the 1990s, the lake is still eutrophic. But a decreased anthropogenic load and rising lake water levels have slowed the eutrophication process.

TUMEN RIVER BASIN[3]

China, the Democratic People's Republic of Korea and the Russian Federation share the basin of the Tumen River, also known as Tumannaya.

Basin of the Tumen River			
Area	**Country**	**Country's share**	
33,800 km^2	China *	23,660 km^2	70%
	DPR Korea *	10,140 km^2	30%
	Russian Federation	25.8 km^2	<0,01%

Sources: Project on water construction works to stabilize the riverbed in the border region of the Tumen River in order to fortify the State border between the Democratic People's Republic of Korea and the Russian Federation, Vladivostok, 2000.
Surface water resources of the USSR, Gidrometizdat, 1972.

* The figures for China and the Democratic People's Republic of Korea are approximations.

[3] Based on information provided by the Federal Water Agency, Russian Federation and the Russian version of the UNEP/GEF project RAS/98/G31 on the strategic action programme for the Tuman River: Transboundary diagnostic analysis, Vladivostok, 2002.

Hydrology

The Tumen, with a total length of 549 km (16 km in downstream Russia), flows into the Pacific Ocean (Sea of Japan). The discharge at mouth is 10.1 km^3/a.

In its lower part, the river flows through an area with light soils, which are easily washed out and transported away by water, so that the river changes its bed annually. The hydrological regime is still poorly understood; therefore, only preliminary discharge characteristics are available.

Discharge characteristics of the Tumen River at the Kasan gauging station (Russian Federation)		
Q_{av}	320 m^3/s	1934–2000
Q_{max}	11,000 m^3/s	Maximum during 1% of the year
Q_{min}	0.74 m^3/s	Minimum during 95% of the year

Source: Project on water construction works to stabilize the riverbed in the border region of the Tumen River in order to fortify the State border between the Democratic People's Republic of Korea and the Russian Federation, Vladivostok, 2000.

Pressure factors

Industrial wastewaters enter the river mainly from the Democratic People's Republic of Korea. Main pressure factors are iron mining at the Musansk ore deposit; industries at Undoksk (chemical factory, paper production and sugar production) and municipal wastewater from municipalities in the Democratic People's Republic of Korea.

In China, the industrial pollution currently decreased, however, pollution with municipal wastewater is permanently increasing.

In the Russian Federation, there are almost no human activities; the main form of land use is wetlands, which are famous breeding areas for birds.

Transboundary impact

Apart from water pollution from China and the Democratic People's Republic of Korea, a major problem is the erosion of the left riverbank and the shift of the riverbed towards the left-hand side in the Russian Federation. This requires water construction work to fortify the riverbank, particularly on the border between the Democratic People's Republic of Korea and the Russian Federation. This works begun in 2004 and will continue until 2008.

Trends

Improving river water quality requires joint activities of all three riparian countries. The drawing up of a multilateral agreement between China, the Democratic People's Republic of Korea and the Russian Federation is of utmost importance. It should provide for joint measures on monitoring and assessment as well as the achievements of water-quality targets in order to decrease the overall human impact on the waters in the Tumen River basin.

The Tumen River basin and adjacent areas in the Democratic People's Republic of Korea are famous breeding areas of birds. Due to urbanization and the destruction of wetlands, these birds lose their breeding grounds and measures to protect and restore wetlands are of great importance.