Chapter 6

WATER MANAGEMENT

6.1 State of water resources

The regional context

The high and large mountains of Kyrgyzstan are the source of important volumes of headwaters that feed a large number of transboundary streams and drain into other Central Asian countries. This is namely the case of the Syr Darya and the Amu Daria rivers, two key rivers draining into the Aral Sea and replenishing it. There are a number of disagreements about annual water allocations among the Central Asian countries.

More than 3,500 rivers that rise on Kyrgyz territory further run through neighbouring countries, such as Kazakhstan, Uzbekistan, Tajikistan and China. The water allocation schemes that were developed under the Soviet regime between the republics concerned are still in force (for further details, see Chapter 4, International Cooperation). At that time, reservoirs and dams had been developed chiefly to serve agricultural irrigation. Today, the water allocated to Kyrgyzstan is 24 per cent of the available resources. The allocated water quantity is calculated every year, depending on the existing flows (see Table 6.1). On average, it represents 11.6 billion m^3 per year. In the early 1990s, Kyrgyzstan fully consumed the water that was allocated to it, while in 1998, because of the reduction in agriculture, it abstracted less than 9 billion m^3.

Inside the country, this sharing imposes specific constraints (Figure 6.1). In the north, the water of the Issyk-Kul basin is fully used internally by the country. In the Chu region, the water is shared with Kazakhstan (52 per cent Kyrgyzstan/48 per cent Kazakhstan). The water of the Talas basin is also shared with Kazakhstan (50 per cent/50 per cent). In the south, waters from the Fergana Valley and Osh *oblast* drain into the Naryn, a tributary of the Syr Daria, whose waters are shared with Uzbekistan and Kazakhstan. The Axon river drains into the Amou Daria. All the rivers of the south ultimately feed the Aral Sea. Along their course, they are subject to important water uptakes for the intensive cotton agriculture developed along their banks. Kyrgyzstan is no exception, as the south of the country is the most agriculture-intensive region, and irrigation there is a necessity.

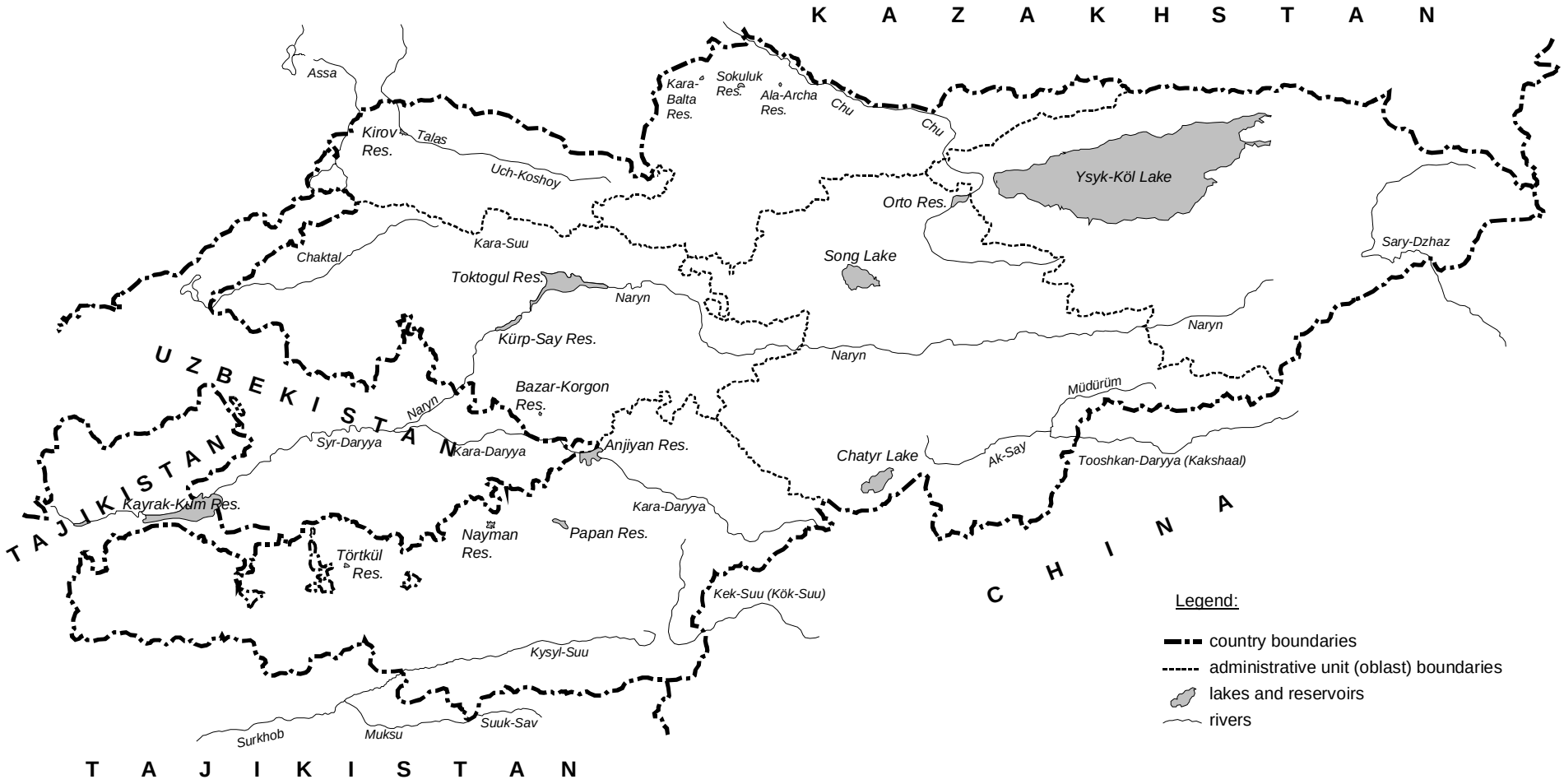
Table 6.1: Main river basins in Kyrgyzstan

River basin	Main tributaries on Kyrgyz territory	Watershed area (km^2)	Average flowrate (Billion m^3/year)
Total		**168,791**	**44.46**
Chu	Chu	14,154	3.73
Talas	Talas	7,640	1.35
Assy		454	0.19
Syr Darya	Naryn, Kara-Darya	99,458	27.42
Amu Darya		7,700	1.25
Issyk-Kul Lake		15,738	3.33
Ili		997	0.36
Tarim		22,650	6.15

Source: NEAP, 1995.

FIGURE 6.1:

MAP OF KYRGYZSTAN



In practice, water is shared through important infrastructure works. Reservoirs make it possible to accumulate the water that will be released at given times of the growing season to neighbouring countries. These reservoirs are also a means of measuring the quantity of water released. Due calculations and accounting are made of water releases. A few examples are the Kyrov reservoir on the Talas river, the Kara-Balta, Sokuluk and Ala-Archa reservoirs on the Chu river, the Toktogul reservoir on the Naryn river, etc. These artificial reservoirs with dams are classically accompanied by hydropower stations. In addition, a system of canals also helps in dividing water and measuring flow rates. Each year, Kyrgyzstan calculates how much water it is authorized to use and then manages the delivery of what is left to the neighbouring countries (see the hotly debated system of compensation described in Chapter 4).

This sharing system, which had been set up in Soviet times in a very different political and economic context, implies a certain number of constraints and conflicts of interest affecting the country's water policy and management:

- The neighbouring countries need water for irrigation during the vegetation period. Their highest demand for water releases from the reservoirs is in summer. Kyrgyzstan, on the other hand, is poor in energy resources and wants to release water to produce electricity in winter, when its demand for energy is the highest.
- In the south, the water quotas left to Kyrgyzstan are too small to allow for the expansion of agriculture. In fact, there are 2.8 million km^2 of arable land that need to be irrigated. Today, 1.2 million km^2 are actually irrigated. The plan is to increase the irrigated area to 1.5 million km^2.
- Finally, all the water infrastructure for the storing and sharing of waters (reservoirs, dams and channels) is located on Kyrgyz territory, and therefore maintained and restored exclusively at Kyrgyzstan's expense.

Climatic factors and water availability

The climate is continental, characterized by cold winters and hot summers. Average temperatures in the valleys fluctuate from minus 18°C in January to 28°C in July. The average annual precipitation is about 533 mm, with over 1,000 mm in the mountains and 150 mm in the plains (Fergana valley). Precipitation occurs between October and April. The primary source of water is snowfall as the average altitude is high. Water flows originate in the melting of snow, permanent snowfields and glaciers.

Kyrgyzstan has huge reserves of groundwater and surface water. There are 10.3 billion m^3 of potential proven annual reserves of groundwaters, and the annual drain of surface waters is 44.5 billion m^3 per year. 650 billion m^3 of ice are stored in glaciers and 1,745 billion m^3 of surface water in lakes and natural reservoirs, 84 per cent of which are located at altitudes above 3,000-4,000 m. Water is also stored in 13 artificial reservoirs with a total capacity of 23.4 billion m^3.

The trends in climatic conditions over the past 20 years show that temperatures are rising. In parallel, droughts are more frequent, water evaporation is more intense, in particular for lakes, and the surface covered by glaciers is diminishing. It is forecast that the surface of ice accretion will reduce by 30-40 per cent by 2025, resulting in a 25-35 per cent decrease in water volume production.

85 per cent of the territory benefits from a positive water balance (water flows). On the remaining 15 per cent the balance is negative, with water lost through recharging underground aquifers, irrigation, and evaporation. This concerns the Chu Valley, the periphery of the Fergana Valley, plains around lakes and the foothills and alluvial plains of other valleys.

Surface water

Rivers: There are six main catchment basins (see Table 6.1):

- Syr-Darya (525 km long, called Naryn river upstream from the Fergana valley), flowing to Tajikistan and Uzbekistan; major Kyrgyz tributaries are the Kara-Suu and the Kara-Darya rivers; and also the Chatkal river flowing west to Uzbekistan;
- Chu (221 km), the Talas and Assa river basin flowing to Kazakhstan;
- the south-eastern small catchment areas of Aksay, Sary Dzhaz and Kek Suu draining to China;
- Lake Issyk-Kul interior basin, which has no outlet (inflows are balanced by evaporation and water uses);

- Kyzyl Suu, which is a Kyrgyz tributary of the Amu Darya River basin in the south-west;
- upstream of the Ili river catchment area, which is a tributary of the Balkhash basin in Kazakhstan.

The Naryn watershed covers 59,000 km^2, i.e. 30 per cent of Kyrgyzstan, and generates 31 per cent of its total water volume. The second largest river in Kyrgyzstan, the Kara Darya, has a watershed of 31,000 km^2, and generates 10 per cent of the country's water flow. Both of them cross over agricultural regions, where water is mainly used for irrigation (see Figure 6.1). Their flows are regulated by a series of dams and reservoirs (in particular, the 19.5 km^3 Toktogul reservoir) which are the country's most important source of hydroelectric power. The watershed of the Chu River, in the north, is home to major urban and industrial centres and is also one of the most important irrigated areas. This watershed of 38,000 km^2 is half in Kazakhstan and half in Kyrgyzstan. The upper Chu river flow is regulated by the Orto-Tokoy reservoir (volume of about 47 km^3).

Lakes: There are 1,923 lakes in Kyrgyzstan, totalling a water surface of 6,836 km^2 (total watershed area 15,738 km^2). The largest are lakes Issyk-Kul (6,236 km^2), Son-Kul (270 km^2) and Chatir-Kul (175 km^2). Most of them are situated at high altitudes between 2,000 m and 3,500 m (see Table 6.2). The total storage capacity of the lakes (excluding Issyk-kul) is only 10 per cent of the total run-off (i.e. about 4.5 billion m^3), which means that lakes do not play an important role in the regulation of water flow over the year. Wetlands occupy 0.5 per cent of the territory in the alluvial valleys and along the banks of Lake Issyk-Kul.

Lake Issyk-kul has a high recreational value and is exceptionally clear. More than 80 rivers from the Terskey and Kungey-Alatoo Mountains flow into the Lake. The Lake has no outlet. Therefore, it is sensitive to all pollution inflows, mineral salt inflows (the salinity of the Lake is on the increase), water uptakes and evaporation, as all these factors threaten its ecological equilibrium.

Reservoirs: Artificial reservoirs have been created to regulate the water flows from the melting of snow and glaciers in spring and store it till the vegetation period in summer (Table 6.2). Fifteen major reservoirs with a total capacity of 15.6 billion m^3 have been built to regulate the fluctuating river flows. 24 smaller ones have capacities ranging from 1 to 10 million m^3. There is a significant loss of storage capacity in these 15 major and 24 smaller reservoirs due to the

Table 6.2: Major natural and artificial reservoirs

	Area (km^2)	Altitude (m)	Volume (Million m^3)	River basin
Lakes				
Issyk-Kul	6,236	1,606	1,738,000	Issyk-Kul
Sonk-Kul	270	3,013	2,640	Naryn
Chatyr Kul	154	3,530	610	Naryn
Sary Chelek	4.9	1,873	483	Naryn
Cheul-Suu	4.5	3,514	338	Ak Sail
Kara-Suu	4.2	2,022	223	Naryn
Mertbachir	4.5	3,304	129	Sary Dzhaz
Kullun	3.3	2,856	118	Kara-Darya
Reservoirs				
Toktogul	284		19,500	Naryn
Andizhan	-		1,750	Kara-Darya
Kirov	26.5		550	Talas
Orto Tokoi	25		470	Chui
Kocksai	12		370	Naryn
Papan	7.1		260	Ak-Buura
Tashkumyr	-		250	Naryn
Tjurtkul	6.6		90	Isafa

Source: NEAP, 1995.

sedimentation of suspended solids brought in with the influent waters. This is an important problem as spare water capacities are vital for agriculture (irrigation) and hydropower production. Equally important is the maintenance of dams, which has been inadequate for a few years now, some of them present a real danger of bursting (See Chapter 3).

The biggest storage capacity is in the Syr Darya basin, in particular with the huge Toktogul reservoir (19.5 billion m^3) on the Naryn River. It is a multi-purpose reservoir for irrigation, hydropower production and protection against floods. Situated close to the Uzbek border, its irrigation and flood functions mostly concern the Uzbek territory.

Hydropower plays a key role in Kyrgyzstan. It provides 90 per cent of domestic electricity needs, with an estimated 3,000 MW of installed capacity (compared to an economically feasible potential of 6,200 MW). As said above, there is a conflict of interest between the production of electricity, for which demand peaks in winter, and the irrigation water requirements, which peak in the summer cropping season. The water demands for irrigation come mostly from abroad.

Quality of surface waters: It is difficult to have a clear picture of the quality of surface water, as monitoring is scarce and increasingly unreliable (see below the section on monitoring). In general it is said that the water bodies suffer only low levels of pollution. All river basins have an adequate water oxygen content (5-6 mg/l) and low organic and nutrient substance content (BOD5 down to 2-3 mg/l, nitrates below 1 mg/l). River water is particularly pure in the upper stretches (e.g. Naryn, Amu-Darya, and other mountain rivers).

However in the vicinity of urban, agricultural and industrial centres, the quality of river water deteriorates. Pollution hot spots are found in the populated Chu river basin, the lower section of Kara-Darya and Naryn tributaries in the Osh and Djalal-Abad *oblasts*, and the Tyup rivers flowing into Lake Issyk-Kul. In these places, high concentrations of nitrates (above 3 mg/l), nitrites (0.7 mg/l), oil and grease (0.5 mg/l), phenols (above 0.001 mg/l) and pesticides (DDT and HCH group) have been detected. Pollution by mine tailing dumps also occur in several places in the country, such as radioactive contamination of the Mailuu-Su River, cadmium contamination of the Sumsar River (320 times higher than the concentration limit) and other heavy metals (copper, zinc and lead) in the Djalal-Abad *oblast*.

In order to protect water supply sources, a number of designated areas and watersheds have restricted access and limited land-use conditions. As much as 172,260 ha are thus protected, including 18,900 ha encompassing the vulnerable Lake Issik Kul. But the enforcement of protection measures is uneven.

Groundwater

3.4 billion m^3/year of groundwater resources were available for abstraction in the early 1990s, a figure which has probably decreased, as no investments have been made since then and some pumping systems have been abandoned because of a lack of maintenance. At that time, 2.0 billion m^3/year in the Chu river basin, 0.8 in the Syr Darya basin and 0.8 in the Issyk-Kul catchment area were potentially extractable (Table 6.3). The volume of groundwater is sufficient to meet present and future needs, save perhaps the aquifer

Table 6.3: Groundwater reserves

	Estimated reserves		Aquifers	Proven reserves		Wells
	Billion m^3/year	*Thousand m^3/day*	*Number*	*Billion m^3/year*	*Thousand m^3/day*	*Number*
Total	**10.71**	**29,348**		**3.76**	**10,289**	**5,900**
Chuisk	2.80	7,648	13	2.03	5,553	2,207
Tals	0.82	2,250	4	0.11	306	245
Issyk-Kul	2.11	5,803	7	0.76	2,083	1,078
Naryn	3.34	9,154	3	0.01	41	459
Osh	0.95	2,595	13	0.41	1,131	1,105
Djalal-Abad	0.69	1,898	2	0.43	1,175	806

Source: NEAP, 1995.

serving Bishkek, where present abstraction seems close to its maximum (other underground sources or surface water might be sought in the future if demand for drinking water continues to increase). Aquifers are recharged both by precipitation and by river water infiltration.

Monitoring shows that in some places the water quality of the aquifer's upper layers is deteriorating. Where there is infiltration from irrigation canals and from irrigated areas, groundwater is threatened by contamination. Because of infiltration, the water quality in the upper layers is threatened by the poor protection from sanitary perimeters around the water uptakes (wells), the improper development of irrigation methods, untreated waste-water discharges, and inefficient water drainage. There is also the improper storage (illegal dumping) of waste, in particular tailings containing radioactive substances, heavy metal salts, cyanogen-containing substances, which are deposited in troughs and hollows.

Here are some examples of groundwater pollution:

- In the Orto-Alysh region, from where 60 per cent of the drinking water for Bishkek city is extracted, groundwater is polluted by nitrates (concentration exceeding the norm for drinking water) to a depth of 150 metres; pollution is from domestic activities at the surface;
- In the south-west of Kara-Balta city, groundwater is polluted by nitrate and manganese from tailing storage from a hydro-metallurgical factory;
- Infiltration from beneath the tailing ponds of the Kara-Balta mining complex causes the infiltration of chromium compound in groundwaters; the State Agency that performs systematic investigations at this site has also shown high contents of sulphate, manganese (up to 15 mg/l), molybdenum (up to 7.0 mg/l) and uranium (0.03 mg/l);
- The whole region of Kara-Balta suffers severe pollution of groundwater beneath industrial premises; 15 wells are no longer used because the groundwater is unfit for human consumption;
- In the region of the Makmalzoloto gold-extracting factory, abnormal mineralization of groundwater is on the increase as is the chlorate and sulphate content;
- In the southern regions (Osh), groundwaters are polluted by pesticides and fertilizers (e.g. Tuia, Kerki-Dong, Suzak, Kutarma, Kyzyl-Bulak, Karavan villages).

6.2 Water uses and anthropogenic pressures

General

In the early 1990s, Kyrgyzstan consumed its entire water allotment. Since 1991, the volume of water abstracted has shrunk by more than 20 per cent to 8.5 billion m^3 in 1997 and 8.8 billion m^3 in 1998 (Table 6.4). Most of the water is extracted from the surface; groundwater uptake is only about 6-7 per cent of total uptake. As the main water distribution networks suffer from bad maintenance, leaks have increased and represent above 25 per cent of the total uptake. In particular, 90 per cent of the losses occur in the obsolete irrigation network (Chu and Osh Oblasts). This problem has been increasing since 1990 and affects all distribution networks. Abstracted groundwater volumes have halved over the same period, as many pumping stations are no longer operational.

Until 1993-1994, allotted water quotas were completely used in all water basins except the Amu Darya River basin. In 1993-1994, the areas draining to the Aral Sea basin of Naryn, Chatkal and Kara-Darya, and Kyzyl Suu consumed between them 45 per cent of the water allotted to the whole country. These are areas of highly intensive and water-consuming agriculture where cotton is grown. Kyrgyz projects to expand irrigation are also situated mainly in this region. It is questionable whether under the existing water-sharing agreements, there is still much room for new uses, such as expanding irrigation, unless water use for other purposes is lastingly cut.

Traditionally, the bulk of water has always been used for irrigation in Kyrgyzstan, a trend which is still true today (Figure 6.3). In 1995 irrigation used 89 per cent and industry came second with 7 per cent. In 1998 irrigation consumed 91 per cent of water and domestic uses 5 per cent. Since 1991, water use has decreased by 29 per cent overall, or specifically by about 80 per cent for industry, 40 per cent for agriculture excluding irrigation, 25 per cent for irrigation; but it has increased by 25 per cent for domestic consumption (Figure 6.4). Total industrial output declined by 65 per cent between 1991 and 1995 and agriculture activities fell by 45 per cent in the same time. Pollution pressure has decreased accordingly.

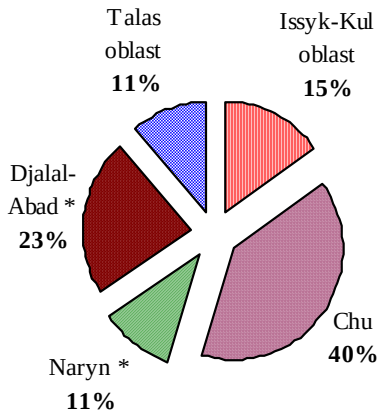
Table 6.4: Water abstraction and uses in the different oblasts (administrative regions), 1997

	Abstraction		Water use						Total used/total abstracted	Losses
	Surface water	Under-ground water	Total	Domestic uses	Industry	Irrigation	Agriculture (excluding irrigation)	Other		
	Million m³								*%*	
Total	**7,877.6**	**575.8**	**6,177.8**	**316.1**	**141.8**	**5,597.4**	**111.5**	**11.0**	**73.1**	**26.9**
Issyk-Kul	920.5	28.0	757.5	9.0	5.0	735.0	7.5	1.0	79.9	20.1
Naryn*	644.0	16.0	545.9	10.0	2.0	526.9	6.0	1.0	82.7	17.3
Chu	2,435.0	256.0	1,493.0	225.4 **	87.8	1,151.8	21.0	7.0	55.5	44.5
Djalal-Abad*	1,017.0	135.0	1,046.9	19.0	18.0	970.9	38.0	1.0	90.9	9.1
Osh*	2,199.0	140.8	1,756.1	51.7	25.0	1,650.4	29.0	0.0	75.1	24.9
Talas	662.1	14.0	578.4	1.0	4.0	562.4	10.0	1.0	85.5	14.5

Source: Ministry of Agriculture and Water Resources.

Note:
* Oblasts of which river flows are tributaries of the Aral Sea basin;
** Of which 205 million m3 for Bishkek.

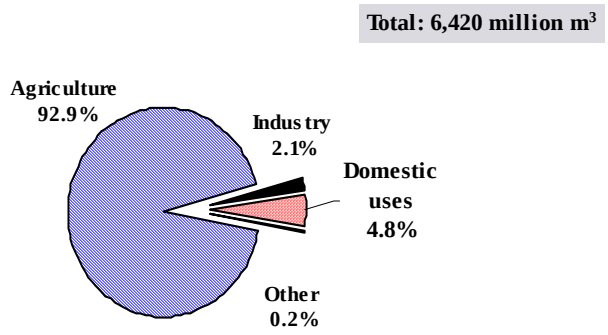
Figure 6.2: Use of water in the different oblasts, 1998



Source: Ministry of Environmental Protection, 1999 State of the Environment Report.

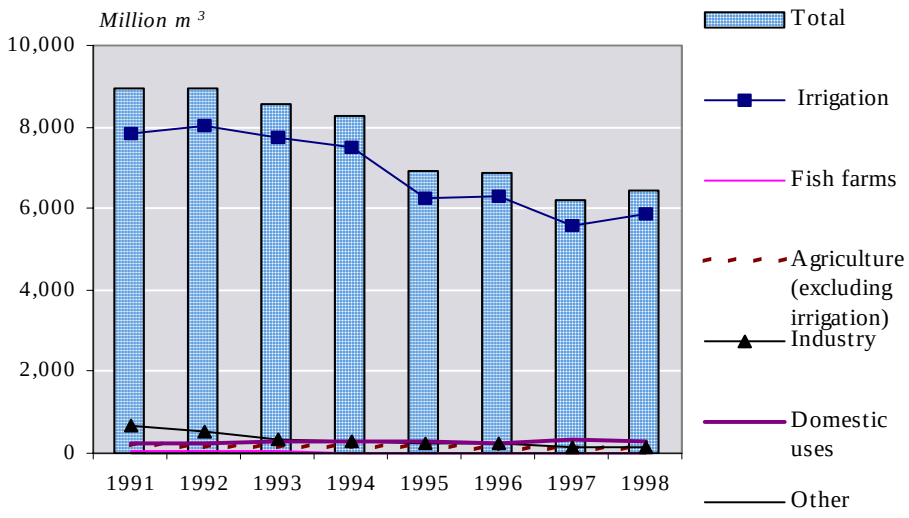
Note:
* Oblasts of which river flows are tributaries of the Aral Sea basin.

Figure 6.3: Water uses, 1998



Source: Ministry of Agriculture and Water Resources.

Figure 6.4: Water uses, 1991-1998



Source: Ministry of Agriculture and Water Resources.

At *oblast* level, the use pattern depends on the predominant sector of activity (Figure 6.2 and Table 6.4). The Chu *oblast*, which is the most densely populated (it includes the city of Bishkek) and the most industrialized, uses comparatively also much water for domestic and industrial use: irrigation 77 per cent, domestic use 15 per cent and industry 6 per cent. In all other *oblasts*, irrigation uses more than 90 per cent. Also in all *oblasts* abstraction rates are about 10 to 27 per cent higher than used volumes depending on the place, which shows the importance of losses in the main distribution systems.

Agriculture and irrigation

The agricultural sector is heavily dependent on irrigation. It seems that among the primary reasons for the current low harvest yields are the inefficient management and maintenance of irrigation systems, irrational use of water resources and lack of modern irrigation technology (see Chapter 9).

In 1999, irrigated areas covered 1.06 million ha, out of a total potential of 2.25 million ha. Irrigation is most widespread in the Syr-Darya River basin (42 per cent), the Talas and Chu River basins (41 per cent) and around Lake Issyk-Kul. There is a wide variation in the use of water for irrigation, ranging from 3,800 m^3/ha/year in the Chu basin to 11,200 m^3/ha/year in the Syr-Darya basin, the country's average being 9,000 m^3/ha/year.

Water is supplied mainly through river diversion. The irrigation infrastructure includes pumping stations, diversion works, reservoir facilities, distribution canals and water control structures. The network is made up of about 13,000 km of canals, most of them unlined. The reservoirs and main canals constitute the inter-farm network, whilst secondary distribution networks inside the former kolkhozes and sovkhozes constitute the in-farm network. Although the main network has been well designed, the secondary distribution system is in general poorly designed, built and maintained, and an increasing length of it is no longer operational. In the former system, this entire infrastructure, including its development, operation and maintenance, was the State's responsibility. Nowadays, the responsibility of the main network is still with the Ministry of Agriculture and Water Resources but the responsibility for the in-farm network has been shifted to farmers. Farmers are strongly encouraged to create water users' associations (WUAs) at village level. For more details, see Chapter 9.

Since the beginning of the 90s, the maintenance of the irrigation infrastructure has been increasingly neglected, as the expenditures on operation and maintenance have regularly shrunk. In 1991 expenditures were only 56 per cent of estimated requirements, in 1992 they were 9 per cent, and in 1993 a mere 5 per cent. Today, the losses along the distribution system are high, the reservoirs need to be cleaned and the dams repaired.

Domestic water supply

About 90 per cent of drinking water comes from underground. It is extracted from some 5,900 wells

with a total discharge of 1.6 million m^3/day (Tables 6.3 and 6.4).

The urban population (i.e. 40 per cent of the total population) is supplied mostly good-quality groundwater through water supply networks (Table 6.5). A quite important part of the urban population is supplied from standpipes in streets and yards. There are also a few towns that rely on surface water for their supply. There, the quality of the water is uneven. For instance, one of the principal water sources for Osh city is the Ak-Buura River. This river, which is located in a basin with much livestock and large farms, rarely endowed with sanitation facilities, is subject to sudden floods. These floods wash out the soils with all their pollutants and so contaminate the water supply. Another city, Kara-Kul, also relies on surface water from the Kara-Kul and Kashka-Su rivers for 60 per cent of its population. In general, areas with low-quality drinking water are the populated areas of the Chu river basin, Osh and Djalal-Abad *oblasts*, and the rivers flowing into Lake Issyk-Kul. For instance, Karakol city, close to Lake Issyk-Kul, is supplied with low-quality drinking water. The water is neither filtered nor disinfected and causes numerous infectious diseases.

In rural areas, there has been a programme under way for many years to expand the piped water supply. About 70 per cent of the 2.5 million rural population is now served by a small piped water supply system. Usually the water comes from underground, except for about 634 villages, 92 per cent of them in the south-west, that are supplied from open water reservoirs and irrigation canals. At present, many groundwater intakes from wells are out of order (because not repaired) and not controlled by the local authorities.

The remaining 30 per cent of the rural population is supplied by individual wells without disinfecting equipment. The distribution system is highly dispersed: 97 per cent of the rural piped service is supplied from 770 groundwater wells that feed 662 water mains supplying 26,814 street hydrants and standpipes. In some places, street and yard standpipes are the predominant means of water distribution.

Built in the 1970s, 70 per cent of the current water supply network is said to be in poor condition and needs rehabilitation. Often, there are no fences around sanitary protection zones of water intakes, and cattle come to pasture and drink water there. The water is rarely treated before distribution. About 48 per cent of the supply facilities have no disinfectant installations. In the main towns, disinfecting treatment facilities exist but disinfection is not performed. The risk of contamination occurs along the often badly maintained pipe system. Funds are available only for emergency repairs and cannot cover disinfection equipment or even chemical disinfectant for existing units. The lack of funds since 1991 has resulted in a reduction in experienced staff, and consequently in bad operation and maintenance and poor water quality monitoring. In particular in the rural areas, the staff of Kyrgyzselremstroy, the State water supply enterprise, is about ten per cent of what it was in the 1990s.

The problem of inadequate drinking-water quality and its impact on human health is described in detail in Chapter 10.

Industry

Water consumption by industry has fallen from 674 million m^3 in 1991 to 138 million m^3 in 1998. More than 60 per cent of this quantity is used in the Chu *oblast*, which is the most industrialized area in the country, the rest is used in the Osh and Djalal-Abad *oblasts*, where important mining and textile (cotton retting) industries are located.

Waste-water discharges and pollution

There are no data about waste-water discharges either because monitoring is no longer performed or because data are not available to the authorities. The Report on the State of the Environment in Kyrgyzstan published in 1998 reports that annually 900 to 1,150 million m^3 of waste water is discharged into natural receiving bodies. Only 300 to 635 million m^3 undergo waste-water treatment, be it mechanical, biological or physico-chemical. 1.42 to 0.75 million m^3 of toxic or dangerous waste water is discharged without any treatment. Based on the situation in 1990s, waste-water treatment units (WWTU) represent a capacity of 300 million m^3/year. Industrial waste water is generally treated in municipal waste-water facilities, possibly after a detoxifying or primary treatment. The monitoring of municipal waste-water treatment plant outflow is the responsibility of the State enterprise operating the plant (see further below).

Table 6. 5: Water supply systems and sewage systems, 1991-1998

	1991	1992	1993	1994	1995	1996	1997	1998
Water supply systems								
Number of main cities equipped	21	21	20	20	20	20	20	20
Number of small towns	29	29	29	29	29	29	29	29
Number of rural areas and smaller villages	946	956	999	999	999	1,018	1,018	878
Water sewage systems								
Number of main cities equipped	18	18	17	17	17	17	17	17
Number of small towns	15	14	14	15	15	15	15	15
Number of rural areas and smaller villages	54	54	56	56	56	56	56	56

Source: Ministry of Environmental Protection, State of the Environment Report, 1999.

However, the above-mentioned figures are theoretical, as they assume that (i) waste water collection capacity in towns equals about 70 per cent of the water supply capacity, (ii) existing WWTU are functioning at their nominal capacity and (iii) biological treatment is functioning. This was true in the early 1990s. Today, the quantity of waste water discharged has dropped to 400-450 million m^3/year. 40 per cent of the 350 WWTU do not operate at all, and 30 per cent do not meet government standards, as they have not received any funds for maintenance or repair since 1991. In 1997, out of 24 sewage plants in the Osh *oblast* only two just met sanitary requirements, as did one out of 34 in the Djalal-Abad *oblast* and 6 in the Naryn *oblast*. Most of those that are operating have only the mechanical stage functioning. The treatment plants in Karakol, Cholpon-Ata, Balykchy, Djalal-Abad, Osh, Tokmok, Mayluu-suu, Naryn and other cities are in a critical condition and need reconstruction.

Pollution removal performance is largely unknown as only the Naryn *oblast* continues to report on water discharge; the other *oblasts* are no longer transmitting data. As for the capital, at the moment the WWTP of Bishkek city is working, but 35 per cent of Bishkek city is not connected to any sewage system. In the Issyk-Kul *oblast*, out of the 78 treatment plants, only 4 are more or less operating (i.e. only the primary treatment stage might work); their removal rates are in any case unknown. In Osh, where two waste-water treatment plants operate and have been subject to some repair over the past year, the performance on BOD is 17 per cent and on suspended solids 67 per cent. In rural areas, more than 90 per cent of settlement have no sewage systems and no individual installations to treat waste waters (septic tanks, absorbing pits or other means, see Table 6.5).

There is no quantified information on the pollution discharge by agriculture, be it point pollution (manure from cattle breeding) or diffuse (fertilizers and pesticides impacting river water quality). But untreated manure containing sewage and livestock wastes is perceived as one of the most dangerous sources of water pollution at present.

Information on industrial pollution discharge has been lacking since 1996, and figures after 1995 are mere prognoses (See the State of the Environment report of 1998 on components such as ammonium, nitrites and nitrates, petroleum and oil products, toxic substances (DDT and HCH) and heavy metals (copper, chromium and zinc). Also, it seems that contamination from radioactive refuse from past mining activities also occurs but is not measured. According to the NEAP prognosis, toxic pollution has increased since 1995. Due to the recession, the preliminary treatment facilities at industrial plants are rarely operated. In the Bishkek region, they function at 5 to 10 per cent of their capacities, if at all. In general, they are outdated, obsolete and require overhauling.

6.3 Water management

Policies and strategies

For the time being there is no national strategy for the use of water resources or their protection. In Soviet times, planification of the use of water resources for 5-year periods was the rule. Kyrgyzstan and the other four Aral Sea countries have decided on their water priorities at regional level (see details in Chapter 4). In short, they are to prepare a regional strategy on water management and, on the basis of this strategy, complete the necessary legal framework, limit water consumption by introducing quotas and address

water quality as well as water quantity. Today, Kyrgyzstan is following these guidelines internally under the guidance of international programmes and international financial institutions, as can be seen by the projects currently implemented throughout the country. Table 6.6 summarizes the main water projects.

The Aral Sea problem has attracted much international assistance in water management to the Central Asian countries concerned. Two objectives of the Aral Sea Programme are of direct concern to Kyrgyzstan: developing joint management of transboundary waters and building regional institutions to achieve these goals. The Programme is funded jointly by the 5 affected countries and external foreign financing. The Programme also aims at assisting the riparian States in adopting macroeconomic and sectoral policies that support water resource development. The first phase focuses on important elements for Kyrgyzstan, such as the preparation of a regional water resource management strategy, the development of a regional environment monitoring system to track water availability and consumption, and the implementation of an integrated water and land management in the upper watersheds. All of these objectives directly affect the country's water management policy and have been taken into account in the NEAP.

The new NEAP, which is in preparation, mainly consists of a long list of projects. Many concern water management. They integrate sectoral energy and agriculture concerns, mostly irrigation infrastructure; they also encompass public water supply needs and infrastructure as well as pollution protection works (sewerage and WWTP). The projects are listed for each *oblast*. Corresponding investments and funding sources are given. Priorities are also set. Short-term (i.e. 1998), medium-term (1999-2000) and long-term (2005) actions are defined. The total investment estimates allot 8.9 billion soms to the short-term, 2.1 billion soms to the medium-term and 6.9 billion soms to the long-term actions. In the present economic situation this does not appear realistic (total expenditures on water for 1997 were about 9 million soms). Moreover, the short- and medium-term deadlines are almost past.

A Clean Water and Health Programme has been developed since 1998. Coordination is ensured by the Kyrgyz-Russian (Slavonic) University. The Programme is ambitious and has numerous aims and components. It consists of projects of varying quality and importance. It is not clear how the Programme relates to the NEAP and NEHAP (see Chapter 10). The financing is not clear either. The Programme focuses mostly on technical problems, but does not integrate the managerial, institutional and financial aspects.

A national irrigation rehabilitation strategy and action plan (NIRAP) should start to be developed in late 1999, with the financing of the EU. It will serve as an important input in the design of future irrigation projects.

The lack of a national strategy has led to an absence of cooperation, coordination and strategic views at territorial level. There are no management plans for water allocation or water protection. Management is made on the spot, separately in the different *oblasts*, by local offices of the Ministry of Agriculture and Water Resources and the Ministry of Environmental Protection. They have no concerted actions. However, as far as water allocations are concerned, each *oblast* knows how much water it can distribute, as quotas for each *oblast* are set by the Ministry of Agriculture and Water Resources. In other areas of water management, the *oblasts* are not working together to develop common strategies or synergies.

Legal framework

The 1994 Water Law strengthens the legal basis for water management and the regulation of both water quality and water use (see Chapter 1). There are provisions to introduce economic elements including infrastructure operation, maintenance and construction. This applies to agriculture, industry and households.

The Water Law introduced specific provisions for the management of water infrastructures and the establishment of water users' associations (WUAs) (Article 18). However, the Law does not provide for clear water rights (e.g. the ownership of main irrigation and secondary irrigation infrastructure and the legal status of WUAs), which creates difficulties in particular in rural areas and in irrigation infrastructure. The main water infrastructure is still the responsibility of the Ministry of Agriculture and Water Resources. Where they exist, WUAs are responsible for the maintenance of the secondary irrigation network. They should store and distribute water amongst their members in accordance with the water abstraction licences. They should also handle

in-farm water infrastructure, manage water use and take water protection measures.

Kyrgyzstan was the first Central Asian country to introduce charges on irrigation water (Law of 1995, see the section on economic instruments below). Currently, a decree is in preparation for fixing charges for water abstraction for all users.

The Law on Drinking Water was adopted in 1999. Standards for drinking-water quality are being worked out (see Chapter 10 for more details).

Institutional framework

The Ministry of Agriculture and Water Resources is responsible for water allocation, water accounting and for regulating and issuing permits for water use. Together with the local authorities (*oblasts* and *rayons*) it is also responsible for the construction and maintenance of infrastructure for irrigation water, including reservoirs with their dams and main canals, and for delivering irrigation water. With the privatization of farms, the in-farm water distribution has increasingly shifted into the hands of water users' associations. The Ministry of Agriculture and Water Resources monitors ground and surface water quantity and quality in irrigated areas. It negotiates water allocations with the neighbouring countries, and delivers and keeps records of the agreed water quantities. The Ministry's inspectors verify that the actual water uptakes comply with the permits. Also, the Ministry decides on the level of the charges on water resources use for irrigation and other activities, and collects them.

The Ministry of Environmental Protection is in charge of protecting water quality; regulating the discharge of pollutants into water bodies and collecting fines and fees for such discharges. It delivers emission permits to enterprises and other polluters. Polluters are responsible for monitoring water quality within 500 metres of the point of discharge. The Ministry of Environmental Protection with its inspectorate and Water Monitoring Department supervises and checks the monitoring system and controls permit compliance. The Ministry has regional offices in each *oblast*. They control compliance and levy fees and fines on polluters for violations; they can decide to close industrial activities when the law is infringed. In the Issyk-Kul *oblast*, four facilities were closed for such reasons in 1998 and two in 1999. However, in this period of economic difficulties, inspectors are more inclined to negotiate than to impose sanctions.

At territorial level, water is managed by the *oblast* administrative units. Related tasks are performed for water allocation by the local office of the Ministry of Agriculture and Water Resources and at the same time by the local office of the Ministry of Environmental Protection for water protection. The concept of management by hydrographic basin (or catchment basin) is not put into practice.

The supply of domestic, municipal and industrial water is the responsibility of three organizations. In Bishkek (38 per cent of the urban population), a water enterprise (Bishkek Vodokanal) is responsible under the city council for water supply and waste-water collection and treatment. In smaller cities, similar responsibilities are under the Kyrgyzjylkommunsoyuz State enterprise (KJKS). In each *oblast*, the KJKS operates water management through local vodokanals that are responsible of water supply, sewers and wastewater treatment. These local units carry out projects, and operate and maintain facilities. They should cover all their expenses with the charges they collect from users for their services. As other water users, they apply for a licence for abstracting water to the MAWR. In rural areas, where 60 per cent of the population lives, it is the MAWR that is responsible for water supply and wastewater treatment, through its state rural water enterprise (Kyrgyzselremstroy). It manages piped water supply and sewage when they exist (See Table 6.5). A major difference with the vodokanals is that the operation and maintenance of infrastructure is budgeted directly by the Ministry of Agriculture and Water Resources.

Irrigation water infrastructure is still mostly under the control of the Ministry of Agriculture and Water Resources except where WUAs have been set up. WUAs are only in their infancy but should become important local institutions. Flood infrastructure is the responsibility of the Ministry of Emergencies and Civil Defence (see Chapter 4).
The Ministry of Health, with its inspectorate and SANEPID (i.e. sanitary and epidemiology) institute, controls the quality of tap water and that of water discharged from water-treatment facilities.

6.4 Management tools

Monitoring

Water monitoring is spread over different State agencies/institutions:

- The State Agency for Meteorology (Hydromet) of the Ministry of Environmental Protection

monitors surface water quantity and quality. In 1991, Hydromet had a routine monitoring network of about 180 stations located on rivers, lakes and reservoirs. Samples were taken by car to one of its two laboratories in Osh and Bishkek. There, the global basic parameters of water quality, plus a few specific elements as heavy metals and some organic pollutants (oils, pesticides, phenols, etc.), were determined. The methodology used was traditional wet chemistry. The results were published in an annual report in which they were compared to the then prevailing quality standards and maximum allowable concentration (MAC). They were also compared to the results of the previous year. During the past ten years, the monitoring capacity of Hydromet has deteriorated for economic reasons. Today, it monitors only on the Chu River. The Osh laboratory no longer performs water analysis. The monitoring of Lake Issyk-Kul has been interrupted since 1992, with an exception in 1998 when a few monitoring points were checked following an accidental discharge of cyanides in the vicinity of the Lake. In the area which is still monitored, sampling frequency is twice a year (winter and spring) instead of once a month in the 1990s. Hydromet functions on a State budget which hardly covers the salaries of the 700 staff still working there (1,500 staff before 1992).

- The State Committee for Geology and Mineral Resources of the Ministry of Environmental Protection monitors groundwater quality and quantity. This Committee explores, maps and tests the aquifers. It operates a network of 800 observation points. Because of the lack of funds, only 75 per cent of these points were monitored in 1995, a situation that has likely deteriorated since then. This Committee also gives the authorization for abstracting groundwater (water passports) which should then be submitted to the Ministry of Agriculture and Water Resources to receive a water abstraction permit.
- The Environmental Monitoring Department of the Ministry of Environmental Protection monitors the purification performances of municipal waste-water treatment plants and of the major industrial enterprises. There is one such department and laboratory per *oblast*. They all coordinate their action with the Ministry's inspection services and the local *oblast* administration. Out of the 1,200 water standards, the laboratories of the Department are able to verify about 20. The Department also has a data and analysis section, which is working on an inventory of data for the past 5 years. It has collected data from Hydromet about the water quality of the Chu river and from the Ministry of Agriculture and Water Resources on pesticide use. The Monitoring Department does not transmit its data to the statistical office. So far the data are only used as information for the Ministry of Environmental Protection's inspections. They are not processed at all.
- The monitoring of emissions discharges is the task of the emitters. The results of self-monitoring are to be checked regularly by the central inspection laboratory of the Ministry of Environmental Protection, a procedure which seems to have been interrupted because of a lack of funds.
- The Ministry of Agriculture and Water Resources monitors the pesticides, fertilizers, and mineral content of the irrigation waters.
- The Ministry of Health monitors the quality of drinking water.

Box 6.1: The Pilot Environmental Monitoring and Management Capacity Building Project

The objective of the Environmental Monitoring and Management Capacity Building Project of the Asian Development Bank and Finland is to strengthen the capacity of Kyrgyz institutions to effectively carry out environmental monitoring and data management. It includes a training-of-trainers programme in environmental monitoring and data management; pilot-scale monitoring and data management on case studies; providing two mobile monitoring units and data management equipment for the training; drafting plans for environmental monitoring and data management; preparing guidelines and manuals. The Project started in 1998 and will be ended in spring 2000. It is now in the implementation phase of pilot studies. The Project is sited in the Chu region (Chu river valley), which is densely populated (includes Bishkek city) and where most of the industrial activities are located. The Project applies in particular to water. All monitoring institutions for water (Monitoring Department of the Ministry of Environmental Protection, Hydromet, Ministry of Health, State Committee of Geology and Mineral Resources, Academy of Science, Statistical Office) are involved. Staff members went to Finland for training; they are also trained on the computers that have been installed in the MEP.

Currently, a pilot project of the Asian Development Bank (ADB) and Finland (see Box 6.1) aims at improving cooperation between the different monitoring agencies, and at developing the use of data as a decision-making instrument, in particular in shaping strategies and action plans. The US$ 1.2 million project is financed 11 per cent by Kyrgyzstan, 36 per cent by Finland and 53 per cent by ADB. In a concerted manner, the German Association for Technical Cooperation (GTZ) is also developing a pilot programme for water quality monitoring in the Chu valley.

International agreements

International agreements on water allocation are putting strict constraints on water management with concrete quotas. For instance, the agreement between Kyrgyzstan, Kazakhstan, Uzbekistan on the use of transboundary water resources of the Naryn and Syr-Darya reservoirs fixes the daily quantity of water and the schedule of releases that Kyrgyzstan should deliver during the 1999 vegetation period from the Toktogul reservoir. The daily quotas differ from month to month:

Jun:	Mar:	Sep:
500 m^3/day	400 m^3/day	190 m^3/day
Jul:	Apr:	
650 m^3/day	300 m^3/day	
Aug:	May:	
600 m^3/day	230 m^3/day	

Similarly, water quotas are set by other international commissions for the release of water from other reservoirs. These obligations prevail over domestic priorities. Therefore, they influence water use and allocation down to local level. This has a knock-on effect on the management of water: Kyrgyzstan must release water in summer although it would prefer to release it in winter, when domestic electricity demand is high. Unfortunately, that is the period of reservoir refilling. Kyrgyzstan's reservoirs have a capacity that its own uses do not justify. Kyrgyzstan has to operate, maintain and rehabilitate reservoirs, dams, principal channels for transboundary irrigation water as they are on its territory. This puts a huge financial burden on the country and restricts other action in water management.

Two international river basin agencies (the water management associations BVOs) were established in 1996 for the Amu Darya and the Syr Darya rivers. They operate hydraulic structures and installations on rivers. With the Interstate Council for Water Coordination (ICWC) they are responsible for ensuring compliance with water withdrawal limits and guaranteeing the annual water supplies.

Regulatory instruments

There are two kinds of permits/licences for water:

- A water abstraction permit that defines water quantities and that all users, private as well as public, should obtain from the Ministry of Agriculture and Water Resources. These permits are delivered at the oblast level and should be in line with the quota available for the oblast (each oblast has its own water quota).
- A water discharge permit delivered by the Ministry of Environmental Protection. It is a single permit based on the maximum allowable concentration (MAC) and quality standards of the receiving water body, as in the former Soviet system. MACs are calculated for each enterprise and for 25 major pollutants. There are 1,243 quality standards, which are in line with the Russian standards of 1998. They are more restrictive than before, in particular for toxics (for instance for cyanides, 0.1 mg/l before 1998 and 0.035 mg/l since). The permit includes a daily self-monitoring and yearly reporting obligation to the Ministry's inspectorate.

Three different inspectorates are involved in checking compliance with water legislation: the inspectorate of the Ministry of Agriculture and Water Resources for water abstraction, the inspectorate of the Ministry of Environmental Protection for the discharge permit and the inspectorate of the Ministry of Health for drinking-water quality. A compulsory reporting system for all water users and dischargers (public and private enterprises) was introduced in 1998. A form has been proposed for the first time in 1999. It covers the quantities of water abstracted/used each month; as well as the characteristics of the water discharged (quantities and a few pollutants such as BOD_5, COD, SS, dry matters, SO_4^-, Cl^- and oil products) and the type of treatment; information on the permit limits and on the treatment facilities is also mentioned. Inspections by the Ministry of Environmental Protection of permit compliance have shown that 60-65 per cent of nature protection facilities in enterprises are working unsatisfactorily, leading to the pollution of water resources.

Table 6.6: Ongoing projects in water management or with a water component

Title/issue	Donor	Project period	Cost/financing (million US$)	Comments/purpose
Strategy on Water Management	IFAC/GEF	1999-2000		The project is under the Aral Sea Programme. The National Commission on Environment under the President entrusted in 1999 with drawing up a strategy; work will start in end 1999
National Irrigation Rehabilitation Action Plan (NIRAP)	TACIS/EU	1999	**0.2** mln / grant	Development of strategies and priorities for the rehabilitation, modernization and development of sustainable irrigation infrastructure
Irrigation Rehabilitation Project	World Bank/IFAD	1998-2004	Total cost **46.8** mln / of which **35** mln IDA loan	Rehabilitation of primary and secondary canals (serving up to 345000 ha) and major (12) dams; institutional development; O&M transfer to private sector; capacity building of the Water Resources Department.
On-farm Irrigation Pilot Project	FAO	late 1999	**0.4** mln / grant	Development of on-farm irrigation and improvement to enhance productivity/pilot approach for the on-farm irrigation projects of the World Bank and Asian Development Bank
Agricultural Area Development Project	Asian Development Bank	1999-2005	Total cost **50** mln / of which **20** mln only for rehabilitating irrigation / grants and loans	Irrigation component coordinated with the World Bank on farm-irrigation project: rehabilitation of on-farm drainage and irrigation in Chui Oblast ; capacity building in rayon irrigation administrations
On-farm Irrigation Project	World Bank/IFAD	2000-2005	Total cost **25** mln / of which **20** mln IDA loan	Rehabilitation of on-farm irrigation (168000ha) and drainage infrastructure; development of WUAs and irrigation advisory services
Development of WUAs	Asian Development Bank	1996-1997 completed	**0.9** mln / grant	Established legal framework for WUAs; support services; 3 pilot WUAs in Issyk-kul Oblast
Rural Infrastructure Services Project	Asian Development Bank	2000-2006	Total cost **44** mln / of which **35** mln loan	Institutional strengthening and rehabilitation of water supply in 500 villages and 5-10 small cities; sanitation. Will cover Chui, Djala-Abad and Osh oblasts

Table 6.7: Investments for the protection and use of water resources, 1991-1998

	1991	1992	1993	1994	1995	1996	1997	1998
Total* *(Million soms)*	0.04	0.3	2.8	7.9	7.4	4.4	13.1	9.1
as share of total environmental investment (%)	*63*	*82*	*48*	*29*	*26*	*16*	*40*	*24*
- of which:								
for sewage systems *(th. soms)*	0.02	0.2	1.17	1.15	0.58	3.76	9.36	6.6
" " *(as % of total)*	*34*	*77*	*42*	*14*	*8*	*85*	*72*	*73*
- of which:								
mechanical treatment *(th. soms)*	0.02	0.09	0.215	1.134	0.575	3.76	9.35	6.6
biological treatment *(th. soms)*	-	0.1	0.944	0.016	-	-	1.6	-

Source: Ministry of Environment, State of the Environment Report, 1999.

* Investment for protection and use of water resources meaning current expenditures for operating the plants, as no investments have been made since 1991, and very few rehabilitation works carried out.

Projects under way

A series of projects are being developed that concern the improvement of irrigation water management and of the water supply and sanitation infrastructure. They are summarized in Table 6.6. More details are given in Chapter 4 as most of these projects are sustained with international financing.

Economic instruments

Saving water is an essential objective at regional level. So far only Kazakhstan and Kyrgyzstan have introduced water charges as an incentive towards this goal. Kyrgyzstan has put water charges on abstracted water, including for public supply, industrial and irrigation use. Water savings are mainly to be achieved in irrigation water. The Ministry of Agriculture and Water Resources regularly reduces water allocation to promote savings and satisfy the demand of new users. It has introduced a system of water tariffs, which is designed to be an incentive to reduce consumption. The price of water is far higher in the irrigation season (0.03 som/m^3) than out of the irrigation season (0.015 soms/m^3).

Industry and the public also pay for the water they use (Chapter 2, Table 2.1). For households, the water charges are included in a global user charge paid for municipal services to the local communal department or municipal services. Household tariffs for water and sewerage services are established by local authorities. They are based on the accounts of the local Urban Municipal Services units, which are regulated by the State Committee on Prices. The prices are deliberately kept down as it is commonly accepted that most people could not afford higher prices. In addition, the local authorities do not allow the maintenance cost of existing facilities to be reflected in the charge rate. The underpayment by domestic and municipal consumers is compensated by higher tariffs for industrial enterprises. In 1998, most of the unpaid water charges in Bishkek were from State enterprises or State organizations (Table 2.2 and section 2.1 in Chapter 2).

Kyrgyzstan has tried to install water meters in pilot residential buildings with the money collected from household and enterprise water charges. However, it seems that it has not been successful as people simply destroyed the water meters. The reason is that in the absence of a water meter, charges arecalculated as a function of the number of registered inhabitants in a flat. In fact the predominant situation is that flats are occupied by a large number of people but that only one inhabitant is officially registered, which grossly underestimates the presently calculated consumption and hence the charges.

Expenditures for managing water

Since 1991, no investments have been made either in irrigation infrastructures, or in water supply or water sewage and treatment facilities. Details on investments for the protection and use of water resources and treatment of sewage are given in Table 6.7. The table clearly shows that very little investment has been spent on water over the past decade, and in an uneven manner. The bulk of

investment over the past three years is on waste-water treatment rather than on water supply, and almost all concentrated on the operation of mechanical treatment. In 1998, 9.1 million soms (i.e. US$ 0.2 million) were invested on water supply and treatment, of which about 70 per cent devoted to mechanical waste-water treatment.

6.5 Conclusions and recommendations

At present, in Kyrgyzstan, there is no national strategy for the management of water resources, or for their protection or for drinking-water management. The only document that gives directions and priorities about water is the NEAP of 1995, worked out with the assistance of the World Bank. This absence of strategic views undoubtedly makes it difficult for the many local stakeholders (several authorities involved in water management and the water users) to coordinate their respective actions and for potential foreign donors to decide on what issue they should concentrate their assistance. International funding institutions follow the NEAP priorities. Whether the priorities defined 5 years ago by foreign experts still fit the present situation and the expectations of the Kyrgyz people for the future is a point that also needs to be clarified. The water issue is of key importance in the short, medium and long term as it has many political, social and economic repercussions (human health, sectoral activities and international relations).

Recommendation 6.1:
The development of a consistent national water strategy, in cooperation with all the public administrations and non-governmental sectors concerned, should be seen as an urgent requirement. All concerned ministries and institutions should align their own relevant policies and practices on the national water strategy. The national water strategy should focus on the sustainable use of water resources, and should cover the protection of water quality, water supply, water pollution control and protection against floods, as well as the priority investments in the water sector. The national strategy should integrate the needs of sectoral activities, the needs of the population and the water-sharing arrangements with neighbouring countries. See also Recommendation 4.2.

Reconsidering the actual administrative managerial structure for water is essential. The current structure is still adapted to the previous organization of the Soviet system. Responsibilities and tasks are spread over different administrative bodies at different levels, governed by different ministries and financed according to differing criteria/rules and different channels. To coordinate this complex task sharing, it seems that there is no national body that could balance decisions and financing, grant priority to actions and decide on national or local management plans. For instance, each *oblast* deals strictly with its part of the territory. Therefore, hydrographic basins are managed in separate trunks. There is no forum for working out the common problems of a hydrographic basin. In these conditions, the country can hardly see where its most demanding priorities lie. Shifting towards a hydrographic basin management would be premature at present. However, steps should be taken to better integrate water supply and waste-water treatment problems and to improve the cooperation between the major actors.

Recommendation 6.2:
A national council or committee should be created to give direction to the implementation (i.e. not necessarily involving supervisory functions like monitoring) of water policies at national level, harmonize the conditions for water supply (irrigation and public supply) and waste-water treatment, and integrate actions at river basin level.
Water strategies developed at local (oblast) level, where water problems are especially acute and specific, could also be useful. In particular, water saving and conservation strategies should be worked out in the southern oblasts. There, irrigation is the main consumer. There are conflicts with neighbouring countries over water allocation as well as problems with the pollution of surface water, impairing the quality of drinking-water supply and food.

Recommendation 6.3:
Oblasts should be encouraged to develop coordinated water management plans in catchment areas by agreeing on concerted priorities and objectives when they share common water resources. See also Recommendation 10.3.

The NEAP is being updated by the Centre for Strategies and Policies on the Environment of the Ministry of Environmental Protection, with the cooperation of other ministries and stakeholders. It embraces water use and protection. It lists the different actions and investments necessary for remedying the water management and protection situation. The list includes investments in

rehabilitating the irrigation infrastructure including dam maintenance, main channels and in-farm network repair and maintenance. All works necessary to rehabilitate and improve water supply have also been estimated. The rehabilitation and construction of waste-water treatment units are also covered. The document presents a cost estimate at State level or at oblast level of the different works mentioned above, with their priority ranking: short term (1998), medium term (1999-2000) and long term (2005). Apart from the fact that the short-term and medium-term periods are already over and implementation of the plan has not started, the sums at stake are huge (about 9 billion soms for 1998, 2 billion soms for 1999-2000 and 7 billion soms for 2005). Kyrgyzstan will ask for foreign financing. But this will not free the country from the financial burden of consequent future debts. Compared to the real expenditure made by the country over the past years, which peaked at 13.1 million soms in 1997, and bearing in mind the country's current economic potential, the plan and schedule do not seem realistic.

Recommendation 6.4:
The projects included in the upcoming National Environmental Action Plan should be reviewed in order to arrive at a realistic schedule and priority programme. Such a programme for water investments seems to be a precondition for obtaining any foreign financing. See also Recommendation 1.2.

Supplying safe drinking water and protecting people's health from any contamination due to the mismanagement of water is priority number one. Chapter 10 extensively covers this issue, including in Recommendations 10.1, 10.2 and 10.3.

Important irrigation projects are conducted under the umbrella of the World Bank and the Asian Development Bank. However, funding alone would not be sufficient to ensure the success of the projects. Infrastructure is not the only element at stake. User-acceptability is of key importance. Therefore relations between the local administration for agriculture and water resources management and the farmers are to be improved. As for WUAs, it is possible that complementary legislation may be needed to clarify their status and make them fully operational. They need a legal status, to be independent of government, able to collect taxes from their members, borrow funds, take action to maintain and upgrade the part of the irrigation infrastructure under their responsibility.

Recommendation 6.5:
The legal status of water users' associations should be clarified in order to make them fully operational and responsible, as they are key players in any water-saving strategy.

It is important that farmers see the advantage of water users' associations and not only the constraints imposed by the new system. Concrete messages by agriculture and irrigation experts (i.e. extension services for farmers; see Recommendation 9.1 in Chapter 9) should be adapted to each specific region. For this, projects that are in direct contact with the farmers, as is UNDP/Capacity 21, are important. Money and training should be introduced at grassroots level in order to have a direct and concrete impact. Awareness campaigns are another important tool as carried out by the GEF International Fund for Saving the Aral Sea. These kinds of actions in the field should be more numerous and should be preferred to the traditional way of injecting finance at ministry level, which often results in dilution of funds before they reach their targets. So far, UNDP/capacity 21 and the GEF programme do not apply to the whole territory. The other *oblasts* would also greatly benefit from similar actions.

Recommendation 6.6:
Actions to involve people at the local level in day-to-day water management, protection and saving should be developed and extended to the whole country along the lines of UNDP/Capacity 21 and the GEF awareness campaign, starting in the Chu and Issyk-kul oblasts. Ways should be found to ensure that more international funds are spent at the grassroots level closer to those concretely involved in the management, operation and maintenance of the water distribution systems.

Supplying safe drinking water to the public is a difficult endeavour at present in Kyrgyzstan. Most of the infrastructures in cities are obsolete and do not guarantee a satisfactory water quality. In the countryside, since the disappearance of the sovkhozes and kolkhozes that were in charge of managing water supply, the practice of individual uptakes of water, in canals and surface water bodies is growing. In most cases, and especially in some very populated rural *oblasts*, such as Osh and Djalal-Abad, this water is not potable. Improving the infrastructure is certainly a necessity (see the projects currently in the pipeline). Applying the user-pays and polluter-pays principles in a fair and affordable manner is another considerable problem,

but certainly points in the right direction. See Recommendation 2.1.

Controlling water pollution is the next objective that the Ministry of Environmental Protection should pursue as this issue is directly within its competence. This longer-term objective should nevertheless be envisaged as soon as possible, as it means drastic moves in the way water pollution permits are designed. Therefore, it will require particular efforts from and training of the inspectors to adjust to a modern way of controlling pollution release. At present, the system, which is still identical to the Soviet one, does not encourage polluters to reduce their pollution. There is no internal strategy within the Ministry of Environmental Protection to rationalize pollution management. The data on discharged pollution that are generated by enterprises and by the Ministry's Monitoring Department and produced to the inspectorate, are not used as a decision-making tool. It is at present impossible to obtain a clear picture of the main polluters, by enterprise or sector of activity. Nor it is possible to have a clear idea of the major pollution hot spots throughout the country and along the water bodies. This information should exist and be used by the Ministry of Environmental Protection in order to work out common strategies with the sector ministries or to agree upon specific goals to reduce pollution emissions. See Recommendation 2.5.

Drawing up a water strategy means that preliminary information on water quality and water use should be available and as comprehensive as possible. The monitoring of water is spread over a number of different institutions. There are apparently no major problems of overlapping. However, the processing of data, the transmission and exchange of information between institutions, cooperation between monitoring institutions, the use of data as a tool for decision-making are practically non-existent. Moreover, serious financing problems make it difficult to carry out monitoring programmes properly, making monitoring data scarce and unreliable. It is problematic when the lack of data affects the monitoring of the quality of groundwater used for drinking purposes.

At the present time of dire financial straits, it is important to refocus the monitoring strategy. It should be oriented towards an integrated monitoring system *(see Chapter 2 and Recommendation 2.6)*. If full systematic monitoring is not possible, methods should be reconsidered in order to build a more result-oriented system. Efforts should concentrate on a few selected methodologies and parameters that describe specific local problems and produce data for decision-making.
This problem is of considerable importance and deserves having foreign assistance continue to recommend well adapted and/or new monitoring technologies, finance equipment and train local people, following the pilot project on Environmental Monitoring and Management Capacity Building that Finland and ADB are implementing at the Ministry of Environmental Protection. Extending this Project to the whole country as initially planned is an endeavour that deserves to be kept high on the agenda.

Recommendation 6.7:
Aquifers whose waters are used for human consumption should be monitored regularly and extensively.

Finally, no improvement in water management can be achieved without a competent and professional managerial and operational staff. The key water management institutions have been seriously weakened over the past decade. Too much competence has drained out of the ministries and other levels of administration. It is important to find ways to keep highly trained and competent people at all levels of administration. See Recommendation 1.2.