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REPORT

CENTRAL AND EASTERN EUROPE

NEWLY INDEPENDENT STATES

MONGOLIA

MUNICIPAL WATER AND WASTEWATER SECTOR

NEEDS ASSESSMENT

October 1993

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REPORT

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NEEDS ASSESSMENT**

by

Tarik Pekin
and
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ABOUT THE AUTHORS

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FYI Information Resources of Washington, D.C. provided data retrieval support to the above team. FYI specializes in providing information on the Newly Independent States and Baltic States, and has conducted various market studies in these countries for the U.S. Government.

LIST OF ACRONYMS AND ABBREVIATIONS

USAID	United States Agency for International Development
USEPA	United States Environmental Protection Agency
WASH	Water and Sanitation for Health
USDOC	United States Department of Commerce
CEE	Central and Eastern Europe
NIS	Newly Independent States
FSU	Former Soviet Union
EC	European Community
PHARE	Poland and Hungary Assistance for Restructuring Economies
EBRD	European Bank for Reconstruction and Development
GDP	Gross Domestic Product
GNP	Gross National Product
sq. km.	square kilometer

EXECUTIVE SUMMARY

This report summarizes the needs of the municipal water and wastewater sector in the countries of Central and Eastern Europe (CEE), the Newly Independent States (NIS) and Mongolia. The needs assessment was conducted by Camp Dresser & McKee, International, Inc. for the U.S. Agency for International Development, Bureau for Private Enterprise, Office of Capital Projects and Engineering. This study is part of a larger infrastructural needs assessment initiated by the USAID on several industrial sectors.

The purpose of this assessment is to define countries and specific areas which present the greatest potential for U.S. industry participation in the development of the municipal water and wastewater sectors. The desired output is identification of projects ranging in cost from \$10 to \$50 million which can be implemented within 12 to 24 months, with high probability of success and demonstration value.

This study was conducted in the U.S. during September and October 1993, using only available data. The data search included a complete review of the current Department of Commerce, National Data Bank which contains all country market reports published within the last three years. Publications and reports of the international finance organizations, the USAID and others were also reviewed. Particular attention was given to the recommendations and observations of experts with field experience in the study region.

The environmental sector needs of the subject countries are great. The environmental damage from present and past industrial pollution is overwhelming and the current deterioration of equipment and services in the water and wastewater sector is a threat to public health in most of the countries. The financial and institutional capacity is very low and increasing this capacity will take some time. International programs are directing significant components of their assistance to regulatory policy and institutional reforms that are prerequisites to sound environmental management. *The financial resources available for environmental improvement in the countries of Central and Eastern Europe, including the Former Soviet Union, will be severely constrained over the next 5-10 years, if not longer.*

The current level of activity for the U.S. industry in the municipal water and

wastewater sectors of these countries is not significant. Pollution control equipment imports by the subject countries are only a fraction of the same imports by the current trading partners of the U.S. *The U.S. opportunities in the environmental and municipal sector should be viewed in terms of its great long term potential rather than the conditions created by the current political and economic crises in these countries.* With a combined population of 415 million and a GNP of over \$1,000 billion, they are still an economic force and potential technology partner handicapped only by the current conditions.

The specific needs of the sector are defined by the deteriorating conditions added to an insufficient infrastructure which is the legacy of the old centralized planning system. Rehabilitation of the equipment of existing facilities and improving operations is the greatest specific need. This need is the basis of the recommended projects in this report. Investment in completely new construction is not recommended except in a few cases where properly designed but unfinished facilities can be completed with very high benefit to cost ratios. Investments in the civil works components of construction would not meet urgent local needs nor demonstrate unique U.S. technology. In any case, the long duration required for planning and design of new facilities would prevent meeting the criteria of 12 to 24 month project implementation.

This report recommends packages of relatively small projects designed to target similar needs in municipalities in various locations or countries. Many facilities are almost identical in the region, as a result of central planning and manufacturing, and therefore have the same weaknesses. With a budget of about \$10 per municipal user, many significant improvements can be demonstrated with U.S. technology in many locations. Outside of the capital cities, the majority of urban centers have a population of one or several hundred thousand (a listing of all centers with a population above 50,000 in all of the subject countries is appended to this report). For example, with a budget of \$1 million, major needs of a municipal water or wastewater facility of a city of 100,000 can be met. A project package can include several municipalities in selected countries. The cost of these interventions can be compared, e.g. to the cost of a new wastewater treatment facility which would be in the order of \$100 to 225 per user depending on the technology and conditions.

Five project packages that match five types of sectoral needs are recommended in this report for consideration. Table ES-1 gives a summary of these sectoral needs and corresponding recommended project packages.

**TABLE ES-1 MUNICIPAL WATER AND WASTEWATER SECTOR
NEEDS AND RECOMMENDATIONS**

SECTORAL PROBLEM	RECOMMENDATIONS
1. Shortage of water quality monitoring and testing equipment and facilities.	Project package consisting of; (a) potable and other water quality testing equipment for many countries particularly for testing of health related parameters, and (b) an advanced regional laboratory in one country. Package Budget of \$5 million consisting of \$3 million for (a) and \$2 million for (b).
2. Public health threat due to deterioration of existing water supply and water treatment facilities and services.	Project package consisting of new water treatment equipment such as pumps, disinfection equipment, flow monitoring devices and basic maintenance tools to meet the most urgent needs in ten communities with an average size of 100,000 people. Package Budget is \$5 million.
3. Lack of water treatment facilities for small communities.	Project package consisting of two small prefabricated water treatment plants to serve a population of 5,000 each. Package Budget is \$1 million.
4. Water pollution due to deterioration and low quality of existing wastewater treatment facilities.	Project package consisting of equipment to rehabilitate and upgrade existing plants. The most prevalent problems are related to sludge management and wastewater aeration. Four to seven sites out of many possible locations and countries. Package Budget is \$17.5 million.
5. Unfinished water and wastewater treatment facilities.	Project package consisting of completion of two facilities that provide high benefit to cost ratios. Package Budget is \$3 million.

The first recommended project package mainly concerns providing potable and other water quality testing equipment particularly for monitoring health related parameters. In less industrialized countries and those in areas of regional conflict, shortages of essential equipment and supplies are critical and even basic laboratory glassware or simple portable apparatus would be most welcome. Basic testing equipment can be provided for a high number of countries and locations with a budget of \$3 million or much less. The cost is not sensitive to size of facility, and therefore, capital cities can be included. In this package, establishment of an

advanced regional laboratory, in Eastern Slovakia, with potential private sector participation is also included. The budget for the laboratory is \$1 to 2 million and would meet a wide range of needs in addition to municipal. The overall package budget is \$5 million.

The second package concerns rehabilitation of existing water supply and water treatment facilities. The typical equipment are new well pumps, disinfection equipment, flow measurement devices. The facilities should also be equipped with regular maintenance shop tools that are now in scarcity particularly in the less industrialized countries of the area. The budget is \$5 per user or \$500,000 per typical site. Ten municipalities can be assisted with a total budget of \$5 million.

The third package is related to provision of small packaged water treatment plants. They are needed in many places. For example, communities in the Aral Sea Disaster Zone of Central Asia have emergency needs for small systems but even the City of Moscow has reportedly initiated a program of installing such systems in satellite communities. This demonstration package would require a budget of about \$100 per user or \$ 1 million for 10,000 people.

The fourth package addresses the important rehabilitation and upgrading needs of the wastewater treatment plants of the region. The most prevalent problems are related to; (a) treatment and disposal of wastewater sludge; (b) wastewater aeration equipment, and (c) general deterioration and lack of certain critical equipment. Almost every treatment plant has failed to treat their sludges which are stockpiled on-site as semi-solids. Some of the sludge sites have toxic metals leaching into the groundwater. The stockpiles have immense proportions in places like the Moscow Wastewater Treatment Plant. The recommended projects will consist of installation of sludge dewatering/stabilization equipment. Existing buildings usually have ample space and civil construction can be avoided. The budget is \$10 per user capacity, with \$1 million per typical site. A total budget of \$5 million is assumed for five equivalent sites. The second important problem is created by inefficient and poor quality aeration equipment. The needed equipment consists of compressors or surface aerators plus air diffusers in some cases. The approximate cost for aeration equipment is \$10 per user. A budget of \$5 million is assumed for a package of two projects. Finally in this package are equipment for general rehabilitation needs, such as pumps, control devices, instrumentation and safety equipment. Each site has these needs and neither sludge treatment or aeration equipment can be effective without rehabilitating basic equipment. The additional budgetary cost is \$5 per user. The USAID already has initiated demonstration project in Bulgaria at two separate municipalities, one for sludge and the other for aeration equipment.

The fifth package involves completion of selected treatment facilities. One specific project example from Russian Far East is installation of wastewater pumping stations to convey the wastewaters to a recently completed municipal wastewater treatment plant that now receives wastes at only 20% of its capacity. Another specific example is provision of equipment to an uncompleted wastewater treatment plant in Slovakia after some design modifications. The budget is \$3 million for this package.

One important factor considered in formulation of above recommendations is the fluid political and economic conditions in the Region. Country focus, project sites or funding levels may all need to be revised on very short notice. Packaging of small projects addressing common sectoral needs in a wide geographic area provides a very high number of possible demonstration sites and therefore provides great flexibility in program design. The budgets for the above five project packages total to \$31.5 million but the funding can easily vary with the actual number and size of projects selected.

The technical people and professionals of the Region have the capacity to participate effectively in the above projects with assistance from the U.S. One concern that should be addressed in the procurement process of above equipment is the requirement of capable local service and maintenance organizations in partnership with the U.S. vendors. If this is not provided, equipment and therefore the demonstration may not be effective. Technical training should also be an integral part of all the projects.

SECTION 1 - DESCRIPTION OF THE SECTOR

The municipal water sector is discussed here in general.

Institutions. The municipal water and wastewater sector concerns water supply, water treatment and distribution and wastewater collection and disposal. It is a public service sector. It is closely linked to public health. Bringing safe water to the public and treatment and disposal of wastewaters in an urban setting require massive expenditures and facilities. For example, building treatment plants for municipal wastewaters costs about \$225 per each person at 1993 world prices. A medium size city of 100,000 would require a capital investment of about \$23 million, not including collection systems. Planning, financing, building and operating such facilities at reasonable cost to the public require effective institutions at national and administrative levels. Policies made at regulatory level profoundly impact the costs to the public and benefits to the environment.

Facilities and Technology. The facilities of the sector and related technology are mostly conventional. A major part, physically and in terms of cost, consist of civil and structural engineering works; i.e. excavation, foundations, concrete, buildings, channels, piping, etc.

The raw water can be surface waters or groundwater. When stream waters are utilized, dams and reservoirs for flow control and water storage are generally required in the absence of natural ponds or lakes. Supply of bulk water from surface waters is usually a function of a regional water authority rather than individual municipalities as is the case for the former socialist economies of the region. Groundwater is generally the preferred source as it is usually of high quality and only minimal treatment (disinfection) is sufficient for potable use before distribution. The surface waters are treated by sedimentation and filtration of solids. Chemicals are used to aid the separation of solids and for disinfection. More advanced treatment may be required in critical cases. After treatment, the water is distributed to industrial, commercial and domestic users with a distribution network.

The wastewaters are collected and conveyed to a treatment system that provides a level of treatment that ideally protects the quality and designated uses of the

receiving waters. The industrial dischargers connected to a municipal collection system are required to pre-treat their wastewaters to make it suitable for joint treatment with domestic wastewaters.

The mechanical, electrical and electronic equipment that go into these systems; such as pump stations and treatment plants are the relatively complex components. Examples of the equipment are pumps, valves, clarifiers, filters, mixers, motors, electrical controls, and process and analytical instrumentation. Most of this equipment is a collection of what is used in many industries in various sectors, with some modifications.

The municipal water and wastewater sector in the region, in many ways, is similar to the sector in the West. Institutionally, the differences are great reflecting the differences in the political and economic systems. The sector technology, at least on paper, is quite similar but the equipment of the region is not diverse and often is of very poor quality.

SECTION 2 - NEEDS ASSESSMENT

2.1 Needs, Demands and Capability

In the CEE and NIS, municipal water needs have generally been met in the sense that piped water is supplied to a high number of communities. In general, these water supplies have been safe enough in terms of infectious disease control. This is mostly due to heavy chlorination of both wastewater and water but also due to widespread reliance on bottled water. Nevertheless, safe drinking water is not generally assured as safety of drinking water is dependent on many parameters including those related to medium and long term health effects. Heavy chlorination that controls infectious organisms may also create toxic organics as a by-product. Metals (e.g. mercury and lead), toxic organics and carcinogenic substances in drinking water are all of concern but are not well documented. Recently, even outbreaks of infectious diseases were experienced due to shortage of materials. The current deterioration of equipment and services, particularly at the water treatment plants, is an immediate threat to public health in most of the countries. The municipal wastewater disposal facilities are even more inadequate and often non-existent.

In summary, the needs of the municipal water and wastewater sector are very high. On the other hand, current institutional and financial capacity is at its lowest point. Construction of facilities throughout the Region have been halted due to lack of funds. Municipal budgets are totally inadequate and national funds are limited. Unemployment is high. User fees, pollution fees and penalties are very low as a significant finance source.

This low financial capacity is due to the collapse of the old system and current transitional conditions rather than the potential of the countries. These countries now have a combined population of about 415 million people with a GNP of \$1,080 billion giving an average per capita income of about \$2,600 per year (see Table 1). When adjusted for actual purchasing power, the equivalent income more than doubles. They are middle income countries as defined by the World Bank. The population is highly educated. Many of their scientists are world-class. Yet, they do not have a banking system or effective currency. Bartering is still the only major international and even areawide transaction means. As shown by the economic indicators in Table 2, the CEE countries and Russia are currently in economic decline with only Poland showing improvement in income and industrial production.

TABLE 1 BASIC INDICATORS

	Population			Area 1000 sq. km.	GNP US\$		Life	Literacy
	millions	Annual	Urban		Total	Per	Expectancy	Literacy
		growth	(percent)						(percent)	(billions)	capita	Years at birth	percent
Newly Independent States	282.9				759.2	2684		
Armenia	3.4	1.5	68	30	7.3	2150	72	*
Azerbaijan	7.1	1.4	54	87	11.9	1670	71	*
Belarus	10.3	0.2	66	208	32.0	3110	71	*
Georgia	5.5	0.4	56	70	9.0	1640	73	*
Kazakhstan	16.8	0.7	57	2717	41.5	2470	69	*
Kyrgyzstan	4.5	1.4	38	199	7.0	1550	66	*
Moldova	4.4	0.1	47	34	9.5	2170	69	*
Russian Federation	148.7	0.0	74	17075	478.8	3220	69	*
Tajikistan	5.5	3.1	32	143	5.8	1050	69	*
Turkmenistan	3.8	2.5		488	6.5	1700	66	*
Ukraine	52.0	0.0	67	604	121.7	2340	70	*
Uzbekistan	20.9	2.4	41	447	28.2	1350	69	*
Central & Eastern Europe	131.1				320.1	2441		
Albania	3.3	1.1	34	29	2.7	820	73	72
Bulgaria	9.0	-0.2	68	111	16.6	1840	72	93
Bosnia & Herzegovina	4.4	0.5		51	14.1	3200	70	86
Croatia	4.8	0.4		56	26.9	5600	72	97
Czech Republic	10.3	0.3		79	25.4	2470	72	99
Estonia	1.6	0.0	72	45	6.1	3830	70	
Hungary	10.3	-0.4	62	93	28.0	2720	70	99
Latvia	2.6	-0.1	71	65	8.9	3410	69	98
Lithuania	3.7	0.2	68	65	10.0	2710	71	
Macedonia	2.0			26	2.0	1000	72	
Poland	38.2	0.3	62	313	68.4	1790	71	98
Romania	23.0	0.2	53	238	32.0	1390	70	96
Serbia & Montenegro	10.6			102	44.5	4200	72	89
Slovakia	5.3	0.3		49	13.1	2470	72	99
Slovenia	2.0	0.2		20	21.4	10700	74	99
Mongolia	2.2	2.6		1567	2.0	900	63	90

Notes: Most of the above basic indicators are taken from Reference 26.

* = Very high literacy rate for NIS. Rates by country are not available.

TABLE 2
ECONOMIC INDICATORS FOR COUNTRIES IN CENTRAL AND EASTERN EUROPE

	<i>GDP¹</i>			<i>Industrial production¹</i>			<i>Agricultural production¹</i>			<i>Unemployment rate (%)</i>			<i>Gross foreign debt (billion \$)</i>		
	90	91	92	90	91	92	90	91	92	90	91	92	90	91	92
Albania	-13.1	-30.0	-11.0 ²	-7.5	..	..	-7.4	..	..	8.6	50.0	70.0 ²	0.35	0.55	..
Bulgaria	-11.8	-22.9	..	-16.3	-27.5	-17.5 ²	-6.7	-13.2	..	1.7	10.2	12.5 ²	10.0	11.4	12.0 ²
CSFR	0	-16.0	-15.0 ²	-4.0	-21.0	-22.0 ²	-2.0	-14.0	..	1.0	7.0	5.0 ²	8.1	9.3	9.1 ²
Croatia	-8.5	-15.0 ¹²	-20.0 ¹²	-11.3	-28.5	-14.6	-3.5	-8.2	-19.8 ¹³	9.8	14.2	17.5 ²	..	..	2.6 ¹¹
Estonia	-3.6	-10.8	-30.0 ²	-5.6	..	-38.0 ²	-3.2	..	..	..	..	0.7 ²	..	0.4	..
Hungary	-5.0	-10.2	..	-10.5	-19.1	-18.9 ²	-4.0	-3.0	..	1.7	8.5	10.1 ²	21.3	22.7	21.6 ²
Latvia	-0.2	-7.9	-30.9 ²	7.4	0	..	-17.2	-3.6	..	..	..	1.6 ²	..	0.8	..
Lithuania	-5.0	-12.8	-35.0 ²	0.3	-1.3	-41.0 ²	-11.5	-8.0	-18.0 ²	..	..	1.1 ²	..	1.0	..
Poland	-11.6	-7.0	1.0	-24.2	-12.9	4.2	-2.2	-2.0	-11.0	6.3	11.8	13.6 ²	46.6	46.9	47.0
Romania	-7.4	-13.0	..	-17.4	-18.7	-17.6 ²	-3.0	-5.0	..	..	2.9	5.4 ²	0.3	1.9	3.2
Russia	0.4	-9.0	-14 ²	-0.1	-8.0	-13.5 ²	-3.6	-4.7	..	..	0.1	0.2 ²	38.0	40.1	43.4 ²
Slovenia	3.4	-9.3	-6.5	-10.1	-11.6	-13.0	1.0	-3.3	-17.0	4.7	8.1	11.3	19.5	18.7	17.3
Ukraine	-3.0	-10.0	-18.0 ²	-1.0	-13.0	-15.0 ²	-7.0	-4.0	-20.0 ²	0	0	0 ²	..	..	..

1/ Percentage change over the (same period of the) previous year.

Latest period for which data are available:

2/	January-March	7/	April
3/	January-April	8/	May
4/	January-May	9/	June
5/	January-June	10/	July
6/	March	11/	December

12/ Estimated data based on current prices

13/ Preliminary data

Sources: Commission of the European Communities, Directorate-General for Economic and Financial Affairs. 1992. *European Economy*, Supplement A (8/9). Croatia Ministry of the Environment. Slovenia Ministry of Economic Affairs and Development.

Note: Table 2 reproduced from Reference 10.

It is evident that the financial resources available for environmental improvement in the countries of Central and Eastern Europe, including the Former Soviet Union, will be severely constrained over the next 5-10 years, if not longer.

2.2 Specific Areas and Problems

The problems of the sector can be grouped as sectorwide or site-specific.

Sectorwide. Even though the CEE and NIS countries and Mongolia cover vast areas populated by diverse cultures, it is possible to generalize the existing sectorwide conditions and needs particularly in the municipal environmental sector. This is mostly due to the fact that these countries shared essentially the same type of centralized planning and large scale manufacturing systems that resulted in uniformity rather than diversity. One factor that needs to be emphasized is that urbanization and urban infrastructural development was government policy in these countries and one of the top priorities of their programs. The municipal water and wastewater facilities that have been built are often of the same grand scale as the large parks and wide avenues and immense buildings that are part of the typical urban scene in these countries. However, the quality and performance is very low particularly in the Former Soviet Union (FSU) with somewhat higher quality achieved in some countries of Eastern Europe. Even new construction and equipment look deteriorated. All plants use mild steel that corrode before they are installed. Walkways and ladders are often dangerous rather than safe by Western standards. A plant looks almost the same, whether it is in the Ukraine or the Russian Far East. "Of typical Soviet design" is now a well established term with environmental engineers who study the plants. When these facilities do not perform, they create problems proportional to their scale. For example, residuals (sludges) that are generated from water and wastewater treatment are an immense and uniform problem. Sludge stabilization facilities do not work and untreated sludges are stockpiled on plant sites. The Moscow treatment plant is a case in point with its vast stockpiles. All plants have minimal process monitoring devices and certain plants do not have accurate flow measurement devices. Analytical equipment for monitoring of toxic organics is lacking.

Table 3, FSU Water Pollution Control Equipment Demand, gives a highly detailed breakdown of equipment demands by unit and actual installations for 1985, 1990 and projected demand for 1995. The original source is the former Soviet government. The table is important as it gives a sectorwide picture of demand although unrealistically stringent Soviet regulations might have raised the "demand" above actual environmental need. The table also gives a clear picture of

TABLE 3
FORMER SOVIET UNION (FSU)
WATER POLLUTION CONTROL EQUIPMENT DEMAND

EQUIPMENT TYPE	1985		1990		1995
	Demand (units)	% met	Demand (units)	% met	Projected Demand (units)
PRIMARY TREATMENT EQUIPMENT					
Bar screens with mechanical cleaning	3,301	99	3,500	100	3,700
Cutting screens	1,802	39	2,427	33	3,050
Comminutors	1,078	146	1,484	175	1,890
Netting and microscreens	1,206	25	1,646	24	2,090
AERATION AND GAS SEPARATION EQUIPMENT					
Brush aerators	799	10	928	11	1,060
Vertical-shaft mech. aerators	1,130	26	1,436	30	1,750
Centrifugal blowers	4,988	30	5,816	30	6,645
Compressors	196	11	306	9	420
WASTEWATER SETTLING EQUIPMENT					
Rectangular clarifier sludge scrapers	808	41	1,087	39	1,370
Circular clarifier sludge scrapers	790	54	1,206	44	1,625
FILTRATION EQUIPMENT					
Filters	5,634	67	8,147	58	10,660
Underdrain systems	2,768	90	13,975	18	25,200
STORAGE, TRANSPORTATION, PREPARATION, AND REAGENT MEASURING EQUIPMENT					
Centrifugal chemical pumps	11,473	43	16,385	42	21,300
Auto-control dosing pumps	5,021	4	5,864	4	6,580
Manual-control dosing pumps	2,586	39	3,870	33	5,250
Mechanical chemical contact tank	1,830	10	2,236	10	2,640
Non-mechanical chemical contact tank	3,010	8	4,008	8	5,000
Saturators	46	0	84	0	NA
Polymer-mixing equipment	372	40	513	39	NA

EQUIPMENT TYPE	1985		1990		1995
	Demand (units)	% met	Demand (units)	% met	Projected Demand (units)
DISINFECTION AND WATER QUALITY IMPROVEMENT EQUIPMENT					
Chlorinators	4,475	89	5,130	97	5,740
Chlorine evaporators	685	2	1,153	1	1,550
Ozonators	182	43	330	30	480
Fluoridizers	266	0	367	0	470
Magnetic treatment equipment	1,073	0	268	0	NA
Electrodialysis equipment	1,262	16	1,362	22	1,460
Bacteriological equipment	1,654	345	2,141	462	NA
SLUDGE CONCENTRATION EQUIPMENT					
Vacuum filters	995	16	1,251	22	1,510
Filter-presses	566	16	582	20	600
PUMPING EQUIPMENT					
Horizontal centrifugal solids-handling pumps	1,209	48	1,745	43	2,280
Horizontal centrifugal sludge pumps	9,531	78	10,455	92	11,500
One-step consolidating horizon.centrif. pumps	35,851	87	55,065	88	74,270
Horizontal centrifugal vortex pumps	4,972	81	8,778	57	12,680
Vertical centrifugal wastewater pumps	662	28	859	32	1,056
Submerged centrifugal pumps	3,358	6	5,345	5	7,400
Rotary pumps	167	30	206	24	NA
Plunger pumps	977	38	1,216	37	1,520
LOW-FLOWRATE EQUIPMENT					
Packaged water treatment plants	374	40	405	37	485
Packaged wastewater treatment plants	3,472	22	4,347	21	5,229

Source: U.S. Department of Commerce, International Trade Administration, "Ukraine - Water Pollution Control Equipment, Market Research Report ISA 9106," based on a June 1, 1991 report by FYI Information Resources. Reference No. 37.

Note: Equipment nomenclature as given by FSU sources. Demands are official FSU figures.

the types of equipment that the industry have failed to produce in any substantial quantity. The statistics also confirm the observations of U.S. and Western specialists at treatment plants in terms of weaknesses. The demand for sludge concentration equipment is high and modern and efficient dewatering devices such as belt filters are not even offered in the system. Relatively advanced pumps such as rotary and plunger pumps are in higher demand and submersible pump demand has been met at only 5% in 1990. Equipment with any level of automation (e.g. auto-control dosing pumps) is in low supply. Process control instrumentation is not even listed. Chlorinator demand is met at 97% which reflects the Soviet emphasis placed on chlorine production and disinfection of both potable water and wastewater. It should be noted that the table says nothing about quality of equipment. For example, bar screen (with mechanical cleaning) demand is met but field observations show the actual equipment to be of very low quality and still requiring a lot of manual cleaning.

Observation of equipment needs in Eastern Europe show needs very similar to the FSU. A recent wastewater sector market research report for Poland by the U.S. Embassy in Warsaw indicate similar needs (see Reference 36).

In addition to treatment equipment, water distribution networks and wastewater drainage systems require maintenance, replacement or additions. In many cases, water losses due to leakage are substantial in addition to the overuse of subsidized water.

Site Specific. Construction of many plants in the Region are now halted. Completion of these plants may initially be viewed as a cost-effective solution. However, some of these plants have not been well planned and in some instances have been greatly oversized to meet the assumed demands of an increased urban population in a distant future. Phasing of facilities have not been considered. In some cases, completion of existing facilities can meet immediate needs at low cost and high benefit.

2.3 U.S. Opportunities

Globally, the U.S. is in the forefront of environmental sciences, management and technology. However, a high level of competition exists worldwide, particularly in the water sector. The countries of the CEE and NIS will potentially develop a huge environmental market because of their size, industrial potential and needs. Presently, these countries are not substantial as importers of U.S. equipment. Table 4 gives a summary of available U.S. Department of Commerce Best

TABLE 4 POLLUTION CONTROL MARKETS

	Population (millions)	GNP (billions)	Environmental Market Scenario (millions)	USDOC BEST MARKETS RESEARCH - FY'93 POLLUTION CONTROL EQUIPMENT*								
				Total Market		Import Market		Imports from U.S.		Receptivity	Competition	Market Barriers
				1992(e)	% average annual growth '92-94	1992(e)	% average annual growth '92-94	1992(e)	% average annual growth '92-94			
Newly Independent States	282.9	759.2	6073									
Armenia	3.4	7.3	58									
Azerbaijan	7.1	11.9	95									
Belarus	10.3	32.0	256									
Georgia	5.5	9.0	72									
Kazakhstan	16.8	41.5	332									
Kyrgyzstan	4.5	7.0	56									
Moldova	4.4	9.5	76									
Russian Federation	148.7	478.8	3831							2	2	5
Tajikistan	5.5	5.8	46									
Turkmenistan	3.8	6.5	52									
Ukraine	52.0	121.7	973									
Uzbekistan	20.9	28.2	226									
Central & Eastern Europe	131.1	320.1	2561									
Albania	3.3	2.7	22									
Bulgaria	9.0	16.6	132							5	3	5
Bosnia & Herzegovin	4.4	14.1	113									
Croatia	4.8	26.9	215									
Czech Republic	10.3	25.4	204							5	2	3
Estonia	1.6	6.1	49									
Hungary	10.3	28.0	224							4	3	5
Latvia	2.6	8.9	71									
Lithuania	3.7	10.0	80									
Macedonia	2.0	2.0	16									
Poland	38.2	68.4	547	125	40	60	200	2.5	20	5	2	2
Romania	23.0	32.0	256	27	20	18	15	2	100	5	4	5
Serbia & Montenegro	10.6	44.5	356									
Slovakia	5.3	13.1	105							5	2	3
Slovenia	2.0	21.4	171									
Mongolia	2.2	2.0	16									

* From Reference 41 (e) = estimated

Market Research Reports for Fiscal Year 1993. Market assessments are available for seven (7) countries including the Russian Federation. Market estimates are available for Poland and Romania. Poland represents a best case as relatively high level of environmental expenditures are being made at about 1% of GDP which amounted to an estimated US\$840 million in 1991. Poland's total pollution control equipment market in 1992 was estimated at US\$125 million with the import portion at US\$60 million. The U.S. had a US\$2.5 million (4%) share in the import market. The much smaller Romanian market had US\$2 million worth of imports from the U.S. If we compare these numbers to equipment imports by Canada and Mexico from the U.S., they were US\$1533 million and US\$132 million, respectively.

Table 4 includes an estimate of the potential pollution control equipment market in the Region as a scenario. On the (arbitrary) assumption of the market at 0.8% of GNP, the total would be US\$8,650 million. It should be noted that the pollution control equipment market is primarily made of the products of the other markets; such as pumps, control equipment, etc. and therefore provides important leverage for other markets.

The U.S. opportunities in this market should be viewed in terms of its great long term potential rather than the conditions created by the current economic crises in these countries.

2.4 Investment Climate

The local and international investment climates related to the environmental sector are described below.

Local. The investment climate in the sector reflect the general investment climate but has much lower priority than the other sectors that produce revenue. Financial and institutional capacity is low. Statistics on actual expenditures are scarce as indicated in Table 4. In Poland, where there has been rapid increase pollution charges and fees, the total environmental investment expenditures are relatively high but is still low in terms of needs.

International. The international concern about the environment in the Region is great, parallel to other global environmental concerns. A summary of major programs sponsored by the U.S. and international agencies and financial institutions is given in Appendix D. Most recently, on April 29 and 30, 1993, in Lucerne, Switzerland, the environmental ministers from the U.S., Western Europe,

Central and Eastern Europe, and the industrialized republics of the NIS held the first follow up meeting to the Rio Environment Conference. The environmental ministers agreed to the following actions:

- expanded global and regional cooperation on environmental issues in CEE and NIS countries
- endorsement of an Environmental Action Program (EAP) for CEE and the NIS.

The EAP calls for priority action in three areas: policy reform, institutional strengthening and investments. To implement the EAP, the ministers established a Task Force to coordinate implementation of policy and institutional reforms and a Project Preparation Committee (PPC) to facilitate investments. The PPC members are the U.S., EC, Denmark, Finland, Germany, the Netherlands, Norway, Sweden, Switzerland, the European Bank, the Nordic Investment Bank, NEFCO, and the World Bank. The U.S. is a major leader in this international group and is represented by the AID. The first meeting of the PPC was held in June 1993 in the Washington, D.C. area and was co-chaired by AID/EUR. Table 5 (Main Areas of Focus of G-24 and PHARE Assistance for Environment) is reproduced from the EAP dated 30 March 1993. The table shows the extent of the international cooperation. The EAP defines CEE Countries as Central Europe and the industrialized European Republics of the FSU, and therefore includes Belarus, Ukraine, Moldova and European Russia.

The Danube Environmental Program is a major international cooperative effort in Eastern Europe. Within the framework of this program, the AID/WASH Project has conducted water basin studies in Hungary, Slovakia, Romania, Bulgaria, Moldova, and the Ukraine. Diagnostic missions and pre-investment studies included municipal water and wastewater facilities. Table 6 summarizes the program and areas of focus of the donors. Additional information is provided in Appendix C on high priority projects.

Joint missions of the World Bank, USAID and USEPA visited the Russian Federation in February 1993 and in June 1993 in connection with the Russia: Environment Management Technical Assistance Project. The early preparatory phases of this project involve development of action plans toward establishment of a Project Preparation Unit and Implementation Unit (PPIU) and assist the Russian Government in development of a National Environmental Action Plan.

These cooperative international technical assistance programs focus primarily on increasing institutional and policy making capacity toward a democratic political

TABLE 5

MAIN AREAS OF FOCUS OF G-24 AND PHARE ASSISTANCE FOR ENVIRONMENT

Recipient →	Estonia	Latvia	Lithuania	Poland	CSFR	Hungary	Romania	Bulgaria	Albania
Donor ↓									
Finland	wtr, air			wtr, air					
Denmark	wtr, wst	wtr, wst	wtr, wst	wtr, wst, air	wtr, wst, air	wtr, wst, air			
Sweden	wtr	wtr, wst, air	wtr	wtr, air	wtr				
Norway				wtr, air, inst	wtr, wst, air				
Netherlands		inst		all sectors	inst	all sectors			
Belgium				mon	mon	mon			
Switzerland					wst	wst			
Austria				air	wtr, wst, air	air			
France				inst (wtr)	inst	inst (wtr)	inst (wtr)		
Germany				inst	inst	inst	inst	inst	
UK				inst	inst	inst	inst	inst	
USA	inst	inst	inst	all sectors	all sectors	all sectors	inst	inst	
Canada				inst	inst	inst	inst		
Japan				air, wst	air, inst	wst		inst	
EC (PHARE)	inst	inst		all sectors	wtr, wst, inst	all sectors	inst, mon	inst, mon	

Abbreviations:

wtr = water treatment
wst = waste treatment

air = air pollution
mon = pollution monitoring

inst = institution building, incl. training and policy studies
inst (wtr) = institution building with water sector focus

Source: Reference 10

**TABLE 6
ENVIRONMENTAL PROGRAM FOR THE DANUBE RIVER BASIN
PRIORITY BASINS SELECTED FOR PRE-INVESTMENT ACTIVITY**

	CSFR	HUNGARY	SLOVENIA	CROATIA	BOSNIA	YUGO SLAVIA	ROMANIA	BULGARIA	MOLDOVA	UKRAINE
EBRD/PHARE	Bodrog, Vah and Upper Tisza	Bodrog and Upper Tisza					Siret	Iskar		Bodrog and Upper Tisza Siret
Global Environmental Facility (World Bank)	Morava and Nitra	Bast Tizza (Koros) Central Tisza (Zagyva)					East Tisza (Kores) Olt	Vit/Oscan System		
World Bank/ Barbara Gauntlett Foundation							Prut		Prut	Prut
World Bank/ Japanese Grant Facility			Sava							
USAID/USEPA	Upper Tisza (Hornad)	Ataler Sajo					Arges	Jantra		
Austria	Morava, Dye(Thaya) and Homa Nitra									
Japan		Sajo								
Netherlands	Hron									
Funding to be Determined		Drava	Drava	Drava Sava	Sava	Sava	Jija Kalomita			

system and free market economy. These reforms are of the highest priority as they are prerequisites to any improvements in all of the sectors. International activities also focus on problem definition and establishment of priorities to aid in decision making. The immense environmental problems of the subject countries require targeting of assistance to areas where the greatest benefits will be achieved. The level of funding for these international programs, although substantial for their purpose, are not at capital funding levels, particularly when measured by the needs of the municipal environmental sector.

2.5 Potential Projects

In the development of potential projects, the programs and general goals of the U.S. Government in the region, programs of the international finance organizations, the Environmental Action Program for Central and Eastern Europe, immediate and urgent needs of the recipient countries were considered. The funding level was assumed for projects in the range of US\$10 to \$50 million, with a durations of 12 to 24 months, as requested. Additional criteria require projects of high visibility and of demonstration type. They should be replicable and dovetail into the international programs. The project program should be flexible in view of the fluid conditions in the Region and also assure a high probability of success.

When the above level of funding is measured, in terms of the potential number of people benefiting (on the basis of providing new biological wastewater treatment), about 670,000 people or about seven small cities will benefit from a hypothetical maximum budget of \$150 million (see Table 7 below for typical per capita costs). This probably represents no more than 1/200 of the population that may need similar facilities under ideal conditions. Project of this size cannot even be planned in a cost-effective manner within 12 to 24 months in the municipal sector particularly under the present local institutional limitations.

**Table 7 Wastewater Treatment Technology Capital Costs
US\$ per person**

Technology	Plant Size = 100,000 people	Plant Size = 1,000,000 people
Primary Treatment Plant	100	65
Biological Treatment Plant	225	150

The recommended approach to project development in the municipal water sector is to prepare project packages that address sectorwide equipment needs at a large number of municipal facilities. The highest environmental benefits for a given investment will be gained by rehabilitating existing systems with new modern and efficient equipment. This approach will also demonstrate US technology of comparative advantage and minimize funding of civil works. USAID has already initiated projects of this type in Bulgaria based on the findings of studies under the Danube Environmental Program. Selected facilities with high benefit to cost ratios can also be completed.

We recommend packages of relatively small projects designed to target similar needs in municipalities in various locations or countries. Many facilities are almost identical in the region, as a result of central planning and manufacturing, and therefore have same weaknesses. With a budget of about \$10 per municipal user, many significant improvements can be demonstrated with U.S. technology in many locations. Outside of the capital cities, the majority of urban centers have a population of one or several hundred thousand (a listing of all centers with a population above 50,000 in all of the subject countries is given in Appendix A). For example, with a budget of \$1 million, major needs of a municipal water or wastewater facility of a city of 100,000 can be met. A project package can include several municipalities in selected countries. The cost of these interventions can be compared, e.g. to the cost of a new wastewater treatment facility which would be in the order of \$100 to 225 per user depending on the technology and conditions.

Five project packages that match five types of sectoral needs are recommended in this report for consideration. Table 8 gives a summary of the recommended project packages.

The first recommended project package mainly concerns providing potable and other water quality testing equipment particularly for monitoring health related parameters. In less industrialized countries and those in areas of regional conflict, shortages of essential equipment and supplies are critical and even basic laboratory glassware or simple portable apparatus would be most welcome. Basic testing equipment can be provided for a high number of countries and locations with a budget of \$3 million or much less. The cost is not sensitive to size of facility, and therefore, capital cities can be included. In this package, establishment of an advanced regional laboratory, in Eastern Slovakia, with potential private sector participation is also included. The budget for the laboratory is \$1 to 2 million and would meet a wide range of needs in addition to municipal. The overall

package budget is \$5 million.

The second package concerns rehabilitation of existing water supply and water treatment facilities. The typical equipment are new well pumps, disinfection equipment, flow measurement devices. The facilities should also be equipped with regular maintenance shop tools that are now in scarcity particularly in the less industrialized countries of the area. The budget is \$5 per user or \$500,000 per typical site. Ten municipalities can be assisted with a total budget of \$5 million.

The third package is related to provision of small packaged water treatment plants. They are needed in many places. For example, communities in the Aral Sea Disaster Zone of Central Asia have emergency needs for small systems but even the City of Moscow has reportedly initiated a program of installing such systems in satellite communities. This demonstration package would require a budget of about \$100 per user or \$1 million for 10,000 people.

The fourth package addresses the important rehabilitation and upgrading needs of the wastewater treatment plants of the region. The most prevalent problems are related to; (a) treatment and disposal of wastewater sludge; (b) wastewater aeration equipment, and (c) general deterioration and lack of certain critical equipment. Almost every treatment plant has failed to treat their sludges which are stockpiled on-site as semi-solids. Some of the sludge sites have toxic metals leaching into the groundwater. The stockpiles have immense proportions in places like the Moscow Wastewater Treatment Plant. The recommended projects will consist of installation of sludge dewatering/stabilization equipment. Existing buildings usually have ample space and civil construction can be avoided. The budget is \$10 per user capacity, with \$1 million per typical site. A total budget of \$5 million is assumed for five equivalent sites. The second important problem is created by inefficient and poor quality aeration equipment. The needed equipment consists of compressors or surface aerators plus air diffusers in some cases. The approximate cost for aeration equipment is \$10 per user. A budget of \$5 million is assumed for a package of two projects. Finally in this package are equipment for general rehabilitation needs, such as pumps, control devices, instrumentation and safety equipment. Each site has these needs and neither sludge treatment or aeration equipment can be effective without rehabilitating basic equipment. The additional budgetary cost is \$5 per user. The USAID already has initiated demonstration project in Bulgaria at two separate municipalities, one for sludge and the other for aeration equipment.

The fifth package involves completion of selected treatment facilities. One specific project example from Russian Far East is installation of wastewater

pumping stations to convey the wastewaters to a recently completed municipal wastewater treatment plant that now receives wastes at only 20% of its capacity. Another specific example is provision of equipment to an uncompleted wastewater treatment plant in Slovakia after some design modifications. The budget is \$3 million for this package.

One important factor considered in formulation of above recommendations is the fluid political and economic conditions in the Region. Country focus, project sites or funding levels may all need to be revised on very short notice. Packaging of small projects addressing common sectoral needs in a wide geographic area provides a very high number of possible demonstration sites and therefore provides great flexibility in program design.

The technical people and professionals of the Region have the capacity to participate effectively in the above projects with assistance from the U.S. One concern that should be addressed in the procurement process of above equipment is the requirement of capable local service and maintenance organizations in partnership with the U.S. vendors. If this is not provided, equipment and therefore the demonstration may not be effective. Technical training should also be an integral part of all the projects.

TABLE 8 PROJECT PACKAGES, BUDGETS AND LOCATIONS

SECTORAL PROBLEM	PROJECT RECOMMENDATIONS	APPROX. POPULATION TO BENEFIT	EXAMPLE PROJECT LOCATION
1. Shortage of water quality monitoring and testing equipment and facilities.	Project package consisting of; (a) potable and other water quality testing equipment for many countries particularly for testing of health related parameters, and (b) an advanced regional laboratory in one country. Package Budget of \$5 million consisting of \$3 million for (a) and \$2 million for (b).	(a) General (b) General	(a) Most countries. Greater need at less industrialized countries (b) Kosice (Slovakia)
2. Public health threat due to deterioration of existing water supply and water treatment facilities and services.	Project package consisting of new water treatment equipment such as pumps, disinfection equipment, flow monitoring devices and basic maintenance tools to meet the most urgent needs in ten communities with an average size of 100,000 people. Package Budget is \$5 million.	1,000,000	10 Locations (e.g.): Riga (Latvia) Ukraine Russia Poland
3. Lack of water treatment facilities for small communities.	Project package consisting of two small prefabricated water treatment plants to serve a population of 5,000 each. Package Budget is \$1 million.	10,000	2 Locations: Russia Central Asia
4. Water pollution due to deterioration and low quality of existing wastewater treatment facilities.	Project package consisting of equipment to rehabilitate and upgrade existing plants. The most prevalent problems are related to sludge management and wastewater aeration. Four to seven sites out of many possible locations and countries. Package Budget is \$17.5 million.	1,500,000	4 to 7 Locations (e.g.): Hungary The Czech R. Poland Bulgaria Belarus Romania
5. Unfinished water and wastewater treatment facilities.	Project package consisting of completion of two facilities that provide high benefit to cost ratios. Package Budget is \$3 million.	200,000	2 Locations: Nakhodka (Russia) and Krompachy (Slovakia)
TOTAL BUDGET	\$ 31.5 MILLION		

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Vital Statistics - Moldova
Vital Statistics - Mongolia
Vital Statistics - Poland
Vital Statistics - Romania
Vital Statistics - Russian Federation
Vital Statistics - Serbia and Montenegro
Vital Statistics - Slovakia
Vital Statistics - Slovenia
Vital Statistics - Tajikistan
Vital Statistics - Turkmenistan
Vital Statistics - Ukraine
Vital Statistics - Uzbekistan

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28. Bulgaria - CMP9206
29. Czechoslovakia - CMP9209
30. Hungary - CMP9210
31. Poland - CMP9208
32. Romania - CMP9209
33. Russian Federation - CMP930
34. Yugoslavia, Former - CMP910800

Industry Subsector Analysis (ISA)

35. Hungary - Environmental Issues - ISA9306
36. Poland - Waste Water Treatment Plant Services & Equip. - ISA9303
37. Ukraine - Water Pollution Control Equipment - ISA9106
38. U.S.S.R (FSU) - Environmental Management Services - ISA9107

39. International Market Insights (IMI)

Czechoslovakia - Environmental Cleanup Plans - 930602
Poland - Environmental Project - 930205
Russian Federation -Environmental Project - 921030
Slovenia - Environmental Project - 920716

40. Economic Policy Trade Practices (ETP)

Bosnia (Former Yugoslavia)
Bulgaria
Croatia (Former Yugoslavia)
Czechoslovakia
Estonia
Latvia
Lithuania
Poland
Romania
Serbia and Montenegro (Former Yugoslavia)
Slovenia
Former Soviet Union

41. Best Market Reports

World - Pollution Control Equipment - BMR9301

APPENDIX A

Population of Cities and Towns

**Central and Eastern Europe
Newly Independent States
Mongolia**

APPENDIX A

POPULATION OF CITIES AND TOWNS

CENTRAL AND EASTERN EUROPE

ALBANIA

1989 Census:		3,182,400
% Urban: 34		
Durrës		82,700
Elbasan		80,700
Korçë		63,600
Shkodër		79,900
Tiranë		238,100
Vlorë		71,700
Total for above cities:		616,700
% of Population:		19

BOSNIA

1987 E:		4,400,464
% Urban:		
Banja Luka (metro)		193,890
Banja Luka	(130,900)	
Sarajevo (metro)		479,688
Sarajevo	(341,200)	
Tuzla (metro)		129,967
Tuzla	(67,300)	
Zenica (metro)		144,869
Zenica	(67,500)	
Total for above cities:		948,414
% of Population:		22

BULGARIA

1989 E:		8,986,636
% Urban: 68		
Asenovgrad		
Blagoevgrad		74,236

Burgas		200,464
Dimitrovgrad		57,102
Dobrič		112,582
Gabrovo		80,930
Haskovo		93,609
Jambol		97,414
Kârdžali		58,995
Kazanlâk		63,776
Kjustendil		55,620
Loveč		50,872
Mihajlovgrad		55,203
Pazardžik		83,451
Pernik		97,930
Pleven		136,287
Plovdiv		364,162
Razgrad		56,494
Ruse		190,720
Silistra		56,907
Sliven		109,432
Sofija (metro)		1,205,000
Sofija	(1,136,875)	
Stara Zagora		158,151
Šumen		107,973
Varna		306,300
Veliko Târnovo		71,709
Vidin		65,892
Vraca		81,992
Total for above cities:		4,093,203
% of Population:		46

CROATIA

1987 E:		4,673,517
% Urban		
Osijek (metro)		162,490
Osijek	(106,800)	
Rijeka (metro)		199,282
Rijeka	(166,400)	
Split		191,074
Zagreb		697,925
Total of Above Cities:		1,250,771
% of Population:		27

THE CZECH REPUBLIC AND SLOVAKIA

1990 E:		15,661,734
% Urban		
Banská Bystrica		87,834
Bratislava		444,482
Brno (metro)		450,000
Brno	(392,285)	
České Budějovice (metro)		114,000
České Budějovice	(99,428)	
Chomutov (metro)		80,000
Chomutov	(55,735)	
Děčín (metro)		72,000
Děčín	(56,034)	
Hradec Králové (metro)		113,000
Hradec Králové	(101,302)	
Jihlava		54,855
Karlovy Vary (Carlsbad)		58,039
Kladno (metro)		88,500
Kladno	(73,347)	
Košice		237,099
Liberec (metro)		175,000
Liberec	(104,256)	
Martin		66,678
Mladá Boleslav		49,195
Most (metro)		135,000
Most	(71,360)	
Nitra		91,297
Olomouc (metro)		126,000
Olomouc	(107,044)	
Opava (metro)		77,500
Opava	(63,440)	
Ostrava (metro)		760,000

Ostrava	(331,557)	
Frýdek-Místek	(66,791)	
Havířov	(92,037)	
Karviná	(69,521)	
Pardubice		95,909
Plzeň (metro)		210,000
Plzeň	(175,038)	
Poprad		53,039
Praha (metro)		1,325,000
Praha	(1,215,076)	
Přerov		51,996
Prešov		90,121
Prievidza		52,624
Prostějov		52,074
Spišská Nová Ves		45,260
Teplice (metro)		94,000
Tiplice	(55,287)	
Trenčín		57,813
Trnava		72,866
Ústí nad Labem (metro)		115,000
Ústí nad Labem	(106,499)	
Žilina		97,508
Zlín (metro)		124,000
Zlín	(87,189)	
Total of above cities:		5,607,689
% of Population:		36

ESTONIA

1991 E:		1,581,800
% Urban: 72		
Kohtia-Järve		74,700
Narva		83,000
Pärnu		54,200
Tallinn		481,500
Tartu		115,300
Total of above cities:		808,700
% of Population:		51

HUNGARY

1991 Census:		10,354,842
% of Urban: 62		
Békéscaba (metro)		67,691
Békéscaba	(58,900)	
Budapest (metro)		2,515,000
Budapest	(2,018,035)	
Érd	(43,563)	
Debrecen		213,927
Dunaújváros		58,874
Eger		62,474
Győr		129,598
Hódmezővásárhely (metro)	51,180	
Hódmezővásárhely	(42,800)	
Kaposvár		71,368
Kecskemét (metro)		103,568
Kecskemét	(82,000)	
Miskolc		194,033
Nagykanizsa		53,700
Nyíregyháza (metro)		114,596
Nyíregyháza	(88,800)	
Ózd		43,020
Pécs		170,023
Salgótarján		47,500
Sopron		55,140
Szeged		176,135
Székesfehérvár		109,106
Szolnok		78,661
Szombathely		85,702
Tatabánya		73,854
Vác		33,858
Veszprém		64,277
Zalaegerszeg		62,357

Total for above cities:		4,635,642
% of Population:		45

LATVIA

1991 E:		2,680,500
% Urban: 71		

Daugavpils		129,000
Jelgava		74,500
Liepāja		114,900
Rīga (metro)		1,005,000
Rīga	(910,200)	
Jūrmala	(66,500)	
Ventspils		50,400

Total for above cities:		1,373,800
% of Population:		51

MACEDONIA

1987 E:		2,064,581
% Urban:		

Bitola (metro)		143,090
Bitola	(76,200)	
Skopje (metro)		547,214
Skopje	(444,900)	

Total for above cities:		690,304
% of Population:		33

POLAND

1991 E:		38,183,200
% Urban: 62		

Bełchatów		57,400
Biała Podlaska		53,100
Białystok		270,600
Bielsko-Biała		181,300
Bydgoszcz		381,500
Chełm		66,400
Częstochowa		258,000
Dzierżoniów (Reichenbach) (metro)		89,000
Dzierżoniów	(38,000)	

Elbląg (Elbing)		126,100
Ełk		52,400
Gdańsk (Danzig)(metro)		909,000
Gdańsk	(465,100)	
Gdynia	(251,500)	
Sopot	(46,700)	
Głogów		73,300
Gniezno		70,400
Gorzów Wielkopolski (Landsberg an der Warthe)		124,300
Grudziądz		102,300
Inowrocław		77,700
Jastrzębie-Zdrój		103,700
Jelenia Góra (Hirschberg)		93,400
Kalisz		106,200
Katowice (metro)		2,778,000
Katowice	(336,800)	
Będzin	(76,200)	
Bytom (Beuthen)	(231,200)	
Chorzów	(131,900)	
Dąbrowa Górnicza	(136,900)	
Gilwice (Gleiwitz)	(214,200)	
Jaworzno	(99,500)	
Mysłowice	(93,800)	
Piekary Śląskie	(68,500)	
Ruda Śląska	(171,000)	
Siemianowice Śląskie	(81,100)	
Sosnowiec	(259,400)	
Świętochłowice	(60,500)	
Tarnowskie Góry	(74,100)	
Tychy	(191,700)	
Zabrze (Hindenburg)	(205,000)	
Kędzierzyn Kozle		71,700
Kielce		214,200
Konin		80,300
Koszalin (Köslin)		108,700
Kraków (metro)		828,000
Kraków	(750,500)	
Krosno		49,700
Kutno		50,400
Legnica (Liegnitz)		105,200
Leszno		58,300
Łódź (metro)		1,061,000
Łódź	(848,200)	
Pabianice	(75,200)	
Zgierz	(59,000)	
Łomża		59,300
Lubin		82,300
Lublin (metro)		389,000
Lublin	(351,400)	
Mielec		61,800
Nowy Sącz		78,200

Olsztyn (Allenstein)		162,900
Opole (Oppein)		128,400
Ostrołęka		50,700
Ostrowiec Świętokrzyski		78,600
Ostrów Wielkopolski		73,300
Piła (Schneidemühl)		72,300
Piotrków Trybunalski		81,000
Płock		123,400
Poznań (metro)		672,000
Poznań	(590,100)	
Przemyśl		68,500
Puławy		85,700
Raciborz (Ratibor)		64,400
Radom		228,500
Radomsko		50,400
Rybnik		144,000
Rzeszów		153,000
Siedlce		72,000
Skarżysko-Kamienna		50,900
Słupski (Stolp)		101,200
Stalowa Wola		70,000
Starachowice		56,600
Stargard Szczeciński (Stargard in Pommern)		71,000
Starogard Gdański		49,500
Suwałki		61,300
Świdnica (Schweidnitz)		63,300
Świnoujście (Swinemünde)	43,300	
Szczecin (Stettin) (metro)		449,000
Szczecin	(413,400)	
Tarnów		121,200
Tczew		59,500
Tomaszów Mazowiecki		69,900
Toruń		202,300
Wałbrzych (Waldenburg) (metro)		207,000
Wałbrzych	(141,000)	
Warszawa (metro)		2,323,000
Warszawa	(1,655,700)	
Legionowo	(50,800)	
Pruszków	(53,700)	
Włocławek		122,200
Wodzisław Śląski		111,800
Wrocław (Breslau)		643,200
Zamość		61,800
Zawiercie		56,600
Zielona Góra (Grünberg)		114,100
Żory		67,000
Total for above cities:		16,613,300
% of Population:		44

ROMANIA

1989 E:		23,151,564
% Urban:53		
Alba Iulia		72,331
Alexandria		58,384
Arad		191,428
Bacău		193,269
Baia Mare		150,456
Bîrlad		75,843
Bistrița		79,544
Botoșani		119,563
Brăila		242,595
Brașov		352,640
București (Bucharest) (metro)		2,300,000
București	(2,036,894)	
Buzău		145,423
Călărași		76,240
Cluj-Napoca		317,914
Constanța		315,917
Craiova		300,030
Deva		77,336
Drobeta-Turnu Severin		107,420
Focșani		101,799
Galați		307,376
Gheorghe Gheorghiu-Dej		57,057
Giurgiu		72,275
Hunedoara		88,583
Iași		330,195
Lugoj		54,350
Mediaș		75,521
Miercurea-Ciuc		49,148
Oradea		225,416
Petroșani (metro)		76,000
Petroșani	(53,324)	
Piatra Neamț		115,782
Pitești		162,395
Ploiești (metro)		310,000
Ploiești	(247,502)	
Reșița		110,260
Râmnicu Vîcea		107,996
Roman		77,021
Satu Mare		136,881
Stîntu-Gheorghe		72,092
Sibiu		184,036
Slatina		86,360
Slobozia		50,995
Suceava		105,921
Timișoara		333,365

Tirgoviște		100,426
Tirgu Jiu		93,252
Tirgu-Mureș		164,781
Tulcea		94,935
Turda		64,374
Vaslui		73,666
Zalău		65,190
Total for above cities:		9,123,781
% Population:		39

SLOVENIA

1987 E:		1,936,606
% Urban:		
Ljubljana (metro)		316,607
Ljubljana	(233,200)	
Maribor (metro)		187,651
Maribor	(107,400)	
Total for above cities:		504,258
% Population:		26

NEWLY INDEPENDENT STATES

ARMENIA

1989 Census:		3,283,000
% Urban: 68		
Abovjan		53,000
Jerevan (metro)		1,315,000
Jerevan	(1,199,000)	
Ečmiadzin	(53,000)	
Kirovakan		169,000
Kumajri		120,000
Razdan		56,000
Total for above cities:		1,713,000
% Population:		52

AZERBAIJAN

1991 E:		7,136,000
% Urban: 54		

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Ali-Bajramly		61,500
Baku		2,020,000
Baku	(1,080,500)	
Sumgait	(236,200)	
Gjandža		282,200
Mingečaur		90,900
Nachičevan'		61,700
Šeki (Nucha)		63,200
Stepanakert		55,200
Total for above cities:		2,634,700
% Population:		37

BELARUS

1991 E:		10,260,400
% Urban: 66		
Baranoviči		166,700
Bobrujsk		223,000
Borisov		150,200
Brest		277,000
Gomel'		503,300
Grodno		284,800
Lida		95,000
Minsk (metro)		1,694,000
Minsk	(1,633,600)	
Mogil'ov		363,000
Molodečno		93,500
Mozyr'		103,000
Novopolock		96,600
Orša		125,300
Pinsk		123,800
Polock		78,700
Rečica		69,400
Sluck		60,100
Soligorsk		96,000
Vitebsk		361,500
Žlobin		60,800
Žodino		56,000
Total of above cities:		5,081,700
% of Population:		50

GEORGIA

1991 E:		5,464,200
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% Urban: 56

Batumi		137,500
Gori		70,100
Kutaisi		238,200
Poti		51,100
Suchumi		120,000
Tbilisi (metro)		1,460,000
Tbilisi	(1,279,000)	
Rustavi	(161,900)	
Zugdidi		50,600
Total of above cities:		2,127,500
% of Population:		39

KAZAKHSTAN

1991 E: 16,793,100
% Urban: 57

Akt'ubinsk		266,600
Alma-Ata (metro)		1,190,000
Alma-Ata	(1,156,200)	
Arkalyk		64,900
Balchaš		87,600
Celinograd		286,000
Čimkent		438,800
Džambul		312,300
Džetygara		48,900
Džezkazgan		111,100
Ekibastuz		138,900
Gurjev		156,700
Karaganda		608,600
Kentau		65,100
Kokčetav		143,300
Kustanaj		233,900
Kzyl-Orda		158,200
Leninogorsk		69,500
Pavlodar		342,500
Petropavlovsk		248,300
Rudnyj		128,800
Šachtinsk		65,300
Saptajev		61,400
Saran'		62,600
Ščučinsk		56,000
Semipalatinsk		344,700
Ševčenko		169,000
Taldy-Kurgan		136,100
Turkestan		81,200

Ural'sk	214,000
Ust'-Kamenogorsk	332,900
Žanatas	53,000
Zyr'anovsk	53,800
Total of above cities:	6,730,000
% of Population:	40

KYRGHYZSTAN

1991 E: 4,422,200
 % Urban: 38

Biškek	631,300
Džalal-Abad	79,900
Kara-Balta	55,000
Karakol (Prževal'sk)	64,300
Kyzyl-Kija	49,400
Oš	238,200
Tokmak	71,200

Total of above cities: 1,189,300
% of Population: 27

MOLDOVA

1991 E: 4,366,300
 % Urban: 47

Bel'c'	164,900
Bendery	141,500
Kišin'ov	676,700
Rybnica	62,900
Tiraspol'	186,000

Total of above cities: 1,232,000
% of Population: 28

RUSSIAN FEDERATION

1991 E: 148,542,700
 % Urban: 74

Abakan	157,300
Actubinsk	50,800
Ačinsk	122,000
Alapajevsk	50,300
Alatyr'	47,700

Aleksandrov		68,600
Aleksin		74,200
Al'metjevsk		132,700
Amursk		59,600
Anapa		55,900
Angarsk		268,500
Anžero-Sudžensk		107,000
Apatity		88,600
Archangel'sk		420,400
Armavir		162,200
Arsenjev		71,200
Art'om		70,100
Arzamas		111,800
Asbest		84,900
Astrachan'		511,900
Azov		80,700
Balakovo		201,300
Balašov		97,300
Barnaul (metro)		673,000
Barnaul	(606,800)	
Belaja Kalitva		48,500
Belebej		54,500
Belgorod		311,400
Belogorsk		74,300
Belorečensk		51,900
Beloreck		73,100
Belovo		92,900
Berezniki		199,700
Berezovskiy		48,300
Ber'ozovskij		51,900
Bijsk		234,600
Birobidžan		86,300
Blagoveščensk		211,000
Borisoglebsk		72,100
Boroviči		62,800
Br'ansk		458,900
Bratsk		259,400
Bud'onnovsk		57,500
Bugul'ma		91,100
Buguruslan		54,100
Buj		62,900
Bujnask		57,900
Buzuluk		85,100
Čajkovskij		88,300
Čapajevsk		96,000
Čebarkul'		50,700
Čeboksary		436,000
Čechov		60,200
Čel'abinsk (metro)		1,325,000
Čel'abinsk	(1,148,300)	
Čeremchovo		73,600

Čerepovec	315,900
Čerkessk	117,000
Černogorsk	79,700
Chabarovsk	613,300
Chasavjurt	72,800
Cholmsk	51,800
Čistopol'	66,600
Čita	376,300
Čusovoj	58,000
Derbent	81,500
Dimitrovgrad	127,000
Dmitrov	65,600
Doneck	48,900
Dubna	67,200
Elista	92,700
Gelendžik	48,600
Georgijevsk	63,700
Georgiu-Dež	54,600
Glazov	106,000
Gorno-Altajsk	47,500
Gr'azi	47,700
Groznyj	401,400
Gubkin	76,400
Gukovo	67,700
Gus'-Chrystal'nyj	77,000
Inta	60,900
Irbit	51,300
Irkutsk	640,500
Išim	65,900
Išimbaj	71,000
Iskitim	68,700
Ivanovo	482,200
iževsk	646,800
Jakutsk	193,300
Jarcevo	54,000
Jaroslavl'	638,100
Jefremov	56,600
Jegorjevsk	74,200
Jejsk	79,400
Jelabuga	60,500
Jelec	121,300
Jelizovo	48,700
Jermolajevo	65,600
Jessentuki	86,300
Joškar-Ola	247,800
Jurga	94,000
Južno-Sachalinsk	164,000
Kačkanar	48,900
Kaliningrad (Königsberg)	408,100
Kaluga	315,500
Kamensk-Šachtinskij	73,100

Kamensk-Ural'skij		208,700
Kamyšin		124,400
Kanaš		56,100
Kandalakša		54,300
Kansk		109,900
Kaspijsk		61,900
Kazan' (metro)		1,165,000
Kazan'	(1,107,300)	
Kemerovo		520,700
Kimry		62,000
Kinel'		33,800
Kinešma		104,900
Kiriši		53,100
Kirov		491,200
Kirovo-Čepeck		95,600
Kislovodsk		116,800
Kizel		36,600
Klin		95,100
Klincy		71,200
Kogalym		48,200
Kol'čugino		45,600
Kolomna		163,500
Komsomol' sk-na-Amure		318,800
Korkino		44,800
Korsakov		45,300
Kostroma		281,800
Kotlas		68,900
Kovrov		161,900
Krasnodar		631,200
Krasnojarsk		924,400
Krasnokamensk		57,800
Krasnokamsk		67,000
Krasnoturjinsk		67,200
Krasnoufimsk		46,100
Krasnoural'sk		34,800
Krasnyj Sulin		43,200
Kropotkin		76,600
Krymsk		51,100
Kujbyšev		51,600
Kungur		81,800
Kurgan		363,833
Kursk		433,300
Kušva		43,300
Kuzneck		100,000
Kyzyl		88,000
Labinsk		58,600
Leninogorsk, Tatarskaja A. S. S. R.		63,300
Leninsk-Kuzneckij		133,400
Lipeck		460,100
Livny		52,600
Lys'va		77,800

Machačkala		333,500
Magadan		154,900
Magnitogorsk		443,900
Majkop		152,500
Mcensk		49,200
Meleuz		55,200
Meždurečensk		107,500
Miass		169,700
Michajlovka		58,700
Mičurinsk		109,400
Mineral'nyje Vody		72,500
Minusinsk		74,200
Mončegorsk		68,100
Moršansk		50,500
Moskva (metro)		13,150,000
Moskva	(8,801,500)	
Balašicha	(137,600)	
Chimki	(135,500)	
Dolgoprudnyj	(71,100)	
Domodedovo	(56,300)	
Elektrostal	(153,000)	
Fr'azino	(54,000)	
Ivantejevka	(53,200)	
Kaliningrad	(161,500)	
Klimovsk	(57,600)	
Krasnogorsk	(91,700)	
Lobn'a	(61,000)	
L'ubercy	(164,900)	
Lytkarino	(51,700)	
Mytišči	(153,900)	
Naro-Fominsk	(58,800)	
Noginsk	(122,700)	
Odincovo	(128,400)	
Podol'sk	(208,500)	
Reutov	(68,900)	
Sčelkovo	(109,600)	
Solnečnogorsk	(56,700)	
Zelenograd	(162,700)	
Zeleznodoroznyj	(99,300)	
Murmansk		472,900
Murom		126,000
Nabereznyje Selny		510,100
Nachodka		164,500
Nadym		52,200
Nal'čik		240,600
Nazarovo		65,200
Neftejugansk		95,500
Ner'ungri		77,200
Nevinnomyssk		123,300
Nikolo-Berjozovka		110,500
Nižnekamsk		196,200

Nižneartovsk		247,400
Nižnij Novgorod (Gorky) (metro)		2,025,000
Nižnij Novgorod	(1,445,000)	
Bor	(64,500)	
Dzeržinsk	(286,700)	
Kstovo	(65,300)	
Nižnij Tagil		439,200
Njagan		59,800
Nojabr'sk		88,900
Noril'sk		169,000
Novgorod		233,800
Novočeboксarsk		119,300
Novočerkassk		188,500
Novodvinsk		50,300
Novokuzneck		601,900
Novomoskovsk, Tula oblast (metro)		365,000
Novomoskovsk	(145,800)	
Uzlovaja	(64,000)	
Novorossijsk		188,600
Novošachtinsk		107,300
Novosibirsk (metro)		1,600,000
Novosibirsk	(1,446,300)	
Berdsk	(80,400)	
Novotroick		107,600
Novyj Urengoj		93,600
Obninsk		103,700
Okt'abr'skij		106,700
Omsk (metro)		1,190,000
Omsk	(1,166,800)	
Orechovo-Zujevo (metro)		205,000
Orechovo-Zujevo	(136,800)	
Orenburg		556,500
Or'ol		345,200
Orsk		272,200
Osinniki		63,200
Otradnyj		49,600
Partizansk		50,000
P'atigorsk		131,100
Pavlovo		72,200
Pavlovskij Posad		70,800
Pečora		65,500
Penza		551,100
Perm'		1,180,000
Perm'	(1,110,400)	
Pervoural'sk		143,700
Petropavlovsk-Kamčatskij		272,900
Petrozavodsk		277,400
Polevskoj		71,900
Prochladnyj		58,500
Prokopjevsk (metro)		410,000
Prokopjevsk	(272,600)	

Kisel'ovsk	(126,900)	
Pskov		207,500
Puškino		75,800
Ramenskoje		88,800
Rasskazovo		49,800
R'azan'		527,200
Revda		66,000
Roslavl'		60,700
Rossoš		58,900
Rostov-na-Donu (metro)		1,165,000
Rostov-na-Donu	(1,027,600)	
Batajsk	(93,300)	
Rubcovsk		172,500
Ruzajevka		52,100
Rybinsk		252,600
Rzev		70,900
Sachty		227,700
Sadrinsk		87,500
Safonovo		56,300
Salavat		151,400
Sal'sk		61,700
Samara (metro)		1,505,000
Samara	(1,257,300)	
Novokujbyševsk	(113,200)	
Sankt-Peterburg (metro)		5,525,000
Sankt-Peterburg	(4,466,800)	
Gatčina	(80,600)	
Kolpino	(144,500)	
Petrodvorec	(83,800)	
Puškin	(95,300)	
Saransk		319,600
Sarapul		110,600
Saratov (metro)		1,155,000
Saratov	(911,100)	
Engel's	(183,600)	
Satka		51,100
Sčokino		68,800
Sergijev Posad (Zagorsk)		115,600
Serov		103,800
Serpuchov		141,200
Severodvinsk		251,500
Severomorsk		66,200
Slav'ansk-Na-Kubani		58,500
Smolensk		349,800
Soči		341,500
Sokol		46,700
Solikamsk		110,200
Sisnovyj Bor		56,700
Spassk-Dal'nij		61,100
Staryj Oskol		181,900
Stavropol'		328,300

Sterlitamak		252,200
Stupino		74,600
Suja		69,000
Surgut		261,100
Sverdlovsk (metro)		1,620,000
Sverdlovsk	(1,375,400)	
Verchn'aja Pyšma	(53,500)	
Svetlogorsk		71,600
Svobodnyj		80,900
Syktyvkar		224,000
Syzran'		174,900
Taganrog		293,600
Talnach		65,600
Tambov		309,600
Temirtau		213,100
Tichoreck		67,600
Tichvin		71,800
Tobol'sk		96,800
Toljatti		654,700
Tomsk		505,600
Toržok		50,500
Troick		89,800
Tuapse		63,800
Tujmazy		59,800
Tula (metro)		640,000
Tula	(543,600)	
Tulun		53,700
T'umen'		494,200
Tver'		455,300
Tyndinskij		64,700
Uchta		112,100
Ufa (metro)		1,118,000
Ufa	(1,097,000)	
Uglič		40,000
Ulan-Ude		362,400
Uljanovsk		648,300
Usolje-Sibirskoje		106,800
Ussurijsk		160,200
Ust'-Ilimsk		112,200
Ust'-Kut		61,800
V'za'ma		59,900
Velikije Luki		115,400
Verchn'aja Salda		55,100
Vičuga		49,700
Vidnoje		56,900
Vladikavkaz		306,000
Vladimir		355,600
Vladivostok		648,000
Volchov		50,100
Voigodonsk		180,700
Voigograd (metro)		1,360,000

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Volgograd	(1,007,300)	
Volžskij	(278,400)	
Vologda		289,200
Vol'sk		65,500
Volžsk		62,000
Vorkuta		117,400
Voronež		900,000
Voskresensk		81,400
Votkinsk		104,500
Vyborg		81,100
Vyksa		62,200
Vyšnij Voločok		64,600
Zeleznogorsk		89,200
Zel'onodol'sk		97,000
Zigulevsk		45,000
Zima		39,400
Zlatoust		208,200
Zukovskij		101,300
Total for above cities:		85,529,333
% of Population:		58

TAJKISTAN

1991 E:		5,358,300
% Urban: 32		
Chudzand (Leninabad)		164,500
Dušanbe		582,400
Kul'ab		79,300
Kurgan-T'ube		58,400
Total for above cities:		884,600
% of Population:		17

TURKMENISTAN

1991 Census:		3,714,100
% Urban:		
Ašchabad		412,200
Čardžou		166,400
Mary		94,900
Nebit-Dag		59,500
Nebit-Dag		89,100
Tašauz		117,000

Total for above cities:	939,100
% of Population:	25

UKRAINE

1991 Census:	51,944,400
% Urban: 67	

Achtyrka		52,300
Aleksandrija		104,900
Art'omovsk		90,800
Belaja Cerkov'		204,400
Belgorod-Dnestrovskij		56,800
Berd'ansk		138,700
Berdičev		93,400
Cerkassy		302,200
Cernigov		305,700
Cernovcy		258,800
Červonograd		74,000
Char'kov (metro)		2,050,000
Char'kov	(1,622,800)	
Cherson		365,400
Chmel'nickij		244,500
Dnepropetrovsk (metro)		1,600,000
Dnepropetrovsk	(1,189,300)	
Dneprodzeržinsk	(284,400)	
Doneck (metro)		2,125,000
Doneck	(1,121,300)	
Charcyzsk	(69,300)	
Makejevka	(423,900)	
Drogobyč		79,200
Džankoj		54,500
Energodar		51,500
Fastov		54,400
Feodosija		85,600
Gorlovka (metro)		700,000
Gorlovka	(336,600)	
Dzeržinsk	(50,500)	
Jenakijevo	(120,100)	
Ivano-Frankovsk		241,000
Izmail		95,100
Iz'um		64,800
Jalta		89,300
Jevpatorija		110,500
Kaluš		69,400
Kamenec-Podol'skij		104,900
Kerč		178,300
Kijev (metro)		3,250,000
Kijev	(2,635,000)	
Borispol'	(52,700)	

Brovary	(84,800)	
Kirovograd		277,900
Kolomyja		66,200
Komsomol'sk		56,000
Konotop		97,700
Konstantinovka		107,800
Korosten'		67,500
Kovel'		69,700
Kramatorsk (metro)		515,000
Kramatorsk	(201,300)	
Druzkovka	(74,400)	
Slav'ansk	(137,100)	
Krasnoarmejsk (metro)		180,000
Krasnoarmejsk	(73,300)	
Dimitrov	(65,500)	
Krasnodon (metro)		165,000
Krasnodon	(54,800)	
Krasnyj Luč (metro)		320,000
Krasnyj Luc	(113,400)	
Antracit	(72,800)	
Kremenčug		240,600
Krivoj Rog		724,000
Lisičansk (metro)		415,000
Lisičansk	(126,400)	
Rubežnoje	(75,100)	
Severodoneck	(133,300)	
Lozovaja		74,100
Lubny		60,300
Luck		209,500
Lugansk (Vorošilovgrad) (metro)		650,000
Lugansk	(503,900)	
L'vov		802,200
Marganec		54,700
Mariupol' (Ždanor)		521,800
Melitopol		176,900
Mukačevo		88,000
Nežin		82,000
Nikolajev		511,600
Nikopol'		159,000
Novaja Kachovka		59,000
Novograd-Volynskij		56,100
Novomoskovsk, Dnepropetrovsk oblast	76,600	
Novovolynsk		56,400
Odessa (metro)		1,185,000
Odessa	(1,100,700)	
Ljičovsk	(56,000)	
Pavlograd		134,300
Pervomajsk		83,800
Poltava		320,100
Priluki		72,900
Romny		57,700

Roven'ki		58,500
Rovno		239,300
Sepetovka		51,900
Sevastopol'		366,200
Simferopol'		352,600
Smela		81,200
Sostka		95,200
Stachanov (metro)		700,000
Stachanov	(112,700)	
Br'anka	(64,500)	
Kommunarsk	(126,000)	
Pervomajsk	(52,000)	
Stryj		68,200
Sumy		303,300
Sverdlovsk, Vorosilovgrad oblast (metro)	45,000	
Sverdlovsk	(83,700)	
Svetlovodsk		57,900
Ternopol'		219,200
Torez (metro)		320,000
Torez	(88,100)	
Sacht'orsk	(73,100)	
Snežnoje	(68,900)	
Uman'		97,700
Užgorod		122,600
Vinnica		380,900
Zaporožje		896,600
Žitomir		297,500
Žoltyje Vody		64,900
Total for above cities:		27,008,500
% of Population:		52

UZBEKISTAN

1991 E:		20,708,200
% Urban: 41		
Almalyk		116,400
Andižan		298,300
Angren		132,600
Bekabad		82,800
Buchara		249,600
Chodžejli		61,200
Čust		48,700
Denau		49,300
Džizak		110,900
Fergana		226,500
Gulistan		56,900
Jangijul'		56,900
Kagan		49,800

Karši		168,000
Kattakurgan		59,600
Kokand		175,000
Margilan		124,900
Namangan		319,200
Navoi		111,600
Nukus		179,600
Šachrisabz		53,200
Samarkand		370,500
Taskent (metro)		2,325,000
Taskent	(2,113,300)	
Cirčik	(158,400)	
Termez		90,400
Urgenč		130,400
Total for above cities:		5,647,300
% of Population:		27

MONGOLIA

1989 E:		2,040,000
% Urban:		
Darchan		69,800
Ulaanbaatar		548,400
Total for above cities:		618,200
% of Population		30

APPENDIX B

Country Profiles and Needs Assessment

**Newly Independent States
Baltic Countries**

ENVIRONMENTAL INFRASTRUCTURE NEEDS
ASSESSMENT

COUNTRY OVERVIEWS
WATER PROFILES
EVALUATIVE MATRICES
AND
ILLUSTRATIVE PROJECTS

FOR THE COUNTRIES OF THE FORMER SOVIET UNION

OCTOBER 1993

PREPARED BY FYI INFORMATION RESOURCES, WASHINGTON, DC,
IN COOPERATION WITH CAMP DRESSER & McKEE

FOR THE CAPITAL CONSTRUCTION OFFICE
OF THE AGENCY FOR INTERNATIONAL DEVELOPMENT

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Country Profile: Armenia

DEMOGRAPHICS¹

Population²: 3,504,000

Urban: 68.2%

Rural: 31.8%

Population density: 113.3 per km²

Average family size: 4.7

Birth rate (per 1,000): 24

Death rate (per 1,000): 6.6

Infant mortality (per 1,000)³: 18.6

Life expectancy: 69.6 years

Ethnicity⁴: Armenian 93.3%; Azeri 2.6%; Russian 1.6%; Ukranian 0.3%

Largest cities⁵: Yerevan (capital) 1,168,000; Gyumri (formerly Leninakan) 228,000

Territorial-administrative divisions⁶: 37 districts, 27 cities

ECONOMY⁷

Gross national product: \$7.5 billion

GNP per capita⁸: \$2,150

Gross domestic product:

Change in GDP⁹: declined by 12% in 1991, perhaps by as much as 50% in 1992

Foreign investment: limited

National revenue shares: industry 54.5%; agriculture 18.5%

Employment¹⁰: 1,283,000 non-agricultural workers

Completed higher education¹¹: 13.8%

Roads¹²: 7,400 km paved; 300 km unpaved

Major sectors: hydroelectric power, electric motors, machine tools and metalworking, chemicals
and petrochemicals, light metallurgy

Secondary sectors: processed foods, building-materials manufacture, shoes and clothing

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Major industrial enterprises:

Major crops: fruits, grapes

Secondary crops: grains

State/collective farms: 80% of farmland privatized in 1991¹³

Largest farms:

GEOGRAPHY & NATURAL RESOURCES¹⁴

Size: 29,800 km²

Borders: Georgia, Azerbaijan, Turkey, Iran

Coastline: none

Land use: 1.3 million hectares of arable land, of which 450,000 hectares are sown

Oblasts: none

Precipitation: 200-400 mm/year

Temperature: high: 24-26; low: -5 degrees celcius

Flora/fauna: deciduous mountain forests, Alpine meadows

Minerals¹⁵: copper, precious metals, bauxite, lead, zinc, others

ENVIRONMENT & HEALTH¹⁶

Urban pollution index¹⁷: Yerevan (chloroprene, nitrogen dioxide, ozone)

Accidental releases: Nairit Industrial Complex experienced a major leakage in April 1990

Areas of major contamination: Lake Sevan, source of hydroelectric power, water level fell 50 feet between 1940 and 1978; scarce water resources contaminated by agricultural runoff and industrial emissions

Disease outbreaks:

1. Unless otherwise indicated, information in this section is from Goskomstat SSSR, *Narodnoe khoziaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94.
2. National Geographic Society, *Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Central Intelligence Agency, *Comparative Soviet Nationalities by Republic* (map), 9-89, and FYI archives.
5. Glavnoe upravlenoe geodezii i kartografii, *Atlas SSSR* (Moscow, 1989), 112.
6. Glavnoe upravlenoe, 112.
7. Unless otherwise indicated, information in this section is from *Bol'shoi entsiklopedicheskiy slovar* (Moscow, 1991), 74-75.
8. National Geographic Society, *Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
9. Materials from proprietary FYI Information Resources archives.
10. Goskomstat SSSR, *Narodnoe khoziaistvo SSSR v 1990 godu* (Moscow, 1991), 102. This figure represents "rabochie" and "sluzhashchiye," which are categories roughly equivalent to "blue collar" and "white collar" workers. Figures for agricultural employment are from FYI archives.
11. Goskomstat, 210.
12. This information is based on Soviet statistics and may not accurately reflect the percentage of paved roads.
13. *The Washington Post*, 10/4/91.
14. Unless otherwise indicated, information in this section is from *Bol'shoi entsiklopedicheskiy slovar* (Moscow, 1991), 74-75.
15. Materials from proprietary FYI Information Resources archives.
16. Unless otherwise indicated, information in this section is based on proprietary materials from FYI Information Resources archives.
17. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.

Water Overview: Armenia

NATURAL RESOURCES

Rivers: Araks, headwaters—Turkey

Tributaries: Akhuryan, Arla, Vorotan

Lakes: Sevan

Soils: mountain meadow and steppe soil¹

Critical water contamination sites: the Araks, Arla, and Vorotan rivers have been targeted among the most critically polluted in the former Soviet Union²

WATER USAGE

Industrial³: 520 million m³/year

Agricultural⁴: 2,434 million m³/year

Domestic⁵: 591 million m³/year

Total wastewater⁶: 554 million m³/year

Treated: 309 million m³/year (to normative standards), 4 million m³/year (insufficiently)

Total intake: 4,147 million m³/year

Treated: field research required

Sources⁷:

Wells: 1,633 million m³/year

Surface water: 2,514 million m³/year

Network: most of Armenia's drinking water is drawn from wells which are fed by underground streams formed by seepage from Lake Sevan

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Common problems: lack of financial resources, lack of technology, lack of treatment systems in general

Source water: rivers

Common contaminants: pesticides, fertilizers

Common treatment methods: experimental biological treatment; field research required

OPERATING ENVIRONMENT

Financing: in 1991, each factory had to fund its own environmental efforts;⁸ sums accumulated from the collection of fines are distributed between rayon and council budgets, ministry's environmental protection fund, and state budget. Enterprises which have environmental protection programs are granted loans or allocations from this fund.⁹

Taxation: field research required

Liability: field research required

Personnel: field research required

Monitoring/testing: initiated by water distribution and sewage systems, Armenian Industrial Building Materials Association, and housing and public utilities and services authorities¹⁰

Metering: field research required

Fees/fines: through the resolution passed by the government in April 1992, "On Establishing Fees for the Exploitation of Natural Resources and Environmental Pollution," a fine system was established through which the polluter can receive back 75 percent of the fine paid if the money is invested in ecological improvement.¹¹

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. B.I. Kochurov, N.I. Koronkevich, A.V. Antipova, T.B. Kenisova, N.A. Zherebtsova, O.Yu. Bykova, *Karta Naiboleye Ostrykh Ekologicheskikh Situatsiy* (Institut Geografii AN SSSR).
3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
6. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
7. Gosudarstvennyy Komitet SSSR po Statistike, 69.
8. FYI Information Resources Research Archives (November 1991).
9. "Government Considers Natural Resource Use, Pollution Fees," *JPRS Report: Environmental Issues* (30 December 1992), 63.
10. *JPRS Report: Environmental Issues* (30 December 1992), 63.
11. *JPRS Report: Environmental Issues* (30 December 1992), 63.



Country Profile: Azerbaijan

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 7,146,000

Urban: 53.5

Rural: 46.5

Population density: 82.4 per km²

Average family size: 4.8

Birth rate (per 1,000): 26.4

Death rate (per 1,000): 6.2

Infant mortality (per 1,000)³: 23.0

Life expectancy: 71.0 years

Ethnicity: 82.5% Azeri, other groups include: Armenian, Russian, Talysh, Kurd, Udi

Largest cities⁴: Baku (capital) 1,713,000, Ganca 270,000, Sumquayit 234,000, Ali Bayramli 51,000, Naxcivan 51,000

Territorial-administrative divisions: Naxcivan Republic; Nagorno-Karabakh Autonomous Region; 61 districts; 65 urban areas

ECONOMY⁵

Gross national product: \$12 billion

GNP (per capita)⁶: \$1,670

Gross domestic product:

Change in GDP:

Foreign investment:

National revenue shares: 42.1% industry, 30.2% agriculture

Employment⁷: industrial 1,357,000, administrative/service 696,000

Completed higher education⁸: 10.5%

Roads⁹: 24,000 km. of paved roads, 1,300 km. unpaved

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Major sectors: oil and gas production, chemicals and petrochemicals

Secondary sectors: machine building (especially for energy industry), metallurgy, food processing

Major industrial enterprises:

Major crops: grains

Secondary crops: cotton, grapes

State farms:

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹⁰

Size: 86,600 km²

Borders: Georgia, Armenia, Iran, Russian Federation

Coastline: Caspian Sea

Land use¹¹: 1,465,000 hectares sown

Oblasts: none

Precipitation: 200 mm/yr (foothills), 1,200-1,700 mm/yr (lowlands)

Temperature: high 25-27 (lowlands), 5 (mountains); low 3 degrees celcius (lowlands), -10 (mountains)

Flora/fauna: 50% of territory is mountainous

Minerals: oil, gas

ENVIRONMENT AND HEALTH

Urban pollution index¹²: Baku (petrochemical- and oil production-related wastes)

Accidental releases:

Areas of major contamination¹³: Caspian Sea severely contaminated from oil industry, industrial air pollution, pesticide overuse damaged soil

Disease outbreaks:

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. For all cities except the capital, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 90.
5. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 23.
6. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
7. Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye." Russian terms roughly equivalent to "blue collar" and "white collar."
8. Goskomstat, 210.
9. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
10. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 23.
11. Reliable figures for total arable land not available.
12. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
13. ISAR, *Surviving Together* (Summer 1993), 15.

Water Overview: Azerbaijan

NATURAL RESOURCES

Rivers: Kura, headwaters—Turkey

Tributaries: Araks

Lakes (name/size): Sarysu

Soils: mountain meadow and steppe soil¹

Critical water contamination sites: Sumgait suffers from high levels of petroleum products, phenols, acids, heavy metals, and mercury²; the Araks suffers from toxic wastes dumped into it in Armenia; in the Okhchuchay, the concentration of heavy metals exceeds the maximum permissible concentration by 100 times or more³

WATER USAGE

Industrial⁴: 3,023 million m³/year

Agricultural⁵: 8,726 million m³/year

Domestic⁶: 640 million m³/year

Total wastewater⁷: 597 million m³/year

Treated: 306 million m³/year (to normative standards), 71 million m³/year (insufficiently)

Total intake (from natural sources)⁸: 14,902 million m³/year

Treated: field research required

Sources⁹:

Wells: 1,456 million m³/year

Surface water: 13,446 million m³/year

Network: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: field research required

Source water: rivers

Common contaminants: pesticides, fertilizers, products of oil industry, leaching of chemicals into groundwater due to rising water level of the Caspian Sea

Common treatment methods: field research required

OPERATING ENVIRONMENT

Financing: government is having difficulty financing ecological programs, is seeking international cooperation¹⁰

Taxation: field research required

Liability: no ecological norms or restrictions on hazardous production operations¹¹

Personnel: field research required

Monitoring/testing: ecological testing has been initiated by the Azerbaijan Green Movement¹²;

Azeri Academy of Sciences; other government agencies

Metering: system of fee-paying use of natural resources has not yet been developed¹³

Fees/fines: field research required

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. Arif Useynov, "Chernobyl on the Caspian," *Rossiyskaya Gazeta* (8 April 1993), 7.
3. "Azerbaijan Produces New 'Conceptual Document' on Environment," *JPRS Report: Environmental Issues* (3 September 1992), 74.
4. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnykh Resursov v SSSR* (Moscow: 1989), 72.
5. Gosudarstvennyy Komitet SSSR po Statistike, 75.
6. Gosudarstvennyy Komitet SSSR po Statistike, 74.
7. Gosudarstvennyy Komitet SSSR po Ochrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
8. Gosudarstvennyy Komitet SSSR po Statistike, 70.
9. Gosudarstvennyy Komitet SSSR po Statistike, 69.
10. "Azerbaijan Produces New 'Conceptual Document' on Environment," *JPRS Report: Environmental Issues* (3 September 1992), 74.
11. *JPRS Report: Environmental Issues* (3 September 1992), 74.
12. Mary Carpenter and Lynn Richards, "The Azerbaijan Green Movement: A Snapshot," *Surviving Together* (Summer 1993), 15.
13. *JPRS Report: Environmental Issues* (3 September 1992), 75.

Country Profile: Belarus

DEMOGRAPHICS¹

Population: 10,260,000

Urban: 67.1%

Rural: 32.9%

Population density: 49.4 per km²

Average family size: 3.2

Birth rate (per 1,000): 12.7

Death rate (per 1,000): 10.7

Infant mortality (per 1,000): 11.9

Life expectancy: 71.3 years

Ethnicity²: Belarusian 77.9%; Russian 13.2%; Polish 4.1%; Ukrainian 2.9%

Largest cities: Minsk (capital) 1,658,000³; Homel 488,000; Mahilow 359,000; Vytebsk 347,000;
Hrodna 263,000; Brest 238,000⁴

Territorial-administrative divisions: six oblasts, of which Minsk (including the City of Minsk) has
a population of 3,266,000; Brest, Vytebsk, Homel, Hrodna and Mahilow oblasts each have a
population between 1.1 and 1.7 million

ECONOMY⁵

Gross National Product: \$32 billion

GNP per capita⁶: \$3,110

Gross domestic product: 71.88 billion, 1991 rubles

GDP⁷: dropped by 15% in 1992

Foreign investment⁸: more than 650 joint ventures

National revenue shares: industry 49%; agriculture 27.9%

Employment: agricultural⁹ 985,000, industrial¹⁰ 2,889,000, administrative/service 1,347,000

Completed higher education: 10.8%

Roads¹¹: 43,900 km of paved roads; 3,700 km unpaved.

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Major sectors¹²: agricultural machinery, electronics, chemicals, agriculture

Secondary sectors: textiles, timber

Major plants:

Major crops: potatoes, grain, sugar beets

Secondary crops: flax, fruit

State/collective farms:

Largest farms:

GEOGRAPHY AND NATURAL RESOURCES¹³

Size: 207,600 km²

Borders: Russia, Ukraine, Latvia, Lithuania, Poland

Coastline: none

Land use: 9,500,000 hectares of arable land, of which 6,208,000 are sown; 3,137,300 hectares of marsh or swamp land have been drained

Oblasts¹⁴: Minsk (city and oblast) 40,800 km²; Homel 40,400; Vytebsk 40,100; Brest 32,300; Mahilow 29,000; Hrodna 25,000

Precipitation: 500-700 mm/year

Temperature: high 17-19 degrees celcius; low -4 to -8 degrees celcius

Flora/fauna:

Minerals: deposits of potassium, rock salts, oil, peat

ENVIRONMENT AND HEALTH

Urban pollution index¹⁵: Mahilow (carbon bisulphide, nitrogen dioxide, hydrogen sulphide, phenol)

Accidental releases¹⁶: Belarus was hardest hit of all Soviet republics by the Chernobyl accident; at least 60% of land contaminated by the 1986 accident is in Belarus

Areas of major contamination: Homel and Mahilow Oblasts

Disease outbreaks:

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. Kathleen Mihalisko, "The Outlook for Independent Belarus," *RFE/RL Research Report*, 1 (24), 1993, 9.
3. Mihalisko, 9.
4. Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 90.
5. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 122-123.
6. National Geographic Society, *Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
7. Materials from proprietary FYI Information Resources archives.
8. *The Republic of Belarus Business Report*, March/April 1993, 3.
9. Belarus State Committee on Statistics cited in IMF, *Economic Review: Belarus* (April 1992), 62.
10. Goskomstat, 102. These figures represents "rabochiye" and "sluzhashchiye," terms roughly equivalent to "blue collar" and "white collar."
11. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
12. Mihalisko, 9; and materials from proprietary FYI Information Resources archives.
13. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 122-123.
14. Goskomstat, 71.
15. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
16. David Marples, "The Legacy of the Chernobyl Disaster in Belarus," *RFE/RL Research Report*, 2 (5), 1993, 46.

Water Overview: Belarus

NATURAL RESOURCES

Rivers: Zapadnaya Dvina, headwaters—north of Andreapol', Russia; Dnepr, headwaters—north of Safonovo, Russia; Sozh, headwaters—Smolensk, Russia; Viliya, headwaters—northwest of Minsk; Neman, headwaters—Uzda; Pripyat', headwaters—west of Kovel', Ukraine

Tributaries: Berezina (to Dnepr)

Lakes: Chervoknoye, Sporovskoye, Chernoye, Bobrovichskoye, Naroch', Boginskoye, Drivyaty, Snuby, Sho, Osveyskoye, Neshchepoye, Lukomskoye, Selyava

Soils: podzol, which coincides with forest zones of the Soviet region, is characterized by leaching (precipitation exceeds evaporation), and a highly acidic surface layer¹

Critical water contamination sites: Gomel' (50-100+ maximum permissible concentrations lead, zinc), Minsk (100+ MPC oil products), Soligorsk (25-100 MPC chlorides, 30-60 MPC overall growth of mineral content, 20-80 MPC oil products)²

WATER USAGE

Industrial³: 1,681 million m³/year

Agricultural⁴: 388 million m³/year

Domestic⁵: 651 million m³/year

Total wastewater⁶: 994 million m³/year

Treated: 929 million m³/year (to normative standards), 65 million m³/year (insufficiently)

Total intake⁷: 2,779 million m³/year

Treated: field research required

Sources⁸:

Wells: 1,149 million m³/year

Surface water: 1,630 million m³/year

Network: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: lack of reprocessing centers, lack of technology, deterioration of existing equipment

Source water: rivers, reservoirs

Common contaminants: pesticides, industrial spills, fertilizers

Common treatment methods: field research required

OPERATING ENVIRONMENT

Financing: field research required

Taxation: field research required

Liability: no law on industrial waste has yet been ratified

Personnel: field research required

Monitoring/testing: field research required

Metering: field research required

Fees/fines: interregional ecological prosecutor's offices try pollution cases

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1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
 2. *The Institute of Geography Water Report*, FYI Information Resources Research Archives.
 3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruchayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnykh Resursov v SSSR* (Moscow: 1989), 72.
 4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
 5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
 6. Gosudarstvennyy Komitet SSSR po Ochrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
 7. Gosudarstvennyy Komitet SSSR po Statistike, 70.
 8. Gosudarstvennyy Komitet SSSR po Statistike, 69.

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Country Profile: Estonia

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 1,581,000

Urban: 71.5

Rural: 28.5

Population density: 35.1 per km²

Average family size: 3.1

Birth rate (per 1,000): 14.1

Death rate (per 1,000): 12.3

Infant mortality (per 1,000)³: 12.3

Life expectancy: 70.0 YEARS

Ethnicity⁴: 63% Estonian, 30.3% Russian, 3.1% Ukrainian, 1.8% Belorussian, 1.1% Finn

Largest cities⁵: Tallinn (capital) 502,000, Tartu 113,000, Narva 81,000, Parnu 53,000

Territorial-administrative divisions: 15 districts, 33 urban areas

ECONOMY⁶

Gross national product: \$6 billion

GNP (per capita)⁷: \$3,830

Gross domestic product:

Change in GDP⁸: fell by 4% in 1990, 11% in 1991

Foreign investment⁹: mainly Finnish and Swedish

National revenue shares: 44.2% industry, 24.0% agriculture, 11.4% construction,¹⁰

6.0% transport and communications

Employment¹¹: agriculture and forestry 109,000,¹² industrial 420,000, administrative/service

206,000

Completed higher education¹³: 11.7%

Roads¹⁴: 14,800 km. of paved roads

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Major sectors: food processing, wood and paper products, textiles and other consumer goods, agriculture, machinery, forestry

Secondary sectors: chemicals, construction materials, mining

Major industrial enterprises¹⁵: Tallinn Plywood and Furniture, Marat (textiles), Elektrotehnika (semiconductor devices, electronics), Electrotechnical Factory im. Kh. Pegel'man (electronics, hearing aids)

Major crops: potatoes

Secondary crops: vegetables, grains

State farms¹⁶: 335

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹⁷

Size: 45,100 km²

Borders: Russian Federation, Latvia

Coastline: Baltic Sea (including Gulf of Finland)

Land use: 1,400,000 hectares of arable land, of which 930,000 are sown

Oblasts: none

Precipitation: up to 700 mm/yr

Temperature: high 17, low -6 degrees celcius

Flora/fauna: 40% of territory forested; 66% of forests are coniferous, including old growth forest habitats which are protected but threatened by illegal logging¹⁸; boglands, lake regions

Minerals: Oil shale, limestone

ENVIRONMENT AND HEALTH

Urban pollution index¹⁹: no Estonian cities listed

Accidental releases: Estonian oil tanker ran aground and lost 17,600 gallons of oil and deisel fuel in the Gulf of Finland in early 1993²⁰

Areas of major contamination: poor storage of toxic chemicals, fertilizers, and manure have contaminated soil and water in agricultural areas such as Laane, Jarva, Parnu, Rapla; bodies of water also polluted by industrial wastes, especially pulp and paper producers²¹

Disease outbreaks:

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Riina Kionka, "Migration to and from Estonia," *Report on the USSR*, 9/14/90, 20; also Philip Hanson, "Estonia's Narva Problem, Narva's Estonian Problem," *RFE/RL Research Report*, 4/30/93, 17; and *The Economist*, 7/18/92, 50.
5. For all cities except the capital, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 82.
6. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 706-707.
7. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. International Monetary Fund, *Economic Review: Estonia* (April 1992), 5.
9. *Journal of Commerce*, 8/25/92.
10. Department of State, *Country Reports on Economic Policy and Trade Practices* (Washington, 1992), 250.
11. Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye," Russian terms roughly equivalent to "blue collar" and "white collar."
12. Central Intelligence Agency, *Estonia: An Economic Profile* (July 1992), 5.
13. Goskomstat, 210.
14. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
15. Materials from proprietary FYI Information Resources archives.
16. Central Intelligence Agency, 12.
17. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 706-707.
18. ISAR, *Surviving Together* (Summer 1993).
19. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy доклад: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
20. *Washington Post*, 1/20/93.
21. *Rahva Haal*, 12/14/90, 2, cited in JPRS-TEN-91-016, 86.



Water Overview: Estonia

NATURAL RESOURCES

Rivers¹: Narva, headwaters—Chubskoye ozero; Yagala, headwaters—Yarva Yani; Kazari, headwaters—Gootsi; Parnu, headwaters—north of Koigu; Pirita, headwaters—east of Koze; Keila, headwaters—east of Yuuru

Lakes: more than 1,150 lakes and bodies of water—Peipsi, Vyrts"yarv, Rouge Suurjarv

Soils: podzol, which coincides with forest zones of the Soviet region, is characterized by leaching (precipitation exceeds evaporation), and a highly acidic surface layer²

Critical water contamination sites: greatest pollution sources of municipal and industrial waste water—Tallinn and Kohtla-Jarve; cities incapable of treating full wastewater capacity—Narva (biological purification plant with a capacity of 60,000 m³/day cannot handle current flow of 100,000 m³/day), Sillamae (nitrogen and phosphorus presence has been targeted in the drinking water supply), Kohtla-Jarve (38,000 m³/day of incompletely purified waste water is discharged into the Baltic Sea; 7,000 m³/day is discharged without any purification attempt), Rakvere (8,000 m³/day of sewage is discharged into the river Selja without purification), Haapsalu (4.6 m³/day incompletely purified water is discharged into the Haapsalu Gulf), and Kuressaare (no purification attempts)³

WATER USAGE

Industrial⁴: 2,707 million m³/year

Agricultural⁵: 45 million m³/year

Domestic⁶: 129 million m³/year

Total wastewater⁷: 517 million m³/year

Treated: 271 million m³/year (to normative standards), 192 million m³/year (insufficiently)

Total intake from natural source⁸: 2,974 million m³/day⁹

Treated: field research required

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Sources¹⁰:

Wells: 165 million m³/year

Surface water: 2.809 million m³/year

Network: Tallinn—680 km sewage network (tunnel and branch sewers), 27 main pumping and biochemical purification stations, 2.8 km pipe which disposes waste water into Tallinn bay.

Water supply consists of a number of canals which connect surrounding reservoirs and lakes to city system. Additionally, 60,000 m³/day is provided through wells.¹¹

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: deterioration of equipment, lack of funds for renovation, lack of biological treatment equipment, lack of technology and technological know-how

Source water: rivers, reservoirs

Common contaminants: products of oil-shale industry, paper and pulp industry

Common treatment methods: sewage—mechanical, mechanical-chemical (370,000 m³/day)¹²;
purification—filtration, chlorination, coagulation¹³

OPERATING ENVIRONMENT

Financing: the Finnish and Estonian ministries of environment have agreed to coordinate efforts to refurbish and enlarge water purification plants on the Gulf of Finland and to construct water purification chemicals factories in Tallinn and Kohtla-Jarve. Finnish sub-contractors will be providing assistance during the project.¹⁴ The cost for Estonia to implement the 20-year Helsinki plan for the clean-up of the Baltic Sea as estimated by the Environmental Protection Minister is 1.55 billion ECU [European currency units]. Most of the cost will be incurred from the reconstruction of electric power stations in Narva, Kohtla-Jarve, Tallinn, Parnu, Pide, and Kehra.¹⁵

Taxation: field research required

Liability: field research required

Personnel: field research required

Monitoring/testing: partially conducted by sewage departments. Because of the ever-increasing political interest in the environment in Estonia, a number of private enterprises are engaged in ecological testing. Testing is also carried out by a number of scientific institutes located in Estonia.

Metering: field research required

Fees/fines: levied by local governments on factories violating ecological standards

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1. Nordic Project Fund, *Study of Environmental Protection—Estonia and Partly Latvia and Lithuania* (Helsinki: 1989), 39.
 2. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
 3. Nordic Project Fund, 41-43.
 4. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
 5. Gosudarstvennyy Komitet SSSR po Statistike, 75.
 6. Gosudarstvennyy Komitet SSSR po Statistike, 74.
 7. Gosudarstvennyy Komitet SSSR po Ochrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
 8. Gosudarstvennyy Komitet SSSR po Statistike, 70.
 9. *A Short Survey of Environmental Problems of Estonia*, FYI Information Resources Research Archives.
 10. Gosudarstvennyy Komitet SSSR po Statistike, 69.
 11. *A Short Survey of Environmental Problems of Estonia* (FYI Archives).
 12. *A Short Survey of Environmental Problems of Estonia* (FYI Archives), 11.
 13. *A Short Survey of Environmental Problems of Estonia* (FYI Archives), 14.
 14. "Estonia: Finland Signs Pact to Aid Water, Air Cleanup," and "Estonia: Environmental Pact Aims at Cleanup for Gulf of Finland," *JPRS Report: Environmental Issues* (23 August 1993): 40-41.
 15. "Estonia's Environment Minister on Cost of Baltic Sea Cleanup," *JPRS Report: Environmental Issues* (22 May 1992), 87.

Country Profile: Georgia

DEMOGRAPHICS¹

Population²: 5,476,000

Urban: 56.2 %

Rural: 43.8 %

Population density: 78.4 per km²

Average family size: 4.1

Birth rate (per 1,000): 17.0

Death rate (per 1,000): 8.4

Infant mortality (per 1,000)³: 15.9

Life expectancy: 72.8 years

Ethnicity⁴: Georgian 70%; Armenian 8%; Azeri 6%; Russian 6%

Largest cities⁵: T'bilisi (capital) 1,283,000, K'ut'aisi 220,000, Rust'avi 147,000, Bat'umi 135,000, Sokhumi 130,000

Territorial-administrative divisions: two republics: Abkhazia 534,000, Ajaria 381,000; one autonomous region: South Ossetia 99,000; 61 urban areas

ECONOMY⁶

Gross National Product: \$9 billion

GNP per capita⁷: \$1,640

Gross domestic product⁸: 17 billion, 1991 rubles

Changes in GDP⁹: declined approximately 25% in 1991

Foreign investment: limited investment in oil sector

National revenue shares: industry 39.4%; agriculture 30.0%

Employment¹⁰: industrial 1,388,000; administrative/service 603,000

Completed higher education¹¹: 15.1%

Roads¹²: 20,300 km of paved roads; 1,500 km unpaved

Major sectors: agriculture, food processing (especially tea, wine), light industry

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Secondary sectors: machine building, chemicals, petrochemicals, oil production, metallurgy

Major industrial enterprises:

Major crops: tea, grapes

Secondary crops: citrus fruits, bay leaf, grains

State/collective farms:

Largest farms: major tea plantations located on the Black Sea coast

GEOGRAPHY AND NATURAL RESOURCES¹³

Size: 69,700 km²

Borders: Russian Federation, Azerbaijan, Armenia

Coastline: Black Sea

Land use:

Oblasts¹⁴: republics: Abkhazia 8,600 km², Ajaria 3,000 km²; autonomous regions: South Ossetia 3,900 km²

Precipitation: 1,000-2,800 mm/year in mountains; 300-600 mm/year in eastern Georgia

Temperature: high 23-26 degrees celcius; low 3 to -2 degrees celcius

Flora/fauna: majority of territory mountainous; 40% of territory covered with forest.

Minerals: manganese, copper, iron ore, limited deposits of oil, coal, gas

ENVIRONMENT AND HEALTH

Urban pollution index¹⁵: T'bilisi (formaldehyde, phenol)

Accidental releases:

Areas of major contamination: bacteria-infested surface waters (71%) result from a high level (83%) of untreated waste being discharged¹⁶; excessive pesticide levels found in 25% of soil¹⁷

Disease outbreaks: highest rate of digestive system ailments in the NIS¹⁸

1. Unless otherwise indicated, information in this section is from Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Materials from proprietary FYI Information Resources archives.
5. For all cities except the capital, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 90.
6. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 122-123.
7. National Geographic Society, *Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. Materials from proprietary FYI Information Resources archives.
9. Materials from proprietary FYI Information Resources archives.
10. Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye," Russian terms roughly equivalent to "blue collar" and "white collar."
11. Goskomstat, 210.
12. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
13. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 122-123.
14. Goskomomstat, 71.
15. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya deryatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
16. Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR* (New York, 1992), 114, 124.
17. Feshbach, 66.
18. Feshbach, 124.

Water Overview: Georgia

NATURAL RESOURCES

Rivers: Kura, headwaters—Turkey

Lakes: Ritsa, Paravani, Khozapini, Dzhanbargyol

Soils: west—red-yellow soil, characterized by its clay content, is highly productive; north, east, south—mountain meadow and steppe soil¹

Critical water contamination sites: cities bordering the Black Sea suffer severe industrial pollution; Batumi, specifically, is critically polluted²

WATER USAGE

Industrial³: 1,182 million m³/year

Agricultural⁴: 1,282 million m³/year

Domestic⁵: 659 million m³/year

Total wastewater⁶: 626 million m³/year

Treated: 309 million m³/year (to normative standards), 55 million m³/year (insufficiently)

Total intake (from natural sources)⁷: 3,802 million m³/year

Treated: field research required

Sources⁸:

Wells: 1,016 million m³/year

Surface water: 2,786 million m³/year

Network: field research required

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CBE/MONGOLIA INFRASTRUCTURE PROJECT.

Source water: rivers

Common contaminants: products of oil refining industry, pesticides, fertilizers

Common treatment methods: field research required

OPERATING ENVIRONMENT

Financing: attempts are being made by the government to create a national ecological fund⁹

Taxation: field research required

Liability: legal and normative acts in field of ecology are "inadequate"¹⁰

Personnel: field research required

Monitoring/testing: field research required

Metering: field research required

Fees/fines: field research required

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1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
 2. D.J. Peterson, "The State of the Environment: The Water," *Report on the USSR* (16 March 1990), 18.
 3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
 4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
 5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
 6. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
 7. Gosudarstvennyy Komitet SSSR po Statistike, 70.
 8. Gosudarstvennyy Komitet SSSR po Statistike, 69.
 9. "Georgia Faces 'Critical' Ecological Situation," *JPRS Report: Environmental Issues* (24 January 1992), 66.
 10. *JPRS Report: Environmental Issues* (24 January 1992), 65.

Country Profile: Kazakhstan

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 16,947,000

Urban: 57.6%

Rural: 42.4%

Population density: 6.2 per km²

Average family size: 4.0

Birth rate (per 1,000): 21.7

Death rate (per 1,000): 7.7

Infant mortality (per 1,000)³: 26.4

Life expectancy: 68.8 years

Ethnicity⁴: Kazakh 39.7%, Russian 37.8%, German 5.8%, Ukrainain 5.4%, Uzbek 2.0%, Tatar 2.0%, Uigur 1.1%, Belarusian 1.1%

Largest cities⁵: Almaty (capital) 1,161,000; Qaraghandy 633,000; Shymkent 389,000; Pavlodar 331,000; Semey 330,000; Oskemen 321,000; Zhambyl 315,000; and 14 cities between 100,000 and 200,000 inhabitants⁶

Territorial-administrative divisions: 19 oblasts, of which five, Almaty (including Almaty city), Shymkent or South Kazakhstan, Qaraghandy, Qostanay, and Zhambyl, each has more than one million inhabitants; 222 districts; 83 urban areas

ECONOMY⁷

Gross national product: \$42 billion

GNP (per capita)⁸: \$2,470

Gross domestic product:

Change in GDP:

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Foreign investment⁹: Chevron Corporation signed a \$20 billion, 40 year deal in 1993; AT&T signed a \$500 million, 10-year deal in 1993; 40 functioning joint ventures¹⁰; has U.S. Most

Favored Nation status

National revenue shares: 25.1% industry, 34.2% agriculture, 8.6% transportation and communications

Employment¹¹: agricultural 1,347,800, industrial 4,507,000, administrative/service 1,969,000

Completed higher education¹²: 9.9%

Roads¹³: 82,500 km of paved roads, 11,800 km unpaved

Major Sectors: oil, natural gas, coal, agriculture, metallurgy

Secondary sectors: chemicals, forestry, food processing

Major industrial enterprises:

Major crops: grain

Secondary crops: potatoes, vegetables

State farms¹⁴: 2,516 state and collective farms

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹⁵

Size: 2,717,300 km²

Borders: Russian Federation, Turkmenistan, Uzbekistan, Kyrgyzstan, China

Coastline: Caspian Sea, Aral Sea

Land use¹⁶: 35,658,000 sown hectares; 2,260,000 hectares were drained for agricultural use

Oblasts¹⁷: four oblasts (Zhezkazghan, Aqtobe, Qyzylorda, Almaty) cover over 200,000 km² each

Precipitation: 300 mm/year; (100 mm/year in deserts, 1600 mm/year in mountains)

Temperature: high 19-30 , low -18 to -3 degrees celcius

Flora/fauna: steppe and desert habitats

Minerals: oil, gas, coal, iron ore, chromite, manganese, copper, titanium, gold, silver, aluminum, uranium

ENVIRONMENT AND HEALTH

Urban pollution index¹⁸: Almaty, Zhambyl, Zyrianovsk, Temirtau, Ostkemen, Shymkent have severe air pollution

Accidental releases: beryllium released by Ulba Metallurgical Combine in Ostkamen, 1990¹⁹

Areas of major contamination: Semey (formerly Semipalatinsk) nuclear test site; 100,000 tons of nuclear waste stored in open sites at Ostkemen²⁰; Aral Sea and Caspian Sea seriously threatened by industry and agriculture.

Disease outbreaks²¹: Kazakh officials reported an abrupt rises in cases of cholera in mid-September 1993. Reports varied from "dozens" of cases to 2,500.

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.

2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).

3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.

4. Bess Brown, "Kazakhs Now Largest National Group in Kazakhstan," *Report on the USSR*, RL 201/90, 1990, 19.

5. For all cities except the capital, Glavnoye upravlenoe geodezii i kartografii, *Atlas SSSR* (Moscow, 1989), 82.

6. Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 116.

7. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 122-123.

8. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.

9. *The New York Times*, 3/10/93.

10. Central Intelligence Agency, *Kazakhstan: An Economic Profile* (July 1993), 5, 18.

11. Central Intelligence Agency, 5; and Goskomstat, 102. These figures represent "rabochiye" and "sluzhashchiye," terms roughly equivalent to "blue collar" and "white collar."
12. Goskomstat, 210.
13. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
14. Central Intelligence Agency, 12.
15. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 122-123.
16. Reliable figures for total arable land not available.
17. Goskomstat, 72.
18. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: sostoyaniye prirodnoy sredy i prirodookhrannaya deyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 200.
19. Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR* (New York, 1992), 177.
20. Feshbach, 177.
21. *The Washington Post*, 9/14/93, A18; *The Wall Street Journal*, 9/14/93, 1.

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Water Overview: Kazakhstan

NATURAL RESOURCES

Rivers: Irtysh, headwaters—Zaysan lake; Ishim, headwaters—southwest of Arkalyk; Tobol, headwaters—southwest of Tobol; Ural, headwaters—west of Miass, Russia; Syrdar'ya, headwaters—merging of Naryn and Karabarya rivers; Ili, headwaters—China

Lakes: Balkhash, Alakol', Zaysan, Zhaltyr, Aralsor, Shalkar, Sarykopa, Kushmuruk, Shaglyteniz, Kyzylkak, Siletiteniz, Tengiz, Zhalauly, Markakol', Sasykkol'

Soils: northeast—chestnut soils, characterized by high alkalinity and salt accumulation; southwest—desert soils¹

Critical water contamination sites: Kzyl-Orda (15-50 maximum permissible concentration sulfates), Almaty (50-100+ MPC mercury), Pavlodar (50-100 MPC mercury)²

WATER USAGE

Industrial³: 7,493 million m³/year

Agricultural⁴: 24,398 million m³/year

Domestic⁵: 1,237 million m³/year

Total wastewater⁶: 591 million m³/year

 Treated: 252 million m³/year (to normative standards), 284 million m³/year (insufficiently)

Total intake (from natural sources)⁷: 33,440 million m³/day

 Treated: field research required

Sources⁸:

 Wells: 2,333 million m³/year

 Surface water: 37,107 million m³/year

Network: half the villages in Kazakhstan are using undrinkable water⁹

FACILITIES

Treatment facilities: field research required

 Operating at full capacity: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CBE/MONGOLIA INFRASTRUCTURE PROJECT.

Operating below capacity: field research required

Under construction: field research required

Common problems: inability to treat high mineral content in wastewater, lack of technology

Source water: rivers

Common contaminants: suspended compounds and chemicals, pesticides, fertilizers

Common treatment methods: field research required

OPERATING ENVIRONMENT

Financing: since the demise of the Soviet Union, the Kazakh government has realized its responsibility to finance environmental protection operations but has had difficulty finding the resources to equal the 1 billion rubles which had been allocated by the USSR government toward the Aral Sea clean-up project.¹⁰ New regulations passed in March 1993 assess usage fees for water consumption at the rayon, oblast', and national level. Revenues are reallocated to various regions by Ministry of Ecology.¹¹

Taxation: field research required

Liability: field research required

Personnel: field research required

Monitoring/testing: Sanitary Epidemiological Service (SES), under the Ministry of Health, supervises operations of republican, oblast, and city SES departments which focus on bacteriological contamination; Ministry of Geology is responsible for underground assessment and surveys; Committee for Water Resources monitors surface waters¹²

Metering: field research required

Fees/fines: New regulations passed in March 1993 assess usage fees for water consumption at the rayon, oblast', and national level.¹³ SES has the right to close plants and facilities in violation of standards.¹⁴ The East Kazakhstan Oblast Soviet of People's Deputies sets fines for water polluters, which are adjusted annually for inflation.¹⁵

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. *The Institute of Geography Water Report* (FYI Information Resources Research Archives).
3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional' noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
6. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel' nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
7. Gosudarstvennyy Komitet SSSR po Statistike, 70.
8. Gosudarstvennyy Komitet SSSR po Statistike, 69.
9. FYI Information Resources Research Archives (April 1993).
10. D. Yuryeva, "Programs Instead of Water," *Eko Kuriyer* (25 January 1992), 7.
11. FYI Archives (April 1993).
12. FYI Archives (April 1993).
13. FYI Archives (April 1993).
14. FYI Archives (April 1993).
15. "East Kazakhstan Oblast Sets Fines for Polluters," *JPRS Report: Environmental Issues* (16 June 1993), 40.

Country Profile: Kyrgyzstan

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 4,506,000

Urban: 38.1%

Rural: 61.9%

Population density: 22.3 per km²

Average family size: 4.7

Birth rate (per 1000): 29.3

Death rate (per 1000): 7.0

Infant mortality (per 1000)³: 30.0

Life expectancy: 68.8 years

Ethnicity⁴: Kyrgyz 52%, Russian 22%, Uzbek 12%, Ukrainian and other 14%

Largest cities⁵: Bishkek (capital) 642,000; Osh 209,000; Jalal-Abad 74,000; Tokmak 71,000;

Przheval'sk 64,000; Kara-Balta 55,000; 21 urban areas

Territorial-administrative divisions: six oblasts, of which Osh and Chuy (including Bishkek city)

have more than 1,000,000 inhabitants each; Jalal-Abad 782,000, Ysyk-Kol 427,000,

Naryn 260,000, Talas 198,000

ECONOMY⁶

Gross national product: \$7 billion

GNP (per capita)⁷: \$1,550

Gross domestic product:

Change in GDP:

Foreign investment⁸: limited, includes Korean, Polish, Turkish, and Canadian firms.

National Revenue Shares: 34.3% industry, 39.3% agriculture, 13.0% construction, 3.8%
transportation and communications

Employment⁹: industrial 864,000, administrative/service 389,000

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Completed higher education: 9.4%

Roads¹⁰: 16,800 km of paved roads, 2,200 km unpaved

Major sectors¹¹: agriculture, agricultural and other machinery, hydroelectric energy, light metallurgy, textiles

Secondary sectors: food processing, building materials, coal, gas, oil

Major industrial enterprises¹²: large sugar refineries, hydroelectric stations on the Naryn river

Major crops: cotton, grains

Secondary crops: vegetables, fruits

State farms¹³: 14,000 private farms

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹⁴

Size: 198,500 km²

Borders: Kazakhstan, China, Tajikistan, Uzbekistan

Coastline: none

Land use¹⁵: 1,314,000 sown hectares

Oblasts: six, of which two (Naryn and Ysyk-Kol) cover over 40,000 km² each.

Precipitation: 180-250 mm/year; 900-1000 mm/year in the southwest.

Temperature: High 15-27; Low -1 to -18 (-27 in mountains) degrees celcius

Flora/fauna: desert and semi-arid, as well as mountain-steppe habitats

Minerals¹⁶: iron ore, tin, mercury, gold, coal, gas, oil

ENVIRONMENT AND HEALTH

Urban pollution index: Osh (dust, nitrogen dioxide)

Accidental releases:

Areas of major contamination: one of the least damaged environments of the NIS; cotton-producing regions damaged by pesticides; water supply polluted from industry and agriculture¹⁷, including Ysyk-Kol Lake¹⁸

Disease outbreaks: 320,000 annually recorded cases of typhoid, viral hepatitis, other intestinal infections due to poor water quality¹⁹

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Materials from proprietary FYI Information Resources archives.
5. For all cities except the capital, Glavnoye upravleniye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 139.
6. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 122-123.
7. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNO or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. Materials from proprietary FYI Information Resources archives.
9. Goskomstat, 102. These figures represent "rabochiye" and "sluzhashchiye," terms roughly equivalent to "blue collar" and "white collar."
10. Figures cited here should not necessarily be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
11. Mihalisko, 9.
12. Materials from FYI Information Resources archives.
13. Materials from proprietary FYI Information Resources archives.
14. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 122-123.
15. Reliable figures for total arable land not available.
16. Moscow TASS in English 0957 GMT 7 Jun 91 cited in FBIS-SOV-91-113, 76.
17. Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR* (New York, 1992), 74.
18. Moscow Television Service in Russian 1430 GMT 5 Jun 90, cited in FBIS-SOV-90-119, 118.
19. Feshbach, 84-85.

Water Overview: Kyrgyzstan

NATURAL RESOURCES

Rivers: Chatkal, headwaters—Chatkalskiy khrebet; Kara-Kul'dzha, headwaters—Ferganskiy khrebet; Ak-Say, headwaters—khrebet At-Bashy; Naryn, headwaters—khrebet Borkolboy; Kyzyl-Suu, headwaters—Alayskaya dolina; Chuu, headwaters—khrebet Dzhumgal-Too

Lakes: Issyk-Kul', Song-Kel'

Soils: mountain meadow and steppe soil¹

Critical water contamination sites: the Chuu river has been targeted as one of the most critically polluted rivers in the former Soviet Union²

WATER USAGE

Industrial³: 678 million m³/year

Agricultural⁴: 9,107 million m³/year

Domestic⁵: 265 million m³/year

Total wastewater⁶: 180 million m³/year

Treated: 140 million m³/year (to normative standards), 30 million m³/year (insufficiently)

Total intake (from natural sources)⁷: 12,116 million m³/day

Treated: field research required

Sources⁸:

Wells: 921 million m³/year

Surface water: 11,195 million m³/year

Network: traditional villages for rural laborers do not have basic sanitation systems, including water mains, sewage lines and treatment systems, and water purification systems; source of drinking water is the canal or tributary that collects runoff from irrigated fields⁹

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

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Operating below capacity: field research required

Under construction: field research required

Common problems: conflict between industrial, agricultural, and domestic sectors for scarce water resources¹⁰; lack of efficient irrigation technology

Source water: rivers, canals

Common contaminants: industrial waste, pesticides, chemical fertilizers, defoliants

Common treatment methods: further field research required; most drinking water is completely untreated

OPERATING ENVIRONMENT

Because of the extremity of the depletion of water resources in the Central Asian region, little is presently being done to improve water quality. The desiccation of the Aral Sea due to mismanagement of water resources by all four Central Asian countries and the general scarcity of water resources needed to propel the largely agricultural economy is monopolizing the time and energies of the governments of these countries and conservation-conscious individuals and associations.

Financing: independent, volunteer organizations are raising some of the funds necessary to address ecological concerns¹¹

Taxation: field research required

Liability: field research required

Personnel: field research required

Monitoring/testing: field research required

Metering: regional officials are adamantly against the imposition of fees for the use of natural resources

Fees/fines: field research required

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. B. I. Kochurov, N. I. Koronkevich, A. V. Antipova, T. B. Kenisova, N. A. Zherebtsova, O. Yu. Bykova, *Karta Naiboleye Ostrykh Ekologicheskikh Situatsiy* (Institut Geografii AN SSSR).
3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruchayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnkh Resursov v SSSR* (Moscow: 1989), 72.
4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
6. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
7. Gosudarstvennyy Komitet SSSR po Statistike, 70.
8. Gosudarstvennyy Komitet SSSR po Statistike, 69.
9. Peter Pavilionis, "Central Asia's Environmental Politics," *USCSAR Reports* (Fall 1991), 35-51.
10. Gregory Gleason, "The Struggle for Control over Water in Central Asia: Republican Sovereignty and Collective Action," *Report on the USSR* (21 June 1991), 11-19.
11. "Voluntary Work Raises Funds for Issyk-kul Lake," *JPRS Report: Environmental Issues* (20 June 1990), 118.

Country Profile: Latvia

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 2,702,000

Urban: 71.1%

Rural: 28.9%

Population density: 41.6% per km²

Average family size: 3.1

Birth rate (per 1,000): 14.1

Death rate (per 1,000): 13.0

Infant mortality (per 1,000)³: 13.7

Life expectancy: 69.6 years

Ethnicity⁴: 52% Latvian, 34% Russian, 4.5% Belorussian, 3.4% Ukrainian, 2.3% Pole, 1.3% Lithuanian

Largest cities⁵: Riga (capital) 910,000, Daugavpils 128,000, Liepaja 114,000, Jelgava 72,000, Jurmala 65,000, Ventspils 52,000

Territorial-administrative divisions: 26 districts, 56 urban areas

ECONOMY⁶

Gross national product (per capita)⁷: \$3,410

GNP: \$9 billion

Gross domestic product:

Change in GDP:

Foreign investment: U.S. and German firms most active

National revenue shares: 44.1% industry, 25.7% agriculture, 14.4% transportation and communications

Employment⁸: industrial 745,000, administrative/service 349,000

Completed higher education⁹: 11.5%

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Roads¹⁰: 18,400 km. of paved roads, 2,100 km. unpaved

Major sectors: forestry, forestry products, hydroelectric power, food processing, agriculture

Secondary sectors: chemicals, steel production

Major industrial enterprises:

Major crops: potatoes

Secondary crops: vegetables, grains

State farms¹¹: 601

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹²

Size: 64,500 km²

Borders: Estonia, Lithuania, Belarus, Russian Federation

Coastline: Baltic Sea (including the Gulf of Riga)

Land use: 2,500,000 hectares of arable land, of which 1,651,000 hectares are sown

Oblasts: none

Precipitation: 500-800 mm/year

Temperature: high 16-18, low -7 to -2 degrees celcius

Flora/fauna: 30% of territory is forested, predominantly coniferous, with rare "wet forests" which are biologically diverse¹³; fertile lowlands; peat bogs; 3,000 small lakes

Minerals: dolomite, limestone, gypsum, gravel

ENVIRONMENT AND HEALTH

Urban pollution index¹⁴: no Latvian cities on list

Accidental releases: Novopolotsk Chemical Works in Belarus released toxins in late 1990,¹⁵

including cyanides and probably prussic acid, into the Daugava river which flows into Latvia

Areas of major contamination: soil and groundwater around Riga contaminated from toxic waste disposal and seepage¹⁶; industrial waste and untreated sewage pollute Gulf of Riga¹⁷

Disease outbreaks:

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1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Central Intelligence Agency, *Latvia: An Economic Profile* (August 1992), 4.
5. Except for the capital, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988) 84.
6. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 690-692.
7. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye," Russian terms roughly equivalent to "blue collar" and "white collar."
9. Goskomstat, 210.
10. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
11. Central Intelligence Agency, 10.
12. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 690-691.
13. ISAR, *Surviving Together* (Summer 1993).
14. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
15. Tass in English 0926 gmt, 11/13/93 cited in SWB SU/W0154 A/19, 11/16/90, item 75.
16. Vides aizsardzibas klubs, *VAK Newsletter #13*, 7/30/91, 1.
17. Valdis Abols, "Environmental Problems and the Environmental Movement in Latvia," speech made in Washington, D.C., 1/29/91.

Water Overview: Latvia

NATURAL RESOURCES

Rivers: Daugava, headwaters—flows out of Zapadnaya Dvina river; Venta, headwaters—Autse, Lithuania

Tributaries: Ayviyekste, Osha, Dubna (into Daugava); Abava (into Venta)

Lakes: Lubanas, Engures, Ustas, Liyepayas, Papes, Sivera, Osveiskoye, Reznas, Aluksnes, Alauksts, Burtnicku, Babites

Soils: podzol, which coincides with forest zones of the Soviet region, is characterized by leaching (precipitation exceeds evaporation), and a highly acidic surface layer¹

Critical water contamination sites: Daugavpils (20-80 maximum permissible concentration chlorides), Olaine (up to 200 MPC chlorides, 100+ MPC phenols, 100+ MPC other organic compounds), Riga (15-50 MPC sulfates, 100+ MPC phenols, 100+ other organic compounds), Ventspils (20-80 MPC oil products, 50-100 MPC phenols), Yelgava (100+ MPC phenols), Yurmala (100+ MPC phenols);² in Riga, only 8 percent of the volume of wastewater is treated to meet normative standards; raw sewage is directed into the Daugava River where it is swept into the Baltic Sea³

WATER USAGE

Industrial⁴: 358 million m³/year

Agricultural⁵: 76 million m³/year

Domestic⁶: 218 million m³/year

Total wastewater⁷: 367 million m³/year

Treated: 110 million m³/year (to normative standards), 142 million m³/year (insufficiently)

Total intake (from natural sources)⁸: 671 million m³/year

Treated: field research required

Sources⁹:

Wells: 306 million m³/year

Surface water: 365 million m³/year

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Network: most of Latvia's drinking water is obtained from wells; in 1988, Riga was the only republic capital in the USSR without sewage treatment facilities¹⁰; two industrial centers, Ventspils and Liepaja, discharge wastewaters directly into the Baltic Sea. The port of Ventspils is equipped with local water treatment systems.¹¹ In the past, the Riga Water Supply and Sewerage Department has been forced to cut off the city's water supply due to leakage caused by the Novopolotsk polymer works.¹²

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: lack of proper disposal techniques for chemicals, biological purification of waste water, lack of environmentally safe technology

Source water: rivers

Common contaminants: toxic chemical substances, products of paper and pulp industry, pesticides, fertilizers, municipal discharges

Common treatment methods: biological, chemical

OPERATING ENVIRONMENT

Financing: government does not have enough money to finance refurbishing of water system; therefore, groups such as "Baltic Eco" attempt to raise money to fund them and lobby for more government support. In July 1993, projects were aimed at the construction of purification systems in Riga.¹³ In March 1993, a seminar was held in Estonia on the acquisition of financial resources for the execution of the Helsinki program for the protection of the Baltic sea, water resources, and the environment of Latvia.¹⁴ Taxes collected for use of natural resources are allocated toward environmental endeavors.¹⁵

Taxation: for use of natural resources, introduced by law "On Natural Resource Taxes" passed on 12 December 1990¹⁶

Liability: field research required

Personnel: field research required

Monitoring/testing: city municipal governments, scientific research institutes, green parties and movements

Metering: field research required

Fees/fines: sanctions for effluent releases and resource use exceeding regulations, introduced by law "On Natural Resource Taxes" passed on 12 December 1990¹⁷

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1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
 2. Institute of Geography of the USSR (FYI Information Resources Research Archives).
 3. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 203.
 4. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
 5. Gosudarstvennyy Komitet SSSR po Statistike, 75.
 6. Gosudarstvennyy Komitet SSSR po Statistike, 74.
 7. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, 99.
 8. Gosudarstvennyy Komitet SSSR po Statistike, 70.
 9. Gosudarstvennyy Komitet SSSR po Statistike, 69.
 10. *Environmental Protection Club of Latvia* [newsletter] (FYI Information Resources Research Archives).
 11. Nordic Project Fund, *Study of Environmental Protection—Estonia and Partly Latvia and Lithuania* (Helsinki: 1989), 32-33.
 12. FYI Information Resources Research Archives (February 1993).
 13. "Latvia: Annual 'Baltic Eco' Session Convenes in Riga," *JPRS Report: Environmental Issues* (6 July 1993), 28.
 14. "Estonia: Seminar Studies Financial Resources for Baltic Sea Protection," *JPRS Report: Environmental Issue* (19 March 1993), 54.
 15. "Baltic States' Environmental Laws Surveyed," *JPRS Report: Environmental Issues* (12 November 1992), 64.
 16. "Baltic States' Environmental Laws Surveyed," 64.
 17. "Baltic States' Environmental Laws Surveyed," 64.

Country Profile: Lithuania

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 3,736,000

Urban: 68.8

Rural: 31.2

Population density: 57.2 per km²

Average family size: 3.2

Birth rate (per 1,000): 15.3

Death rate (per 1,000): 10.7

Infant mortality (per 1,000)³: 14.3

Life expectancy: 71.5 years

Ethnicity⁴: 79.6% Lithuanian, 9.4% Russian, 7.0% Pole, 1.7% Belorussian, 1.2% Ukrainian,

Largest cities⁵: Vilnius (capital) 566,000, Kaunas 417,000, Klaipeda 201,000, Siauliai 140,000,

Panevezys 122,000, Alytus 71,000

Territorial-administrative divisions: 44 districts, 92 urban areas

ECONOMY⁶

Gross national product: \$9 billion

GNP (per capita)⁷: \$2,710

Change in GNP⁸: declined 61% in 1992

Gross domestic product:

Change in GDP:

Foreign investment⁹: less than in other Baltic states, Scandinavian countries are predominant joint venture partners

National revenue shares: 34.5% industry, 31.5% agriculture

Employment¹⁰: agricultural 298,000, industrial 999,000, administrative/service 460,000

Unemployment¹¹: 10%

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Completed higher education¹²: 10.6%

Roads¹³: 35,800 km of paved roads, 8,700 unpaved

Major sectors: Agriculture, machine building, food processing, textiles

Secondary sectors: chemicals, construction materials, forestry and forestry products

Major industrial enterprises:

Major crops: grains, potatoes

Secondary crops: vegetables

State farms¹⁴: 1,135

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹⁵

Size: 65,200 km²

Borders: Latvia, Russian Federation (Kaliningrad), Poland, Belarus

Coastline: Baltic Sea

Land use: 3,600,000 hectares of arable land, of which 2,326,000 are sown

Oblasts: none

Precipitation: 630 mm/year

Temperature: high 17, low -5 degrees celcius

Flora/fauna: 25% of territory is forest (pine, spruce, birch, other)

Minerals: limestone, clay, gravel

ENVIRONMENT AND HEALTH

Urban pollution index¹⁶: no Lithuanian cities listed

Accidental releases:

Areas of major contamination: surface water contains elevated levels of bacteria (38%)¹⁷; water and soil contaminated with heavy metals and nitrates, air with sulfates and nitric acids¹⁸

Disease outbreaks:

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Central Intelligence Agency, *Lithuania: An Economic Profile* (September 1992), 5. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. A. Stanaitis and P. Adlys, *Lietuvos TSR Gyventojai* (Vilnius, 1973), 104; and *Tiesa* 3/10/90, cited in Saul Girnius, "Migration to and from Lithuania," *Report on the USSR*, 9/14/90, 25.
5. For all cities except the capital, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 90.
6. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 719.
7. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. Saulius Girnius, "The Lithuanian Economy in 1992," *RFE/RL Research Reports*, 4/16/93, 29.
9. Materials from proprietary FYI Information Resource archives.
10. Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye," Russian terms roughly equivalent to "blue collar" and "white collar." Figures for agricultural employment are estimated from sources including Central Intelligence Agency, 6.
11. Material from proprietary FYI Information Resources archives. This figure is meant to represent only a rough estimate of unemployment, official figures are considerably lower and commonly accepted as underrepresenting both unemployment and underemployment.
12. Goskomstat, 210.
13. Central Intelligence Agency, 13.
14. Central Intelligence Agency, 12.
15. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 719.
16. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
17. Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR* (New York, 1992), 124.
18. *Lietuvos Aidas* JPRS-TEN-91-016, 84.

Water Overview: Lithuania

NATURAL RESOURCES

Rivers: Neman

Lakes: Rekivas, Drisvyaty, Diskay, Dusya

Soils: podzol, which coincides with forest zones of the Soviet region, is characterized by leaching (precipitation exceeds evaporation), and a highly acidic surface layer¹

Critical water contamination sites: Ionava region (100 maximum permissible concentrations ammonia/um), Kedaynyay (20-80 MPC ammonia/um)

WATER USAGE

Industrial²: 3,150 million m³/year

Agricultural³: 126 million m³/year

Domestic⁴: 302 million m³/year

Total wastewater⁵: 450 million m³/year

Treated: 114 million m³/year (to normative standards), 212 million m³/year (insufficiently)

Total intake (from natural sources)⁶: 3,605 million m³/year

Treated: field research required

Sources⁷:

Wells: 505 million m³/year

Surface water: 3,100 million m³/year

Network: municipal sewage of Neman and Sovetsk is discharged into the Neman; construction of biological purification systems has commenced in Vilnius, Klaipeda, and Palanga; Vilnius and Kaunas dispose of wastewater into the Neman⁸

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Under construction: field research required

Common problems: lack of biological purification, low capacity for wastewater treatment, lack of technology

Source water: rivers

Common contaminants: products of paper and pulp industry, pesticides, fertilizers

Common treatment methods: biological treatment

OPERATING ENVIRONMENT

Financing: government has been seeking assistance from abroad; in March 1992, the government of Lithuania signed an agreement with Sweden to provide assistance in the preparation of ecological analysis, construction of purification facilities, and other projects⁹

Taxation: field research required

Liability: standards for quality of water, definition of rights and responsibilities of government, enterprises, and individuals set by resolutions and normative acts based upon 12 January 1992 "Law on Environmental Protection"¹⁰

Personnel: field research required

Monitoring/testing: governmental agencies, scientific-research institutes, green parties and movements

Metering: field research required

Fees/fines: set by resolutions and normative acts based upon 12 January 1992 "Law on Environmental Protection"¹¹

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional' noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
3. Gosudarstvennyy Komitet SSSR po Statistike, 75.
4. Gosudarstvennyy Komitet SSSR po Statistike, 74.
5. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel' nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
6. Gosudarstvennyy Komitet SSSR po Statistike, 70.
7. Gosudarstvennyy Komitet SSSR po Statistike, 69.
8. Nordic Project Fund, *Study of Environmental Protection—Estonia and Partly Latvia and Lithuania* (Helsinki: 1989), 35.
9. Lithuania, Sweden Sign Environmental Cooperation Accord." *JPRS Report: Environmental Issues* (22 May 1992), 88.
10. "Baltic States' Environmental Laws Surveyed," *JPRS Report: Environmental Issues* (12 November 1992), 64.
11. "Baltic States' Environmental Laws Surveyed," 64.

Country Profile: Moldova

DEMOGRAPHICS¹

Population²: 4,372,000

Urban: 47.5%

Rural: 52.5%

Population density: 129.6 per km²

Average family size: 3.4

Birth rate (per 1,000): 17.7

Death rate (per 1,000): 9.7

Infant mortality (per 1,000)³: 19.0

Life expectancy: 68.7 years

Ethnicity⁴: Moldovan (*i.e.*, ethnic Romanian) 64.5%; Ukrainian 13.8%; Russian 13.0%; Gagauz 3.5%

Largest cities⁵: Chisinau (capital) 754,000; Tiraspol 173,000, Balti 157,000, Bender 130,000, Ribnita 58,000

Territorial-administrative divisions⁶: 40 districts, 21 urban areas

ECONOMY⁷

Gross National Product: \$12 billion

GNP per capita⁸: \$2,710

Gross domestic product:

Change in GDP:

Foreign investment: limited

National revenue shares: industry 37.2%; agriculture 35.3%; construction 8.9%; transportation and communications 3.8%; trade and other 14.8%

Employment⁹: 1,540,000 agricultural, 985,000 industrial, 437,000 administrative/service

Completed higher education¹⁰: 9%

Roads¹¹: 10,200 km; 700 km unpaved

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Major sectors: agriculture, food processing, wine production

Secondary sectors: machine tools, chemicals, woodworking, metallurgy

Major industrial enterprise¹²: Hincesti Wine-Making Plant, Triaspol Foundry Machine Factory,

Moldaugdromash (makes immersion pumps), Moldavizolit, Moldenergo)

Major crops: fruits, grapes, vegetables

Secondary crops: grains, corn

State/collective farms:

Largest farms:

GEOGRAPHY AND NATURAL RESOURCES¹³

Size: 33,700 km²

Borders: Ukraine, Romania

Coastline: none

Land use: 2.5 million hectares of arable land, mainly "black earth," of which 2.1 million hectares are sown

Oblasts: none

Precipitation: 400-560 mm/year

Temperature: high: 19-22; low: -5 to -3 degrees celcius

Flora/fauna: 9% of territory covered by forest; 75 rare animal species, 51 rare plant species¹⁴

Minerals:

ENVIRONMENT AND HEALTH¹⁵

Urban pollution index: no Moldovan cities listed

Accidental releases:

Areas of major contamination: pesticide use was 13 times the USSR average

Disease outbreaks:

1. Unless otherwise indicated, information in this section is from Goskomstat SSSR, *Narodnoe khoziaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Central Intelligence Agency, *Comparative Soviet Nationalities by Republic* (map), 9-89.
5. For all cities except the capital, glavnoe upravlenie geodezii i kartografii, *Atlas SSSR* (Moscow, 1989), 106.
6. Glavnoye upravlenie, 106.
7. Unless otherwise indicated, information in this section is from *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 825-826.
8. National Geographic Society. *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
9. Goskomstat, *Narodnoe khoziaistvo v 1990 godu* (Moscow, 1991), 102. This figure represents "rabochie" and "sluzhashchye," which are categories roughly equivalent to "blue collar" and "white collar" workers.
10. Goskomstat, 210.
11. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
12. Biznes Karta: Moldova, Ukraina, Yuzhnyy rayon (Moscow, 1992), 181, 182.
13. Unless otherwise indicated, information in this section is cited from *Bol'shoi entsiklopedicheskiy slovar'*, 825-826.
14. Materials from proprietary FYI Information Resources archives.
15. Unless otherwise indicated, information in this section is from proprietary FYI Information Resources archives.

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Water Overview: Moldova

NATURAL RESOURCES

Rivers: Dnestr, headwaters—western Ukraine; Dunay—central Europe

Tributaries: Prut (to Danube)

Soils: chernozem, or "black earth," the most fertile soil found within the territory of the former Soviet Union¹

Critical water contamination sites: Rybnitsa and Synzhereya exceeded standards of salt content and strontium in 1990; Leovo suffers pollution by ammonia, Kalarash and Nisporeny by fluorine, Vualkaneshy and Chadyr-Lunga by iron, and Grigoriopol and Kamenka by nitrates; ammonia concentrations are above standards in Nisporeny, Kakhul, Feleshty, Synzhereya, Ryshkany, Teleneshty, and Chimishliya²

WATER USAGE

Industrial³: 2,663 million m³/year

Agricultural⁴: 729 million m³/year

Domestic⁵: 248 million m³/year

Total wastewater⁶: 298 million m³/year

Treated: 207 million m³/year (to normative standards), 90 million m³/year (insufficiently)

Total intake (from natural sources)⁷: 3,703 million m³/year

Treated: field research required

Sources⁸:

Wells: 294 million m³/year

Surface water: 3,409 million m³/year

Network: water in Gloden, Teleneshty, Ryshkany, Floreshty, Shtefan-Voda, Feleshty, Synzhereya, Kakhul, Komrat, Nisporeny, and Leovo is not disinfected⁹

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: lack of equipment, deterioration of present system

Source water: rivers

Common contaminants: fertilizers, pesticides, wastes of livestock-breeding complexes

Common treatment methods: field research required

OPERATING ENVIRONMENT

Financing: field research required

Taxation: field research required

Liability: standards set by State Department of Moldova for Standards¹⁰

Personnel: field research required

Monitoring/testing: Institute of Hygiene and Epidemiology, Ministry of Health, Academy of Sciences, Moldavgeologiya Production Association, former Ministry of Water Management, scientific-Research Institute for Hydroengineering and Land Reclamation¹¹

Metering: field research required

Fees/fines: field research required

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. "Moldova: Impact of Pollutants on Water Quality Surveyed," *JPRS Report: Environmental Report* (9 July 1993), 57-58.
3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional' noye Ispol'zovaniye Prirodnnykh Resursov v SSSR* (Moscow: 1989), 72.
4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
6. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel' nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
7. Gosudarstvennyy Komitet SSSR po Statistike, 70.
8. Gosudarstvennyy Komitet SSSR po Statistike, 69.
9. *JPRS Report: Environmental Report* (9 July 1993), 57-58.
10. *JPRS Report: Environmental Report* (9 July 1993), 57-58.
11. *JPRS Report: Environmental Report* (9 July 1993), 57-58.

Country Profile: Russian Federation

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 149,299,000

Urban: 73.9%

Rural: 26.1%

Population density: 8.7 per km²

Average family size: 3.2

Birth rate (per 1,000): 13.4

Death rate (per 1,000): 11.2

Infant mortality (per 1,000)³: 17.4

Life expectancy: 69.3 years

Ethnicity⁴: 81.5% Russian; 3.8% Tatar; 3.0% Ukrainian; 0.8% Belorussian; 0.6% German; 0.4% Armenian; 0.4% Kazakh

Largest cities⁵: Moscow (capital) 9,003,000; St. Petersburg 5,035,000; Nizhny Novgorod 1,425,000; Novosibirsk 1,423,000; Yekaterinburg 1,331,000; Samara 1,280,000; Omsk 1,134,000; Chelyabinsk 1,119,000; Ufa 1,092,000; Perm' 1,075,000; Kazan 1,068,000; Rostov-na-Donu 1,004,000; 20 cities with 500,000 to 999,999 inhabitants; 31 cities with 300,000 to 499,999 inhabitants

Territorial-administrative divisions: 20 Republics, including Bashkortostan (3,895,000), Tatarstan (3,568,000), Dagestan (1,768,000), Udmurtia (1,587,000); Six Territories (Kray) including Krasnodar (5,051,000), Krasnoyarsk (3,520,000), Stavropol' (2,778,000), Altay (2,777,000); 50 oblasts including Moscow (15,396,000), Leningrad⁶ (6,603,000), Sverdlovsk (4,703,000), Rostov (4,290,000), Nizhny Novgorod (3,688,000), Chelyabinsk (3,583,000), Kemerovo (3,152,000), Perm' (3,071,000); eight oblasts with 2,000,000 to 2,999,999 inhabitants, 23 oblasts with 1,000,000 to 1,999,999 inhabitants; 1,045 urban centers

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

ECONOMY⁷

Gross national product: \$480 billion

GNP (per capita)⁸: \$3,220

Change in GNP⁹: Dropped 15-20% on 1992, 9% in 1991, 2% in 1990

Gross domestic product:

Change in GDP:

Foreign investment¹⁰: U.S. firms, which have the largest share of investment in Russia, have invested over \$400 million, with future commitments of several billion

National Revenue Shares: 44.5% industry, 18.8% agriculture, 13.0% transportation and communication

Employment¹¹: agricultural 9,700,000, industrial 42,966,000, administrative/service 20,912,000

Unemployment¹²: 7-10%

Completed higher education: 11.3%

Roads¹³: 394,000 km of paved roads, 163,000 unpaved

Major sectors: oil, natural gas, coal, machine building, steel production, agriculture, chemicals, timber and wood products, paper, non-ferrous metals

Secondary sectors: agricultural machinery, food processing, consumer goods, fertilizers

Major industrial enterprises:

Major crops: Grains, potatoes, sugar beets

Secondary crops: vegetables, fruit

State farms¹⁴: 26,000 state and collective farms (1992)

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹⁵

Size: 17,075,400 km²

Borders: Norway, Finland, Estonia, Latvia, Lithuania (borders Kaliningrad), Poland (borders Kaliningrad), Belarus, Ukraine, Georgia, Azerbaijan, Kazakhstan, Mongolia, China, North Korea

Coastline: Arctic Ocean, Baltic Sea, Black Sea, Sea of Azov, Caspian, Pacific Ocean

Land use: 224,800,000 hectares of arable land, of which 119,100,000 is sown

Republics, territories, oblasts¹⁶: Yakutia-Sakha Republic (3,103,200 km²), Komi Republic (415,900 km²); Krasnoyarsk Territory (2,401,600 km²), Khabarovsk Territory (824,600 km²);

Tyumen' Oblast (1,435,200 km²), Magadan oblast (1,199,100 km²), Irkutsk Oblast (767,900 km²), Arkhangel'sk Oblast (587,400 km²), Kamchatka Oblast (472,300 km²), Chita Oblast (431,500 km²), Amur Oblast (363,700 km²), Tomsk Oblast 316,900 km²)

Precipitation: 150-2000 mm/year

Temperature: high 1-25, low 0 to -50 degrees celcius

Flora/fauna: includes arctic, steppe, northern forest, european forest habitats

Minerals: oil, natural gas, coal, diamonds, gold, copper, rare metals, manganese, bauxite, uranium, silver, graphite, platinum

ENVIRONMENT AND HEALTH¹⁷

Urban pollution index¹⁸: Krasoyarsk, Samara, Magnitogorsk, Perm', Chelyabinsk, Irkutsk, Krasnodar, Novosibirsk, Omsk, Rostov-na-Donu, Ryazan, Yekaterinburg, Ulan-Ude, Khabarovsk, Yuzhno-Sakhalinsk, Volgograd, Yaroslavl; other areas with multiple pollutant danger¹⁹ include Moscow, St. Petersburg, and Arkhangelsk

Accidental releases: Chernobyl accident (in Ukraine, 1986) contaminated Bryansk, Kaluga and Tula Oblasts; 1957 nuclear accident in Chelyabinsk

Areas of major contamination: Bryansk, Kaluga, Tula, Chelyabinsk Oblasts; portion of Altay Territory bordering on Semey (Semipalatinsk), Kazakhstan, contaminated from nuclear tests (surface 1949-63, underground until 1991)

Disease outbreaks: 4,000 cases of diptheria, 106 deaths, in 1993; also outbreaks of cholera, anthrax, plague

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.

2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).

3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.

4. Materials from proprietary FYI Information Resources archives; and International Monetary Fund, *Economic Review: Russian Federation* (April 1992), 2.

5. For all cities except Moscow and St. Petersburg, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 90.

6. Although the name of the city of Leningrad was changed to St. Petersburg in 1991, the oblast name in which the city is located remains Leningrad. This is also the case with Yekaterinburg (Sverdlovsk).

7. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 278-279.

8. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.

9. Materials from proprietary FYI Information Resources archives.

10. Materials from proprietary FYI Information Resources archives.

11. Goskomstat of the Russian Federation, cited in International Monetary Fund, *Economic Review: Russian Federation* (April 1992), 55; and Goskomstat, 102. The figures for industrial and administrative/service employment represent "rabochiye" and "sluzhashchiye," terms roughly equivalent to "blue collar" and "white collar."

12. International Labor Organization (ILO), cited in *The Wall Street Journal*, 9/15/93, A10. Figures for unemployment represent estimates based on available data. Official statistics in the NIS severely underestimate both actual unemployment and underemployment.

13. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.

14. Timothy Ash, *et al.*, "Russia sets the Pace of Agricultural Reform," *RFE/RL Research Report*, 1 (25), 1992, 57.

15. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 278-279.

16. Goskomstat, 68-70.

17. Unless otherwise indicated, information in this section based on materials from proprietary FYI Information Resources archives.

18. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy prirodnookhrannaya deyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.

19. Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR* (New York, 1992), national pollution map.

Water Overview: Russian Federation

NATURAL RESOURCES

Rivers: Dnepr, headwaters—west of Sychevka; Volga, headwaters—Seliger ozero [lake]; Enisey, headwaters—Mongolia; Lena, headwaters—west of Lake Baykal; Ob', headwaters—west of Barnaul; Kolyma, headwaters—west of Dzhelgala; Amur, headwaters—China
Tributaries: Irtys (into Ob'); Angara, Nizhnyy Tunguska (into Enisey); Alban, Olyokma (into Lena); Argun', Shilka (into Amur); Oka (into Volga)

Lakes: Pskovskoye, Labozhskoye, Onezhskoye, Baykal, Chany, Kulundinskoye

Soils: north—tundra soils, which are poorly drained, highly acidic, and are characterized by a permafrost layer; southeast—grey and brown forest earth, typical of deciduous forested areas, is characterized by its weak leaching and high organic content; chernozem, or "black earth," the most fertile soil found within the territory of the former Soviet Union; far east—mountain forest and tundra soils¹

Critical water contamination sites: Pskov (20-80 maximum permissible concentrations of ammonia/um, 100-200+ MPC ferrous compounds), Smolensk (20-80 MPC ammonia/um), Cherepovets (20-80 MPC ammonia/um, 100+ MPC phenols, 100-200+ MPC ferrous compounds), Vologda (1000+ MPC oil products), Yaroslavl' (20-80 MPC ammonia/um), Kineshma (up to 200 MPC sulfates), Ivanovo oblast' (20-80 MPC ammonia/um, 100-200+ MPC ferrous compounds), Moscow (100+ MPC phenols), Lytkarino (20-80 MPC oil products), Tul'skaya rayon (20-80 MPC ammonia/um), Dankov (100+ MPC phenols), Lipetsk (20-80 MPC oil products, 50-100 MPC phenols), Tambov (20-80 MPC ammonia/um, 100-200+ MPC ferrous compounds), Voronezh (100+ MPC other organic compounds), Voronezhskaya oblast' (10-50 MPC nitrates), Kamensk-Shakhtinskiy (50-100+ MPC zinc, copper, lead), Belaya Kalitva (100+ MPC oil products), Volgograd (15-50 MPC sulfates, 25-100 MPC chlorides, 30-60 MPC overall growth of mineral content, 100+ MPC phenols, 100-200+ MPC ferrous compounds), Akhtubinsk (100-200+ MPC ferrous compounds), Saratov (15-50 MPC sulfates), Saratovskaya oblast' (more than 100 MPC ammonia/um), Balakovo (15-50 MPC sulfates), Saransk (100+ MPC oil products), Samara (100+ MPC oil products),

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Otradniy (30-60 MPC overall growth of mineral content), Orenburg (25-100 MPC chlorides), Sterlitamak (60-100 MPC overall growth of mineral content), Ufa (50-100 MPC phenols), Orsk (100+ MPC oil products), Gay (20-80 MPC oil products), Chelyabinsk (100-200+ MPC ferrous compounds, 50-100+ MPC zinc), Verkhnyaya Pyshma (100-200+ MPC ferrous compounds), Chernushkiy (100+ MPC oil products), Solikamsk (up to 200 MPC chlorides), Pechora region (more than 100 MPC ammonia/um), Tomsk (1000+ MPC oil products, 100+ MPC phenols), Kemerovo (20-80 MPC ammonia/um), Myski (100-200+ MPC ferrous compounds), Abakan (1000+ MPC oil products), Krasnoyarsk (15-50 MPC sulfates), Sayansk (100+ MPC other organic compounds), Angarsk (100+ MPC phenols), Baykalsk (100+ MPC phenols), Ulan-ude (50-100 MPC phenols), Chita rayon (100-200+ MPC ferrous compounds)²

WATER USAGE

Industrial³: 58,054 million m³/year

Agricultural⁴: 22,319 million m³/year

Domestic⁵: 14,273 million m³/year

Total wastewater⁶: 30,633 million m³/year

Treated: 3,487 million m³/year (to normative standards), 18,647 million m³/year (insufficiently)

Total intake (from natural sources)⁷: 105,828 million m³/day

Treated: field research required

Sources⁸:

Wells: 12,551 million m³/year

Surface water: 93,275 million m³/year

Network: Russia's main water network is 200,000 km long. 75,000 pipeline accidents and bursts occur annually. There is no centralized water supply in hundreds of cities, and in more than 100 cities, water is delivered on a schedule between specific hours each day.⁹ St. Petersburg's supply and sewage system network is 10,000 km within the city and 12-14,000 km in the region; it supplies 4 million m³ per day and treats 1 million m³ per day.¹⁰

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: an estimated 40% of Russia's water supply and sewerage equipment is outdated and half of the piping of the existing system is beyond useful lifetime;¹¹ lack of chemical reagents; equipment shortfalls; lack of technology

Source water: rivers

Common contaminants: high mineral levels, pesticides, fertilizers

Common treatment methods: chlorination (Yekaterinburg), sedimentation, filtration, sedimentation, aeration, flocculation, some ozonation systems being constructed (though in November 1991, only Minsk, Belarus; Kiev, Ukraine; and Moscow had access to ozonation)¹²

OPERATING ENVIRONMENT

Financing: transition to economic methods of management of nature protection commenced in 1990. Republics, krays, oblasts, and cities participate in defining the amounts and system for collection of payments for pollution. These payments then finance scientific work, the acquisition of instruments and equipment, the construction of waste water urification units, etc. The decree which established payment norms was ratified 9 January 1991. Preliminary payments for pollution in 1992 totaled 22.5 million rubles in Bashkiria, 37 million rubles in Altay Kray, and from 40 to 57 million rubles in Vladimir, Irkutsk, Kirov, and Lipetsk oblasts.¹³ An estimated 70 billion ruble budget is necessary to repair and modernize the water supply system of Russia.¹⁴ In 1992, the federal expenditure for ecological activities was two billion rubles, the same amount which was spent over the period from 1987 to 1991.¹⁵ Discussion is being held concerning the establishment of banks to address the financial concerns of local water supply and sewerage departments.¹⁶ In some regions, such as Tartarstan, loans are being allocated to enterprises which have made a successful effort to ecologically improve their operations.¹⁷

Taxation: tax holidays are extended by some regional governments to enterprises which pursue ecological projects¹⁸

Liability: a law was being considered in December 1992 which would hold local water supply and sewerage departments liable for water pollution;¹⁹ no law has yet been passed guaranteeing the provision of potable water to the population²⁰

Personnel: field research required

Monitoring/testing: pursued by regional and local committees; 61 ecological prosecutor's offices²¹

Metering: not yet instituted federally, but in Yekaterinburg, the installation of home metering systems is being strongly considered, and in St. Petersburg, they are being manufactured²²

Fees/fines: fines and penalties are levied on enterprises by regional governments. Since the demise of the Soviet Union, such practices have become extremely profitable and thus are strongly pursued. The Verkhnyaya Pyshma City Council Committee on Nature Protection has a 30 million ruble budget created from the collection of fines and penalties.²³ The Chelyabinsk Oblast Committee for the Environment collected 11.7 million rubles in fees for the pollution of reservoirs and 2.7 million rubles in fees for the inefficient operations of purification plants.²⁴ In the Krasnoyarsk Kray, legislation was recently passed increasing fines by a factor of 25 for the discharging untreated water.²⁵ In Tartarstan, payments must be made for emissions and discharges. Such payments are saved, however, in accounts for each enterprise which are then used to fund their individual ecological improvement projects.²⁶ Fines are also levied by regional committees of the Association of Water Users.²⁷

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1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
 2. *The Institute of Geography Water Report*, FYI Information Resources Research Archives.
 3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
 4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
 5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
 6. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.

7. Gosudarstvennyy Komitet SSSR po Statistike, 70.
8. Gosudarstvennyy Komitet SSSR po Statistike, 69.
9. Nikolay Tereshko, "What Will We Drink? Coordinating Presidential Council on Problems of Ecological and Health Considers How to Provide Pure Water for the Population," *VEK*, 13 (6-13 November 1992), 6.
10. FYI Information Resources Research Archives (October 1992).
11. *Water Treatment in Russia: Problems and Perspectives—An Overview*, FYI Information Resources (Washington, D.C.: FYI, December 1992), 1.
12. *The Drinking Water Industry in the Soviet Region* (Washington, D.C.: FYI Information Resources, November 1991), 11.
13. R. Mamin, "Without Price and Without a System," *Spaseniye* 5 (February 1992), 4.
14. *Water Treatment in Russia: Problems and Perspectives—An Overview*, 2.
15. "Government Efforts to Support Environmental Enterprises. Use of Resources," *JPRS Report: Environmental Issues* (20 April 1993), 31.
16. *Water Treatment in Russia: Problems and Perspectives—An Overview*, 3.
17. "State of Tatarstan Ecology Examined," *JPRS Report: Environmental Issues*, 29 March 1993, 29.
18. FYI Information Resources Research Archives (April 1993).
19. *Water Treatment in Russia: Problems and Perspectives—An Overview*, 2.
20. Lyudmila Sorokina, "What Is Flowing into the Little Spring," *Rossiyskiye Vesti* (11 June 1993), 4.
21. "Belarus: State Official Comments on Environmental Quality Control," *JPRS Report: Environmental Concerns* (6 July 1993).
22. FYI Information Resources Research Archives (April 1993).
23. FYI Information Resources Research Archives (April 1993).
24. "State of the Environment in the Chelyabinsk Oblast in 1992," *JPRS Report: Environmental Issues* (16 June 1993), 38-40.
25. A. Tarasov, "Fines Increased by Factor of 25," *Izvestiya* (21 April 1993), 2.
26. "State of Tatarstan Ecology Examined," *JPRS Report: Environmental Issues* (29 March 1993), 29.
27. FYI Information Resources Research Archives (October 1992).

Country Profile: Tajikistan

PRESENT SITUATION

DEMOGRAPHICS¹

Population²: 5,272,000

Urban: 31.4

Rural: 68.6

Population density: 37.4 per km²

Average family size: 6.1

Birth rate (per 1,000): 38.8

Death rate (per 1,000): 6.2

Infant mortality (per 1,000 births)³: 40.7

Life expectancy: 69.6 years

Ethnicity⁴: 62.4% Tajik, 23.5% Uzbek, 7.6% Russian, 1.4% Tatar, 1.3% Kyrgyz

Largest cities⁵: Dushanbe (capital) 592,000, Khujand 157,000, Kulob 71,000, Qurghonteppa 55,000

Territorial-administrative divisions: four oblasts, Karotegin (including Dushanbe city) 1,774,000,

Khujand 1,636,000, Qurghonteppa 1,113,000, Kulob 668,000; one autonomous oblast,

Badakhshoni Kuhi 167,000, 19 urban areas

ECONOMY⁶

Gross national product: \$5.5 billion

GNP (per capita)⁷: \$1,050

Change in GDP⁸: significant declines in industrial production in 1992, as high as 50% in some sectors (chemicals, food processing)

Gross domestic product:

Change in GDP:

Foreign investment: concentrated in the mining sector

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

National revenue shares: 37.5% agriculture, 31.5% industry, 14.8% construction, 3.8% transportation and communications

Employment⁹: agricultural 2,108,000, industrial 789,000, administrative/service 370,000

Completed higher education¹⁰: 7.5

Roads¹¹: 13,300 km.

Major sectors: agriculture, cotton processing and cotton products, machine tools

Secondary sectors: hydroelectric power, mining, food processing, construction materials

Major industrial enterprises:

Major crops: cotton, grains

Secondary crops: rice, fruits, grapes

State farms:

Major farms:

GEOGRAPHY AND NATURAL RESOURCES¹²

Size: 143,100 km²

Borders: Uzbekistan, Afghanistan, China, Kyrgyzstan

Coastline: none

Land use¹³: 848,000 sown hectares

Oblasts¹⁴: Karotegin (including Dushanbe city) 28,700 km², Khujand 26,100 km², Qurghonteppe 12,600 km², Kulob 12,000; Badakhshoni Kuhi Autonomous Oblast 63,700 km²

Precipitation: 150-300 mm/year (1,200-2,000 in mountains)

Temperature: high 27-30 (10-12 in mountains), low -1 to 3 degrees celcius (-20 in mountains)

Flora/fauna: mountains comprise 90% of territory, ravine and fertile valley habitats

Minerals¹⁵: uranium, radium, arsenic, natural gas, gold, silver, aluminum, marble, coal

ENVIRONMENT AND HEALTH

Urban pollution index¹⁶: Dushanbe (formaldehyde, nitrogen dioxide, nitrogen oxide)

Accidental releases:

Areas of major contamination: Dushanbe enterprises dispose of hazardous waste in populated areas¹⁷; cotton producing areas contaminated with pesticides, herbicides, fertilizers¹⁸

Disease outbreaks: tooth rot and congenital development defects traced to emissions of Tajik Aluminum Plant in Tursun Zade¹⁹

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1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March, 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Materials from proprietary FYI Information Resources archives; also Eden Naby, "Tajiks Reemphasize Iranian Heritage....," *Report on the USSR*, 2/16/90, 21.
5. For all cities except the capital, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 140.
6. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 440.
7. National Geographic Society, *From Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. Materials from proprietary FYI Information Resources archives.
9. Material from proprietary FYI Information Resources archives; and Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye," Russian terms roughly equivalent to "blue collar" and "white collar."
10. Goskomstat, 210.
11. Figures for the ratio of paved to unpaved roads not available. Unpaved and unmaintained roads should be considered more prevalent.
12. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 440.
13. Figures for total arable land not available.
14. Goskomstat, 73.
15. Materials from proprietary FYI Information Resources archives.
16. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
17. *Izvestiya*, 11/3/90, 1.
18. Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR* (New York, 1992), 74.
19. Feshbach, 108.

Water Overview: Tajikistan

NATURAL RESOURCES

Rivers: Syrdar'ya, headwaters—merging of Naryn and Karabarya rivers; Zeravshan, headwaters—southwest of peak Igla; Kafirnigan, headwaters—Tarakeginskiy khrebet; Vakhsh, headwaters—southwest of peak Igla; Pyandzh, headwaters—Vakhanskiy khrebet; Bartang-Murgab-Oksu, headwaters—Afghanistan

Tributaries: Surkhob (into Vakhsh)

Lakes: Karakul', Sarezskoye, Yashil'kul', Zorkul'

Soils: mountain meadow and steppe soils¹

Critical water contamination sites: field research required

WATER USAGE

Industrial²: 621 million m³/year

Agricultural³: 10,590 million m³/year

Domestic⁴: 494 million m³/year

Total wastewater⁵: 286 million m³/year

Treated: 176 million m³/year (to normative standards), 100 million m³/year (insufficiently)

Total intake (from natural sources)⁶: 12,761 million m³/year

Treated: field research required

Sources⁷:

Wells: 1,126 million m³/year

Surface water: 11,635 million m³/year

Network: traditional villages for rural laborers do not even have basic sanitation systems, including water mains, sewage lines and treatment systems, and water purification systems; source of drinking water is the canal or tributary that collects runoff from irrigated fields⁸

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FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: conflict between industrial, agricultural, and domestic sectors for scarce water resources⁹; lack of efficient irrigation technology

Source water: rivers, canals

Common contaminants: pesticides, chemical fertilizers, defoliants

Common treatment methods: further field research necessary; little water treatment at best

OPERATING ENVIRONMENT

Due to the extremity of the depletion of water resources in the Central Asian region, little is presently being done to improve water quality. The desiccation of the Aral Sea due to mismanagement of water resources by all four Central Asian countries and the general scarcity of water resources needed to propel the largely agricultural economy is monopolizing the time and energies of the governments of these countries and conservation-conscious individuals and associations.

Financing: field research required

Taxation: field research required

Liability: field research required

Personnel: field research required

Monitoring/testing: Ministry of Environment Protection was consolidated on 29 January 1992¹⁰

Metering: regional officials are adamantly against the imposition of fees for the use of natural resources

Fees/fines: field research required

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnnykh Resursov v SSSR* (Moscow: 1989), 72.
3. Gosudarstvennyy Komitet SSSR po Statistike, 75.
4. Gosudarstvennyy Komitet SSSR po Statistike, 74.
5. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
6. Gosudarstvennyy Komitet SSSR po Statistike, 70.
7. Gosudarstvennyy Komitet SSSR po Statistike, 69.
8. Peter Pavilionis, "Central Asia's Environmental Politics," *USCSAR Reports* (Fall 1991), 35-51.
9. Gregory Gleason, "The Struggle for Control over Water in Central Asia: Republican Sovereignty and Collective Action," *Report on the USSR* (21 June 1991), 11-19.
10. "Tajikistan Supreme Soviet Establishes Environmental Ministry," *JPRS Report: Environmental Issues* (3 March 1992), 69.

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Country Profile: Turkmenistan

DEMOGRAPHICS¹

Population²: 3,856,000

Urban: 45.4%

Rural: 54.6%

Population density: 7.6 per km²

Average family size: 5.6

Birth rate (per 1,000): 34.2

Death rate (per 1,000): 7.0

Infant mortality (per 1,000)³: 45.2

Life expectancy: 66.4 years

Ethnicity⁴: Turkmen 70%; Russian 10%; Uzbek 10%

Largest cities⁵: Ashgabat (capital) 416,000; Charjew 166,000; Doshhowuz 110,000; Mary 89,000;
Nebitdag 85,000; Ufra 59,000

Territorial-administrative divisions: five oblasts: Ahal 875,000; Balkan 352,000; Dashhowuz
665,000; Lebap 698,000; Mary 771,000⁶

ECONOMY⁷

Gross National Product: \$6.5 billion

GNP per capita⁸: \$1,700

Gross domestic product:

Change in GDP:

Foreign investment:

National revenue shares: industry 26.0%; agriculture 38.9%; construction 20.4%; transportation and
communications 6.2%

Employment: agricultural⁹ 800,000; industrial¹⁰ 571,000; administrative/service 291,000

Completed higher education: 8.3%

Roads¹¹: 11,400 km of paved roads; 1,900 km unpaved

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Major sectors: agriculture, natural gas, oil

Secondary sectors: textiles, chemicals

Major industrial enterprises: Ufra (formerly Krasnovodsk) Oil Refinery, Charjew Oil Refinery, Kotur-Tepe Oil Field, Nebit-Dag Oil Field, Caspian Sea Oil Fields, Kopet Dag Trough Gas Field, Amu-Dar'ya District Gas Fields

Major crops: cotton, grains

Secondary crops: vegetables, fruits

State/collective farms:

Largest farms:

GEOGRAPHY AND NATURAL RESOURCES¹²

Size: 488,100 km²

Borders: Kazakhstan, Uzbekistan, Afghanistan, Iran

Coastline: Caspian Sea

Land use: 124,300 hectares of sown land, extensively irrigated¹³

Oblasts¹⁴: Ahal 95,400 km²; Balkan 138,500 km²; Dashhowuz 73,600 km²; Lebap 93,800 km²; Mary 86,800 km²; 16 urban areas

Precipitation: 80 mm/year; 300 mm/year in mountains

Temperature: high 28; low -4 degrees celcius

Flora/fauna: desert and mountain habitats; Kara Kum Desert covers 90% of territory

Minerals: natural gas, oil, iodine-bromine, sodium sulphate, salts

ENVIRONMENT AND HEALTH

Urban pollution index¹⁵: Charjew (flouride hydrogen, dust)

Accidental releases:

Areas of major contamination: Nitrogenous Fertilizer Plant in Mary has contaminated population and atmosphere with toxins¹⁶; Doshhowuz Oblast, including the Amu Darya river, contaminated with pesticides, nitrates¹⁷

Disease outbreaks: hepatitis, typhoid, other waterborne infectious diseases are blamed for 27% of infant mortality in Turkmenistan¹⁸

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Materials from proprietary FYI Information Resources archives.
5. For all cities except the capital, Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 136.
6. Population figures based on Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR*, 136.
7. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 507.
8. National Geographic Society, *Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
9. Estimates for work force divisions by sector are tentative and based on proprietary materials from FYI Information Resources archives. Agricultural employment is probably considerably higher than indicated, industrial employment probably lower.
10. Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye." Russian terms roughly equivalent to "blue collar" and "white collar."
11. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
12. Unless otherwise indicated, information in this section based on *Bol'shoi entsiklopedicheskiy slovar'*, 507.
13. No reliable figures for total area of arable land available.
14. Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR*, 136.
15. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
16. Moscow television Service in Russian 1430 GMT 13 Sep 90, cited in FBIS-SOV-90-180, 106.
17. *Izvestiya*, 11/24/90, 2.
18. Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR* (New York, 1992), 75.



Water Overview: Turkmenistan

NATURAL RESOURCES

Rivers: Amu Darya, headwaters—merging of the Pyandzh and Kunduz rivers; Murgab, headwaters—Afghanistan; Tedzhen, headwaters—Iran; Atrek, headwaters—kherebet Khezarmesdzh

Tributaries: Kushka (into Murgab), Sumbar (into Atrek)

Lakes: Sarykamyshskoye, Kattashor 3-ye

Soils: desert soils¹

Critical water contamination sites: sulfate and petroleum products pollute the waters of the Kara Kum canal, Shavat canal, and Amu Darya, Murgab, Kushka, and Sumba rivers;² the Murgab has been targeted as one of the most critically polluted rivers in the former Soviet Union³

WATER USAGE

Industrial⁴: 2,095 million m³/year

Agricultural⁵: 18,162 million m³/year

Domestic⁶: 214 million m³/year

Total wastewater: field research required

Treated (1989)⁷: field research required (to normative standards), 19 million m³/year (insufficiently)

Total intake (from natural sources): 22,498 million m³/year

Treated: field research required

Sources⁸:

Wells: 479 million m³/year

Surface water: 22,019 million m³/year

Network: desalinization installations near Ashkhabad provide local population with purified water;⁹ traditional villages for rural laborers do not have basic sanitation systems, including water mains, sewage lines and treatment systems, and water purification systems; source of drinking water is the canal or tributary that collects the runoff from irrigated fields¹⁰

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FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: conflict between industrial, agricultural, and domestic sectors for scarce water resources¹¹; no purification technology; lack of efficient irrigation technology

Source water: rivers, canals

Common contaminants: pesticides, chemical fertilizers, defoliants, phenols, heavy metals

Common treatment methods: membrane, reverse osmosis, electro dialysis

OPERATING ENVIRONMENT

Because of the extremity of the depletion of water resources in the Central Asian region, little is presently being done to improve water quality. The desiccation of the Aral Sea due to mismanagement of water resources by all four Central Asian countries and the general scarcity of water resources needed to propel the largely agricultural economy is monopolizing the time and energies of the governments of these countries and conservation-conscious individuals and associations.

Financing: field research required

Taxation: field research required

Liability: in the first six months of 1992, 442 officials and individual citizens faced proceedings under the laws "On the Protection of Nature" and "On Increasing Liability for Violations of Ecological Laws."¹²

Personnel: field research required

Monitoring/testing: scientific institutes are developing monitoring equipment and pursuing monitoring needs

Metering: regional officials are adamantly against the imposition of fees for the use of natural resources

Fees/fines: field research required

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. "Turkmenistan Suffers Rise in Air, Water Pollution," *JPRS Report: Environmental Issues* (7 October 1992), 65.
3. B. I. Kochurov, N. I. Koronkevich, A. V. Antipova, T. B. Kenisova, N. A. Zherebtsova, O. Yu. Bykova, *Karta Naiboleye Ostrykh Ekologicheskikh Situatsiy* (Institut Geografii AN SSSR).
4. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
5. Gosudarstvennyy Komitet SSSR po Statistike, 75.
6. Gosudarstvennyy Komitet SSSR po Statistike, 74.
7. Gosudarstvennyy Komitet SSSR po Oxrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
8. Gosudarstvennyy Komitet SSSR po Statistike, 69.
9. FYI Information Resources Research Archives (April 1993).
10. Peter Pavilionis, "Central Asia's Environmental Politics," *USCSAR Reports* (Fall 1991), 35-51.
11. Gregory Gleason, "The Struggle for Control over Water in Central Asia: Republican Sovereignty and Collective Action," *Report on the USSR* (21 June 1991), 11-19.
12. "Turkmenistan Suffers Rise in Air, Water Pollution," *JPRS Report: Environmental Issues* (7 October 1992), 65.

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Country Profile: Ukraine

DEMOGRAPHICS¹

Population²: 52,103,000

Urban: 67.5%

Rural: 32.5%

Population density: 86 per km²

Average family size: 3.2

Birth rate (per 1,000): 12.7

Death rate (per 1,000): 12.1

Infant mortality (per 1,000)³: 12.9

Life expectancy: 70.5 years

Ethnicity⁴: Ukrainian 73%; Russian 21%; other (Belorussian, Moldovan, Polish, German) 6%

Largest cities⁵: Kiev (capital) 2,643,000; Kharkiv 1,587,000; Dnepropetrovsk 1,182,000; Odessa 1,141,000

Territorial-administrative divisions: 24 oblasts, of which four (Dnepropetrovsk, Donetsk, Kiev combined city and oblast, and Kharkiv) each have between 3 and 6 million residents; four additional oblasts (Zaporuzh'ye, Luhansk, L'viv, Odessa) have between 2 and 3 million residents each; the Crimean Republic (pop. 2.5 million) has special republican status; 479 districts; 434 urban areas

ECONOMY⁶

Gross national product: \$121 billion

GNP per capita⁷: \$2,340

Gross domestic product⁸: 2.7 trillion, 1992 rubles

Change in GDP:

Foreign investment⁹: approximately 1,400 joint ventures, 25% operational

National revenue shares: industry 45.3%; agriculture 25.0%

Employment¹⁰: industrial 13,589,000, administrative/service 6,297,000

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Completed higher education¹¹: 10%

Roads¹²: 151,700 km of paved roads; 13,600 km unpaved

Major sectors: heavy industries including machine tools, machine building, mining and metallurgical machines; iron, steel, and coal mining and production; appliances, computers and electronics; food processing; aerospace; cars and trucks; railroad cars; ships and river vessels

Secondary sectors: chemicals, oil and gas refining

Major industrial enterprises¹³: Yuzhnaya Machine Building Factory (Dnepropetrovsk), Petrovskii Metallurgical Plant (Dnepropetrovsk), Zaporozhstal Steel Factory (Zaporozh'e), ZAZ Zaporozh'e Automobile Factory (Zaporozh'e), Dnepropetrovsk Mineral Fertilizer Plant (Dnepropetrovsk), Donetsk Lenin Metallurgical Works (Donetsk)

Major crops: grains, sugarbeets, sunflower seeds

Secondary crops: fruit, watermelons, grapes

State/collective farms:

Largest farms:

GEOGRAPHY AND NATURAL RESOURCES¹⁴

Size: 603,700,000 km²

Borders: Russian Federation, Belarus, Moldova, Poland, Slovakia, Hungary, Romania

Coastline: Black Sea, Sea of Azov; major ports at Odessa, Illichivsk, Kherson, Izmayil, Mariupol, Kerch

Land use: 41,800,000 hectares of arable land, of which 32,922,000 hectares are sown; half of Ukraine's entire territory is considered fertile "black earth" land; 15 Nature Reserves including Black Sea, Poleskii, Carpathian, Shatskii

Oblasts¹⁵: four (Dnepropetrovsk, Odess, Kharkiv, Chernihiv) cover over 30,000 km² of territory each; six (including Crimea) cover between 27,000 and 30,000 each

Precipitation: from 300 mm/year (southeast) to 1,200-1,600 mm/year (Carpathian Mountains)

Temperature: high 18-19, 23-24 degrees celcius; low -7 to -8 degrees celcius

Flora/fauna: steppe, northern forest habitat

Minerals¹⁶: coal, iron ore, manganese, natural gas

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ENVIRONMENT AND HEALTH¹⁷

Urban pollution index¹⁸: Dneprodzerzhinsk (formaldehyde, ammonium hydrate, dust, nitrogen dioxide); Zaporozh'e (nitrogen dioxide, phenol, formaldehyde); Odessa (formaldehyde, fluoric hydrogen); Dnepropetrovsk (dust, formaldehyde, ammonium hydrate); Kryuyy Rih (formaldehyde, ammonium hydrate, dust)

Accidental releases: 11 million tons of dangerous industrial byproducts released annually; 1986 accident at Chernobyl nuclear power plant

Areas of major contamination: Donetsk, Dnepropetrovsk (Donbass coal mining region); Zaporozh'e (steel production, nuclear plants)

Disease outbreaks:

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1. Unless otherwise indicated, information in this section is from Goskomstat, *Narodnoe khoziaistvo v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Central Intelligence Agency, *Comparative Soviet Nationalities by Republic* (map), 9-89.
5. Population for all cities excluding Kiev cited from Glavnoe upravlenie geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 104.
6. Unless otherwise indicated, all information in this section is from *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 521-522.
7. National Geographic Society, *Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. Materials from proprietary FYI Information Resources archives.
9. Materials from proprietary FYI Information Resources archives.
10. Goskomstat, *Narodnoe khoziaistvo SSSR v 1990 godu* (Moscow, 1991), 102. This figure represents "rabochie" and "sluzhashchie," which are categories roughly equivalent to "blue collar" and "white collar" workers.
11. Goskomstat, 210.
12. This information is based on Soviet-era statistics and likely portrays a larger percentage of paved roads than is actually the case.
13. Materials from proprietary FYI Information Resources archives.
14. Unless otherwise indicated, information in this section is from *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 521-522.
15. Goskomstat, *Narodnoe khoziaistvo SSSR v 1990 godu* (Moscow, 1991), 71.
16. Materials from proprietary FYI Information Resources archives.
17. Unless otherwise indicated, information in this section is from proprietary FYI Information Resources archives.
18. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel' nosi' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.

Water Overview: Ukraine

NATURAL RESOURCES

Rivers: Dnepr, headwaters—north of Safonov, Russia; Dnestr, headwaters—western Ukraine; Prut, headwaters—Vorokhta; South Bug, headwaters—Yasnoye

Tributaries: Desna, Pripjat' (into Dnepr)

Lakes: Yalpus, Kitay, Sasyk, Shagany, Alibiy, Burnas

Soils: north—grey and brown forest earth, typical of deciduous forested areas, is characterized by its weak leaching and high organic content; south—chernozem, or "black earth," the most fertile soil found within the territory of the former Soviet Union¹

Critical water contamination sites: Chernovtsy (20-80 maximum permissible concentrations of oil products), Dnepropetrovsk (15-50 MPC nitrates, 50-100 MPC phenols), Dolinskaya (20-80 MPC ammonia/um), Gorlovka (100+ MPC phenols, 100+ MPC other organic compounds), Lisichansk (100+ MPC oil products), Rubezhnoye (100+ MPC phenols), Severodonesk (up to 200 MPC chlorides, 60-100 MPC overall growth of mineral content, more than 100 MPC ammonia/um), Slavyansk (up to 200 MPC chlorides, 60-100 MPC overall growth of mineral content, 20-80 MPC ammonia/um, 100+ MPC oil products), Starokonstantinov (more than 100 MPC ammonia/um)²

WATER USAGE

Industrial³: 16,363 million m³/year

Agricultural⁴: 7,868 million m³/year

Domestic⁵: 4,473 million m³/year

Total wastewater⁶: 6.706 million m³/year

Treated: 3.806 million m³/year (to normative standards), 2.397 million m³/year (insufficiently)

Total intake (from natural sources)⁷: 30,585 million m³/year

Treated: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Sources⁸:

Wells: 4,219 million m³/year

Surface water: 26,364 million m³/year

Network: the sewage treatment system of Odessa has failed to keep up with the rapid growth of the resort industry in the Crimea and frequently breaks down, causing raw sewage to be released directly into the sea. In 1989, the level of improperly-treated wastes emitted rose to 100 million m³. The beaches on the Black Sea are often closed due to the high amount of pollution in the water.⁹

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: inability to produce acceptably-desalinized water, lack of technology, lack of equipment, deterioration of existing equipment

Source water: rivers, Black Sea

Common contaminants: products of ferrous metallurgy, chemical industries, pesticides, fertilizers

Common treatment methods: field research required

OPERATING ENVIRONMENT

Financing: technological development and monitoring done by independent firms contracted by government

Taxation: field research required

Liability: no law has yet been passed that guarantees safe drinking water¹⁰

Personnel: field research required

Monitoring/testing: quality indicators determined by State Committee of Standards (GOSSTANDART); testing done by scientific institutes; government committees set up to study seriously polluted areas; Ministry of Environment and Academy of Sciences jointly studying Donbass

Metering: field research required

Fees/fines: the Kiev Water Supply and Sewage Administration has been granted the right to take funds directly from bank accounts of polluting enterprises¹¹; 11 ecological prosecutor's offices handle pollution cases¹²

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1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
 2. *The Institute of Geography Water Report* (FYI Information Resources Research Archives).
 3. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
 4. Gosudarstvennyy Komitet SSSR po Statistike, 75.
 5. Gosudarstvennyy Komitet SSSR po Statistike, 74.
 6. Gosudarstvennyy Komitet SSSR po Ochrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
 7. Gosudarstvennyy Komitet SSSR po Statistike, 70.
 8. Gosudarstvennyy Komitet SSSR po Statistike, 69.
 9. D. J. Peterson, "The State of the Environment: The Water." *Report on the USSR* (16 March 1990), 18.
 10. "Ukraine: Program Seeks to Improve Quality of Drinking Water," *JPRS Report: Environmental Issues* (9 July 1993), 55.
 11. *Water Resources in the Soviet Region: An Overview* (Washington, D.C.: FYI Information Resources, November 1991), 16.
 12. "Belarus: State Official Comments on Environmental Quality Control," *JPRS Report: Ecological Issues* (6 July 1993), 23.

Country Profile: Uzbekistan

DEMOGRAPHICS¹

Population²: 21,301,000

Urban: 40.3%

Rural: 59.7%

Population density: 46.3 per km²

Average family size: 5.5

Birth rate (per 1,000): 33.7

Death rate (per 1,000): 6.1

Infant mortality (per 1,000)³: 34.6

Life expectancy: 69.5 years

Ethnicity⁴: Uzbek 71.4%; Russian 8.3%; Tajik 4.7%; Kazakh 4.1%; Tatar 2.4%; Karakalpak 2.1%

Largest cities⁵: Tashkent (capital) 2,120,000; Samarqand 388,000; Namangan 291,000; Andijon 288,000; Bukhara 220,000; Fergana 203,000; and nine cities with 100,000 to 199,999 inhabitants.

Territorial-administrative divisions: one republic: Karakalpakstan 1,274,000; 12 oblasts: Tashkent (including Tashkent city) 4,299,000; Samarqand 2,386,000; Fergana 2,226,000; Andijon 1,795,000; Bukhara 1,708,000; Qashqadaryo 1,698,000; Namangan 1,558,000; Surkhondaryo 1,336,000; Khorazm 1,068,000; Jizzakh 780,000; Nawoiy 629,000; Sirdaryo 580,000; 124 urban areas

ECONOMY⁶

Gross national product: \$29 billion

GNP per capita⁷: \$1,350

Gross domestic product (1991 rubles): 56.3 billion rubles

Foreign investment: extremely limited

National revenue shares⁸: industry 31.4%; agriculture 37.6%

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Employment⁹: industrial 3,398,000; administrative/service 1,760,000

Completed higher education¹⁰: 9.2%

Roads¹¹: 37,400 km of paved roads; 1,600 km unpaved

Major sectors¹²: agriculture, cotton processing, cotton harvesting and other machinery, natural gas production, gold mining

Secondary sectors: metallurgy, chemicals, textiles

Major industrial enterprises:

Major crops: cotton

Secondary crops: fruits, vegetables, grains

State/collective farms:

Largest farms:

GEOGRAPHY AND NATURAL RESOURCES¹³

Size: 447,400 km²

Borders: Kazakhstan, Turkmenistan, Afghanistan, Tajikistan, Kyrgyzstan

Coastline: Aral Sea

Land use: 4,349,000 hectares of sown land¹⁴

Oblasts: Nawoiy 110,800 km², Bukhara 39,400 km², Qashqadaryo 28,400 km²

Precipitation: 80-90 mm/year; 1,000 mm/year in mountains

Temperature: high 26-32 degrees celcius; low -10 to 3 degrees celcius

Flora/fauna: Kyzyl Kum Desert covers approximately 60% of territory; fertile valley lands; mountain forest and steppe habitats

Minerals: gold, natural gas, oil, uranium, silver, copper, lead, zinc, coal

ENVIRONMENT AND HEALTH

Urban pollution index¹⁵: Tashkent (nitrogen dioxide, fenol), Fergana (formaldehyde, nitrogen dioxide, dust)

Accidental releases: potentially hazardous radiation source found in Tashkent school¹⁶; severe chemical release in Tashkent subway¹⁷

Areas of major contamination: cotton producing areas contaminated with pesticides; salination of Aral Sea increased from 10% to 23-44% due to irrigation¹⁸

Disease outbreaks: cholera cases in Tashkent¹⁹

1. Unless otherwise indicated, information in this section based on Goskomstat, *Narodnoye khozyaistvo SSSR v 1990 godu* (Moscow, 1991), 68-94, 210.
2. National Geographic Society, *From Communism to Capitalism* (map) (March 1993).
3. Statistical methodology in the former Soviet Union differed from accepted standards, and the measure of infant mortality given is often considered to be lower than it would have been had world statistical standards been used to evaluate the data.
4. Material from proprietary FYI Information Resources archives.
5. Glavnoye upravlenoye geodezii i kartografii, *Atlas SSSR* (Moscow, 1988), 90.
6. Unless otherwise indicated, information in this section is from *Bol'shoi entsiklopedicheskiy slovar'* (Moscow, 1991), 122-123.
7. National Geographic Society, *Communism to Capitalism* (map) (March 1993). It should be emphasized that factors, including a general lack of reliable economic data for the post-Soviet period, the fluidity of exchange rates, and extremely high inflation rates in the NIS, make measurement of GNP or other indicators in dollars or any other currency extremely difficult. Figures presented here represent rough estimates based on available information.
8. No further data available.
9. Goskomstat, 102-103. The figures for industrial and administrative/service employment represent, respectively, "rabochiye" and "sluzhashchiye," Russian terms roughly equivalent to "blue collar" and "white collar."
10. Goskomstat, 210.
11. Figures cited here should not be considered indicative of the actual ratio of paved to unpaved roads. Unpaved and unmaintained roads should be considered more prevalent than indicated.
12. Mihalisko, 9.
13. Unless otherwise indicated, information in this section is from *Bol'shoi entsiklopedicheskiy slovar'*, 122-123.
14. Reliable figures for total arable land not available.
15. Gos. kom. SSSR po okhrane prirody, *Gosudarstvennyy doklad: Sostoyaniye prirodnoy sredy i prirodookhrannaya detyatel'nost' v SSSR v 1989 godu* (Moscow, 1990), 47-50. These cities are listed as having amounts of atmospheric pollution sufficient to pose significant risk to human life and health.
16. *Gudok*, 2/26/91, 3.
17. *Komsomolskaya pravda*, 8/18/90, 3.
18. Materials from proprietary FYI Information Resources archives.
19. *Pravda*, 8/3/90, 1.

Water Overview: Uzbekistan

NATURAL RESOURCES

Rivers: Amu Darya, headwaters—merging of Pyandzh and Kunduz rivers

Tributaries: Zeravshan, Chatkal, Syrdar'ya, Naryn

Lakes: Aybarkul'

Soils: desert soil¹

Critical water contamination sites: Chirchik (20-80 maximum permissible concentration of ammonia/um).² The underground sources in Karakhum, Chorezem, and Karakalpakiya have been described as "disastrous," and surface water is unusable.³ The Amu Darya has been described as an "open agricultural sewer" due to its heavy contamination by salts and chemicals.⁴ Surface water in Kibray, Tashkent, Zingiatinsk, Urtachiechik, Yangiulskiy, Pskentskiy, and Kuychirchik rayons is considered "poor." In the Chinaz, Akkurgan, Bukinskiy, and Bekabad rayons, it is considered "dangerous" with 10 to 12 contaminants exceeding the maximum permissible concentrations. In Arangi-Karabay, Kibray, Poltoratskiy, Yangiyul, Chinaz, Soldatskiy, and Almarzar, the sources of subterranean water is unsuitable for use in households because of industrial waste pollution. The Zeravshan is the most highly polluted river in Uzbekistan due to drainage from irrigated zones and from the industry in Samarkand, Kattakurgan, Navoi, and Bukhara.⁵

WATER USAGE

Industrial⁶: 6,575 million m³/year

Agricultural⁷: 46,216 million m³/year

Domestic⁸: 1,986 million m³/year

Total wastewater⁹: 762 million m³/year

Treated: 497 million m³/year (to normative standards), 58 million m³/year (insufficiently)

Total intake (from natural sources)¹⁰: 73,878 million m³/year

Treated: field research required

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CEE/MONGOLIA INFRASTRUCTURE PROJECT.

Sources¹¹:

Wells: 3,244 million m³/year

Surface water: 70,634 million m³/year

Network: villages use surface or well water; centralized systems exist for cities with populations greater than 8,000.¹² Most of the infectious disease hospitals in Uzbekistan have no plumbing at all.¹³ Traditional villages for rural laborers do not even have basic sanitation systems, including water mains, sewage lines and treatment systems, and water purification systems. Source of drinking water is the canal or tributary that collects runoff from irrigated fields.¹⁴

FACILITIES

Treatment facilities: field research required

Operating at full capacity: field research required

Operating below capacity: field research required

Under construction: field research required

Common problems: conflict between industrial, agricultural, and domestic sectors for scarce water resources¹⁵; lack of awareness of and technology of treatment of wastewater; lack of efficient irrigation technology

Source water: rivers, canals

Common contaminants: pesticides, chemical fertilizers, defoliants

Common treatment methods: further field research required; little water treatment, if any

OPERATING ENVIRONMENT

Because of the extremity of the depletion of water resources in the Central Asian region, little is presently being done to improve water quality. The desiccation of the Aral Sea due to mismanagement of water resources by all four Central Asian countries and the general scarcity of water resources needed to propel the largely agricultural economy is monopolizing the time and energies of the governments of these countries and conservation-conscious individuals and associations.

Financing: government lacks financial resources to solve ecological and environmental crises

Taxation: field research required

Liability: a decree passed by the Council of Ministers on 12 June 1991 requires enterprises to simultaneously register with the local organ of the State Committee of the Republic of

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Uzbekistan for the Protection of Nature when registering with the state;¹⁶ a law passed on 9 December 1992 by the Supreme Council of Republic of Uzbekistan lists environmental violations and liabilities. Water polluters face fines or jail sentences¹⁷

Personnel: field research required

Monitoring/testing: field research required

Metering: regional officials are adamantly against the imposition of fees for the use of natural resources

Fees/fines: field research required

1. J.C. Dewdney, *USSR in Maps* (New York: Holmes & Meier Publishers, Inc., 1982), 14.
2. *The Institute of Geography Water Report* (FYI Information Resources Research Archives).
3. FYI Information Resources Research Archives (April 1993).
4. FYI Information Resources Research Archives (April 1993).
5. "Uzbekistan: Academician on Republic's 'Dwindling' Supply of Clean Water," *JPRS Report: Environmental Issues* (3 May 1993), 37.
6. Gosudarstvennyy Komitet SSSR po Statistike, *Okhrana Okruzhayushchey Sredy i Ratsional'noye Ispol'zovaniye Prirodnikh Resursov v SSSR* (Moscow: 1989), 72.
7. Gosudarstvennyy Komitet SSSR po Statistike, 75.
8. Gosudarstvennyy Komitet SSSR po Statistike, 74.
9. Gosudarstvennyy Komitet SSSR po Ochrane Prirody, *Gosudarstvennyy Doklad: Sostoyaniye Prirodnoy Sredy i Prirodookhrannaya Deyatel'nost' v SSSR v 1989 Godu* (Moscow: 1990), 99.
10. Gosudarstvennyy Komitet SSSR po Statistike, 74.
11. Gosudarstvennyy Komitet SSSR po Statistike, 69.
12. FYI Information Resources Research Archives (April 1993).
13. Murray Feshbach, "Untold Story: The Enormity of Soviet Union's Health Disaster," *Cosmos* 1 (1991), 48.
14. Peter Pavilionis, "Central Asia's Environmental Politics," *USCSAR Reports* (Fall 1991), 35-51.
15. Gregory Gleason, "The Struggle for Control over Water in Central Asia: Republican Sovereignty and Collective Action," *Report on the USSR* (21 June 1991), 11-19.
16. "Uzbekistan: Enterprises Must Register with State Ecological Committees," *JPRS Report: Environmental Issues* (3 May 1993).
17. "Uzbekistan: Legal Expert on Implications of Environmental Law Violations," *JPRS Report: Environmental Issues* (9 December 1992), 35-37.



Environmental Infrastructure—Capital Projects

The projects summarized below and arrayed against select project criteria on the attached matrices are illustrative of the range and type of projects that might be considered--as well as of the nature and availability of necessary information. They are provided as examples; all require further assessment and evaluation, both individually and comparatively against numerous other unlisted opportunities.

1. Bobrovka Water Intake Station

Upgrade and installation of new treatment equipment at this small water station supplying the town of Bobrovka (Sverdlovskaya Oblast) with drinking water.

2. Nukus Municipal Water Intake Station

Construction of modern, small municipal pumping and treatment system for this small Central Asian city, the capital of Karakalpakiya.

3. Yekaterinburg Suburban Intake Stations

Construction and equipping of small suburban apartment complexes with independent, small, de-centralized drinking water treatment systems.

4. Nizhniy Tagil Metallurgical Works

Construction and equipping of individual metalworking shops with wastewater pre-treatment technologies.

5. Antal Bottled Water Facility

Completion of this privately operated water bottling facility in Leningradskaya Oblast.

THESE DATA, PROVIDED BY FYI INFORMATION RESOURCES, ARE EXCLUSIVELY FOR USE IN THE NIS/CBE/MONGOLIA INFRASTRUCTURE PROJECT.

6. Kohtla-Jarve Oil Shale Processing Facility

Construction of pilot wastewater and runoff treatment facilities for this major Estonian polluter of Estonian rivers and the Baltic Sea.

7. St. Petersburg Central Aeration Station

Re-building and equipping the twelve inoperable centrifuges at this municipal and industrial wastewater treatment facility, one of the largest in Europe.

8. Petrovka Steel Plant

Construction of wastewater treatment facilities for steel plant that dumps 132 million cubic meters of waste into Denepr annually.

9. Dniprodzerzhynsk Wastewater Treatment Station

Re-construction and upgrade of overwhelmed municipal treatment facilities which now allow 27 million cubic meters of untreated waste to flow into Dnieper annually.

In addition to these illustrative site-specific projects, the following product and equipment categories are commonly cited as in critically short supply by local operators of water and wastewater treatment stations throughout the former Soviet Union.

- Immersion pumps
- Copper wire and cable
- Scale treatment (preferably chemical methods)
- Pipe repair and replacement (preferably in situ)
- Ozonation Equipment
- Testing and monitoring equipment (field and in-line)
- Desalination equipment

WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

FINANCIAL/ECONOMIC	Project									
	1	2	3	4	5	6	7	8	9	10
local financing ^{\\$} ¹	1	-2	1	1	1	-1	1	0	-1	
local financing [\] ¹	2	-1	2	1	2	0	1	0	0	
local financing ^{\in-kind} ¹	2	-1	2	2	2	1	2	1	1	
local financing ^{\bar{barter}} ¹	2	0	2	2	2	2	2	1	0	
regional foreign investment	2	-2	2	0	2	0	2	-1	NK	
entrepreneurship indicator	1	-2	NK	-1	2	1	1	1	NK	
commercial banking indicator	NK	NK	NK	NK	2	NK	NK	NK	NK	
business infrastructure	0	-1	1	1	1	1	2	1	NK	
availability of project supplies	NK	-2	1	NK	2	1	1	1	NK	
taxation ²	1	NK	1	1	1	NK	NK	NK	NK	
import/export ³	1	NK	1	1	NK	NK	NK	1	NK	
regulatory incentives	1	-1	1	-1	1	NK	NK	NK	NK	
mafia ⁴	-1	NK	0	0	0	-1	0	0	0	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

1. Availability; 0 = some possibility
2. Overall tax climate as favorable or hostile, 0 = incentives cancel out penalties
3. Overall import/export as open or restricted, 0 = average constraints
4. Level of influence, 0 = moderate

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WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

POLITICAL	Project									
	1	2	3	4	5	6	7	8	9	10
local, regional cooperation	1	0	2	2	-2	0	2	0	NK	
local, regional, national cooperation	NK	-2	1	1	-1	0	1	1	NK	
project orientation of local/regional leaders	1	NK	2	NK	-1	-1	2	NK	NK	
perspective of local leaders ⁵	1	NK	1	2	2	-1	2	-1	NK	
perspective of regional leaders ⁵	2	NK	2	2	-2	-1	NK	0	NK	
perspective of national leaders ⁵	1	-2	1	NK	2	1	0	1	NK	
project orientation of key department leaders	2	1	2	-1	NK	NK	2	NK	NK	
perspective of key department leaders ⁵	0	NK	2	1	NK	NK	1	0	NK	
project orientation of regional environmentalists	NK	2	NK	NK	1	2	NK	1	NK	
project champions ⁶	1	1	2	2	2	0	1	NK	NK	
project opponents ⁶	0	-2	-2	-2	-1	-1	-1	-1	NK	
demonstration of regional and local priorities ⁷	0	-1	1	-1	2	-2	2	0	NK	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

- 5. Overall political attitude toward reforms, 0 = neither pro-reform nor pro-"party"
- 6. Existence and level of potential impact, 0 = champion/opponent of average impact
- 7. Record of recent environmentally sound/harmful action, 0 = actions of both types undertaken

WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

PERSONNEL	Project									
	1	2	3	4	5	6	7	8	9	10
leadership reputations	1	-1	1	-2	2	0	NK	NK	NK	
leadership perspective	0	-2	0	0	2	-1	1	NK	NK	
leadership orientation to project	1	1	2	NK	2	-1	1	NK	NK	
level of "free-lancing" ⁸	0	-1	NK	-1	2	0	NK	0	NK	
skill level of workers	-2	-2	1	1	0	-2	1	0	NK	
worker job satisfaction	1	-2	NK	NK	NK	NK	NK	NK	NK	
training required	-2	-2	1	-1	0	-2	1	-1	NK	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

8. Impact of people with "extra-official" jobs. 0 = no impact

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WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

HEALTH AND ENVIRONMENT	Project									
	1	2	3	4	5	6	7	8	9	10
magnitude/definition of problem ⁹	2	-2	1	-2	2	-2	1	1	NK	
project impact	0	2	1	2	2	2	2	1	NK	
local expectations of project impact ¹⁰	NK	NK	NK	NK	1	NK	NK	NK	NK	
local priorities ¹¹	NK	2	2	1	2	2	1	NK	NK	
follow-on opportunities	2	2	2	2	0	NK	2	1	NK	
scale and scope ¹²	2	-1	2	-2	1	-1	2	-1	NK	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

- 9. Discrete or intertwined project; 0 = moderately intertwined
- 10. Realistic or inflated, 0 = realistic
- 11. Compatibility, 0 = no impact on project
- 12. Level of size/complexity, 0 = manageable but not ideal

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WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

Project BUSINESS OPERATIONS AND STRUCTURE	Project									
	1	2	3	4	5	6	7	8	9	10
legal structure	1	NK	NK	NK	1	NK	0	NK	NK	
reputations/strengths of owners/operators	-1	0	1	-1	1	-1	NK	1	NK	
financial and operational control ¹³	-1	-2	NK	-1	2	2	-1	NK	NK	
primary project partner	1	NK	1	0	2	2	1	0	NK	
project replicability	2	2	2	1	-2	-2	1	2	NK	
project orientation of key operational stakeholders	0	NK	2	NK	NK	NK	NK	NK	NK	
understanding of operational problems	-1	-0	1	-2	1	1	2	1	NK	
local firms ¹⁴	1	2	-1	2	2	1	2	1	NK	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

- 13. Divergence, 0 = dual control with average coordination
- 14. Competitive or collaborative local firms, 0 = none

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WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

CULTURAL	Project									
	1	2	3	4	5	6	7	8	9	10
traditions and orientation	-1	-2	0	-1	0	-1	1	-1	NK	
perspective toward aid	0	2	-1	0	2	NK	NK	NK	NK	
experience with aid	-2	-1	-2	-1	0	NK	NK	NK	NK	
familiarity with proposed technology	2	NK	2	NK	1	NK	2	NK	NK	
perspective on proposed technology	NK	NK	NK	NK	2	NK	2	NK	NK	
awareness of environmental problems	2	2	1	1	2	1	2	-1	NK	
special considerations	1	-2	--	-1	-1	-1	0	--	NK	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

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WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

GEOGRAPHIC	Project									
	1	2	3	4	5	6	7	8	9	10
climate	0	-1	0	0	0	1	0	0	NK	
physical accessibility	-1	-2	1	-1	0	1	2	-1	NK	
natural water characteristics	NK	-2	NK	NK	2	NK	NK	NK	NK	
water resources availability	0	-2	1	0	1	--	NK	NK	NK	
special considerations	--	--	--	--	--	--	--	--	NK	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

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WATER AND WASTEWATER TREATMENT IN THE FORMER SOVIET UNION
INFRASTRUCTURE IMPROVEMENTS

Select Project Criteria

TECHNICAL	Project									
	1	2	3	4	5	6	7	8	9	10
systems integration ¹⁵	1	NK	NK	-1	1	1	0	-1	NK	
local service, parts ¹⁶	NK	-2	1	1	1	1	1	1	NK	
local testing, monitoring capacity ¹⁶	0	-1	1	0	2	-1	1	1	NK	
contaminant stream ¹⁷	-2	-2	-1	-2	0	-2	-2	-2	NK	
required capacity ¹⁸	NK	NK	NK	-1	1	-1	-1	-1	NK	
water users	1	0	0	-1	1	0	1	2	NK	
water suppliers	NK	0	-1	NK	--	0	-1	NK	NK	
multiplier effect ¹⁹	2	2	1	2	0	2	0	1	NK	
unknowns	-2	--	--	--	--	--	--	--	NK	
special needs	0	--	--	--	--	--	--	--	NK	

Unless otherwise noted below, the criteria in the matrix above compare project characteristics according to the following scale:

- 2 = unusually high/large/helpful
- 1 = above average
- 0 = average
- 1 = below average
- 2 = unusually low/small/unhelpful

The "NK" notation above indicates that insufficient information was available given the time and scope of the present project. Additional field research is required.

- 15. Likelihood of difficulty/compatibility, 0 = none
- 16. Availability, 0 = modest
- 17. Complexity, 0 = known and average
- 18. Appropriateness, 0 = manageable, but not ideal
- 19. Leverage point, 0 = no particular leverage

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APPENDIX C

Country Profiles and Needs Assessment

Central and Eastern Europe

Country Profiles

COUNTRY PROFILE**ALBANIA****BASIC INDICATORS**

Population:	3.3	million
	34	% urban
Annual Population Growth:	1.1	%
Area:	28,750	km2
GNP per capita:		
GDP per capita:		
Life Expectancy:	73	years at birth
Adult Literacy:	72	% of population

WATER RESOURCES

Annual Freshwater Withdrawal:		cubic km per year
		m3 per capita total
		m3 per capita-domestic use

ECONOMY (1991)

GDP (PPC):		capita
GDP Growth Rate:	35	% (1991)
Inflation	100	% (consumer prices)
Foreign Debt:	\$500	million (1991)
U.S. Economic Assistance:		
Total Imports:	\$180	million
Imports from U.S.:		

COUNTRY PROFILE**BULGARIA****BASIC INDICATORS**

Population:	9.0	million
	68	% Urban
Annual Population Growth:	- 0.2	%
Area:	111,000	km2
GNP per capita:	\$1,840	
GDP per capita:	\$838	
Life Expectancy:	72	years at birth
Adult Literacy:	93	% of population

WATER RESOURCES**Annual Freshwater Withdrawal:**

	14.2	cubic km per year
	1,600	m3 per capita total
	112	m3 per capita-domestic use

ECONOMY

GDP (PPC):	\$4,980	capita
GDP Growth Rate:	-3.8	% (1991)
Inflation	42	% (1991 est)
Foreign Debt:	\$US 13	billion (1992)
U.S. Economic Assistance:	\$US 75	million (1992)
Total Imports:	\$US 4.3	billion (1992)
Imports from U.S.:	\$US	85 million (1992)

COUNTRY PROFILE**THE CZECK REPUBLIC AND SLOVAKIA****BASIC INDICATORS**

Population:	15.7 60 (e)	million % Urban
Annual Population Growth:	0.3	%
Area:	128,000	km2
GNP per capita:	\$2,470	
GDP per capita:	\$3,500	
Life Expectancy:	72	years at birth
Adult Literacy:	99	% of population

WATER RESOURCES (1991)

Annual Freshwater Withdrawal:	5.8	cubic km per year
	379	m3 per capita total
	87	m3 per capita-domestic use

ECONOMY

GDP (PPC):	\$6,280	capita (e)
GDP Growth Rate:	19	% (1991)
Inflation:	10-15	% (1992)
Foreign Debt:	\$US 10	billion
U.S. Economic Assistance:	\$69	million
Total Imports:	\$US10.1	billion
Imports from U.S.:	\$US 187	million (1991)

COUNTRY PROFILE**HUNGARY****BASIC INDICATORS**

Population:	10.3	million
	62	% Urban
Annual Population Growth:	-0.4	%
Area:	93,000	km2
GNP per capita:	\$2,720	
GDP per capita:	\$3,022	(1992)
Life Expectancy:	70	years at birth
Adult Literacy:	88	% of population

WATER RESOURCES**Annual Freshwater Withdrawal:**

5.4	cubic km per year
502	m3 per capita total
45	m3 per capita-domestic use

ECONOMY (1992)

GDP (PPC):	\$6,080	capita (1991)
GDP Growth Rate:	-8.0	% (1992)
Inflation	25	% (1991 consumer prices)
Foreign Debt:	\$US 22.6	billion (e)
U.S. Economic Assistance:		
Total Imports:	\$9.37	billion
Imports from U.S.:	392	million

COUNTRY PROFILE**POLAND****BASIC INDICATORS**

Population:	38.2	million
	62%	Urban
Annual Population Growth:	0.3	%
Area:	313,000	km ²
GNP per capita:	\$1,790	(1991)
GDP per capita:	\$1,850	(1992 e) \$1,780 (1990 e)
Life Expectancy:	71	years at birth
Adult Literacy:	98	% of population

WATER RESOURCES**Annual Freshwater Withdrawal:**

16.8	cubic km per year
600	m ³ per capita total
112	m ³ per capita-domestic use

ECONOMY

GDP (PPC):	\$4,500	capita
GDP Growth Rate:	-11.6	% (1991)
Inflation	45	% (1992 est)
Foreign Debt:	\$45	billion (1991)
U.S. Economic Assistance:	\$100	million (+\$100 mil. charitable donations)
Total Imports:	\$18	billion (\$60 million for pollution control)
Imports from U.S.:	\$470	million (\$3 million for pollution control)

COUNTRY PROFILE**ROMANIA****BASIC INDICATORS**

Population:	23	million
	3	% Urban
Annual Population Growth:	0.2	%
Area:	238,000	km2
GNP per capita:	\$1,390	(1991)
GDP per capita:	\$1,200	(1992 est)
Life Expectancy:	70	years at birth
Adult Literacy:	96	% of population

WATER RESOURCES

Annual Freshwater Withdrawal:	25.4	cubic km per year
	1144	m3 per capita total
	92	m3 per capita-domestic use

ECONOMY

GDP (PPC):	\$6,900	capita
GDP Growth Rate:	5.0	% (1991)
Inflation	130	% (1992 est)
Foreign Debt:	\$US 2.9	billion (1992)
U.S. Economic Assistance:	\$33	million
Total Imports:	\$US 5.5	billion (\$18 million for pollution control)
Imports from U.S.:	\$US 227	million (\$2 million for pollution control)

DISCUSSION

General

Romania has made great strides over the past three years towards establishing a parliamentary democracy, and a market based economy. However, due in the main, to drastic drops in production and trade, and concurrent high unemployment, the economy has suffered great downward dislocations, and indications are that this trend will continue at least into 1994. The country exhibits a great need for foreign goods and services, but the poor economy has deflated the purchasing power for such items to very low levels.

Romania's activities with regard to the environmental sector has been quite focused over the last several years. Recent legislation has provided the environmental sector with a firm legal basis, and the new water law has de-centralized water resources management by establishing River Basin Authorities in each of the country's 14 major river basins. Each authority will function on an autonomous and self-financing basis, and be totally responsible for the all aspects of preserving surface water quality and developing the required quantity needed for water supply and irrigation.

Rumanians have a very high regard for US goods and services, and several hundred American companies are operating across all sectors of the Rumanians economy, alone or as part of joint ventures. This has occurred despite Romania's lack of status as a "most favored nation" (MFN status) with regard to US trade, the somewhat high costs of doing business, and bureaucratic constraints faced by all foreign companies. Ongoing efforts between Romania and the US aimed at fostering trade and business relationships, including granting MFN status to Romania, are expected to further improve the position of US firms. However, without significant levels of external aid, it is doubtful that there will be large gains in the sale of US goods and services

The US Department of Commerce ranks pollution control equipment 10th (of 16) on its listing of "Best Prospects" for US sales to Romania.

Environmental Market

The sector's market size is difficult to quantify, mainly due to the curtailed activity and poor economic situation of the last several years. However as discussed below in "SECTOR NEEDS" the market has a potential of several billion dollars over the next decade.

Sector Needs

Most cities in Romania provide inadequate coverage of wastewater collection and treatment. The levels of population served exceed 70% only in very few large cities. (The active system in Bucharest provides treatment to only about 40% of the total volume of wastewater discharged.) Coverage in medium and smaller cities rarely exceeds half this level, and for the most part, no treatment is provided. Under Romania's sector reorganization, many new wastewater treatment plants will be required, and many existing installations will need extensive upgrading and rehabilitation. New or upgraded pretreatment facilities for industrial wastewater discharges will also be required.

Considering the above, opportunities for US firms include technical assistance for the planning, design and construction of facilities, and the provision of wastewater and sludge treatment handling and treatment equipment, pumps and related measurement and control equipment.

Provision of financing for purchases of goods and services will probably be necessary to insure the success of such ventures, at least in the next few years. Project financing may also be available from several sources. The Rumanians government will make direct investments and loans in the sector, although these may be at modest levels over the next few years.

Funding is also available through US government agencies, including USAID programs, and the TDP and OPIC programs of the US Government. The World Bank, the European Bank for Reconstruction and Development, and other bi-lateral donors are also active participants in the sector.

Potential Projects (Sector wide and site specific):

Providing selected needs for the provision of municipal wastewater treatment and sludge handling and disposal facilities (including, as required, system extensions and/ or rehabilitation needs) for urban (city) systems or several of the some many hundreds of industrial dischargers with no pre-treatment facilities.

Needs Assessment

**Summary Tables from Danube Environmental Program
USAID/WASH Studies**

Tables in this appendix:

Table A & Table B:	Reproduced from Reference No. 20
Table 12:	Reproduced from Reference No. 12
Table 16:	Reproduced from Reference No. 13
Table 28:	Reproduced from Reference No. 4
Table 36:	Reproduced from Reference No. 5

Please see page 20 of the main report for list of references.

Table A
Potential Priority Early Projects

Country	FIRST PRIORITY		SECOND PRIORITY		THIRD PRIORITY	
	Basin	Project	Basin	Project	Basin	Project
Bulgaria	Iskar	Sofia and Samokov	Osem	Trojan and Lovetch	Ogosta	Michailovgrad
	Vit	Pleven	Rusenski Lom	Razgrad		
	Jantra	Gabrovo and Veliko Tomovo	Jantra	Gomo Oriahovitsa and Liaskovetz		
CSFR*	Danube	Istrochem (Bratislava)	Váh	Hlohovec and Leopoldov	Danube	Bratislava, central left bank
	Váh	Trenčín	Nitra	Koželužne tannery (Bošany)	Dudvah	Senica
	Nitra	Novaky industry	Danube	Bratislava, right bank	Morava	Brno
	Morava	Olomouc				
Hungary*	Danube	Győr and Moson Island	Danube	Budapest, north system	Danube	Komárom
	All	Fuel-contaminated groundwater	Tisza	Szolnok		
			Altalar	Tata		
Romania	Jiu	Craiova	Olt	Rimnicu-Vilcea	Danube	Municipal treatment needs in Braila and Galati
	Olt	Govora (Rimnicu-Vilcea)	Danube	Industries in Braila and Galati		
	Argea	Pitesti and Bucharest				

* The analysis of high-priority basins was one of a number of pieces of information provided to donors in early May 1992, to assist them in deciding on future basin studies involving potential investments. Although the Hornad basin in Slovakia and the Hernad and Sajo basins in Hungary were not addressed in the WASH study, the host government and other environmental experts have determined that they are highly polluted and warrant further analysis and investment. Hence, these basins will be the subject of further assessment during Phase II WASH activities.

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Table B
Summary of Top-Priority Projects

Country	Basin	Project	Population	Flow, MLD*	Type of Industries/Project Elements
Bulgaria	Iskar	Sofia	1,200,000	520	Metals, machines, chemicals, textiles, wood, foods/two interceptors, treatment rehab, sludge management
	Iskar	Samokov	47,000	30	Limited industry/further treatment to protect Sofia's water supply reservoir, possible nutrient removal, disinfection
	Vit	Pleven	130,000	108	Animal feed, sugar, oil refinery, slaughterhouse, poultry, dairy, winery, metal finishing/pretreatment, municipal treatment to remove oily waste
	Jantra	Gabrovo	90,000	79	Machines, food, electronics/interceptor for industrial flows, treatment upgrading, sludge management to protect Jantra headwater
	Jantra	Veliko Tormovo	90,000	46	Chemicals (manganese waste)/treatment upgrading, sludge processing equipment
CSFR	Danube	Istrochem	Industrial	21	Rayon, fertilizer, explosives, propylene, polymers/biological treatment added to existing physical/chemical treatment
	Váh	Trenčín	54,000	70	Yeast, alcohol, textiles, building materials, furniture, equipment repair/full treatment of yeast and alcohol waste, new right-bank treatment plant, sludge treatment repair at left-bank plant
	Nitra	Novaky	Industrial	36	Power, PVC plastics/control of arsenic leaching from ash disposal site, restructuring of PVC processing and industrial treatment
	Morava	Olomouc	102,000	53	Food, chemicals, pharmaceuticals/upgrade of existing treatment plant, additional new treatment plant
Hungary	Danube	Győr, Moson Island	120,000	60	Machines, textiles, processed food, alcohol, galvanizing/pretreatment for distillery, completion of Győr and five regional treatment plants to protect groundwater in coarse alluvium
	All	Fuel spills	NA	NA	Dumped or leaked fuels at 300 former military sites/emergency control over migration in aquifers, removal and possible reuse of fuels
Romania	Jiu	Craiova	317,000	500	Chemicals, cars, electrical machinery, food, alcohol, bricks, cement, power/ completion of interceptor and municipal treatment plant, rehabilitation of chemical-plant treatment facilities
	Olt	Govora	Industrial	275	Caustic soda, 70 petrochemicals, machines, power/reduction of brine discharges to the Olt, waste minimization, rerouting of flows or new pretreatment plant for one of three flow streams
	Arges	Pitesti	175,000	150	Oil refinery for fuels and plastics, dyes, beer, rubber, electric motors, chemicals, furniture, meat, wine, cars/upgrading of refinery's treatment, nutrient removal at city's treatment plant
	Arges	Bucharest	2,300,000	1500	Paints, beer, furniture, leather, drugs, textiles, machines, food, trams, electronics, power/completion of 2,000 Mld treatment plant

* Dry-weather wastewater flow or treatment capacity; 3.78 Mld (megaliters per day) = 1 mgd (million U.S. gallons per day)

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Table 12

Danube River Basin Environmental Program, Sajo River Basin, Hungary: Potential Investment Program

Target Problem	Type of Exposure	Population Affected	Potential Solutions	Financial Feasibility	Other Remarks
MUNICIPAL SITES					
1. Protecting Sajo-Hernad Aquifer	Surface water contamination may affect water supply aquifer for Sajo basin	Population in service area: ca. 650,000	<ol style="list-style-type: none"> 1. Extend sewers to unsewered areas 2. Complete Miskolc WWTP upgrading 3. Provide WWTP for expanded service area. 	Total costs for entire system not known. Miskolc upgrading est. cost: \$20 mil. Candidate for IBRD funded program.	
2. Protecting Lazberc Reservoir	Surface water contamination from 10 unsewered towns may pollute inlet streams	Population in service area: ca. 650,000	<ol style="list-style-type: none"> 1. Install sewers 2. Connect to WWTP in Kazinbarcika 	Costs not known; affected municipalities have no funds for investment.	
3. Protecting Bodva R. for drinking water source.	Surface water contamination from unsewered towns	Population in Bodva valley: ca. 100,000	<ol style="list-style-type: none"> 1. Install sewers 2. Develop series of WWTP facilities 3. Water TP for Edeleny 	Est. total costs: \$150 mil. per 1992 basin study. Affected municipalities have no funds for investment; GOH provides some grants thru RDF.	
4. Reducing nitrate levels in Hernad	Surface water contamination from unsewered towns and agricultural runoff	Population downstream: ca. 750,000	<ol style="list-style-type: none"> 1. Study to determine cause and solutions 	Costs not known.	

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Table 12 (continued)

Danube River Basin Environmental Program, Sajo River Basin, Hungary: Potential Investment Program

Target Problem	Type of Exposure	Population Affected	Potential Solutions	Financial Feasibility	Other Remarks
5. Protecting water quality in Sajo basin	High levels of surface water contamination (nitrates and coliform bacteria)	Population in basin: ca. 650,000	1. Study to determine cause and solutions	Costs not known.	
INDUSTRIAL SITES					
6. Scattered waste dump cleanup	Potential groundwater contamination in key drinking water supplies	Population in area: ca. 800,000	1. Study to target high-priority sites.		
7. Controlling industrial wastewater discharges in Miskolc	Surface water contamination affecting Sajo-Hernad aquifer	Population in service area: ca. 650,000	1. Study to determine magnitude of problem	Could be part of Miskolc WWTP upgrading feasibility studies	

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Table 16

Danube River Basin Environmental Program, Hornad River Basin, Slovakia:
Potential Pre-Investment Program

Target Problem	Type of Exposure	Population Affected	Potential Solutions	Financial Feasibility
INDUSTRIAL SITES				
1. VSZ WWTP upgrading: phenols and oil sludges	Contamination of Hornad R. from sludge storage and phenols	Population downstream to Miskolc: ca. 250,000	<ol style="list-style-type: none"> 1. Construct biological treatment facility 2. Construct oil sludge incinerator 	Total costs: \$44 million. VSZ profitable.
2. Rudnany Mine Sludge Lagoon	Potential groundwater contamination in locality; potential contamination of upper Hornad	Population downstream to Ruzin Res: ca. 120,000	<ol style="list-style-type: none"> 1. Stabilize sludge lagoon 2. Monitor groundwater 	Costs not known; mine reducing output but will survive.
3. Krompachy Copper Smelter	Pretreated waste water discharge directly into Hornad; potential contamination from onsite sludge lagoon	Population downstream to Ruzin Res: ca. 100,000	<ol style="list-style-type: none"> 1. Upgrade treatment facility 2. Remove sludge 	Costs not known; operation profitable; already making \$20 million investment for air pollution equipment.
4. Krompachy Municipal Waste Dump	Surface runoff directly into Hornad	Population downstream to Ruzin Res: ca. 100,000	<ol style="list-style-type: none"> 1. Stabilize dump 2. Monitor runoff 3. Relocate dump and control new site 	Costs not known; municipality has no funds for investment.
5. Mercury deposits in Ruzin Reservoir	Potential aquifer contamination in lower Hornad, especially in low-flow augmentation	Population downstream: ca. 400,000	<ol style="list-style-type: none"> 1. Stabilize deposits 	Costs not known.

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Table 16 (continued)

Target Problem	Type of Exposure	Population Affected	Potential Solutions	Financial Feasibility
MUNICIPAL SITES				
6. Presov WWTP overloaded	Contamination of Torysa R. affecting irrigation and bank filtered wells	Population downstream: ca. 300,000	1. Complete new WWTP already under way	Est. cost to complete: \$18 million. Municipality has no funds but work proceeding with local credit from future funding.
7. Krompachy WWTP	Contamination of Hornad R. affecting bank filtered wells	Population downstream to Ruzin Res: ca. 100,000	1. Complete secondary treatment plant (now stopped) 2. Reevaluate design	Est. cost to complete: \$2.1 million. Municipality has no funds to complete.
8. Spisska N. Ves WWTP overloaded	Contamination of Hornad R. affecting bank filtered wells	Population downstream to Ruzin Res: ca. 150,000	1. Add WWTP capacity 2. Rehabilitate existing WWTP 3. Pretreat industry wastewater	Est. cost to expand and rehabilitate: \$17 million. Municipality has no funds.
9. Kosice WWTP overloaded and expansion under way in phases	Contamination of Hornad R. affecting bank filtered wells and water quality entering Hungary	Population downstream to Miskolc: ca. 250,000	1. Complete Phase II biological facility 2. Complete Phase III sludge processing 3. Build phenol facility at VSZ	Est. cost to complete both phases: \$32 million. Possible co-finance of VSZ phenol plant. Candidate for IBRD-funded program.

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Table 28

Potential Projects, Yantra Basin in Bulgaria

Problem Area Description	Contaminants	Approx. Pop. in Area	Potential Projects	Financial Details
GABROVO Inadequate municipal STP performance. Unfinished municipal STP sludge treatment facilities. Industrial direct dischargers.	 BOD, TSS, and NH (500 kg BOD/day). Organics, pathogens, and nutrients to landfills. BOD, TSS, nutrients, and Cr (3000 kg BOD/day).	 74,000	 1. Modifications, rehabilitation, or replacement of existing facilities. 2. Assure ability of municipal STP to accept industrial wastes. 1. Completion or redesign of existing facilities. 1. Minimize the generation of industrial wastes. 2. Construction or modification of industrial wastewater pretreatment facilities. 3. Expansion of municipal collector system to include unserved industries.	 This area is covered by the Gabrovo WS & WW company. Estimated rehabilitation costs are \$1.0 million for collection system and \$1.5 million for the treatment plant. Total cost = \$2.5 million. (Cost included above). Costs unknown.
VELIKO TARNOVO Inadequate municipal STP capacity. Unfinished municipal STP sludge treatment facilities.	 BOD, TSS, & nutrients (8100 kg BOD/day). Organics, pathogens, and nutrients to landfills.	 80,000	 1. Rehabilitation and expansion of the existing STP. 1. Completion or redesign of existing facilities.	 This area is covered by the Veliko Tarnovo WS & WW company. Estimated cost = 2.0 million. (Cost included above).
GORNA ORIAHOVITZA & LIASKOVETS No existing municipal STP. Direct discharge of sugar/spirits factory wastewater.	 BOD, TSS, & nutrients (2400 kg BOD/day) BOD, TSS, & nutrients (139,000 kg BOD/day)	 55,000	 1. Construction of municipal wastewater treatment facilities. 2. Possible provisions for accepting untreated or pretreated industrial wastes. 1. Minimize the generation of industrial wastes. 2. Construction of industrial wastewater treatment or pretreatment facilities.	 This area is covered by the Veliko Tarnovo WS & WW company. Estimated cost for collection system is \$3 million. Estimated cost for the new municipal treatment plan is \$21 million. Alcohol factory is currently operating at 50% capacity to reduce pollution. The treatment facility cost is estimated at \$3 million.
SEVLIEVO No existing municipal STP. Industrial discharges to Rositza.	 BOD, TSS, & nutrients (1200 kg BOD/day). BOD, TSS, nutrients, & Cr (3700 kg BOD/day).	 27,000	 1. Construction of joint municipal and industrial wastewater treatment facilities. 1. Minimize the generation of industrial wastes. 2. Construction of industrial wastewater or pretreatment facilities.	 This area is covered by the Sevlievo WS & WW company. This is a new company. Possible joint funding by WS & WW company and industry. Costs are estimated at \$13 million for the new municipal treatment plant. Estimated cost for collection system is \$4 million. Tannery wastewater pretreatment currently under construction. Additional costs are unknown.
BIALA No existing municipal STP.	 BOD, TSS, and nutrients (500 kg BOD/day).	 11,000	 1. Construction of municipal wastewater treatment facilities.	 This area is covered by the new Biala WS & WW company. Costs are unknown.
PAVLIKENI No existing municipal STP.	 BOD, TSS, & nutrients (1100 kg BOD/day).	 15,000	 1. Construction of municipal wastewater treatment facilities.	 This area is covered by the Veliko Tarnovo WS & WW company. Costs are unknown.
BASIN WIDE Discharge of feedlot wastes to Yantra and tributaries.	 BOD, TSS, & nutrients.		 1. Minimize the generation of wastes. 2. Construction or modification of wastewater treatment or pretreatment facilities.	 Privatization will have an unknown effect on the location, size, and number of these facilities. Costs are unknown.

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Table 36
Potential Projects

Problem Area Description	Contaminants	Approximate Population in Area	Potential Projects	Financial Details
<i>Municipalities</i>				
Bucharest	<ul style="list-style-type: none"> ■ Organics ■ Nutrients 	2,100,000		The World Bank is funding a study of the water and wastewater systems for the city.
Pitesti	<ul style="list-style-type: none"> ■ Nutrients 	180,000	<ul style="list-style-type: none"> ■ Sludge management improvements ■ Headworks expansion ■ Nutrient removal ■ Industrial wastewater pretreatment program 	Funding has been from the central government; however, the economy is now very weak and outside loans will probably be needed.
Cimpulung	<ul style="list-style-type: none"> ■ Nutrients ■ Organics 	44,000	<ul style="list-style-type: none"> ■ Sludge management improvements ■ Flow equalization ■ Improved biological process ■ Nutrient removal ■ Industrial wastewater pretreatment program 	Funding has been from the central government; however, the economy is now very weak and outside loans will probably be needed.
Curtea de Arges	<ul style="list-style-type: none"> ■ Nutrients ■ Organics 	33,000	<ul style="list-style-type: none"> ■ Sludge management improvements ■ Headworks expansion ■ Flow equalization ■ Improved biological process ■ Nutrient removal ■ Industrial wastewater pretreatment program 	Funding has been from the central government; however, the economy is now very weak and outside loans will probably be needed.
<i>Industrial</i>				
Arpechim petrochemical plant	<ul style="list-style-type: none"> ■ Organics ■ Phenol 			The future of this plant is uncertain. It is currently operating at 30% of capacity. ICIM has data on treatment plants and effluent characteristics.
Dacia car factory	<ul style="list-style-type: none"> ■ Metals ■ Phosphorus ■ Cyanide 		<ul style="list-style-type: none"> ■ Improved treatment ■ Metals recovery ■ Waste minimization ■ Spill planning 	
Aro car factory	<ul style="list-style-type: none"> ■ Metals ■ Phosphorus ■ Cyanide 		<ul style="list-style-type: none"> ■ Improved treatment ■ Metals recovery ■ Waste minimization ■ Spill planning 	

APPENDIX D

Related Programs

APPENDIX D

INTERNATIONAL ENVIRONMENTAL PROGRAMS CEE AND NIS

U.S. PROGRAMS

U.S. Agency for International Development (USAID): Presently coordinating more than a dozen programs that include components providing for financial and/or technical assistance on environmental and energy issues in Eastern Europe and NIS

Export-Import Bank of the U.S. (Eximbank) and Affiliates: Creates incentives for the export of U.S. environmental technologies as well as other products. Works with the Private Funding Corp. (PEFCO) to develop private funding for larger export projects.

Overseas Private Investment Corp. (OPIC): Provides loans, guarantees, insurance, and other services to support private U.S. investment in developing countries. Of \$8 billion invested in 1992, nearly a quarter went to Eastern Europe.

U.S. Trade and Development Agency (TDA): Program aimed at increasing U.S. exports by spending \$40 million annually to finance feasibility studies by U.S. firms. Half of studies performed in Eastern Europe region have environmental focus.

U.S. Environmental Protection Agency (EPA): Several million budgeted each year specifically for Eastern Europe to pay for demonstration projects, institution building, and regional projects involving more than one country.

Private Enterprise Funds: Authorized by the Support East European Democracy (SEED) Act of 1989, provides semi-public venture capital funds for small, private firms that have good local partners. Focus is on environmental projects.

MULTI-LATERAL PROGRAMS

The World Bank: Several projects in Eastern Europe as part of larger global environmental, energy and economic development programs. The Global Environmental Facility (GEF), with an annual budget of \$300 million addresses global environmental problems. Russia: Environmental Management Technical Assistance Project is being initiated with the participation of USAID and USEPA.

European Bank for Reconstruction and Development (EBRD): Recently established (1991) bank funded with an initial contribution of 10 billion ECUs from 40 industrialized nations.

Mission statement specifies "environmentally sound and sustainable development in the full range of its activities."

The EC's "Poland and Hungary Assistance for the Restructuring of the Economy" (PHARE) Program: A four-year old program supporting projects in Central and Eastern European countries and the NIS.

Overseas Economic Corporation Fund (OECF): Consolidates Japanese aid for developing nations.

Nordic Investment Bank (NIB): Coordinates aid from five Nordic countries.

COOPERATIVE PROGRAMS

Environmental Action Programme for Central and Eastern Europe: Developed in response to a call by the Ministers from east and west at their 1991 Conference. The program was approved at the Ministerial Conference in Lucerne, Switzerland in April 1993. The industrialized European republics of the FSU (Belarus, Ukraine, Moldova and European Russia) are included in the scope of the program.

The Baltic Sea Joint Comprehensive Environmental Action Programme: Twenty-year program for comprehensive pollution control and prevention in the Baltic Sea catchment area started in 1990. Funded by the countries in the catchment area.

The Environmental Programme for the Danube River Basin: Phase I of a strategic action plan was initiated in 1991, funded by several multi-lateral development agencies and governments. USAID funded studies in Hungary, Slovakia, Romania, Bulgaria, Moldova and the Ukraine.

The Black Sea Environmental Management Program: Project to identify sources of pollution in the Black and Azov seas. Funded by the World Bank and the littoral states.

The Black Triangle Environmental Programme: Focus is on regional air pollution. Funding from governments of Poland, Czechoslovakia, Germany and the EC.

Environmental Training Project Consortium: Funded by the USAID in cooperation with the World Wildlife Fund-US, provides management training in conflict resolution skills for NGOs, enterprises, local officials and others.

Biodiversity Support Program (BSP): Joint venture funded by USAID supports biodiversity projects around the globe.