WATER RESOURCES PROTECTION IN THE REPUBLIC OF KAZAKSTAN AND ECOLOGICAL INFORMATION

Granovsky E.I., Kembaev B.A.,
Lyashenko L.V., Ivashchenko L.A., Panycheva S.B.

(Kazakstan)

At preparation of this information the following official materials of the Ministry of Ecology and Biological Resources (ME&BRRK) and other departments of the Republic of Kazakstan were used:

1. The national report "On the state of the environment of the Republic of Kazakstan in 1994" /ME&BR RK. - Almaty, 1995. - 122 pges

2. The State report "Ecologic state of the environment of the Republic of Kazakstan in 1995 and measures taken for its improvement" / ME&BR RK. - Almaty, 1996. - 129 pges

3. Concept of the United State System of the ecological monitoring of the Republic of Kazakstan (USSEM RK) /ME&BR RK, AS RK. - Almaty, 199. - 13 pges

4. Decision of the VIIth Session of the Interstate Economic Council No 4 as of 24.10.1996 "On agreement on cooperation in the field of ecological monitoring and integration into international monitoring systems" - 7 pges

5. Decision of the VIIth Session of the Interstate Economic Council No 5 as of 24.10.1996 "On provision on the interstate system of ecological monitoring" - 5 pges

6. Information on the activity of the Ministry of Ecology and Biological Resources of the Republic of Kazakstan and ecological situation on the territory of the Republic in 1996. /ME&BR RK. - Almaty, 1996. - 34 pges

7. Information ecological bulletin of the RK for 1996 /ME&BR RK, MPH RK, SA of Hydrometeo RK. - Almaty, 1997. - 68 pges

8. Information ecological bulletin of the RK for 1995 /ME&BR RK, MPH RK, SA of Hydrometeo RK. - Almaty, 1996. - 143 pges

9. Catalogue of the Automated Data Bases of the Republic of Kazakstan /B.A.Kembaev, E.I.Granovsky, V.P.Borodin, L.N.Moskalenko, V.M.Neshchadim, M.I.Rauzina. - Almaty: KazgosINTI, 1966. - 209 pges

10. Bibliography of additions of domestic and foreign scientific and technical literature in problems of ecology /KazgosINTI: Almaty, 1995-1997

11. Journal of abstracts: KazgosINTI, series 1, 1994-1997

12. Bulletin of R&D registration, series 3, 1994-1997

13. Collection of R&D abstracts, series 3, 1994-1997

RESUME

This information is prepared on the basis of analysis of National reports on state of natural environment of the Republic of Kazakstan in 1994 and 1995 and other official documents.

The state of water resources of Kazakstan during the years 1991-1995 (surface, underground, sea waters and drinking water supply sources), the influence of diverse economy branches on state of water resources and their impact upon the environmental pollution as well as financing of nature protection activity are considered in dynamics.

The characteristics of ecological monitoring by diverse controlling departments of the Republic (Hydrometeorological service of the Ministry of Ecology and Biological Resources, the Bodies of State Sanitary inspection of the Ministry of Public Health, Underground Waters Monitoring Centre of the Ministry of Geology and Protection of Mineral Resources and others) and measures taken for water resources conservation are described.

The existing departmental systems of collection, processing, analysis, storage, propagation and use of information, their drawbacks as well as main provisions of the developed Concept of a United state system of ecological monitoring are considered.

The characteristics of data bases in the Kazak State Research Institute of Scientific and Technical Information containing the ecological information are cited.

The information on legislation of the Republic of Kazakstan in the field of water resources conservation and existing normative and methodical documents on water resources are presented.

CONTENT

1. WATER RESOURCES OF KAZAKSTAN

1.1. Surface waters

The basis of water resources of the Republic of Kazakstan is the river flow making up in water content on the average over 100 cubic km 43% of which enters from adjacent states: China, Uzbekistan, Kyrgyzstan, Russia.

The state of resources in 1992-1995 is shown in Table 1.

Table 1

Surface water resources of Kazakstan

Water object	Point of observation	Water discharge, m^3/s				
		average of many years	Average			
			1992	1993	1994	1995
Irtysh (Black Irtysh)	Buran stlm	297.0	292.0	460.0	383.0	289.0
Ishym	Akmola city	5.0	12.2	13.1	1.5	-
Ishym	Turgenevka stlm	4.1	-	-	1.8	5.0
Ili	Kapchagai area	388.0	322.0	385.0	519.0	381.0
Syrdarya	Shardara city	421.0	551.0	671.0	604.0	405.0
Ural	Atyrau city	231.0	228.0	378.0	333.0	-
Ural	Kushum stlm	307.0	-	-	505.0	254.0
Shu	Tashutkul stlm	61.8	42.1	69.0	80.8	48.5
Talas	Pokrovka stlm	20.7	21.1	19.9	34.7	26.0
Assa	Maimak h/s	11.1	10.2	12.3	16.1	10.8

In 1994 water content of the main rivers of the Republic of Kazakstan was above the average of many years norm and in 1995 it varied at the level of this norm. During the recent years the tendency of lowering water abstraction volumes from natural water objects was noted and made up as a whole all over the country in 1994 - 31.9 cubic km, that is 1.8 cubic km less as compared to 1993. In 1995 practically all indices of water utilization of the Republic of Kazakstan also significantly reduced (Table 2).

Table 2

Main indices of fresh water use of natural water bodies of the Republic of Kazakstan (cubic km/year)

Records item	Period				
	1991	1992	1993	1994	1995
Abstracted	36.91	34.12	33.67	31.91	28.81
Used	30.26	27.48	26.92	24.94	22.24
Fresh water losses	5.21	5.17	4.99	6.22	5.52
Total wastes discharge	9.00	8.72	8.34	7.69	7.07
among them:					
into surface wat. bodies	6.88	6.94	6.78	6.04	5.78
into accumulators, relief	1.68	1.77	1.55	1.64	1.27
into underground horizons	0.44	0.01	0.01	0.01	0.02

Correspondingly, the total water abstraction from natural water bodies reduced by 3.1; use - by 2.7; fresh water losses - by 0.7; wastes volumes discharged into surface water bodies - by 0.26; into accumulators, depressions - 0.37 cub.km. The wastes volumes diverted into underground horizons made up 0.02 cub.km. The main volumes of fresh water are abstracted from the rivers Syrdarya (31.4%), Irtysh (18.8%), Ili (13.1%), Shu (8.4%), Nura (4.9%) and the lake Balkhash (5.6%) (Table 3).

Table 3

Water abstraction indices for the basins of the main rivers of the Republic of Kazakstan in 1995 (km^3)

Name of the river	Abstracted	
	Total: including surface waters	
Syrdarya	8.33	8.05
Irtysh	5.29	4.82
Ili	3.72	3.37
Shu	2.22	2.22
Nura	1.41	1.26
Balkhash lake	1.54	1.44
Ural	1.08	-0.98
Torgai	0.32	-0.30
Syrasu	0.34	-0.26

In the administrative and territorial devision the main volumes of fresh water abstraction (km^3) in 1995 were implemented within the boundaries of Kyzyl-Orda (4.98), South Kazakstan (4.44), Pavlodar (3.69), Zhambyl (3.66), Almaty regions including the city of Almaty (3.23).

For the national economy needs in 1995 22.24 km^3 of fresh water (Table 2), among them from the surface sources - 20.57 km 53 0, from underground - 1.67 was used, besides 1.19 km 53 0 of sea water was used.

Total water consumption all over the republic is presented in Table 4.

Table 4

Characteristics of water consumption in the Republic of Kazakstan

Application	Volume (km^3)	%
Industrial needs	4.09	18.4
Domestic needs	1.24	5.6
Irrigation (systematic and basin)	15.8	71.0
Agricultural water supply	0.36	1.6
Pasture flooding	0.33	1.5
Fish farming	0.32	1.4
Miscellaneous needs	0.11	0.5

The main water users are the enterprises of the Ministry of Agriculture (14.37), Kazakstanenergo (2.03), Ministry of power engineering and coal industry (1.34) km^3. In 1995 the industrial water consumption for 60%

was met at the expense of using recirculating water supply. High percent of using recirculating water supply was noted at the enterprises of atomic power engineering corporation (96.4%), Ministry of Industry and Trade (76.2), Ministry of power engineering and coal industry (72.2%).

As a whole total water volume all over the republic in 1995 in the systems of recirculating water supply increased as compared to 1994 by 0.36 and 0.06 km^3, respectively.

Water losses at transportation decreased considerably: in 1995 - 5.52 km^3, in 1994 - 6.22 km^3 .

From the total wastes volume (5.78 km^3) the wastes of standard purity (without purification) - 5.29 km^3, treated to standard - 0.26 km^3 and "polluted" (without purification and insufficiently treated) - 0.23 km^3 are diverted into the surface water bodies in 1995.

The volume of "polluted" wastes tend downwards of late (Table 5).

Table 5

Indices of "polluted" wastes discharge

Years	1991	1992	1993	1994	1995
"Polluted" wastes (km^3)	0.34	0.31	0.29	0.24	0.23

Main wastes volumes (km^3) are discharged into natural water bodies by the enterprises of the company KAZAKSTANENERGO (1.8), GOSKOMVODRESURSY (1.1), corporations of the atomic energy and industry (1.1). In all on the territory of the Republic of Kazakstan function over 5400 enterprises - water users. The greatest discharge share of "polluted" wastes of the total volume (%) falls within the enterprises located in the territories of East Kazakstan (55.0), Pavlodar (22.8), Karaganda (11.2) and Semipalatinsk (10.1) regions.

The volume of collector-drainage waters diverted from the irrigated lands by the category "of standard purity" in 1995 decreased by 0.48 km^3 as compared to 1994 and made up 1.5 km^3. The main volumes are diverted from the territories of three regions: South Kazakstan (0.65), Kyzyl-Orda (0.47) and Almaty (0.28) km^3.

The qualitative state of water bodies despite the considerable decrease of polluted wastes discharge remained unsatisfactory. The basin of the river Irtysh where 0.202 km^3 of polluted wastes (88% of the total discharge volume) were discharged was ecologically unfavourable.

As compared to 1994 the levels of contaminants ingressed alongside with the wastes (Table 6) changed considerably. In 1995 10 times more of suspended matter and 2.2 times of compounds of iron were discharged into water bodies whereas the discharge of compounds of copper, zink, nickel, mercury, on the contrary, decreased considerably.

Table 6

Levels of contaminants ingressed alongside with the wastes

Name of substances	Measurement unit	1995	1994
Suspended matter	thou t	250.66	25.19
Ammonia nitrogen	thou t	2.91	2.71
Nitrogen of nitrate	thou t	1.91	0.71
Organic compounds specified by BOD_5	thou t	6.96	5.95
Oil products	thou t	0.23	0.15
Phenols	t	0.57	0.29
Surface active substances	t	84.01	93.18
Phosphor	t	51.39	55.86
Compounds of iron	t	204.63	91.28
Compounds of copper	t	7.12	8.65
Compounds of zink	t	24.89	40,22
Compounds of nickel	t	0.05	1.49
Compounds of mercury	kg	35.70	64.40

According to the integral estimates of Kazgidromet the rivers Ural and Irtysh where water pollution indices (WPI) made up correspondingly 7.18 and 6.56 units (Table 7) are referred to the most polluted rivers by the group of specific ingredients. The qualitative state of all the rest rivers, the small ones inclusive, remained at the level of 1994. WPI is calculated by the group of substances specific for each basin determining (limiting) water pollution level.

Table 7

Main indices of water quality of water bodies of the Republic of Kazakstan

Name of the basin	Specific substances	WPI				
		1991	1992	1993	1994	1995
Ural	Oxygen, BOD_5, oil products, phenols, boron, copper	2.9	2.8	2.5	2.55	7.18
Syrdarya	BOD_5, nitrogen of nitrite, copper, oil products, phenols	0.94	1.4	0.82	0.75	1.60
Nura	Nitrite and ammonia nitrogen, oil products	2.4	2.7	2.2	2.9	2.07
Sarysu	Oil products, copper, phenols, nitrite and ammonia nitrogen	3.4	2.5	2.94	3.83	3.60
Ili	BOD_5, nitrite nitrogen, oil products, phenols, fluorine, copper	2.0	2.0	1.33	1.71	1.32
Irtysh	BOD_5, oxygen, nitrite and ammonia nitrogen, copper, zink, oil products, phenols, xanthates	6.8	10.4	7.4	8.11	6.56
Ishim	Iron, sulfates, oil products	1.0	1.2	1.2	1.58	1.24

Main water use indices for the basins of large rivers of the Republic of Kazakstan look as follows:

BASIN OF THE RIVER IRTYSH. The river Irtysh is the main water artery of Kazakstan, it supplies with water the eastern region of the republic where over 900 water users are dislocated: the enterprises of non-ferrous metallurgy, chemical industry, machine building, oil refining, food and other branches of the national economy. Fresh water abstraction from the surface basin sources in 1995 made up 4.82 km^3 (20% of the total abstraction all over the country). For the most part, fresh water (3.64 km^3) is abstracted by 333 enterprises of the Pavlodar region. In the East Kazakstan and Semipalatinsk regions water abstraction made up correspondingly 0.51 and 0.36 km^3.

Total wastes discharge into the basin rivers made up 2.1 km^3, polluted wastes - 0.20 km^3 inclusive. Main volume of polluted wastes (0.13 km^3) ingressed into water intakes from the territory of East Kazakstan region where in 1995 functioned 94 enterprises having independent wastewater outlets. The enterprises of Pavlodar (10) and Semipalatinsk (12) regions discharged 1.79 km^3 into the basin of the river Irtysh, among them 0.07 km^3 of polluted wastes.

Water pollution level over a length of the river Irtysh and its tributaries is assessed as "very polluted". In 1995 there were registered 16 cases of extremely high pollution level (EHPL) of the rivers Glubochanka, Krasnoyarka with copper and zink due to the failure of pumps of the drainage and pumping stations and discontinuance of lime supply.

Functioning structures of the local and city purification do not provide the satisfactory level of wastewater purification, as a result, 43.2 thou t of suspended matter, 24.3 t of zink compounds, 8.06 t of copper compounds, 0.31 t of chromium compounds and other substances were discharged into the water body of the river Irtysh basin.

BASIN OF THE RIVER SYRDARYA. On the territory of Kazakstan the r.Syrdarya flows over South-Kazakstan and Kzyl-Orda regions where the main rice- and cotton-planting lands are located.

In 1995 from the surface sources of Syrdarya basin 8.03 km^3 (within the boundaries of South-Kazakstan region - 3.12 and Kyzyl-Orda region - 4.91 km^3) of fresh water were abstracted. The capacity of sewage works in the territory of two regions makes up in total 0.21 km^3 whereas 0.76 km^3 of wastes were discharged into the water body of Syrdarya basin.

Collector-drainage wastes are classified as "of standard purity" and are abstracted into water intakes without any purification. In the South Kazakstan region 0.64 km^3 of collector wastewater were discharged, in Kyzyl-Orda region - 0.12 km^3. By the pollution level the water of the river Syrdarya basin is classified as "moderately polluted". In 1994 collector-drainage waters of rice-growing and other farmings introduced a considerable amount of pesticide preparations and mineral fertilizers the content

of which in the estuary of the r. Syrdarya varied in the range 10-50 of MPC in 1994.

The quality of Syrdarya water deteriorated in 1995: WPI made up 1.6 instead of 0.75 in 1994.

BASIN OF THE RIVER ILI. Ili river and its tributaries flow through the territory of Almaty and Taldy-Korgan regions and their waters are used mainly for agricultural aims. Fresh water abstraction from surface sources in 1995 made up 3.37 km^3, use -2.34 km^3, discharge - 0.33 km^3, including wastes of standard purity without purification 0.32 km^3.

Starting from 1994 the discharge of wastes of Almaty city treated to standard is implemented in emergency cases into Ili river. Almaty disposes a whole complex of mechanical and biological purification structures and after passing them through the combined wastewaters reaches normative levels in all standard and specific ingredients. During winter and partially spring and autumn periods of the year the wastes treated to standard flow into Sorbulak accumulator. In the periods of attaining the approved mark and the volume the discharge into Ili river is accomplished. The wastes treated to standard prior to the discharge into Ili river pass 100 km by the right-bank Sorbulak channel including the system of settling ponds and water storage basins.

THE LAKE BALKHASH is the end water body of all the system of Ili-Balkhash basin. In 1995 the abstraction of water decreased by 0.25 km^3 and made up 1.44 km^3. Main water users are the enterprises of non-ferrous metallurgy and agriculture; they used 1.20 km^3 of water. 0.19 km^3 of wastes including by the category "polluted" - 0.0017 km^3 are discharged into the lake Balkhash.

NURA RIVER BASIN (Central Kazakstan) refers to low-water basins and due to great regulated flow of rivers the river flow formation occurs at the expense of the industrial enterprises wastes discharge.

Fresh water abstraction in 1995 from surface sources made up 1.26 km^3, use - 1.53 km^3, wastes discharge - 1.29 km^3.

1.03 km^3 of wastes without purification by the category "of standard purity" are abstracted to the water bodies of the basin of the r. Nura. The quality of water in 1995 is assessed as "moderately polluted". In 1994 the rivers Nura and Sherubai-Nura during a long period of time receiving the wastes of the enterprises of metallurgical and petrochemical industry passed over to the category of water bodies of "secondary pollution" with mercury. Pollution level of clastic deposits reached 1.2 m, and the weight of the accumulated mercury reached several tens of tons.

URAL RIVER BASIN. Within the republic territory in 1995 there was abstracted 0.98 km^3 from surface water sources. The main volume (0.52 km^3) is used for irrigation and pasture flooding. 0.02 km^3 of wastes including wastes "of standard quality" - 0.0041 km^3, the rest - "treated to standard" are discharged into surface water bodies of the basin.

Pollution index increased from 2.55 in 1994 to 7.18 in 1995; as a result the water quality is assessed as "very polluted".

On the territory of Kazakstan there is no discharge of the polluted wastewater of the r. Ural. The chemical composition of water in the upper stream is formed under the influence of contaminants coming from the territory of Russia. Old slime settlers of Aktyubinsk chemical plant and Aktyubinsk plant of chrome compounds polluting the river with compounds of fluoride, boron and chromium have an impact upon the quality of surface waters of the river through the underground horizon. Increase of these substances content was observed during autumn-winter periods.

1.2. Ground waters

In Kazakstan for domestic water, industrial and service water supply and irrigation of lands 609 deposits of ground waters (GW) are explored. Mining reserves of the deposits proven make up 15.76 km^3 /y. The underground waters as well the surface ones are extremely nonuniform in distribution. More than 63% of their reserves are concentrated in the southeastern part of the territory of the country. Atyrau, Mangistau, Torgai, Akmola, Kokshetau, North Kazakstan and West Kazakstan regions are relatively poor in ground waters. In practice, Atyrau, Aktau, Pavlodar, Petropavlovsk, Semipalatinsk are not provided with ground waters.

The greatest abstractions of ground waters are made in Almaty, South Kazakstan and East Kazakstan regions. In 1995 from the abstracted ground waters 2.16 km^3, for domestic water supply (%) - 57.8 are used, for industrial-technical aims - 18.0; irrigation - 7.3 and pasture flooding - 6.5.

As a result of intense ground waters abstraction and mine drainage there was the regional decrease of ground waters level, the development of earth surface settling. The areas of great depression cones in some cases reach more than 1000 sq.km, and the level decrease - in the centre of depression 100-150-500 m (South-Kazakstan, Zhezkazgan, Karaganda, Kostanai, Kokshetau, East Kazakstan regions).

As is in the previous years the groundwater resources are subject to great anthropogenic pollution. As of 1995 456 ground waters pollution sources are revealed, 103 of them are systematically observed. The content of pollutants in ground waters is given in Table 8.

From substances polluting ground waters prevail sulfates, compounds of nitrogen, phenols, heavy metals. On the territory of location of the metallurgical industry enterprises cadmium, selenium, mercury are present in ground waters. Due to the fact that the list of the substances to be controlled is not regulated the characteristics of ground waters pollution is rough. Much more higher level of ground waters protection from technogenic pollutions as compared to surface waters determine the advantages of their use for domestic water supply.

Table 8

Content of pollutants in underground waters of the Republic of Kazakstan

Name of regions and enterprises	Pollutants	MAC exceeding factor	Source sizes, km²
KARAGANDA REGION			
JSC ISPAT-KARMET, PA KARBID	phenols,	20-79	
	mercury,	22-134	
	nitrates	5.0	
Interfluve Sherubai-Nura Sokyr (mine waters drainage)	mineralization	15.0	
	nitrates	5.0	
ZHAMBYL REGION			
Slime accumulator and settlers	nitrates	1.7	12
ZhPA CHIMPROM Superphosphate plant	fluorine	8.2	
	nitrates	3.0	
PAVLODAR REGION			
Pavlodar section of the north industrial centre (chemical, ruberoid, tractor plants)	mercury	4-7.4	200
	fluorine	0.1-1.9	
Slime accumulator of Ermakov GRES, Ferroalloys plant	ammonium	1.5	
	fluorine	0.8-5.0	
	arsenic	0.1-0.4	
AKTYUBINSK REGION			
Aktyubinsk industrial zone, Heat plant northeastern direction downstream, thinning out in Ilek river	chromium	7-294	11
EAST KAZAKSTAN REGION			
Ust-Kamenogorsk industrial zone	mineralization	8.9	27.5
	nitrites	9.0	
	nitrates	3.3	
	sulfates	11.7	
	chlorides	1.6	
	copper	33.0	
	lead	11.0	
	zink	55.4	
	manganese	23.0	
	fluorine	4.2	
	cadmium	12.0	
	selenium	48.0	
ALMATY REGION			
Almaty GRES	oil products	8.1	
	zink	3.6	
	aluminium	10.0	

1.3. Sea waters

Three unique intercontinental water bodies: the Aral Sea, the Caspian Sea and the Lake Balkhash are located on the territory of the Republic of Kazakstan. Retrospective hydrogeology of these seas is given in Table 9.

Table 9

Hydrogeological characteristics of the seas of the Republic of Kazakstan

Water body name	Period of observation	Parameters			
		Level, abs.m	Water table area, thou km²	Water volume in water body, km³	Ave.vols of tributaries, km³
Aral Sea	1953-1961	53.5	61.1	1080.0	55
including	1981-1986	50.8	60.0	922.0	46
"Large Sea"	1987-1991	37.4	31.2	246.0	
	1992	36.9	30.9	232.5	
	1994	36.6	29.6	223.8	
	1995	36.8	30.2	232.0	
"Small Sea"	1987-1991	38.0	2.5	16.7	
	1992	38.0	2.9	22.0	
	1993	38.3	2.5	22.0	
	1994	40.0	2.8	22.0	
	1995	40.0	2.8	22.0	
Caspian Sea	1991	-27.2	380	78557	385
	1992	-26.9	392.7	78652	287
	1993	-26.9	393.2	78668	340
	1994	-26.7	395.7	78747	396
	1995	-26.6	397.2	78780	*
Lake Balkhash	1991	341.3	16.9	92.56	13.3
	1992	341.1	16.6	89.62	13.2
	1993	341.1	16.5	88.78	18.2
	1994	341.2	16.9	92.04	20.3
	1995	341.3	17.1	93.4	14.4

* no data

The Aral Sea is a water body with features peculiar to both the sea and the lake. During the recent 40 years the Aral Sea streamflow reduced approximately five times, the area of the water body surface decreased more than twice, the level of water in the sea decreased 1.5 times, the river flow influx entirely stopped since 1987. In 1993-1994 the ecological state of the Aral Sea continued to deteriorate practically in all parameters. In 1995 the ecological state of the Aral Sea didn't improve.

The Caspian Sea is the largest water body of the terrestrial globe without outflow. Total length of the Caspian Sea coastline is equal to 7 thou km, including within Kazakstan - 2.3 thou km. For the Caspian Sea the

cyclic change of the level which is conditioned by the climatic factor is characteristic. Started in 1978 the process of the Caspian Sea level rise actively continues with the average velocity 0.14 m/y, and in this connection the populated areas, agricultural lands, oil deposits continue to fall within the flooding and rise zone. The ecological state of the sea deteriorates. By the pollution level the Kazakstan coast of the Caspian Sea refers to "moderately polluted".

Balkhash Lake. The water level in the lake Balkhash didn't change of late, in 1995 it made up 341.3 abs.m. Despite the fact that the volume of the incoming river flow decreased as compared to 1994 water volume in the lake increased a little and made up 93.4 km^3.

The qualitative composition of water of the Lake Balkhash remains as before unsatisfactory. The content of heavy metals, oil products, phenols exceed the standard requirements by 40.3; 38.2; 24.6%, respectively.

The most polluted section of the Lake Balkhash is the region of the bay Bertys where income the industrial wastes of copper-melting and electrolytic shops of the copper plant and non-ferrous metals working plant of the PA BALKHASHMED. Average copper concentration reached here 26 MAC in 1994.

1.4. Drinking water supply sources

The tense situation relative to safe water supply of the population still remains. Average supply of the cities and that of the populated areas is below the standard permissible level approximately 3 times in the whole all over the Republic and 6-8 times in some of its regions.

In 1995 the sharpness of the problem practically didn't decrease. In Table 10 the indices of the specific water consumption of the population in the regions of the republic and the technical level of water supply sources are cited.

The city population of the S-Kazakstan, Aktyubinsk, Atyrau, Kostanai, Zhezkazgan, E-Kazakstan regions and that of Almaty city who by more than 80% were supplied by water systems was better supplied with domestic water in 1995.

To the most low-supplied with domestic water in 1995 referred the cities and settlements of Kyzyl-Orda, N-Kazakstan, Torgai, Taldykorgan regions.

More than 40% of the rural population of the Republic of Kazakstan use for domestic aims the water from decentralized sources (wells, springs, wells not provided with piping system).

Table 10

Indices of supplying the population of the Republic of Kazakstan with water (water consumption norm: city - 550 l/man, village - 125 l/man)

Name of the region, city	Specific daily average water consumption, l/man		Water supply sources, %			
	city	village	Tap water	Decentr. sources	Open basins	Transl-ported water
REPUBLIC OF KAZAKSTAN	25-500	15-320	81.3	11.9	1.6	3.0
Almaty	251.0		100.0	-	-	-
regions:						
Aktyubinsk	250	40-120	81.4	16.5	0.3	1.8
Akmolinsk	125-160	35-60	87.9	4.3	-	2.5
Almaty	80-140	35-50	79.5	21.7	3.7	2.3
Atyrau	250	50-320	73.5	6.9	12.6	7.0
E-Kazakstan	150-300	30-125	85.3	12.1	1.3	0.2
Zhambyl	105-290	27-164	78.7	18.0	-	3.3
Zhezkazgan	40-450	25-75	84.0	10.1	0.1	2.9
W-Kazakstan	130-150	15-80	56.9	3.8	1.5	7.6
Karaganda	120-200	70-125	94.5	4.4	0.1	0.5
Kokshetau	150	150	63.0	27.0	-	10.3
Kostanai	250	60	80.3	14.7	-	2.6
Kyzyl-Orda	50-140	20-40	87.7	9.1	0.4	2.3
Mangistau	120-300	70-250	80.0	0.4	-	19.6
Pavlodar	220-240	50	78.7	16.3	0.3	4.7
N-Kazakstan	25-250	25-30	92.2	5.1	1.6	1.1
Semipalatinsk	40-200	30-120	76.0	25.0	-	0.8
Taldykorgan	60	60	87.6	2.8	9.4	5.6
S-Kazakstan	60-500	35-80	83.0	9.9	3.6	3.2

The qualitative state of the majority domestic water supply sources (surface, underground) does not correspond to GOST standards. The quality of water of the population water use bodies in 1995 on the average all over the republic deteriorated in bacterial pollution and improved in sanitary and chemical indices (Table 11).

In 1995 a little improvement of the water quality in the rivers of Nura, Sarysu, Ili, Ishim is noted.

The share of tap water analysis not corresponding to GOSTU 2874-82 in 1995 somewhat decreased on the whole all over the Republic and made up 5.1% against 6.3% in 1994.

Table 11

Sanitary state of water sources

Indices	Q-ty of water samplings from the tested not meeting the hygienic norms (%)					
	1990	1991	1992	1993	1994	1995
Sanitary-chemical	13.4	20.0	14.2	16.7	14.4	11.7
Microbiological	19.2	14.2	9.4	9.2	8.6	9.7
incl. those containing lactose-posi-tive colibacillus			57.6	57.6	66.0	64.8
isolating pathogens of infectious diseases				29.0	3.4	3.6

The most unsatisfactory quality of the tap water is registered (in %): in the regions of Kokshetau - 15.6 (in 1994 - 13.8), Kyzyl-Orda - 11.8 (10.6), Torgai - 9.9 (13.2) and Almaty - 8.2 (4.1). Sanitary state of decentralized water supply sources by bacteriological indices on the whole over the republic deteriorated (Table 12).

Table 12

Sanitary state of decentralized water supply sources by bacteriological indices

Regions	Share of water samples not meeting the sanitary norms, %	
	1994	1995
REPUBLIC OF KAZAKSTAN	9.1	11.5
Torgai	12.4	32.9
Kyzyl-Orda	27.8	32.9
Kostanai	15.7	21.0
Kokshetau	15.5	17.1
Shymkent	18.1	15.4
Akmola	2.9	9.6
Zhambyl	6.9	13.1

The share of water samples not meeting the sanitary norms increased by 2.4% as compared to 1994. The sanitary state of decentralized sources of Torgai, Kostanai, Kokshetau, Akmola, Zhambyl regions significantly deteriorated.

Unsatisfactory state of domestic water supply systems conditioned flashes of infectious diseases transmitted by water. In 1995 there were registered 4 such cases. The growth of infectious diseases in Kyzyl-Orda, Pavlodar, Kostanai, South Kazakstan, Mangistau and other regions are conditioned by the same factor of transmission.

The main factors responsible for the unsatisfactory state of domestic water supply systems are:

- discharge of polluted insufficiently purified wastes into water bodies and channels;

• low technical level of domestic water supply systems starting from head water intakes to the sections of water supply to the population. According to the data of the Republican sanitary and epidemiological station in 1994 17.0% of water supply systems 10% of which do not have the zones of sanitary control, 9.1% do not have disinfectant facilities didn't meet the sanitary requirements;

• untimely and unqualified fulfilment of prophylactic works; unlawful "cutting in" into water supply system causes the secondary water pollution in water supply systems;

• absence of chlorine-containing and coagulating agents for water treatment.

2. IMPACT OF THE ECONOMIC ACTIVITY ON THE STATE OF WATER RESOURCES OF THE REPUBLIC OF KAZAKSTAN

2.1. General information

In 1995 the production volume in some branches of the republic economy as compared to 1994

increased by (%):

in gas industry	- 29.3
in ferrous metallurgy	- 17.4
in chemical and petrochemical industry	- 3.4

decreased by (%):

in light industry	- 59.8
in wood-working and wood-pulp and paper industry	- 45.0

in food industry - 20.7

The production volume increased mainly at the expense of the following types produce output, %:

- in non-ferrous metallurgy:	
bauxites	- 28.4
alumina	- 24.6
sponge titanium	- 2.5 times
- in fuel and power complex:	
natural gas	- 31.8
oil (gas condensate inclusive)	- 0.9
- in chemical and petrochemical industry:	
chromium oxide	- 79.6
calcium carbide	- 26.0
mineral fertilizers	- 55.6
yellow phosphorus	- 3.9 times
- in ferrous metallurgy:	
iron ores	- 43.8
iron-ore pellets	- 49.6
chromium ore	- 14.9
cast iron	- 6.5
steel	- 2.0
coated sheet and plate	- 77.3
coke in terms of 6%-humidity	- 3.7

The volume of gross agricultural output on the whole all over the republic decreased by 21%. As a result, in 1995 the load on the environmental objects substantially decreased. Thus, as compared to 1994:

- effluents from stationary sources decreased by 5% and made up 394.7 thou t;
- motor transport effluents decreased by 17% and made up 997 thou t;
- fresh water diversion from natural sources decreased by 9.8% and made up 28807.1 mln m^3;
- discharge of polluted wastes into natural water objects decreased by 2.6% and made up 229.86 mln m^3.

The total volume of polluted wastes discharged in 1995 into surface water bodies of the Republic of Kazakstan are distributed between

- industry (63.4%);
- agriculture (32.5%);
- housing facilities and public utilities (4.1%).

For the beginning of 1996 more than 20 billion t of industrial wastes (toxic ones inclusive) which continue to be stored in diverse accumulators without observing any ecological norms and requirements are accumulated in the republic. As a result, ground and surface water resources of many regions of the republic are subject to intense pollution.

On the whole, in 1995 there was no decrease of the technogene load upon the environment of the Republic as compared to 1994.

Now we'll consider the impact of some economy branches upon water resources.

2.2. Power industry

From the total volume of effluents from industrial stationary sources (3097.4 thou t) in 1995 1098.5 thou t fall to the share of power industry enterprises, 42.7% of which being solid wastes. About 64% of sulfur dioxide, 16% of carbon oxide and 18% of nitrogen oxide fall to the share of gaseous substances.

Volumes of wastes discharge into surface water bodies increased by 1688.7 mln m^3 as compared to 1994 and made up 2920.22 mln m 53 0 in 1995. Suspended matter, oil products, chlorides, sulfates, salts of heavy metals are discharged into natural features together with wastes of power plants.

Ash and slag dumps of heat and electric power plants remain as the sources of pollution of soils and ground waters. Annually about 15 mln t of ash and ash and slag wastes are formed in the industry. By 1995 more than 300 mln t of ash and slag wastes are accumulated in the Republic.

2.3. Ferrous metallurgy

In 1995 the enterprises of ferrous metallurgy discharged into atmosphere 348.6 thou t of harmful substances, that is 21.6 thou t (6%) less than in 1994. The greatest volumes are discharged by the enterprises of Karaganda, Kostanai, Pavlodar, Aktyubinsk regions.

In 1995 454.6 mln m^3 of wastewater, 99.7% of them being the wastes of the JSC ISPAT-KARMET are discharged into surface water sources.

2.4. Non-ferrous metallurgy

The enterprises of non-ferrous metallurgy are mainly concentrated in East Kazakstan and Zhezkazgan regions.

In 1995 the non-ferrous metallurgy enterprises discharged 502.9 thou t of harmful substances into the atmosphere, that makes up 87.3% of the preceding year level. From the total volume of harmful substances discharged into the atmosphere more than 97% make up gaseous substances, of which 98% (287.1 thou t) are sulfur oxides. To the specific pollutants of non-ferrous metallurgy enterprises refer: copper, zink, lead, arsenic, mercury, sulfuric acid, hydrogen fluoride and others.

71621 mln m^3 of wastes are discharged into surface water bodies; it is 1.9 times more than in 1994. The main pollutants of water resources are copper and zink. During a year 15 cases of extremely high pollution with these substances were registered in the basin of Irtysh river.

The non-ferrous metallurgy enterprises accumulated a great amount of toxic industrial wastes, the main part of which make up slags and flotation tailings. Only in the East Kazakstan region there were accumulated 18518.9 thou t of toxic wastes in solid, liquid and pasty form, utilized 653 thou t or 3.5% of the total volume of toxic wastes.

2.5. Chemical industry

During the recent years the volumes of effluents, discharges and wastes in chemical industry decreased considerably that in greater part is due to production recession.

In 1995 58.9 thou t of harmful substances are discharged into atmosphere, that is 13% less compared to the level of 1994. Despite the considerable decrease of discharge volumes by the chemical industry enterprises, on the strength of the production specific character they continue to exert a negative impact upon the natural human environment.

In emissions of enterprises specialized in the output of mineral fertilizers, that is Shymkent JSC PHOSPHOR, Zhambyl JSC NODPHOS, JSC SUPERPHOSPHATNY ZAVOD, JSC CHIMPROM, there are such highly toxic substances as phosphoric anhydride, hydrogen phosphide. Very toxic are the emissions of the PA KARBID and Aktyubinsk plant of chrome compounds who discharged 119 kg of mercury and 4380 kg of hexavalent chromium, respectively.

The wastes are mainly discharged by the industry enterprises into accumulators. The enterprises of the chemical industry accumulated in 1995 about 2350 thou t of toxic wastes in solid, liquid and pasty state.

2.6. Oil and gas industry

In 1995 the total volume of wastes in the industry made up 177.2 thou t. The percent of catching harmful substances inflowing into atmosphere is the lowest in the industry - 3%.

In 1995 2.72 mln m^3 wastes of standard purity without purification are discharged into natural surface water objects, into accumulators and depressions - 23.51, into underground horizons - 0.24 mln m^3.

The work of JSCs, associations (enterprises) of MUNAIGAS on decreasing the negative impact of the economic activity upon the natural environment allowed in 1995 as compared to 1994 to reduce the discharges of harmful substances into atmosphere by 67.9 thou t (37%), decrease the consumption of fresh water by 4.6 mln m^3 (by 3.8%),decrease the discharge of polluted wastes into open natural water bodies by 1.0 mln m^3 (by 3.7%).

2.7. Construction industry

The industry specializes in production of cement and other binding wall materials, brick, reinforced concrete structures, nonmetalliferous construction materials.

In 1995 the industry enterprises used 15.91 mln m^3 of fresh water, 28.8% of it being utilized for industrial needs; 0.04 mln m^3 of polluted wastes containing suspended matter, oil products, ammonium nitrogen, nitrates, phosphorus, magnesium, iron and others were discharged into water bodies.

Annually over 3.1 thou t of toxic wastes containing asbestos, a small part of which is utilized, are accumulated at the construction industry enterprises and 84% - are transported into organized storage sites.

2.8. Housing facilities and public utilities

The work of this industry enterprises exerts a negative impact upon the natural environment due to use of surface and ground waters for the needs of domestic, potable and industrial water supply, discharge of unpurified or not fully purified domestic and industrial wastes as well as of surface run-off from urbanized territories and atmospheric emissions from boiler houses, disposal of domestic and industrial wastes at dumping sites.

Country's municipal facilities and services is one of the largest users of fresh water (999.79 mln m^3) replenished by 35% at the expense of surface waters and by 65% - at the expense of ground waters. The quality of ground waters used for water supply for the most part meet the sanitary requirements but their pollution with oil products, heavy metals, pesticide inflowing into water-bearing horizons alongside with wastes increases. Annually 287.1 mln m^3 of wastewater, 45% of which is of standard purity and 54% are not fully purified are discharged into surface waters through communal sewerage system.

2.9. Agriculture

Due to production recession in 1995 the negative impact of mineral and organic fertilizers and pesticides upon the environment decreased. 20960.9 mln m^3 of fresh water that makes up 80% of the total republican volume is abstracted from water bodies by agriculture. At transportation up to 25% is lost. 15556 mln m^3 of fresh water is used for irrigation. Total water abstraction made up 1622.69 mln m^3, of which 1204.93 are discharged into water bodies and into accumulators, depressions and relief - 417.76 mln m^3.

2.10. Impact of the economy branches on the environmental pollution of the Republic of Kazakstan

Impact of some economy branches upon the pollution of water bodies and atmosphere is given in Tables 13 and 14.

Table 13

Discharge of wastes into natural surface water bodies (mln m^3)

Sectors of the economy	1994	1995
Republic of Kazakstan	6035.91	5780.83
Industry as a whole including:	4305.33	4284.36
- power industry	1231.47	2920.22
- non-ferrous metallurgy	36.94	71.21
- oil and gas	1.94	2.72
- construction	0.50	0.04
- housing facilities and public utilities	274.71	287.10
- agriculture	1466.17	1204.93
- other branches	4.72	4.44

Table 14

Discharge of pollutants into the air from stationary sources (thou t)

Sectors of the economy	1994	1995
Republic of Kazakstan	3261.0	3097.4
Industry as a whole including:	2529.0	2216.7
- power industry	1242.0	1098.5
- ferrous metallurgy	370.2	348.6
- non-ferrous metallurgy	576.0	502.9
- chemical industry	67.5	58.9
- oil and gas	172.0	177.2
- construction	59.0	30.6

2.11. Financing of the environmental protection activity

In 1995 5.2 billion tenge that is in comparable prices 42% less than in 1994 (tabl.15) is used in the Republic for environmental protection and

rational use of natural resources by enterprises and organizations of all property forms (Table 15).

Table 15

Sources of financing and volumes of capital investments for environmental protection measures (mln tenge)

Sources of financing	Capital investments volume	
	1994	1995
1. Centralized state budget including:	674.0	275.2
- from the republican budget	-	229.7
- from the local budget	-	45.5
2. Internal funds of the enterprises	6741.0	4947.2
3. As a whole all over the Republic	7415.0	5222.4

The share of centralized funds in the total volume of capital investments for environmental protection measures decreased from 9.1% in 1994 to 5.3% in 1995, and the share of the enterprise internal funds increased from 90.9% to 94.7%. According to absolute values the decrease was 2.5 and 1.4 times, respectively.

Distribution of investments in 1995 by items of expenses and in the region sections is shown in Tables 16 and 17.

Table 16

Distribution of investments intended for environmental protection in 1995

Items of expenses	Volume of capital investments used	
	mln tenge	%
1. Construction of protected natural features	3399.5	65.1
2. Water resources conservation	913.9	17.5
3. Air protection	647.6	12.4
4. Forest, mineral resources conservation and restoration of fish reserves	261.4	5.0
5. As a whole over the Republic of Kazakstan	5222.4	100.0

As well as in the previous years the greatest share in the republican volume of capital investments for environmental protection measures falls within Karaganda, Pavlodar and Atyrau regions having provided 52.6% of the total investments volume all over the country. Very inconsiderable

Table 17

Use of investments for environmental protection
as for Kazakstan regions

Regions	Volume of capital investments used	
	mln tenge	%
REPUBLIC OF KAZAKSTAN	5222.4	100.0
Karaganda	1084.2	20.8
Pavlodar	862.4	16.5
Atyrau	798.2	15.3
Zhezkazgan	475.2	9.1
Mangistau	427.6	8.2
East Kazakstan	407.9	7.8
Aktyubinsk	376.8	7.2
Almaty	304.3	5.8
South Kazakstan	132.8	2.5
West Kazakstan	70.4	1.3
North Kazakstan	66.4	1.3
Akmola	52.4	1.0
Kostanai	44.0	0.8
Kokshetau	30.0	0.6
Semipalatinsk	28.9	0.6
City of Almaty	28.0	0.5
Torgai	26.2	0.5
Taldykorgan	3.7	0.1
Zhambyl	2.0	0.1
Kyzyl-Orda	1.0	0.02

volumes are invested in Kyzyl-Orda, Zhambyl, Taldykorgan, Torgai, Semipalatinsk, Kokshetau, Kostanai regions and in the city of Almaty.

The capacities of nature-protective complexes are seen from Table 18.

Table 18

Capacities of nature-protective complexes
of Kazakstan (thou cub.m / day)

Completed nature-protective complexes	Capacities of structures	
	1994	1995
Waste treatment stations	28.1	60.9
Recirculating water supply systems	758.4	1.7
Plants for catching and processing harmful substances from waste gases, thou t	-	15.0

In 1995 the volumes of current expenses for nature preservation increased significantly. On the whole all over Kazakstan it is utilized 10.87 billion tenge of which it is spent for:

- Water resources conservation - 6.80
- Air protection - 3.79
- Recultivation of lands - 0.28

In the regional section the largest share in current expenses for nature preservation falls within East-Kazakstan (2.13) and Pavlodar (2.03) regions, and the least - within Almaty (0.086), Taldykorgan (0.068), Torgai (0.033) and Kyzyl-Orda (0.032) regions.

3. ECOLOGICAL MONITORING AND ECOLOGICAL INFORMATION

In 1995 as well as in the previous years the ecological monitoring of the Republic of Kazakstan was implemented by diverse state organizations (Table 19).

Table 19

Monitoring trends of state organizations of the Republic of Kazakstan (From the report of ME&BR and the firm SAIS, Almaty)

State body	Monitoring object or field
Ministry of Ecology and Biological Resources	Monitoring control of the sources of pollution, bioresources, reserves, radioecological situation
Chief Administration on Hydrometeorology	Atmospheric air, surface waters, soils, radiation and background monitoring
Ministry of Geology and Mineral Resources Protection	Underground waters
Ministry of Public Health	Health and very dangerous infections, quality of drinking water, food produce quality, sanitary control
Goskomzem	Earth, soil
Agency of Atomic Energy, Ministry of Public Health, Ministry of Ecology and Biological Resources	Radiation (including industrial, noise and electromagnetic)
Emergency Committee	Emergency events and processes of natural and anthropogenic character
Ministry of Science - Academy of Sciences	Seismic, scientific monitoring
Water Resources Committee	Surface waters (freshets, floods)

The state control of natural environment conditions and its pollution is implemented by diverse republican ministries and departments.

The quality of surface waters as for hydrochemical indices is controlled by Kazgidromet subdivisions. Control of drinking water quality from centralized and decentralized sources is implemented by laboratories of the state sanitary and epidemiological inspection. The pollution state of surface

waterways and reservoirs in water use sites is studied by them as well. Control of underground waters and their protection from depletion and pollution is carried out by the State Monitoring Centre of underground waters and dangerous geological processes of the Ministry of Geology and Protection of Mineral Resources of the Republic of Kazakstan. The bodies of the State Sanitary Inspection implement the control of the residual nitrate amounts in food plants and pesticides in foodstuffs.

Systematic observations of surface waters quality in Kazakstan are organized at the end of 30s - beginning of 40s. At present control of surface waters pollution by physical and chemical indices was implemented at 295 control stations, 83 rivers and reservoirs. Control by hydrobiological indices was accomplished at 32 water bodies, 153 control stations. In Kazgidromet laboratories over 70 water quality indices are measured.

Observations of sea water pollution is implemented in the Caspian and Aral Seas. Up to 30 quality indices are determined in sea waters.

Provision of the United system of ecological control by the analytical services of the Ministry of Ecology and Biological Resources is made by the Republican Specialized Laboratory of Analytical Control (RSLAC). The departments of laboratory analysis and control (DLAC) of regional and city administrations are attested for the right of carrying out the analytical control of natural environment pollution, outer inspection of accuracy of measurements is made, inner inspection systems of accuracy of current measurements in DLAC are introduced, the information on up-to-date methods of analysis and analytical control instruments is brought up to the laboratories, seminars and exhibitions are held.

DLAC of territorial administrations of ecological and biological resources carry out the analytical control of water sources state, discharges into reservoirs, operation of sewage works of enterprises, atmospheric emissions sources, pollution of soils, control of analytical information certainty presented by production control services of enterprises implementing thereby "supra-departmental" control.

On the whole, the DLAC subdivisions in 1996 controlled 1987 enterprises for water sources pollution and made 3753 inspections during which 11743 samplings and 141344 determinations were made.

On the basis of materials of water bodies state observations there takes place a continuous data base generation. At the beginning of 80s the processing of observations with the help of automated information system (AIS) "Hydrochemistry" in computers of EC series was carried out. From the start of organizing the observations the pollution data are published and stored in the departmental data collection.

Starting from 1996 the processing and analysis of materials are made in personal computers. AIS AQUA, programming language FOXPRO are introduced. The input data are the journals of hydrochemical pollution (HChP). The generation of factographic data base, processing, service functions (data sorting, issue of reference data on measurement units and in MPC parts, criteria of assessment and so on) are implemented.

Final documents are:

- list of stations;
- journal of HChP;
- hydrochemical composition;
- complex estimate;
- reviews, reference;
- background value;
- water content characteristics;
- quantity of samples

The printed analog "State water cadastre, Annual data on inland surface waters quality" is issued on the basis of the data base established.

Alongside with factographic DB on hydrochemistry the documentary abstract and bibliographic problem-oriented data bases "The Caspian Sea" and "The Aral Sea" containing the information on R&D reports, articles from periodical publications and scientific works collections, deposited manuscripts in the field of hydrometeorology and pollution of water environment are generated. DB are generated in DBMS CDS/ISIS/M under control OC DOS.

DB "The Caspian Sea" is retrospectively viewed since 1964, the volume - 0.7 mb, 607 documents. "The Aral Sea" DB is retrospectively viewed since 1979, volume 0.6 mb, 514 documents.

In the Kazak State Research Institute of Scientific and Technical Information (KazgosINTI) - the National Information Centre where published and unpublished documents of Kazakstan scientists and specialists are processed, besides the specialized abstract and bibliographic (AB) data bases (DB) "Air pollution and protection" and "Pollution and conservation of inland, sea and ocean waters" with retrospective since 1991 a number of DB and data banks (DBn) containing also the information on the problem considered is generated.

This is primarily:

– Accounting of data bases and banks of the Republic of Kazakstan (since 1993; over 200 documents, factographic - F);

– Scientific and technical programs of Kazakstan (since 1993, about 400 documents, F);

– Information cards of research works carried out in Kazakstan (since 1995, over 1500 documents , AB);

– Registration cards of research works carried out in Kazakstan (since 1995, over 2700 documents, B);

– Transaction card of dissertations defended in Kazakstan (since 1994, over 1700 documents, AB);

– Research works deposited in KazgosINTI (since 1994, over 1100 works, AB);

– Research and Development projects and production experience of the Republic of Kazakstan (since 1994, about 10000 documents, AB);

– Automated system of processing of scientific and technical literature (since 1992, over 30000 documents, AB);

– State Register of patents for inventions (holder - Patent Office of the Republic of Kazakstan) - since 1993, over 4100 documents, B).

Printed publications correspond to the majority of data bases and banks indicated).

KazgosINTI is a head organization for development and fulfilment of the Republican target scientific and technical program "Development of the state system of scientific and technical information" (1993-1998) one of its targets being the establishment of the distributed system of data bases and banks also including the data bases on ecological information.

In order to timely inform the state management bodies and wide public on the environmental state the Ministry of Ecology and Biological Resources jointly with the Main Administration on Hydrometeorology, State Committee for Statistics of the Republic of Kazakstan and Ministry of Public Health of the Republic of Kazakstan quarterly issues and by results of the year prepares "The Information Ecological Bulletin".

The same control of subdepartmental laboratories activity is implemented by head laboratories of ministries and departments exercising control functions.

By results of controls the violations of nature protection legislation, rules and regulations are revealed, fines are imposed, decisions for limitation or phase-out of enterprises and shops are made, claims are made, damages are indemnified, the materials are transferred to procurator's offices and militia (Table 20).

Table 20

Measures taken for water resources protection

Indices	Quantity	
	1995	1996
1. Enterprises and objects controls for observance of water legislation are made	11187	12211
2. Violations of legislation, rules and regulations for water resources protection are revealed	19834	22329
3. Administrative penalties are claimed:		
- q-ty	1970	1711
- for the sum, thou tenge	1017.2	1616.5
4. Penalties are collected, thou tenge	1091.8	1616.5
5. Rulings on suspension, limitation, phasing-out of enterprises, shops, some plants are given	219	160
6. Claims on enterprises for violation of nature protection legislation, rules and regulations are made, thou tenge	2865671.7	177188.0
7. Damages and payments are recovered by way of action, thou tenge	51882.5	72858.5
8. Materials are transferred to the procurator's and militia offices on which the proceedings are initiated	193	183

Besides the specialized state control services the scientific institutions of the Ministry of Science - Academy of Sciences, Ministry of Education and Culture, Ministry of Public Health and others make a great contribution to study the state and pollution of the environment.

All data on state of natural environment form a United State Data Collection (USDC). The USCD documents referred to archives collection of the country in the order established are stored in accordance with legislation of the Republic of Kazakstan on archives.

The emergency information and general information the composition of which is approved by the Government of the Republic of Kazakstan together with the list of interested organizations is transferred to its users free of charge.

The ecological data and information intended for legislative and executive bodies, Ministry of Ecology and Biological Resources and Emergency Committee as well as for legal persons financed at the expense of budget are transferred to them free of charge.

From legal persons (except for state power bodies) and natural persons the charges are made only for services related to data collating, copying, replication, transfer or transmission by link channels.

Special information (reference information, bulletins and so forth) on state of the natural environment) and its pollution are given to the users on a contractual payment basis.

At present the Draft Law of the Republic of Kazakstan "On Hydrometeorological activity" oriented on regulation of hydrometeorological activity with the aim of meeting the needs of State Power bodies, Emergency Committee, legal and natural persons in receiving the information on state of the natural environment and its pollution as well as on creating the conditions for establishment of market relations in the field of production, collection, processing, analysis, storage and use (granting, realization) of information is under development by the Agency of Hydrometeorology and Monitoring of natural environment of the Republic of Kazakstan.

In accordance with the decision of the Cabinet of Ministers of the Republic of Kazakstan No 9 as of 03.10.94 the Ministry of Ecology and Biological Resources of the Republic of Kazakstan developed "A concept of the United State System of the ecological monitoring" which was coordinated with interested ministries. By the decision of the Prime Minister of the Republic of Kazakstan as of 01.03.95 the consideration of the concept will be given after adopting a new wording of the "Law on environmental Protection of the Republic of Kazakstan".

The actuality of establishment of the ecological monitoring system is determined by sharp deterioration of environment in the Republic reaching crisis and precrisis states in some of its regions (Aral, Balkhash, Semipalatinsk test range).

The systems of the departmental control of the natural environment

state and anthropogenic impact upon it current in the Republic have a number of significant disadvantages:

- dissociation and methodical incompatability of departmental services of ecological control, insufficiency of automation of processes of receiving, transmission, processing and propagation of information;
- absence of the centres network of processing and complex analysis of the ecological information, standard unified methods of measuring the ecological parameters and sources of anthropogenic impact, complex processing of information and prognostic assessments;
- low quality of apparatus and metrological control of certainty of the information received;
- low quality of the monitoring methodology used. Received by traditional methods the ecological information on the state and dynamics of development of the environment on the whole appears to be contradictory and insufficiently certain.

The aim of the United State System of Ecological Monitoring (USSEM RK) is the provision of the necessary information (retrospective, current, forecast,recommendation) on the state of the natural environment in diverse forms (digital, text, image, cartographic and so on) of all administration levels of the Republic of Kazakstan.

In order to achieve this aim the USSEM RK should fulfil the following functions:

– environmental state and sources of anthropogenic impact control taking into account response reactions of biosphere, the change of sanitary and hygienic situation inclusive;

– systematic collection, processing (generalization), storage, use and propagation of ecological information;

– assessment of the actual state of natural ecosystems,operative revealing of critical situations;

– preparation of operative ecoinformation reports, development of short-term and long-term forecasts;

– preparation of recommendations on normalization and sanitation of ecological situation in concrete regions.

It is of a particular importance to provide joint functioning of already operating and newly designed information and measuring networks and data banks of Kazgidromet, Ministry of Ecology and Biological Resources, the National Academy of Sciences, Goskomzem, Sanitary Epidemiological Medical Service.

Functioning of the USSEM RK should be based on a corresponding legal base. The subscribers (users) of the system may be both the suppliers (owners) and users of the information. The ecological monitoring within the framework of USSEM RK should be implemented at the following levels:

- object including the inspection means of the ecological control;
- local (industrial or power complex, region, city) including the stationary and mobile means of ecological control;

✦ regional (basin) (combination of local sections having general ecological problems), including complex means and complexes of remote ecological control;

✦ republican, including means and complexes of ecological control of space-, air-, ground-based stationing for analysis and forecast of ecolological state on a republican scale and in interaction with ecological systems of other states.

Interaction between subsystems of diverse levels should be accomplished through the system of ecologo-information centres starting from the republican level and ending with laboratories of the ecological control of enterprises (objects).

The existing systems of Kazgidromet, Goskomzem, Water Resources Committee, Ministry of Geology, Ministry of Economy and Biological Resources, Ministry of Public Health of Kazakstan are the basis of subsystems of control of abiotic environmental components. They provide monitoring of the main media. In USSEM RK these subsystems preserve a definite autonomy but by methods, technically and logically they are united into one system.

Subsystem of surface waters monitoring is constructed by basin principle and includes both the existing laboratory control stations at object, regional and basin levels and automated water quality control stations. The information at the basin and republican level is accumulated in data banks.

The biological monitoring subsystem envisages the development of integral indices assessing biota response to the environmental pollution.

Establishment of interrelations between the qualitative and ingredient composition of toxicants, reactions of sensory-test systems and health of the population is important for implementing biological monitoring.

Each level subsystem of the USSEM RK should provide with information the management bodies of its level (object, district, city, regional, republican and so on) free of charge as well as be the source of information for the subsystem of higher level.

The establishment of a United Interstate System of ecological monitoring of CIS countries is envisaged by the decision of Interstate Ecological Council (IEC).

The aim of Interstate Ecological Monitoring system (IEMS) is the information support of management in environmental protection of CIS countries and their regions, shaping of coordinated policy in the sphere of conducting ecological monitoring, support of information network of collection and assessment of ecological data at program, technical, organization levels within the framework of interstate nature preservation programs and projects, integration into international ecologo-information systems.

The main objectives of the IEMS:

– assessment and forecasting of the environmental state, ecological situation on the territory of IEC member states;

– establishment of united basis of methodological, metrological and legal support of the national systems of ecological monitoring;

– formation of a united ecologo-information space with the aim of information support of the persons making decisions at the national, regional and global levels, integration into international systems of ecological monitoring.

The IEMS functions at interstate, state, regional and local levels.

Exchange of data between the national centres of IEC member states is accomplished on the principle of free of charge access to the monitoring data received at the expense of state budget means. Access to the ecological information is possible on the basis of bilateral or multilateral agreements.The project of the Agreement between the Government of the Republic of Kazakstan and UNEP "On establishment and operation of the ground-based station "Mercury" in Kazakstan is at the stage of coordination. The project realization will allow the Republic of Kazakstan to be included into the global system of transmitting the ecological information. A number of materials for organization of nature preservation work in CIS countries is received at present by the system TV-Inform from Russia.

4. LEGISLATION IN THE FIELD OF WATER RESOURCES PROTECTION AND NORMATIVE AND METHODICAL DOCUMENTS

In 1992-1994, in addition to the Law of the Kazak Soviet Socialist Republic "On protection of the natural environment in the Kazak SSR" valid from August 1, 1991 the following laws were brought into force:

- "Water code of the Republic of Kazakstan as of March 31, 1993 No 2061-XII;
- Law of the Republic of Kazakstan as of July 8, 1994 "On sanitary and epidemiological safety of the population";
- Decrees of the Cabinet of Ministers of the Republic of Kazakstan adopted in 1994;
- On approval of the Provisions on the National Council for the problems of the Caspian Sea;
- On adherence of the Republic of Kazakstan to international conventions adopted under the auspices of the NMO International naval organization and NMO convention.
- On taking ecological measures for sanitation of the natural environment;
- On procedure of using waters at fireproof needs;
- On approval of the procedure of development and approval of the schemes of water resources conservation;
- On procedure of using reservoirs for air transport needs.

In 1994 5 normative and methodical documents in the field of water resources conservation are approved:

1. Regulations of surface waters conservation of the Republic of Kazakstan

2. Methods of calculation of MPC norms of the substances in water bodies together with wastewater

3. Manual for control of surface runoff outlet from the populated areas and industrial enterprises into water bodies.

4. Recommendations on control of operation of sewage works and wastes discharge.

5. Recommendations on control of wastes and industrial storm waters discharge from the territories of motor transport enterprises

Methods of analytical control:

1. RK GOST "Methods of determining water toxicity on Daphnia" which is adapted to water bodies of the republic.

2. List of methods for determining the concentration of pollutants in the air, soil, water bodies.

3. Instruction on sampling surface and wastewaters for chemical analysis.

Ecological and economic norms:

1. Methods of specifying payments for environmental pollution.

2. Recommendations on assessment and selection of technical and economic indices of water conservation complexes which include technological schemes of purification and use of mine waters of ore-mining industry.

3. Temporary methods of analysis of the ecological damage made to the state by pollution of underground waters.

Agroecological normatives:

1. Recommendations on specifying the load norms on irrigation fields at growing feed crops.

2. Manual on water quality assessment used for irrigation of Kazakstan lands.

3. Recommendations for using wastewater of Sorbulak accumulator for irrigation of feed and technical crops.

On the initiative of the Ministry of Economy and Biological Resources in 1995 a number of government decrees containing the normative-legal provisions was adopted:

– on approval of the Provision on the procedure of state registration of Waters and their Use (No 160 as of 15.02.95);

– on approval of the list of reservoirs (underground waters) of sanitation Purpose of the Republican Significance (No 95 as of 26.01.95);

– on approval of Keeping the State Water Cadastre (No 75 as of 24.01.95);

– on approval of Provision on Water Protection Zones (No 102 as of 27.01.95);

– on approval of the List of Reservoirs of a particular state significance or of a particular scientific value use of which may be either limited or fully prohibited (No 218 as of 03.03.95);

– on approval of Provision on Fish Reserves Protection and Regulation of Fishery in Reservoirs of the Republic of Kazakstan (No 414 as of 05.04.95);

– on approval of Provision on State Control of Water Resources Conservation (No 600 as of 29.04.95).

Normative and methodical documents in the field of water resorces conservation were prepared and approved:

1. Recommendations on control of wastes and industrial storm waters discharge from the territories of motor transport enterprises.

2. Additions to the Methods of calculation of MPC of the substances in water bodies of the Republic of Kazakstan together with wastewater (section 6, calculation of MPC for wastewater accumulators).

3. Realization of the program of computerization of water protection measures.

CONCLUSION

The industrial and agricultural production recession continued in 1994 promoted the decrease of the negative impact upon the environment of the Republic of Kazakstan (RK).

Despite the increased water content of the main rivers of RK in 1993-1994 as compared to the average many-years norm and some decrease of the industrial wastes discharge volumes, the qualitative state of RK surface waters resources in 1994 remained unsatisfactory. The most unfavourable situation was in the basin of the river Irtysh where extremely high levels of pollution with zinc and copper of the rivers Glubochanka, Krasnoyarka, Breksa, Ulba, Bukhtarma reaching maximum permissible concentration were registered. In 1994 in all 7.69 km^3 of diverse categories wastes, 6.04 km^3 of which entered the surface water bodies,were diverted to natural features.

Underground water resources also continued to be exposed to a great anthropogenic pollution, as a result 450 sources of pollution are revealed. The greater sources are formed in the dislocation zone of Karmetkombinat, Production association KARBID (Karaganda region), heat and electric power plant of Aktyubinsk, sludge settling tanks and slime tanks of Zhamboul Production Association CHIMPROM (Zhamboul region).

The quality of drinking water supply sources hadn't improved in 1994 as compared to the preceeding years, 8.6% of check specimens didn't meet the hygienic requirements.

The ecological conditions of the Aral Sea continued to get worse. In 1994 the water level in the sea made up 36.6 abs.m, the water surface area - 29.6 thou sq.km, the volume of water in the water body - 223.8 cubic km.

The continued process of the Caspian Sea rise strengthened the ecological, economic and social problems of the region in 1994.

In 1994 the industrial enterprises diverted 4.3 cubic km of wastes of diverse pollution level to natural features,76.5% of it being implemented

by the enterprises of fuel and power complex. In whole, the impact level of the main economy branches of RK upon the water body considerably decreased in 1994 as compared to 1993.

However, despite the lowering of the total anthropogenic load on the environment in 1994 there were no adequate changes in the health of the republic population. The ecological factors continue to make a great negative impact upon the reproductive function and natural reproduction of the population, sick rate death rate, of children and aged people, in particular.

During the period from 1992 to 1994 the level of investments in the Republic aimed at environmental protection and rational use of mineral resources decreased 3.3 times and made up 2.3 billion tenge in actual prices that makes up 2.9% of the total level of capital investments to the economy of the Republic.

The ecological investigations were made in diverse directions starting from the assessments of the natural environment condition of the republic concrete regions to the establishment of the information support, hardware, software of natural resources management, mineral resources protection and control of their state including the formation of its legal normative-and-methodical base, improvement of the economic mechanism of regulation, creation of new technologies and methods of purification, utilization of wastes and industrial wastes.

In 1994 to the number of priority trends in the sphere of the environmental protection and rational use of mineral resources of RK in the nearest future refer:

- Improvement of the environmental legislation and system of ecological standards, norms and requirements with further transition to the international standards for integrating Kazakstan into the system of world ecological security.
- Development and realization of target programmes on transfer of the industrial and other enterprises to non-waste, low-waste, closed-cycle technologies, recirculating water supply systems, development of local technologies of purification and utilization of industrial, collector-drainage sewage.
- Reconstruction, expansion of the existing and construction of the new water supply, sewage systems, complex purification and wastes utilization structures in cities and big centres of population of RK.

In 1995 a technogenic impact upon the environment somewhat decreased. The wastes volumes decreased inconsiderably and made up 7.07 cubic km, their main volumes being diverted by the enterprises of the company KAZAKSTANENERGO, GOSKOMVODRESOURCES, Atomic Energy Corporation. The total volume of wastes diversion makes up: 64.3% - by the industry, 35.5% - by agriculture and 4.1% - by housing facilities and public utilities. Despite the preservation of the tendency of annual decrease of "polluted" wastes discharge volumes to natural water bodies the water quality of the majority water bodies of the republic didn't im-

prove and, as before, didn't meet the normative requirements. The most unsuccessful rivers remained the rivers Irtysh, Ural, Syr-Darya.

The underground water continued to be exposed to a great anthropogenic pollution. As of 1995 456 sources of pollution are revealed, their areas varying from some square kilometres to tens and hundreds of kilometres. The greatest pollution source (200 sq.km in size) is registered in the Pavlodar region in the zone of the industrial centre of the chemical, ruberoid and tractor plants.

The acuteness of the problem of supply of the republic population with qualitative drinking water didn't decrease in practice. The cities and settlements of Kyzyl-Orda, North Kazakstan, Torgai, Taldy-Korgan regions referred to the number of the regions pooly supplied with drinking water. As compared to 1994 the specific volume of water specimens not meeting the sanitary norms increased by 2.4%.

Environmental pollution continues to make a great negative impact on the demographic situation in the Republic. More successful regions as of the population health in 1995 were: the city of Almaty, East Kazakstan, Semipalatinsk, Karaganda regions.

The ecological impact factor continues to make worse the demographic situation in the Republic. In 1995 every fourth person suffered from respiratory disease, actually, one half of the republic population suffers from malignant tumors, the sick rate of tuberculosis in regions lacking qualitative drinking water increases; the birth rate index continues to reduce and mortality index to increase on the average all over the Republic. The lowest birth rate index is registered in the city of Almaty, and the highest mortality percent is registered in the regions of East Kazakstan, North Kazakstan where the number of the deceased for each 1000 people made up 13.6 and 12.1 men, respectively.

In 1995 the legislative and normative-and-methodical base of the state, departmental regulation and control system of the resource management continued to actively develop and improve. The projects of 5 main laws and 35 normative and methodical documents are prepared.

Considered in 1994 in the 1st wording "Concept of the united state system of the ecological monitoring" is additionally worked up,agreed and its final consideration is transferred by the Government to the period after adopting the new wording of the Environmental Protection Law.

5.2 billion tenge of capital investments in actual prices are utilized for the environmental protection and rational use of mineral resources in 1995 by the enterprises and organizations of all forms of property that is in comparable prices 42% less as compared to 1994. The share of the centralized means in the total volume of capital investments decreased from 9.1 in 1994 to 5.3% in 1995, and the specific volume of the own means of the enterprises - users of natural resources increased from 90.9 in 1994 to 94.7%.

Environmental protection investments in 1995 were used (billion tenge): for the construction of environmental protection objects - 3.3; for protection

and rational use of water resources - 0.9; for atmospheric air protection - 0.6; for protection and rational use of forest, mineral resources and reproduction of fish reserves - 0.3.

A number of international agreements and contracts is signed in the field of the international environmental cooperation in 1995, the research works on the assessment of the natural features state at the contemporary and perspective levels, on methodical support of the activity of the analytical control of the natural features state, on information support, software of the environmental state management were still carried out.