Chapter 1

Introduction

1 Introduction

1.1 Background

The Republic of Azerbaijan covers an area of 86,600 square kilometres with a population of about 8.0 million (1999)[1]. Occupying the southeastern part of the Greater Caucasus in the north and the Kur-Araz lowland in the south, it enjoys a variety of natural environments.

The independence from the Former Soviet Union (FSU) in 1991, however, resulted in the collapse of trade among the republics of the FSU, only leaving the least efficient industrial systems. The conflict with Armenia over the territory of Nagorno-Karabakh internally displaced approximately 900,000 people. Such unstable economic and social conditions have hindered Azerbaijan from shifting from a planned economy to a market economy. The GDP decreased significantly: to 42% of the1990 level in 1995.

Full-scale industrial development based on the rich oil resources in Baku, the capital of Azerbaijan, and its surroundings started in the latter half of the 19th century, and the Baku oil field was the largest in the world at the beginning of the 20th century. The technology used for more than one century, however, lacks the attention to the environment and keeps affecting the environmental media. Further, rapid industrialisation caused population overgrowth without providing appropriate social services such as wastewater treatment and waste management. After independence, a wide range of environmental damage began to be identified, including the accumulation of toxic substances in the abandoned oil field and aged industrial zones, health impacts and the loss of natural resources.

Ironically, environmental degradation in recent years proceeds at lower pace than before, due to the current diminished economy. As the result of the commencement of economic development assistance by the World Bank and International Monetary Fund and the economic policy of foreign investment promotion, the annual GDP growth turned positive in 1996 for the first time since independence. A record 10% growth rate of GDP was attained in 1998. Therefore, the realisation of sustainable economic development with attention to the environment and integrated environmental management planning is now the aim before the real economic take-off.

Given these conditions, the government of Azerbaijan requested a master plan (M/P) on integrated environmental management in Baku to be drawn up. In response, the Japan International Cooperation Agency (JICA), Japan's technical assistance implementing agency, decided to implement the study in close cooperation with the relevant authorities of the government of Azerbaijan.

After a competitive tender, JICA appointed Kokusai Kogyo Co., Ltd. as the consultant for the study.

[1] Information from State Committee of Statistics.

1.2 Scope of the Study

1.2.1 Environmental Management

Environmental management which is sought for by the study will be defined as a set of actions to be taken to enhance the environmental values and prevent negative impacts on the environment in the course of economic, social and welfare development for current and future generations.

Humans enjoy diverse environmental values, whether consciously or not. They include natural resources such as flora, fauna, bio-diversity as a whole, and minerals; social values such as land space, clean air and water, and peaceful landscape; and other benefits such as pollution assimilation capacity (e.g. dilution and decomposition of pollutants) and balancing effects to control the earth's environment (e.g. maintaining temperature and cutting off ultra-violet rays).

The crucial thing for the environment is that environmental values are in general not infinite and do not regenerate. Once part of the environmental value set has deteriorated, severe impacts on humans and any other living creatures could be brought about. Therefore, development at the cost of the environment will pose unaffordable costs on society in the future, and environmental consideration must be incorporated into the entire socio-economic system.

A master plan on integrated environmental management, which this study is to formulate, aims to show the direction towards sustainable development of Baku city to SCE, BCE and the general public.

1.2.2 Components of Environmental Management

Environmental management contains several components, or tools, to be practicable. They will be represented by the following components.

Policy: Fundamental policies must be set out. They will also include strategies and/or programmes which are to put the policies into practice.

Institution: All activities have to be carried out in a specific manner by somebody with predetermined responsibilities. There are two main sub-components in institutional arrangement: organisation and legislation.

> **Organisation:** There should be (an) organisation(s) which carry/ies legally prescribed responsibility for environmental management and bear(s) capacity to do so. Capacity refers to management skills to strengthen and integrate the components required for environmental management. It should be noted that each component cannot be developed suddenly, but only gradually. Therefore management skills to make the best of currently available resources are also important.
>
> **Legislative structure:** Laws, directions, standards and other binding instruments that describe roles to ensure environmental management must be shown in a written form. The jurisdiction of the environmental organisation(s) must be delineated by legislation.

Human Resources: A human element is vital for environmental management. Not only personnel in the environmental organisation(s) but also all the other members of the society should play his/her own role.

Technology: Sound environmental management requires technology to control pollution and enhance the environment.

Monitoring: The status of the environment must be understood by the environmental organisation(s), and preferably by the general public, through monitoring. Problems that need urgent actions, changes and trends in the environmental quality, regional environmental characters and other information can be drawn from monitoring results.

Hardware: Hardware such as laboratory facilities, computers, well-equipped office space, and communication devices will be the base of reliable and efficient operation of the environmental organisation(s).

Finance: Although development without environmental consideration will be exceedingly costly in the future, environmental management still requires financial resources. As all society members enjoy the environmental values, a system to share the environmental cost in the society is a key requirement.

1.2.3 Objectives of the Study

Based on the understanding described above, the team attempted to enhance environmental management in Baku. Specifically, the study aimed to achieve the following objectives:

1. Formulate a M/P on integrated environmental management for Baku city for the target year 2010 and (an) implementation programme(s) for the selected priority project(s).
2. Pursue technology transfer on developing the M/P by means of joint work between the counterpart personnel and the Japanese study team.

1.3 Policies of the Study

The study team carried out the study with under the following policies:

- to jointly carry out the study with the C/P;
- to formulate a practical plan;
- to contribute to the sustainable growth of Baku city.

a. Joint Work with BCE

It is the C/P that bears responsibilities for implementation of the M/P using the output of the study. The C/P also has knowledge, technology, experience, data and information which are needed for the study. Therefore, there must be sufficient cooperation between the C/P and the team, and the commitment of the C/P to the study will be essential. The team thus requested a decision by the C/P on the occasion of report submission and at other times when critical matters have to be determined. Carrying out a joint study with the C/P should be the first and foremost policy of the study.

To build the close and cooperative relationships between the two parties, the study team proposes to have weekly meetings where progress of the study and study plans will be discussed and mutually understood.

b. Formulation of a Practical Plan

In general, all stakeholders in society basically support an environmental management plan, which seeks for nature conservation and environmental improvement. However, putting the plan into practice is often hindered by several factors, such as greater needs for economic than environmental projects, financial constraints, and inadequate institutional arrangement.

Considering these, the team encouraged the leadership of BCE and SCE as the responsible bodies by promoting their voluntary participation to the study, and proposed a step-by-step implementation schedule in order to ease future financial burdens. The team therefore formulated a M/P which is practical and consistent with the local circumstances.

c. Contribution to the Sustainable Growth of Baku City

The team understands that there is a strong need in Baku city to achieve both economic development and environmental conservation in the 21st century not repeating a pattern of industrial development based on environment exploitation. The team also recognises that there is a requirement in national and international society for the capital to be clean and healthy, considering the spatial importance of the city in the Caucasus region.

Therefore, the team formulated the M/P which will contribute to the sustainable growth of Baku city.

1.4 Study Area

The study shall cover the area under control of the BCE as shown in Figure 1-1.

1.5 Work Schedule

The study is scheduled to take 15 months as shown below and in Figure 1-2.

Phase 1: Understanding the Current Condition of the Environment
A: Preparatory Work in Japan
B: 1st Study Work in Azerbaijan (First Half)

Phase 2: Field Investigations and Future Scenario Setting
C: 1st Study Work in Azerbaijan (Second Half)
D: 1st Study Work in Japan

Phase 3: Formulation of Master Plan
E: 2nd Study Work in Azerbaijan

Phase 4: Formulation of Implementation Programme for Priority Projects
F: 2nd Study Work in Japan
G: 3rd Study Work in Azerbaijan
H: 3rd Study Work in Japan

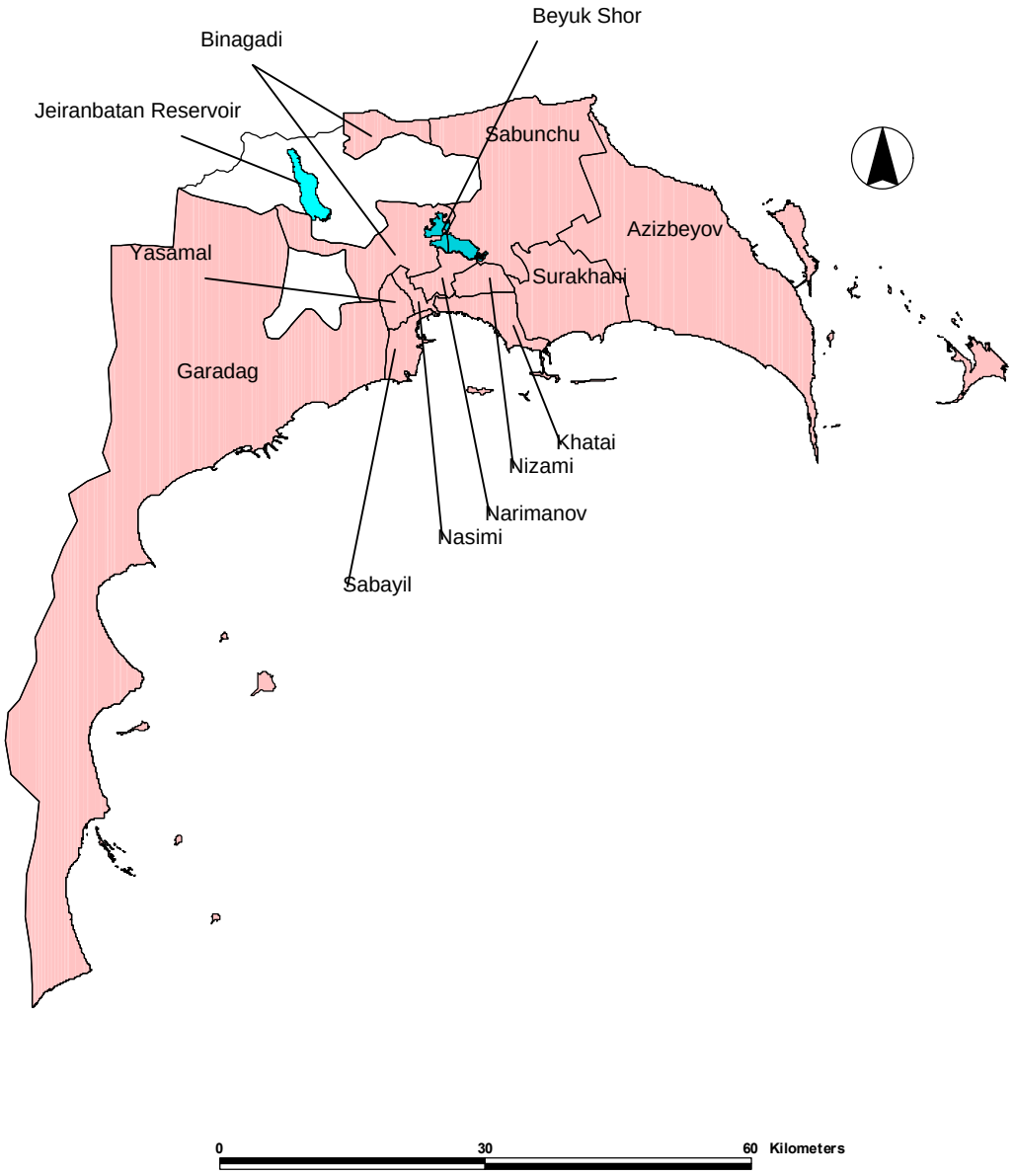


Figure 1-1: Study Area

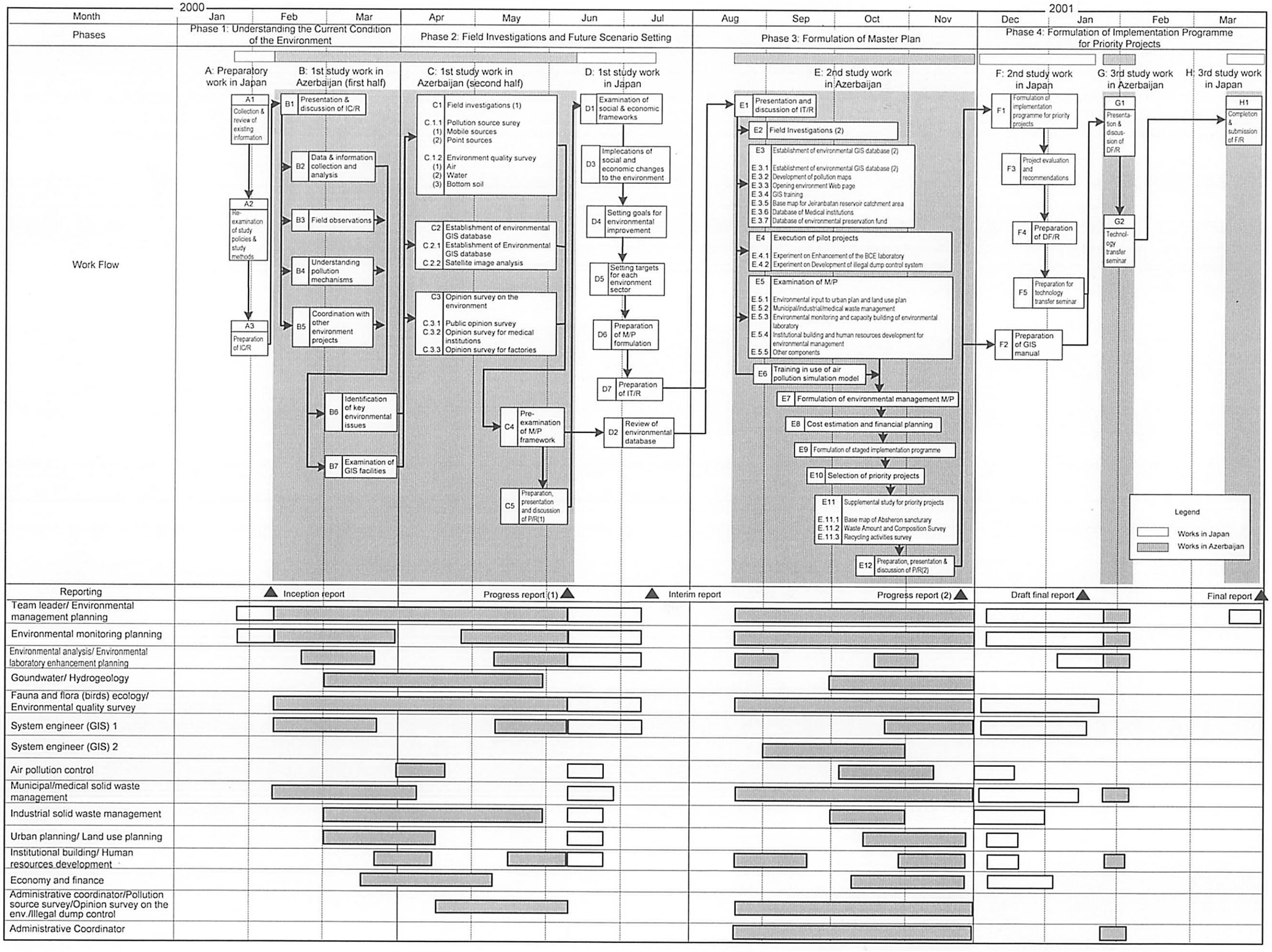


Figure 1-2: Work Process

1.6 Study Organisation and Persons Involved

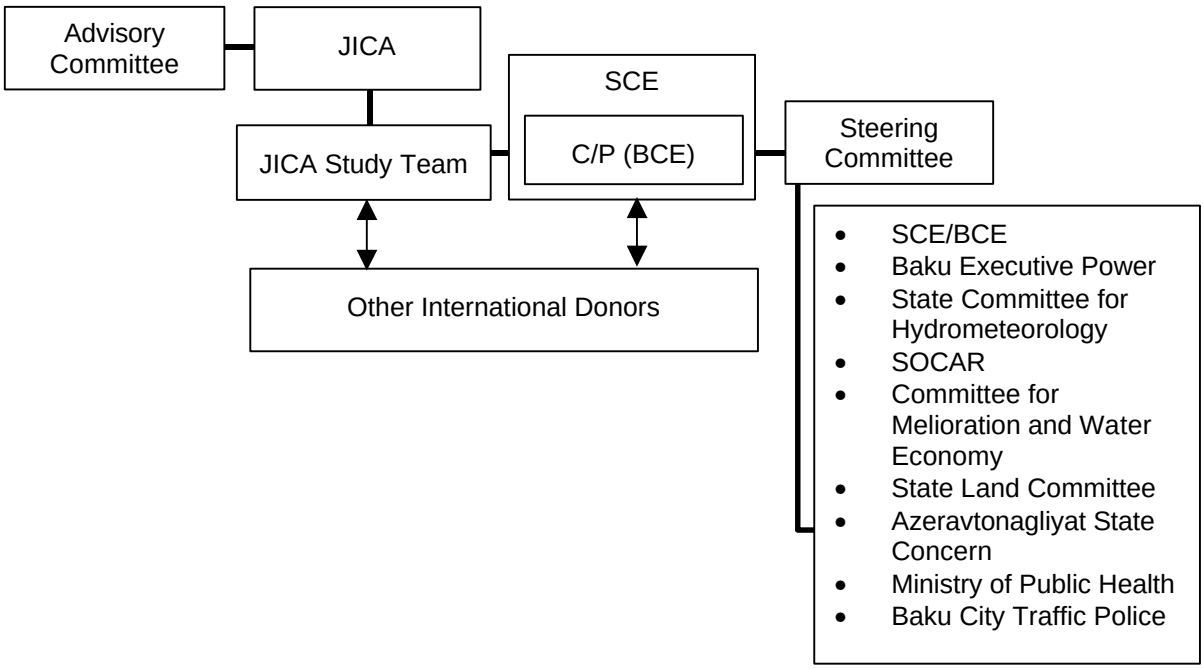
1.6.1 Study Organisation

The counterpart of the study was the BCE (Baku Committee on Ecology and Nature Utilisation Control), a regional sub-committee of the SCE (State Committee on Ecology and Nature Utilisation Control).

A steering committee was organised with an initiative of the BCE and the SCE involving other state organisations and agencies for overall management of the study. The composition of the steering committee members was determined at the commencement of the study through discussion between the BCE/SCE and the team.

JICA organised an advisory committee that provided JICA with necessary advice.

The organisational structure of the study was as shown below.



1.6.2 Persons Involved

a. Counterpart Members of the BCE

Surname – Name	Department	Position in his/her department
Nutsalov, Anver		Deputy chairman
Gasimov, Ahmed Amrah oglu	Soil, flora, and waste control department	Main Inspector
Zeynalov, Adil Saig oglu		Leading Inspector
Ragimov, Zohrab Sultan oglu	Water resources protection unit	Main Inspector
Gambarov, Mirsalam Beyukara oglu	Air protection unit	Inspector
Guseynov, Yasar Ilyas oglu	Fauna unit	Inspector

Celebova, Sevinc Ferayaddin gizi	Chemical Department	Chemical Engineer
Abdullaev, Rasim Ramazan oglu	EIA unit	Main Expert
Dasdemirov, Zaur Zahid oglu	EIA unit	Expert
Suleymanov, Elshan Aydin oglu	Information and environmental education unit	Specialist of Agitation
Cafarov, Aydin Agaverdi oglu	Department for Finance and Accounting	Economist

b. JICA Team Members

Expert	Assignment	Nationality
Susumu SHIMURA	Team Leader and Environmental Management Planning	Japanese
Shinya KAWADA	Environmental Monitoring Planning	Japanese
Yasuji HIMI	Environmental Analysis/ Environmental Laboratory Enhancement Planning	Japanese
Firdovsi Shamil-oglu ALIYEV	Groundwater/Hydrogeology	Azerbaijani
Noriko OTSUKI	Fauna and Flora (Birds) Ecology/ Environmental Quality Survey	Japanese
Kazutoshi MASUDA	System Engineer (GIS) 1	Japanese
Kunito ISHIBASHI	System Engineer (GIS) 2	Paraguayan
Carl HAWKINGS	Air Pollution Control	British
Tamotsu SUZUKI	Municipal/Medical Solid Waste Management	Japanese
Makoto MATSUMURA	Industrial Solid Waste Management	Japanese
Toshiro HAMADA	Urban Planning/Land Use Planning	Japanese
Benjamyn DAMAZER	Institutional Building/ Human Resources Development	British
Kozo BABA	Economy and Finance	Japanese
Ichiro KONO	Administrative Coordinator/ Pollution Source Survey/ Opinion Survey on the Environment/ Illegal Dump Control	Japanese
Teymour ASADOV	Administrative Coordinator	Azerbaijani

c. JICA Advisory Committee

Chairman	Masahiro OTA	Senior Adviser on Environmental Policy Development
Member/ Environmental Management Plan	Kentaro INOUE	Professor, Dep. of Socio Information, Faculty of Informatics, Okayama University of Science

1.7 Reports

The study team submitted the following reports in English and Russian to the government of Azerbaijan.

	Report	Time of Submission	Number of Copies
1	Inception Report	Beginning of February 2000	30 copies (English) 30 copies (Russian Summary)
2	Progress Report (1)	Beginning of June 2000	30 copies (English) 30 copies (Russian Summary)
3	Interim Report	Middle of August 2000	30 copies (English) 30 copies (Russian Summary)
4	Progress Report (2)	End of November 2000	30 copies (English) 30 copies (Russian Summary)
5	Draft Final Report	End of January 2001	Summary 30 copies (English) Summary 30 copies (Russian) Main 10 copies (English) Supporting 5 copies (English) Data Book 5 copies (English)
6	Final Report	End of March 2001	Summary 40 copies (English) Summary 40 copies (Russian) Main 20 copies (English) Main 30 copies (Russian) Supporting 5 copies (English) Supporting 5 copies (Russian) Data Book 5 copies (English) Data Book 5 copies (Russian)

1.8 Technology Transfer

Technology transfer was attempted at occasions shown below by the team.

Occasions	Target	Themes
Throughout the study	C/P Members	Study planning, criteria setting, identification of key issues, use of GIS, environmental analysis and monitoring, etc.
Weekly meetings	C/P Members	Implementation of the study, methods and approaches used/to be used in the study, project evaluation, etc.
Monthly seminars	C/P Members	Themes were proposed by the both sides, including GIS, air pollution, law enforcement, Japan's pollution experience and waste management.
Pilot Projects	C/P Members	Laboratory analytical technique improvement and public awareness raising for illegal dump control.
Discussion on Reports (IC/R, P/R(1), IT/R, P/R(2), and DF/R)	C/P and Steering Committee Members	Findings of the study at each stage, issues to be solved to progress the study, directions for the following stages of the study, etc.
Technology Transfer Seminar	C/P, Steering Committee Members, Others	Output of the study, assessment of environmental management in Baku, recommendations for improvement, implementation plan for priority projects, etc.

Chapter 2

Profile of the Study Area

2 Profile of the Study Area

2.1 Country Profile and the Environment

2.1.1 Socioeconomic Conditions

a. Population

The national population census was carried out in 1989 and 1999. The population figures of intercensal period are estimated on the base of results of 1999. The following figures relate to the beginning of the year.

Table 2-1: Population

	1989	1995	1996	1997	1998	1999
Population (year-end; 1,000)	7,014.2	7,726.2	7,799.8	7,876.7	7953.4	8016.2
Urban (% of total population)	54.2	52.3	52.1	51.9	51.0	51.0

Source: Statistical Yearbook of Azerbaijan 1999 and 2000, SCS

b. National Economy

b.1 Changes in the National Economy

Azerbaijan gained independence after the fall of the Soviet Republic in 1991. The economy dramatically "caved in" as a result of the collapse of the divided production system under the Russian regime and the ruin of the domestic distribution system. The Nagorno-Karabakh dispute (1992-1994) also delivered a fatal blow to the economy. The GDP also started decreasing every year: to 42% of the 1990 level in 1995. Inflation in 1993 and 1994 exceeded previous rates by 1000%, causing the citizens a lot of hardships and depreciating the value of the manat, from 270 to 4,000, to the US dollar. Under these conditions, the election of Heydar Aliyev in 1993 as president and the support of the IMF and the World Bank led to the implementation of economic reforms. The agreement with the enterprises in the west in 1994 on petroleum drilling rights in Chirag in the Caspian Sea, and the announcement of the privatisation plan in 1995, propelled a rise in the 1996 GDP. Consequently a GDP record growth rate of 10% was attained in 1998. However, the difficulty of privatising heavy industries mostly run by the government, stalled industrial production in 1999 to only 30% of the 1990 level.

Table 2-2: Azerbaijan Economic Recovery

	1995	1996	1997	1998	1999
GDP (at current prices; billion manat)	10,669.0	13,663.2	15,791.4	17,203.1	16,489.0
GDP (million US$)	2,415.2	3,180.8	3,960.8	4,446.6	4,004.1
Real growth (%)	-11.8	1.3	5.8	10.0	7.4
Index (1990 = 100)					
- GDP*	41.9	42.4	44.9	49.4	53.0
- Industrial production**	30.1	28.1	28.2	28.8	29.8
- Agricultural production	52.5	54.1	50.8	53.9	57.7

Source: Statistical Yearbook of Azerbaijan 2000, SCS
* Main Macroeconomic Indices of Azerbaijan, 1999, TURAN News Agency
** Statistical Yearbook of Azerbaijan 1999, SCS

These conditions led to the enactment of a presidential decree for establishment of new industries through the development of medium and small scale enterprises.

b.2 Current Economic Conditions

b.2.1 GDP

The 1999 GDP was estimated at 16.5 trillion manat (US$4 billion). Although the value hardly deviates from that of the previous year (17.2 trillion manat = US$4.4 billion), deflators, e.g. decline in the consumer price index, led to an actual increase of 7.4%.

The distribution and growth rates by sector are shown in the table below. The industrial sector is the backbone of the economy of Azerbaijan with a contribution of 11.8 trillion manat (US$2.9 billion). However, the growth rate is only half that of agriculture. Agriculture contributes 4.7 trillion manat (US$1.05 billion), that is 40% of the industrial production amount, and shows a growth rate of over 7%. Industries categorised under “Other Services” have the highest growth rate: over 18%.

Table 2-3: GDP Distribution & Real Growth Rates by Sector

	Distribution Rate (%)		Real Growth Rate (%)
	1999	1998**	
Industry	23.5	22.3	3.5
Agriculture	21.7	20.3	7.1
Construction	9.4	16.4	1.0
Communication	2.9	3.0	-1.7
Transport	11.5	9.9	4.1
Trade & commerce	5.1	5.7	-3.9*
Other activities of production	0.8	0.7	0.8
Other services	18.0	14.9	18.4
Net tax	7.1	6.8	12.1*
Total	100.0	100.0	7.4

Note: * calculated according to the increase of its portion.
Source: Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency
** Statistical Yearbook of Azerbaijan 2000, SCS

In the first half of 2000, GDP was estimated at 9.0 trillion manat (8.5% increase as compared with the same period of previous year). The output of industrial sector was 7.8 trillion manat (4.7% increase), and that of agricultural sector was 1.6 trillion manat (7.1% increase). It is then estimated that industrial sector contributes about 2.5 trillion manat and agricultural sector contributes about 1.0 trillion manat to GDP (the GDP of industrial sector was 32% of its output and the GDP of agricultural sector was 65% of its output in 1999).

b.2.2 Other Principal Economic Indicators

The table below shows other principal economic indicators.

Table 2-4: Principal Economic Indicators in 1999

	Unit	1999	Real change from 1998 (%)
Investment	billion manat	6,586	-3.0
Cargo transportation	1,000 metric ton	58,887	7.3
Passenger transportation	1,000	854,043	0.5
Retail trade turnover	billion manat	9,448	13.3
Volume of paid services	ditto	2,267	5.4
Export	million US$	928.6	53.2
Import	ditto	1,033.5	-4.0
Dollar rate versus manat	manat	4,118	6.4

Sources: Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency
"Baku Today 2000", Zaman-i Company

In 1996 investments amazingly rose to 211% from the previous year. This trend continued in 1997 (151%) and 1998 (145%), consequently pulling the economy along. Unfortunately, the values dropped in 1999. Although investments in electricity, chemical industries, and the transportation & communications sector hardly varied from the previous year, investments in the petroleum industry significantly fell. (Main Macroeconomic Indexes of Azerbaijan 1999, TURAN News Agency)

Exports, on the other hand, widely increased in 1999 after a negative showing in 1998 (only 77.6% of the previous year).

b.2.3 Private Sector

There is no reliable data on the actual situation of the private sector in Azerbaijan, because the change to a market economy is very rapid and the statistics agency (SCS) can not follow the actual situation appropriately.

Under industrial production, the private sector mainly covers petroleum, petrochemicals, food and non-ferrous products. Although showing a growth rate of over 25%, however, it contributes only 35% to the total production amount.

Reforms in the agricultural sector are in progress, but deficiency in equipment and shortage of gas and electricity are considered to have resulted in the decrease in the regional harvest. (Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency)

Consequently, these conditions intensified the need for a shift to a free market economy and the development of medium and small scale enterprises. In 1999, 3,345 venture enterprises were established and 3,081 closed down. Further, 54,067 enterprises were said to have been registered at the beginning of the year 2000. Of these new enterprises, 13,839 are government-owned, 37,677 are private, 1,671 are foreign enterprises, and 880 are established by joint venture. Enterprises related to agriculture total 10,608 (Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency).

According to the 1999 statistics on free market economy (Statistical Yearbook of Azerbaijan, 2000, SCS), there are 19,063 small scale enterprises and co-operatives, and 775 enterprises that are foreign-owned and established by joint venture.

On the other hand, the privatisation of government-owned enterprises progresses at a snail's pace.

Table 2-5: Ratio of Non-Governmental Sector

(unit: %)

	1996	1997	1998	1999
Industrial production volume	7.5	18.3	26.4	35.1
Gross agricultural production	68.5	85.0	95.0	98.0
Volume of Trade turnover	86.4	91.8	97.2	98.2
Volume of paid services*	35.2	42.3	51.0	n/a**

Note: * Contribution to livelihood (repair of shoes, clothing or house and machinery, laundry services etc.), communal dwelling services, cultural services, transport and communications
** "Baku Today 2000" showed 36%, but this is very doubtful because the situation of the paid services did not so far change in 1999.
Source: "Baku Today 2000", Zaman-i Company

As shown above, the conditions that would propel quick economic growth under the initiative of the private sector are not defined.

b.2.4 International Balance of Payments

Trade balance significantly improved in 1999 (from –US$471.0 million in 1998 to -US$104.9 million) when exports totalled US$928.6 million (153.2% of the previous year) and imports US$1,033.5 (96.0% of the previous year).

Main exports are petroleum (43%), products produced from petroleum (33%), and food products (6.5%).

Main imports are equipment and machinery (33%), food products (20%), and metals (11%).

The countries to which the products are mainly exported are: Italy (34%), Russia (8.9%), Greece (7.7%), Turkey (7.4%), and France (6.3%). Imports are mainly from: Russia (22%), Turkey (14%), USA (8.0%), Japan (5.4%), and Germany (4.4%).

b.2.5 Financial Condition of the Central Government

In 1999, the central government revenue amounted to 2,748.4 billion manat (US$667 million), 85% of the initial target. One the other hand, an expenditure of 3,208.0 billion manat has resulted in a shortage of 459.6 billion manat (US$112 million). This amount corresponds to 2.8% of GDP.

The major financial problems of the central government are due to its incapability of taxes collection. Acquiring only 74% of the initial target revenue in the first half of 1999 was said to have raised the collection rate in the latter term when the Director of the National Tax Agency is replaced. Farms and venture enterprises conceal their actual revenues and do not tolerate audit by the tax collection officer. In addition, it is also said that these officers get involved in bribery (Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency).

Tax revenues make up 78% of the central government's revenues.

Table 2-6: Central Government Budget (Breakdown of Revenue & Expenditure)

(unit: billion manat)

			1999		1998**	Ratio of 1999 to 1998
			Value	%	Value	1998=100%
Revenue			2,748.4	100.0	2,327.3	118.1
	Tax revenue		2,130.0	77.5	1,889.5	112.7
		Income tax	448.3	16.3	411.9	108.8
		Profit tax	367.8	13.4	328.5	119.6
		VAT	790.6	28.8	719.2	109.9
		Excise tax*	114.4	4.2	95.8	119.4
		Taxes on external activities (customs duties etc.)	317.6	11.5	293.1	108.4
		Land tax & Property tax	91.3	3.3	41.0	222.7
	Rent (Royalty)		179.6	6.5	174.3	103.0
	Non-tax revenue		348.2	12.7	206.9	168.3
	Other revenues		90.6	3.3	56.6	160.1
Expenses			3,208.0	100.0	2,641.7	121.4
	General expenses		255.2	8.0	161.7	157.8
	Law-enforcement and security		343.1	10.7	288.5	118.9
	Education		790.4	24.6	581.5	135.9
	Public health		186.2	5.8	152.5	122.1
	Social security		606.3	18.9	614.7	98.6
	Domestic Investments		334.1	10.4	226.9	147.2
	Other expenses		692.7	21.6	615.9	112.5
Deficit			459.6	-	314.4	146.2

Note: * Excise tax is mostly levied from the sale of oil products.
Source: Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency
** Statistical Yearbook of Azerbaijan 2000, SCS

b.3 Employment & Lifestyle

In spite being on the cusp of economic recovery, the citizens of Azerbaijan are still working hard to survive as a result of the nation's recent economic downfall. In addition, national problems such as unemployment, refugee settlement, and widening income differentials, are also becoming more serious. Although the government announced an unemployment rate of 1.0% in 1999, the survey carried out by the Ministry of Economics showed a rate of 17%.

b.3.1 Employment

As shown in the following table, the employed population by industry type continues to decrease even though economic indicators show recovery.

Table 2-7: Changes in the Employed Population by Industry Type

(unit: 1,000)

	1990	1995	1997	1998	Rate of 1998 to 1990 (1990=100)
Industry	420.6	295.5	205.8	205.7	48.9
Agriculture	350.0	188.7	78.7	71.2	20.3
Construction	223.3	137.9	95.2	63.0	28.2
Transport & communication	212.8	152.4	116.8	90.4	42.5
Trade & Commerce	162.5	86.4	46.4	34.5	21.2
Business services	62.7	38.2	19.7	13.8	22.0
Communal & Personal services	89.4	72.6	66.1	63.5	71.0
Health care	163.9	164.6	166.9	165.3	99.2
Education, etc	381.1	396.9	379.2	370.7	96.9
General administration	33.8	38.4	39.3	39.8	116.3
Total	2,100.1	1,572.0	1,214.1	1,117.9	51.1

Source: Statistical Yearbook of Azerbaijan 2000, SCS

b.3.2 Salary

The average monthly salary in January 2000 was reported at 201,300 manat (16.2% increase from the previous year) (Azernews, March 1-7, 2000). However, income widely varies by industry: the financial industry indicates 591,999 manat, the social services sector 52,400, and the agricultural sector 65,000.

b.3.3 Prices

According to the central bank, the inflation rate was negative in 1999 as shown in the table below.

Table 2-8: Inflation and Exchange Rates

	Unit	1996	1997	1998	1999	2000
Index of prices to the previous year	%	119.9	103.7	99.2	91.5	103.0*
Exchange rate of the manat to US$	manat	4295.5	3,986.8	3,868.8	4,118.0	4432**

Source: "Baku Today 2000", Zaman-i Company
* Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency
** at 2nd May, 2000 (Azernews May 3-9, 2000)

b.3.4 Household Income

The 1999 gross national revenue was estimated at 16 trillion 3.648 billion manat (US$3.92 billion) (Statistical Yearbook 2000). If divided by the 1999 population census of 7,952,000, the per capita gross national revenue would be 2.05 million manat (US$469). If a household averages 4.7 persons, the contribution to the gross national revenue would be 9.08 million manat/per annum (757 thousand manat/month).

On the other hand, the 1999 Azerbaijan Statistical Yearbook indicates that the household income is very dependent on revenues from the sale of harvests and commodities, as shown in the following table.

Table 2-9: Distribution of Average per Capita Income in 1998

	1000 manat/year	%
Wages & salaries	309.0	17.0
Dividends	19.6	1.1
Income from sale of harvest and commodities*	1,069.0	58.6
Pension and aid	118.0	6.5
Study grant	1.6	0.1
Income from foreign currency exchange	199.2	10.9
Income from finance system	27.4	1.5
Other incomes	79.0	4.3
Total	1,822.8	100.0

Note: * including non-registered trade and services
Source: Statistical Yearbook of Azerbaijan 1999, SCS

2.1.2 Industry

a. Industrial Structure

It is very difficult to find reliable data on the industrial structure in Azerbaijan.

In the year (1991) under the Russian regime, agriculture and industry respectively contributed 30.4% and 23.6% to the GDP. In 1999, the manufacturing industry occupied 23.5%, agriculture 21.7%, and "others" 54.8%; the decrease in the contribution of the agricultural sector is in proportion to the increase in the contribution of the other sectors. A closer look into the industrial components shows a decline in the manufacturing sector and rapid growth in the petroleum industry.

Table 2-10: Changes in Industrial Structure

(unit: %)

		1991	1995	1999*
Industry		23.6	27.3	23.5
within	Manufacturing sector	21.0	14.7	4.4
	Oil sector	2.6	12.6	19.1
Agriculture		30.4	25.1	21.7
Others		46.0	47.6	54.8

Sources: Country Profile "Azerbaijan 1999-2000", EIU
Main Macroeconomic Indices of Azerbaijan 1999, TURAN News Agency

Amidst the transition to a free market economy, the development of medium and small scale enterprises has increased the number of enterprises from 6,361 in 1995 to 16,504 in 1998. Correspondingly, the number of employees also increased from 52,647 to 114,893 in the same period. As can be seen from the table below, commercial and real estate businesses predominate.

Table 2-11: Activities under the Market Economy (1999)

(unit: billion manat)

	Small enterprises & co-operatives		Foreign & joint ventures	
	Number of operated enterprises	Volume of sold products, works and services	Number of operated enterprises	Volume of sold products, works and services
Agriculture, hunting, forestry and fisheries	1,761	74.4	-	-
Industry	1,518	568.3	149	1,939.4
Construction	792	143.4	79	347.0
Retail and wholesale, repair of goods and things	7,105	367.7	177	38.9
Hotels & restaurants	433	5.8	14	57.4
Transport, stock holdings & communication	206	39.6	78	361.0
Leasing and real estate operations	6,074	176.3	247	129.5
Health care & social services	140	1.0	9	3.2
Education	29	0.4	7	0.7
Other public utilities, social & individual services	1,005	14.0	15	3.1
Total	19,063	1,390.9	775	2,841.3

Source: Statistical Yearbook of Azerbaijan 1999, SCS

b. Manufacturing Industry

The table below shows the changes in the physical volume indices of industrial production by sector. Aside from the fact that the petroleum and electricity sectors have maintained 60% of the 1991 volume, other sectors are generally under the 30% level. The metallurgical and lumber industry only have 1%.

Table 2-12: Physical Volume Indices of Industrial Production by Sector

(unit: %)

1991=100%	1995	1997	1998
Industry Total	33.1	30.9	31.6
Electricity	64.0	57.6	61.0
Oil sector	62.2	56.7	65.9
Ferrous metallurgy	2.4	3.4	1.0
Bright metallurgy	12.0	9.9	6.4
Chemistry and petro-chemical industry	15.2	13.7	12.1
Machinery & metal-working	15.3	12.5	8.7
Industry of construction materials	14.1	12.9	10.0
Glass and china industry	18.6	20.9	22.0
Forestry, wood and pulp-paper industry	4.2	4.5	1.6
Light industry	38.5	19.1	11.1
Food industry	18.4	11.2	10.9
Flour and compound fodder industry	41.7	10.3	5.3

Sources: Statistical Yearbook of Azerbaijan 1999, SCS

The following table shows the main industrial activities in 1999. In comparison to 1995, industries that incurred an increase in production are as follows: extraction of crude oil & natural gas, non-metal mineral substance, transport equipment and supply electric energy, gas and water. On the whole, however, production is still on the decrease. Dependence on petroleum, therefore, is not likely to be eliminated.

Table 2-13: Structure of Industrial Production(1999)

	% of total	indices, 1995=100
Extraction of crude oil & natural gas	40.5	145.4
Production of coke, oil-refining and nuclear fuel products	20.8	77.1
Production of chemical products	4.0	96.7
Refining of food and beverage	3.0	61.6
Production of sewing goods	1.8	13.3
Production of car and equipment	1.2	44.4
Production of non-metal mineral substances	1.0	133.7
Production of transport equipment	0.7	129.2
Publication industry & printed materials	0.7	79.6
Production of ready made metal products	0.5	62.7
Production of electric cars & devices	0.3	75.4
Production of principal materials	0.6	70.3
Production of clothes, decoration & colouring of fur	0.2	38.2
Lot production of plastic and rubber manufacturing	0.2	19.8
Dressing & processing of leather, production of suitcases, bags, & footwear	0.1	36.6
Production of other goods	0.9	n/a
Supply of electric energy, gas and water	23.7	105.2
Total	100.0	99.1

Source: Statistical Yearbook of Azerbaijan 2000, SCS

2.1.3 Administration and Organisation

a. General

The executive branch of government in Azerbaijan is headed by the President. The prime minister is appointed by and accountable to the President. The legislature is required to confirm the prime minister's appointment. On the advice of the prime minister, the President appoints the ministers and heads of other ministry level entities (including state committees). The Cabinet of Ministers (COM), a distinct constitutional entity, comprises the prime minister, heads of central executive entities and other designated members, including for example, the Chief of Staff of the COM. The structure is illustrated in Figure 2-1 below.

There are currently:

- 17 ministries;
- 19 state committees;
- 9 main administrations[1]

which together form the machinery of central government in Azerbaijan. Figure 2-2

[1] police, tax inspection, etc.

refers.

In Azerbaijan, which inherited the former soviet systems, the process of reorientating the state towards more modern democratic institutions and a market economy is still at an early stage. Low state capability hinders progress in economic, social and environmental management. There is a general lack of accountability and transparency, specifically from the executive to the legislature. Azerbaijan can be characterised by a dominant executive and weak legislative oversight. The organisation of government is extremely complex, opaque and fragmented. It is rarely clear who, below the most senior levels, has the authority to make even minor decisions. In many countries such decisions may well be devolved to junior civil servants within a pre-determined legal framework.

b. Issues

The role of the state in Azerbaijan is, however, being re-examined. There have been several attempts during Azerbaijan's transition to a market based economy to redefine the functions the state should perform. This is true of environmental management as with all other areas of government.

The role of the state is unclear - it continues to perform many of the functions which are inappropriate in a market based economy. At the same time, functions which should be performed by the ministry level bodies are not being conducted.

> ***General example***
> *The central government, through ministries still owns and controls numerous public enterprises.*
>
> ***Environmental example***
> *Environmental Impact Assessments are carried out by SCE staff and those from regional committees, whilst there is no clear environmental policy for reducing emissions from industries currently operating.*

Decision making is extremely centralised. This is true at ministry and state committee level. Even minor matters reportedly go to highest levels for decision. Naturally, this leads to delays, since higher levels are under tremendous volume pressure and have to attend to affairs of state generally. Decisions may not be taken because there is no system of delegation of authority and there is no support for the exercise of individual initiative.

> ***General example***
> *The decision to abolish hotel registration fees (US$ 22 per visit) could not be made without reference to the COM, despite a willingness by state owned hotels to absorb this cost within their tariff structure. Privately owned hotels have done so.*
>
> ***Environmental example***
> *The deputy chairmen at SCE or regional committees have only very limited budgetary responsibility and purchasing authority.*

Informal decision making structures and processes are more important than formal ones. Decisions depend more on who has access to the ultimate decision maker, rather than which body has the stronger or better justified case. At senior levels, access is strictly controlled.

Decision making is therefore not transparent and individuals (or managers of enterprises) have little understanding of the correct legal processes which, in any event, may not prove relevant to the decision making process.

In many cases it is important to note that there is no apparent current, appropriate legislative or economic base for the organisational structure of the executive. The higher echelons of central government frequently do not appear to have an understanding of the future expenditure assignments, rights and structures at the regional and local levels.

> ***General example***
> *The budget authority for the recently elected municipalities has not been clarified. Elections have taken place but it is unclear what specific responsibilities these municipal bodies will have, how these will be funded or what local tax raising powers may exist.*
>
> ***Environmental example***
> *In the case cited as the general example, it is unclear what responsibilities the municipalities will have for solid waste disposal, how this will be monitored and what funding will be available to ensure continuity of service.*

The inter-relationship between central entities is dominated by the role of the president's office and the COM in decision making processes. State committees are rarely involved in these decision making processes and setting policy is therefore a less integrated process than would be desirable. (There is an exception where the head of the committee is close to the president or members of the COM.) The committees, in practice, take their instructions from the COM and implement these. They rarely, if ever, initiate policy decisions without such support.

This structure fuels speculation about - and provides scope for - corruption in the form of payoffs, kickbacks, patronage and other suspect procedures.

There have been numerous proposals for the reform of the machinery of central government, many of which have been led by the World Bank. To date, no set of proposals has been formally agreed. However, there have been some initial steps to reform the ministries of health and education (the largest two) and the State Committee for Ecology.

In the case of the State Committee for Ecology, there are proposals for the development of the committee staff, institutional capacity upgrading and a clear set of recommendations substantiating the move from state committee status to that of a ministry for environmental protection.

These proposals have been accepted by the chairman of the committee (currently deputy prime minister Hassanov) and the World Bank is keen to initiate an implementation programme to assist the government to make the recommended changes.

If implemented, these would require the ministry to be concerned with development of policy and its implementation through other bodies.

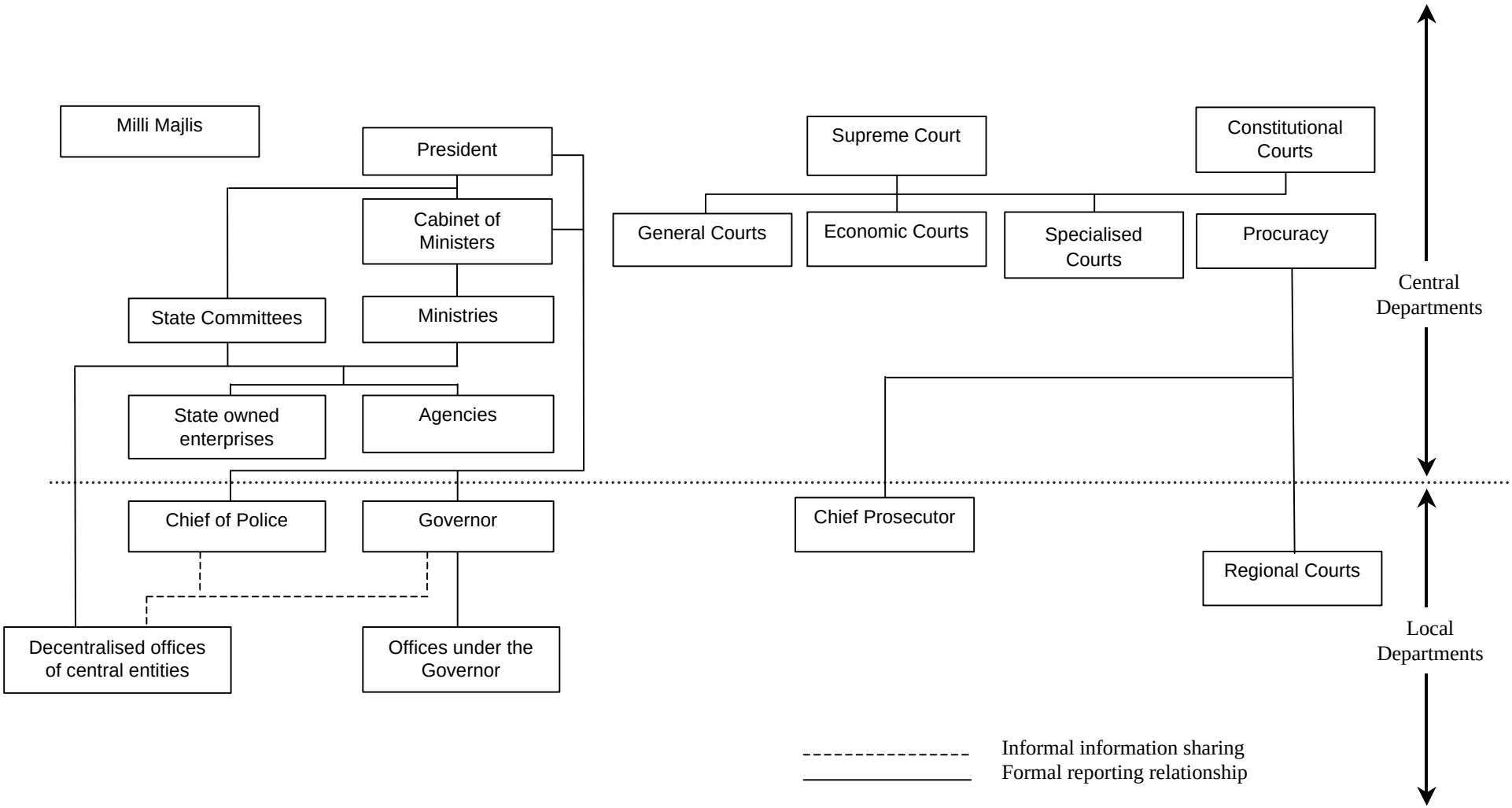


Figure 2-1: State Organisation of Azerbaijan Republic

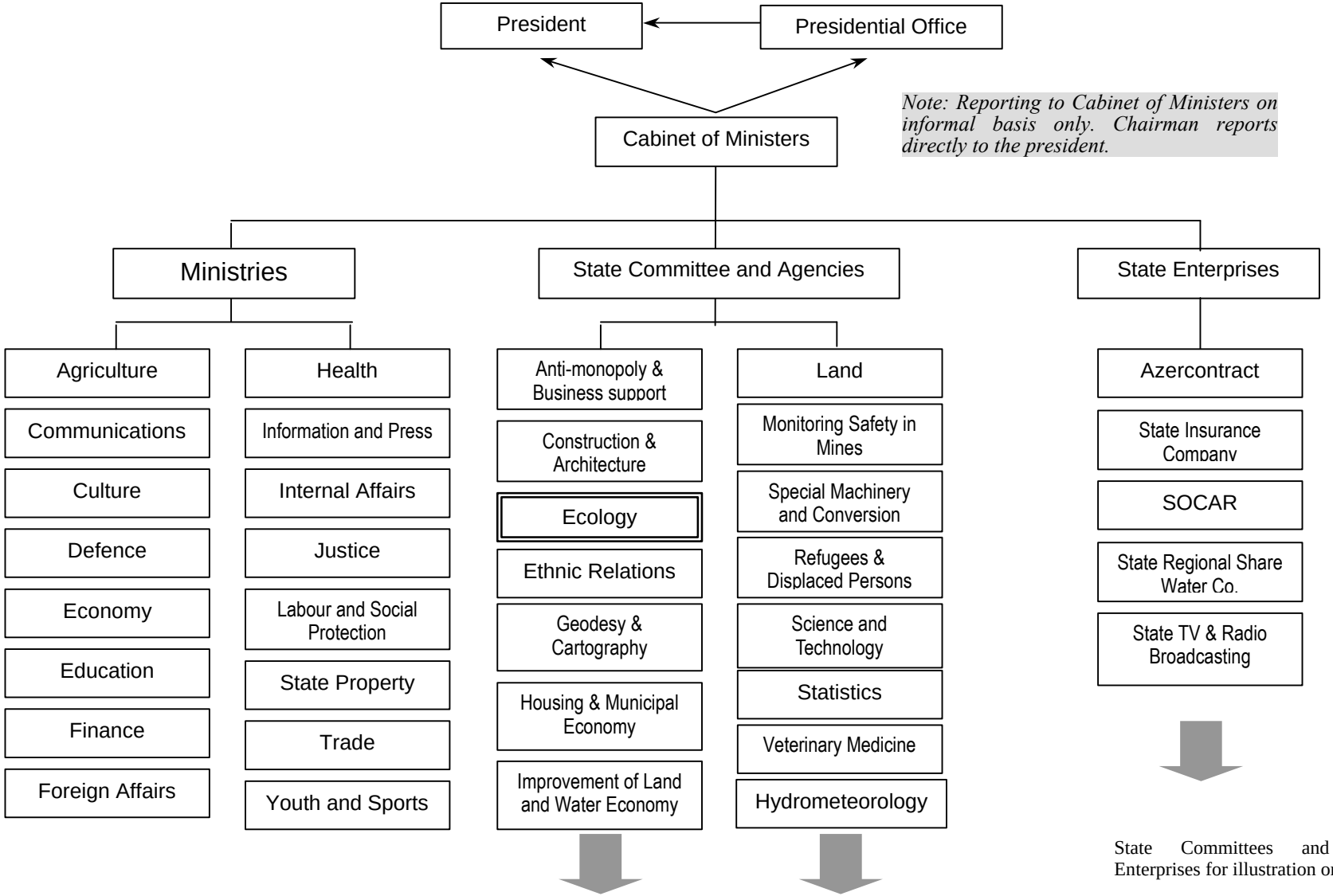


Figure 2-2: Organisation of Central Government

2.1.4 Natural Settings

a. Land

The Azerbaijan Republic lies between Greater Caucasus and Lesser Caucasus, and also includes the autonomous republic of Nakhichevan in the southwest across Armenia. The country borders Russia in the north, Georgia in the northwest, Armenia in the southwest, Iran in the south, and Turkey to the west of Nakhichevan. In the east it faces the Caspian Sea with a more than 800 km coastline. The central, and major part of the country is called Kura-Araks lowland where the Kura river flows in the centre. Talysh mountains are on the border with Iran, to the north of which spreads the Lenkoran depression.

The elevation of the coast is as low as –27m, resulting in 18% of the territory being below the ocean level. Lowlands above the ocean level stretches 39%, somewhat higher plateau and hilly land up to 2,500m elevation occupies 39.5%, and the remaining 3.5% is mountainous over 2,500m.

The Republic's total area is 86,600 square kilometres, including Nagorno-Karabakh currently occupied by Armenia. The land use of the country is estimated as follows.

Table 2-14: Land Use of the Country

<table>
<tr><td colspan="4">Total area: 86,600 km^2</td></tr>
<tr><td colspan="3">Agricultural land (4,414 km^2)</td><td rowspan="2">Forest and woodland (950 km^2)</td></tr>
<tr><td>Permanent crops (263 km^2)</td><td>Permanent pasture (2,479 km^2)</td><td>Arable land (1,672 km^2)</td></tr>
</table>

Source: FAOSTAT Agriculture Data (http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture)

b. Water System

The Kura River is one of the most important geographical components not only in Azerbaijan, but also in the Caucasus region. After crossing the border between Georgia and Azerbaijan, it meanders with a notably small gradient, leaving a number of lakes segregated form the river. The majority of rivers in Azerbaijan are Kura's tributaries originating in Greater Caucasus and Lesser Caucasus. The Araks River, which borders part of the southern limit of Azerbaijan, is one of those tributaries. The Kura River, with help of the Araks River and geological conditions of the area, carries high concentration of suspended solids and dissolved salts.

The other minor rivers flow from Greater Caucasus towards north, or from Lesser Caucasus towards the south. Parts of those in the north are tributaries of the Samur River which flows on the border with Russia.

c. Climate

The presence of the Caspian Sea, Greater Caucasus, Lesser Caucasus and Kura-Araks lowland make up Azerbaijan's peculiar topography, which then creates diverse climate.

The hottest months are July and August, average temperature being over 27^{o}C in the Kura-Araks lowland, the south of Absheron peninsula and the south of Nakhichevan. In high ranges of Greater Caucasus and Lesser Caucasus temperature in summer goes only up to about 10^{o}C. Climate in areas of particularly high elevation is tundra.

January is the coldest. In the Kura-Araks lowland and the Caspian coastal zone average temperature ranges from 0 to 3^{o}C, while in the mountainous areas it can be as low as -15^{o}C.

Rainfall also varies across the country. The eastern and southern coastal area of Absheron peninsula is the driest with annual precipitation less than 200mm/year. The most part of the Kura-Araks lowland is also dry, having rainfall of about 200 to 300mm/year. These areas are the climate of semi-desert and arid steppes. Mountainous areas of Greater Caucasus, Lesser Caucasus, and Lenkoran lowland enjoy much rainfall over 1200mm/year: rainfall in Lenkoran lowland can reach 1600mm or more.

Distribution of rainfall throughout the year also differs by region. The eastern half of Kura-Araks lowland, Absheron peninsula, Nakhichevan, coastal area of Lenkoran and area near the Talysh mountains have dry summers, while hilly areas of Greater Caucasus and Lesser Caucasus have dry winters. The central area of Lenkoran depression tends to have rainfall evenly through the year.

2.2 Profile of the Study Area

2.2.1 Definition of Study Area

a. Study Area

The country is divided into 65 districts and 11 cities and heads of those 76 administrative units are all appointed by the President. One of the cities is Baku, or more often called Greater Baku, and is the capital. The administrative body is known as BEP (Baku Executive Power). Baku also corresponds to the area under the control of the BCE and the study area. The study area is further divided into 11 districts (see Figure 1-1). Each district has its district executive power office, headed by an appointee of the mayor.

It should be noted that the study area is spotted with a number of small agricultural areas, which are under the control of Absheron executive power and, in terms of the environment, Absheron Committee for Ecology. Such administrative complications often hampers the proper execution of environmental management by the BCE.

b. Municipalities

On December 12, 1999 and March 26, 2000 partial local elections in the municipalities of Azerbaijan were held. However, at present it seems that not the result of the elections as such, rather the trial of smooth local election procedures was the main point.

There are more than 2,000 municipalities in the country (49 out of them are said to be in Baku city.). Many of the municipalities used to be called settlements. Accordingly one unit of municipality is presumed to be rather small (having three to four thousand population on average).

At present the substance of municipalities is vague. Even higher officers of the central government do not have a clear idea of actual responsibilities of the municipalities. Although the responsibility and status are described in a law regarding municipality, which was published on 12 July 1999, the substance is “enshrouded in

mist". It is not yet known how to distribute responsibility and power among BEP, the district executive power offices and municipalities. There are neither premises nor offices for municipalities and no staff of municipalities with whom the team could meet to discuss the issues. The proper and actual status of municipalities will be defined as time goes by and as the actual situation evolves.

Therefore, it seems appropriate to consider that the BEP and its subordinate organisations of 11 districts are the administrative organisations to be studied practically, although in the long run, municipalities will gain more presence in environmental management.

2.2.2 Natural Environment

a. Meteorology

Azerbaijan Republic can be divided into five physical-geographic areas, namely Kura-Arak lowlands, Greater Caucasus, Lesser Caucasus, Lenkoran and Nakhichevan areas. The climate of these areas varies. Baku City is located on the Absheron peninsula northeast of the Kura-Arak lowlands, and its climate is semi-arid.

The average temperature in Baku is 26.0°C, 4.0°C and 14.6°C in summer, winter and throughout the year, respectively. Baku's average rainfall is around 200 mm/year, most of which occurs between September and February.

Wind velocity does not fluctuate much and the annual average was calculated at 3.8 m/sec. Wind velocity exceeds 15 m/sec on 60 – 100 days a year.

Yearly average wind direction is from northwest to northeast 60% of the time and southwest to northeast 30% of the time, although the former is relatively more dominant in summer.

Meteorological data, expressed as geometrical means between 1990 and 1999, are shown in Table 2-15, while the wind direction data are in Table 2-16.

Remarks: The hydro meteorological station of the State Committee for Hydrometeorology (Hydromet) was established in the early 1900s close to "Nagorniy Park", the Governmental residence, to measure meteorological data for Baku City. In April 1994 the station was relocated to "Dendro Park"(6 micro-region), and then to Khirdalan settlement in February 1999, in accordance with the standards of WHO (relocation R=30 km). It is the only representative meteorological station in the study area.

Table 2-15: Meteorological Data (1990-1999)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Monthly average rainfall	(mm)	24.1	21.2	12.4	15.8	11.4	6.3	6.1	0.8	24.0	22.7	23.4	26.0	194.2
Monthly average air temperature	(°C)	4.0	4.3	6.9	12.4	17.6	23.4	26.0	25.9	21.3	16.5	10.5	6.1	14.6
Maximum air temperature	(°C)	18.4	21.4	20.6	31.5	34.0	37.5	36.3	36.5	34.0	29.2	25.7	19.0	---
Minimum air temperature	(°C)	1.7	0.5	3.0	6.9	12.6	17.1	20.8	20.2	15.7	9.8	3.8	2.1	---
Monthly average wind velocity	(m/sec)	3.4	4.0	3.9	3.8	3.4	3.7	4.5	4.5	4.0	3.7	3.6	3.3	3.8
Monthly average maximum wind velocity	(m/sec)	6.3	7.0	7.0	7.0	6.3	6.8	7.5	7.4	7.0	6.7	6.5	6.5	6.8
Maximum wind velocity	(m/sec)	24	26	26	27	26	28	23	28	27	25	30	29	30

Table 2-16: Wind Direction Data (1990-1999)

(unit: %)

	N	N-E	E	S-E	S	S-W	W	N-W
Jan	18	12	4	11	7	16	5	29
Feb	15	10	7	13	12	14	6	23
Mar	20	14	5	12	14	8	4	23
Apr	16	9	5	15	11	12	5	28
May	19	8	8	16	12	8	5	23
Jun	30	7	6	12	7	11	3	26
Jul	35	11	5	7	4	7	3	28
Aug	32	13	7	10	6	4	4	24
Sep	28	9	9	16	9	4	4	24
Oct	17	10	8	17	14	9	5	20
Nov	24	10	5	10	10	14	5	24
Dec	22	8	6	9	9	17	4	26
Average	23	10	6	12	10	10	4	25

b. Topography

Baku City can be roughly divided into three sections in terms of topography: eastern plain, western hilly area and western coastal corridor.

The eastern plain includes the urbanised central city area, districts of Surakhany, Sabunchu and Azizbeyov, and the northern part of Binagadi district. The area is generally flat, mostly at an elevation of below 50m. Water for agricultural and horticultural irrigation is pumped from the Jeiranbatan reservoir through the canal.

The western hilly area extends from the Binagadi valley, just off the city centre, to Gobustan, where many ancient caves are found in rocky hills. The elevation is not more than about 400 m, but some of the peaks are mud volcanoes and the southeast face of the precipice stands out.

The western coastal corridor is about 10km wide and runs along the Caspian Sea coast approximately 60 km from the Bibi-Heybat oilfield to the south end of the city boundary. Most parts of the corridor are 25 m below sea level. A highway from Baku to Astana is on the corridor, and this connects small settlements and production units such as a cement factory and an oil terminal.

c. Territorial Surface Water

There are more than 200 big and small lakes that altogether cover about 50 km^2 and about 50 saline marshes (1,980km^2) on the Absheron Peninsula. The formation of such a significant number of lakes is explained in different ways by various scientists, but mainly picked out two possibilities: origins of lacustrine cratering and water and salt reserves in these lakes. This study does not aim to comment especially on the geological conditions of lacustrine cratering, but wants to note that in majority of cases in the lacustrine region, rocks constitute alternating layers of dark-gray clay and grayish-yellow, rarely with interlayer, limestone and gray sand, saturated with salt. Sand is usually argillaceous. Under natural conditions, the formation of salt reserves is connected with the leaching of salt-bearing rocks, constituting hillsides of lacustrine craters, by surface water and replenishment of lakes with highly mineralised strata water of the Paleogene and Neogene (particularly the productive strata), and the accumulation of a small amount of salt from atmospheric and ground

water; sometimes it is a combination of all these factors, including effluents. The lakes of Western Absheron are recharged by atmospheric precipitation. Accordingly, the bigger the surface runoff area and amount of argillaceous rocks constituting crater are, the higher the role for recharging becomes. Recharging with highly mineralised pressure water is very important for Central Absheron lakes where the productive strata crop out. However, this type of lake recharge manner has been studied poorly and reduced sharply during the last decades due to the drop in the movement of strata water from productive strata as a result of intensive oil extraction activities. Ground water is also the recharge source of several lakes (Boyuk-Shor, Masazir, Kamenskoye, Zirya, Saray-shor, Alatava, etc.).

d. Hydro-geological Conditions

The Absheron peninsula constitutes the southern-western continuations (about 2000km^2) of the Great Caucasus. The eastern part protrudes deeply into the Caspian Sea. In the west, the border lies along the meridian of promontories Kilazinskaya spit (in the north) and Sangachal (in the south), where it merges with the low section of the Gobustan foothills.

Orographically, the territory of the peninsula can be divided into the following: northwestern and southwestern lowland, northern (hilly-ridgeline plain) and eastern plains.

Numerous saline lakes and salinas are a distinctive feature of the landscape.

The biggest lakes are situated in the northern part of the peninsula (e.g. Masazir Lake - 10 km^2). These lakes are mainly recharged by precipitation and partially by ground water. A large amount of wastewater (oil) also flows into most of these lakes, drastically changing the regime of a number of lakes (Zikh, Girmizi, Boyuk Shor, etc.) in return.

Seepage from the Absheron canal, artificial lakes and wastewater reservoirs has also expanded the area occupied by salinas. The general mineralisation in lakes fluctuates from 2-10 to 100 g/l, although in certain cases it reaches 300 g/l and more.

The water of these lakes is usually chloric-sulphurous, sodium-magnesium, considerably rarely sodium-calcium. Some lakes, including Boyuk Shor and Ganli-Gel, are a serious threat to the area not only in terms of their effects on the environment but because it also inundates the surrounding land.

Lake Boyuk Shor is a serious threat to the highway Baku-Airport, Bakikhanov settlement and Bul-bula settlement, and lake Ganli-Gel imperils Baku. The lakes located at the territory of Baku airport jeopardises the airport, highway Baku-Airport, Surakhani settlement, etc.

In general, the problems of the Absheron Peninsula represent a special environmental issue.

After investigations and special research, it could be necessary to decide to drain these lakes, cease wastewater discharge, regulate water regime and so on. Hydro-geologists, hydrologists, ecologists, biologists and town planners, should participate in the assessment of the existing situation, take necessary decisions and forecast further ramifications. We should take into consideration the fact that the Caspian Sea level fluctuation does not directly influence the aqueous-saline regime of

lakes. In this report, this issue is considered in connection with the ground water regime.

e. Flora

The Absheron peninsula is semi-desert or arid by nature, but still has diverse vegetation. The recent study states there are 729 species of plants on the peninsula[2].

The majority of those are ephemerales (*ephemera*) or ephemeroids (*ephemeroida*), that form synusium (*synusia*). Many of those are halophyta (*halophytes*) including a number of species of saltwort (*Salsola L.*) in the saline land of nearly one third of the peninsula and sagebrush (*Altemisia L.*) in steppe in the south of Baku. The common species are; *Salsola ruthenica, Suaeda Forsk., Zerna Panzer, Medicago L., Convolulus L., Artemisia hanseniana, Noaea mucronata, Salsola noulosa, Alhagi camelorum, Astaragalus L., Capparis L.* and others. There are 29 endemic species in the Absheron peninsula, three of which are peculiar only to this area, namely *Galium L.* (bed straw)*, Linaria Mill.* (toad flax)*,* and *Astragalum caucasicus* (Milkvetch)*.*

Higher vegetation is rather minor, covering only about not more than 10% of the peninsula. Although it is a small figure, it is also a result of great efforts made over decades to increase city greenery. At the end of the 19th century when the Baku economy was in full swing, fertile soil was imported using returning oil tankers which otherwise would have been empty to sail back to Baku after exporting oil. Trees were then also brought from outside, whose appropriateness to the climate and soil condition in Baku had to be well examined and which then required careful nurturing.

The natural tree vegetation includes fig tree (*Ficus carica*), tamarisk (*Tamarix L.*), buckthorn (*Rhamnus L.*), pomegranate (*Punica granatum*), juniper (*Juniperus L.*), feral almond (*Amygdalis L.*), and pistachio (*Pistacia L.*). These trees and others such as poplar (*Populus L.*), cider (*Cedrus Link*), mulberry (*Morus L.*), olive tree (*Olea europaea*), and apricot (*Armeniaca Mill.*) have been planted in recent decades, adding scenic beauty to the city.

Since the natural capacity of the land to maintain higher vegetation is still limited and the climate is dry, watering is necessary and is a burden to the authorities.

f. Fauna

The unique climatic and geological condition of the Absheron peninsula creates its peculiar animal kingdom. The Caspian Sea is inhabited by 78 fish species that can be observed in Azerbaijan, 41 among those being found around the peninsula with 5 species in the Azerbaijan Red Data Book. Sturgeon is of particular importance in terms of biodiversity and economy. The vast land hosts highly diversified reptile and amphibian species including two out of 13 species in the Red Data Book. As for Mammals, four species out of 14 in the Red Data Book are found in the peninsula (see Table 2-17).

[2] Òàãèåâà Å., "Åíäåìèêè Àïøåðîíà è Ïðîáëåìà èõ Ñîéðàíåíèÿ", *Ìàð. Êîíô. Êðàåâåäöåíêîâî îáùåñòâà Àçåðáàéäæàíà*, 1998.

Table 2-17: Fish, Amphibian, Reptile, and Mammal Species of the Absheron Peninsula Listed in the Azerbaijan Red Data Book

Class	Species	Common Name	
Fish	*Abramis sapa*	Bream	Þæíîêàñïèéñêàÿ áåëîãëàçêà
	Lucioperca marina	Sea sander	Ìîðñêîé ñóäàê
Amphibians and Reptiles	*Testudo graeca*	Spur-thighed mediterranean tortoises	Ñðåäèçåìíîìîðñêàÿ ÷åðåïàõà
	Phrynocephalus helioscopus	Toad-headed agamids	Òàêûðíàÿ êðóãëîãîëîâêà
Mammals	*Hyaena hyaena*	Striped hyena	Ãèåíà
	Vormela peregusna	Marbled polecat	Ïåðåâÿçêà
	Panthera pardus	North African leopard	Ëåîïàðä
	Gazella subgutturosa	Goitered gazelle	Äæåéðàí

Source: Academy of Sciences

The richness of fauna in Absheron is, however, largely due to bird species. A list of birds that can be found in the country includes 366 species and further survey might increase this figure. Among these, 231 species or more are in the territory of the Absheron peninsula[3].

Since the location of the peninsula is an important area for about 10 million migratory birds across Azerbaijan, as many as 41% (97) of the species found in the peninsula are migratory. The composition of the birds species fluctuates: 50 species or more may be found in the winter migration season but in other seasons one may see only 10 species. In terms of bird population, it is the highest in winter (from the end of December to the middle of February). The majority of wintering species are waterfowls.

Islands of the Caspian Sea off Baku are the main places of nesting. A great number of colonies of herring gulls, mediterranean gulls, sandwich terns, shelducks, ruddy shelducks, collared pratincoles, and plovers nest on islands such as Gil, Zenbil, Garasu, Babur, Pirsagat, Sangi-Mugan, Pirallahi and Boyuk Tava.

Shah Dili, or Absheron Sanctuaries, is rich in reed beds, and different species of herons, marsh harriers, moorhens, coots, purple gallinules, waders, gulls and terns nest there.

In hilly or semi-desert areas in the peninsula the following can be found: bee-eaters, crested larks, isabelline wheatears, starlings, hooded crows, lesser kestrels, lanners, rock partridges, stone curlews, black-bellied sand grouses, crested larks, and choughs.

The most characteristic species on the peninsula is coot. They breed near shallow waters with vegetation. They migrate in the middle of November and are one of the most common species in winter.

The next important species is herring gull. It is not migratory and a great number of them are found, especially on islands and cliff sides. They breed from the end of March and after breeding they spread along a seacoast. Five to seven thousand birds inhabit Gil Island, but their population is reported to be decreasing due to human disturbance and oil pollution.

[3] Ñóëòàíîâ Ý.Ã., "Î âëèÿíèè íåôòÿíîãî çàãðÿçíåíèÿ íà ïîâåäåíèå ïòèö", *Ìàòåðèàëû âòîðîãî ñúåçäà ôèçèîëîãîâ Àçåðáàéäæàíà*, 1999, 164-165.

Purple gallinule is an important species being listed in the Red Data Book. Their major habitat is Shah Dili because reed beds are their preferable place for nesting. They are vulnerable to human intervention.

The peninsula is inhabited by 93 species of birds which are (i) species of global conservation interest, (ii) species in an unfavourable conservation status concentrated in Europe, or (iii) species in an unfavourable conservation status not concentrated in Europe according to the European conservation categories. The Azerbaijan Red Data Book includes 37 bird species, 17 of which are found in the Absheron peninsula. These are listed on Table 2-18.

Table 2-18: Bird Species Found in the Absheron Peninsula and the Azerbaijan Red Data Book

Species (common name)	Conservation category and status (*)	Migration status	Habitat
Pelecanus onocrotalus (White pelican, Ðîçîâûé ïåëèêàí)	3 rare	Wintering Migration	Along the coast (Alyat)
Pelecanus crispus (Dalmatian pelican, Êóäðÿâûé ïåëèêàí)	1 vulnerable	Wintering Migration	Along the coast (Alyat)
Platalea leucorodia (Spoonbill, Êîëïèöà)	2 endangered	Migration	Along the coast
Phoenicopterus ruber (Greater flamingo, Ôëàìèíãî)	3 localised	Migration Wintering	Along the coast
Cygnus olor (Mute swan, Ëåáåäü-øèïóí)		Wintering Migration	Along the coast (North-east part of coast, Alyat)
Haliaetus albicilla (White-tailed eagle, Îðëàí-áåëîõâîñò)	3 rare	Settled	Gobustan, Alyat cape
Accipiter gentilis (Goshawk, Òåòåðåâÿòíèê)		Migration	Along the coast (In semi-desert)
Aquila nipalensis (Towny eagle, Ñòåïíîé îðåë)	3 vulnerable	Migration	Along the coast (In semi-desert)
Aquila chrysaetos (Golden eagle, Áåðêóò)	3 rare	Migration	Along the coast (In semi-desert)
Falco cherrug (Saker, Áàëîáàí)	3 endangered	Migration	Along the coast
Falco peregrinus (Peregrine, Ñàïñàí)	3 rare	Migration	Along the coast
Porphyrio porphyrio (Purple gallinule, Ñóëòàíêà)	3 rare	Breeding	Along the coast (Shah Dili, Sangachal)
Tetrax tetrax (Little bustard, Ñòðåïåò)	2 vulnerable	Migration	Along the coast (In semi-desert)
Otis tarda (Great bustard, Äðîôà)	1 declining	Migration	Along the coast (In semi-desert)
Glareola nordmanni (Black-winged pratincole, Ñòåïíàÿ òèðêóøêà)	3 rare	Breeding Wintering	Along the coast and islands
Chettusia gregaria (Sociable plover, Êðå÷åòêà)	1 endangered	Migration	Along the coast
Pterocles orientalis (Black-bellied sandgrouse, ×åðíîáðþõèé ðÿáîê)	3 vulnerable	Breeding	Semi-desert, foothills and mountain zones

* 1,2 & 3 – it is category of Species of European Conservation Concern

1- Species of global conservation concern
2- Unfavourable Conservation Status, and concentrated in Europe
3- Unfavourable Conservation Status, and not concentrated in Europe

Source: Institute of Zoology, Academy of Sciences, May 2000.

2.2.3 Land Use

a. Evolution of Baku

The evolution of Baku city is shown in the following Figure 2-3 and Figure 2-4.

Baku, the capital of the Azerbaijan Republic, has been a big industrial, political and cultural centre since soviet times. The city also has an important port that was one of the biggest ports of the FSU. The city is situated on the hilly Absheron peninsula, well know for its large oil and gas fields.

Forty seven industrial communities are scattered around Baku. The Population of Baku City reached 1,072,600 by 1st January 1962 putting the city in the fourth place in the FSU, after Moscow, Leningrad and Kiev.

Baku is one of the ancient communities of Azerbaijan. The first reference to Baku dated from the 8^{th} century. In the 15^{th} century Baku was the second residence of Shirvanshahs after Shemaha. In 1806 the city was joined to Russia. In the beginning of the 20^{th} century Baku was changing into a city of universal importance and took first place in the world for oil production.

From the end of 19^{th} century to the beginning of 20^{th} century Baku became one of the largest revolutionary centres in Russia.

During soviet times Baku had significantly changed. Lop-sided developing oil industry gave place to overall industrial development involving chemical, machinery, electrical and other industries. Meanwhile a large number of secondary and high schools, museums, theatres, cinemas and libraries as well as a network of scientific institutions with the Academy of Sciences at the head had been established.

At the beginning of the 20^{th} century, the Absheron peninsula including Baku city had practically no trees, because of the deficiency of fresh water.

Today the city has the population of 2,025,300 (1999) including internally displaced people, and the city area was expanded to over 2,000 km^2, including 116 km^2 of agricultural land, 18 km^2 of forest plantation, 173 km^2 of residential area, 248 km^2 of industrial area.

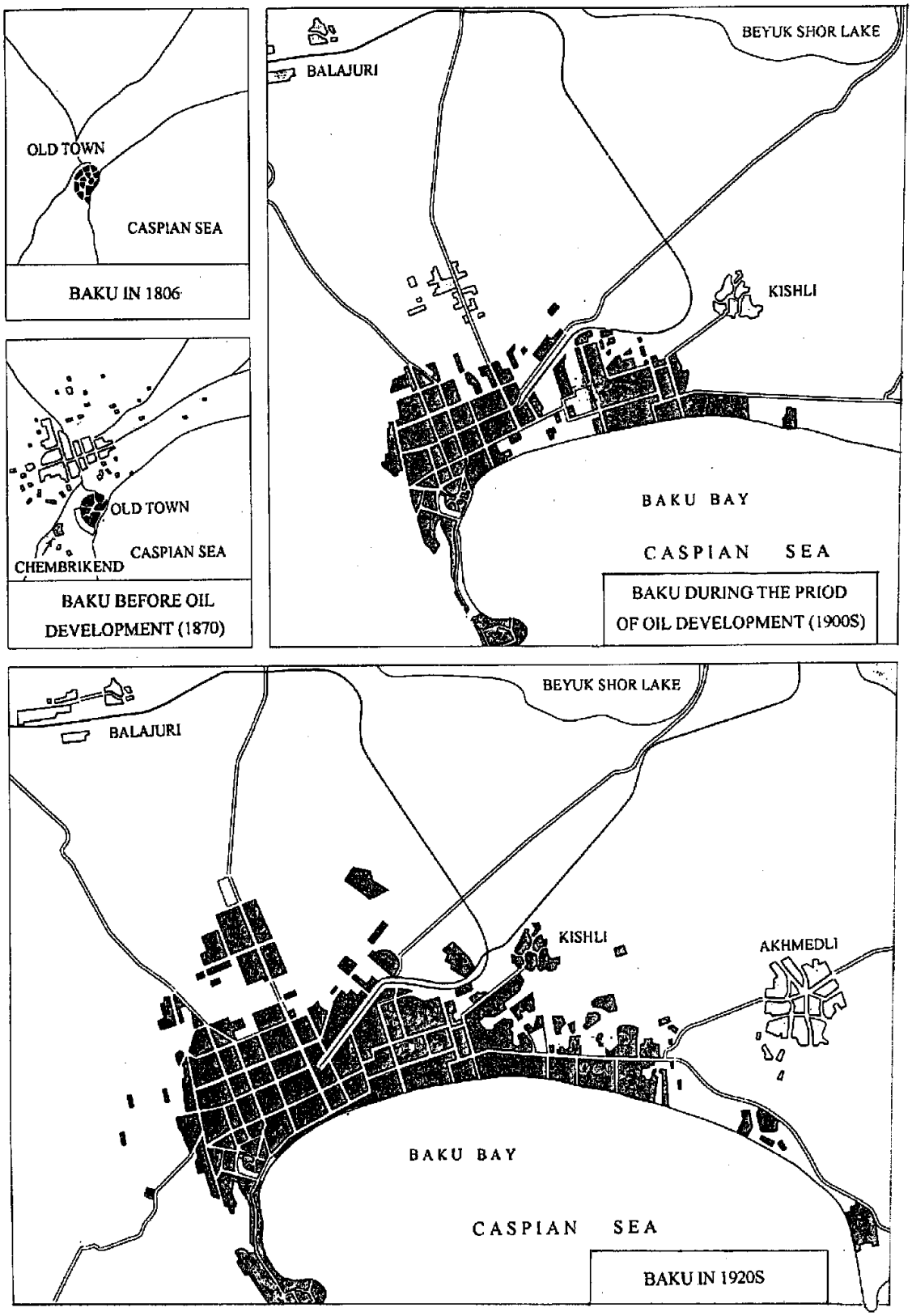


Figure 2-3: Evolution of Baku (1)

Source: Atlas of the Azerbaijan Republic

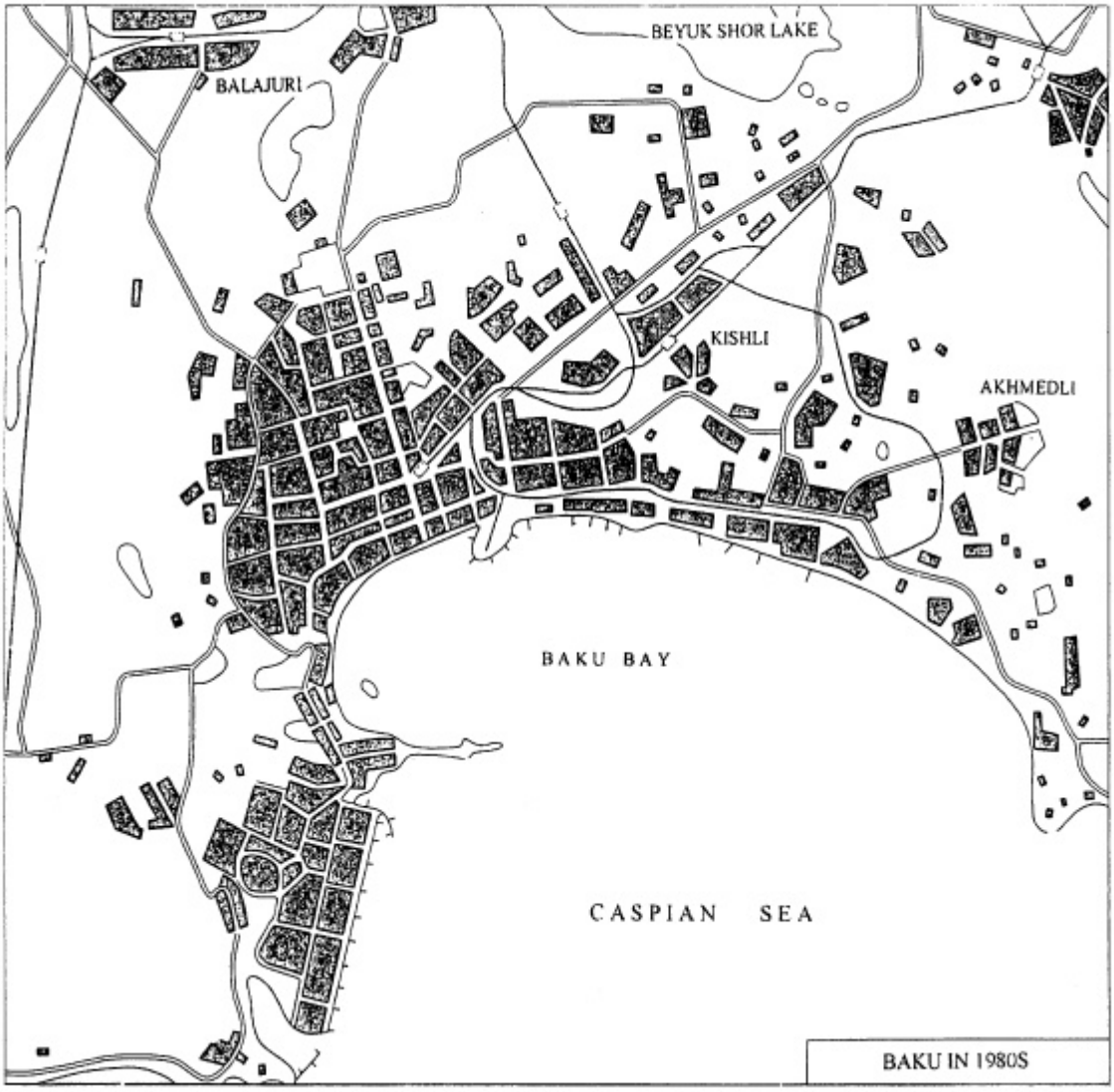


Figure 2-4: Evolution of Baku (2)

Source: Atlas of the Azerbaijan Republic

b. Land Use of Baku

The current land use of Baku is shown in Figure 2-5. This land use map was prepared for a GIS introduced by the team to the BCE on the basis of the following data and information.

- The base map for the Greater Baku is a hard copy topographic map at the scale of 1:10,000 with coordinate system Pulkovo 1942.
- The air-photo survey as well as field survey for the base map has been carried out in the years 1972, 1975, 1976, 1977, 1985, 1986.
- The years of production of this base map is from 1989 to 1996.
- Also the base map of Greater Baku at the scale of 1:5,000 has been used. These maps have been produced from the maps of 1:2,000 scale.
- The air-photo survey and field survey for the map of 1:5,000 scale have been carried out in the years 1980, 1982, 1983, and produced within years 1989 – 1996.
- The air-photo survey and field survey for the map of 1:2,000 scale have been carried out in the years 1980,1982, 1983, and produced within years 1987 – 1989.
- The areas which have been revised on the base map are as follows;
    - Sangachal – Primorsk area (southern part of Baku)
    - The 9th mikrorayon area
    - The area between former Sovyetskaya street and Narimanov prospect
    - The parks named after Aliyev within area of the whole city
    - The surrounding areas around hotels Hyatt Regency and Europe
    - Sharifsadeh street and many other buildings within territory of the whole Baku city
- All alterations have been made based on the data received from the general architectural and city planning division of BEP
- The base source for land use is a hard copy topographic map of Baku at the scale of 1:10,000 (adjustment has been carried out by maps of 1:5,000 and 1:2,000 scale) as well as information received from Department for Green Plantation of Municipality of Baku. Also this information has been adjusted and updated by field surveys.

In the City of Baku, a vast area (1,324 km^2) is unused open space, which extends to the south-west and east sides of the city. Oil fields (180 km^2) are surrounding the central part of the city and oil fields are as large as the whole residential area. A large industrial zone exists in the central part of the city (Nizami district and Khatai district) dividing the residential area in two. This industrial zone extends from the Caspian Sea to Bayuk shor lake. However, many factories in this industrial zone are not working. In Khatai district alone 30 large factories and 12 transportation related industries have been closed. There are many more small industries which were closed.

The areas according to land use categories are shown in the following table.

Table 2-19: Land Use of Baku city

Land Use	Area (Km^2)	%
Agriculture - Cattle breeding	9.37	0.44
Agriculture - Crops	49.15	2.32
Agriculture / Vineyard	57.35	2.70
Cemetery	5.83	0.27
Commercial area	1.59	0.08
Forest plantation	17.51	0.82
Industry - Oil field	178.85	8.42
Industry - Quarry	4.50	0.21
Industrial area	64.93	3.06
Institutional / Public building	20.33	0.96
Abandoned institutional and residential	0.46	0.02
Open space	1,294.60	60.98
Park and green area	5.90	0.28
Recreational area	158.48	7.47
Historical reserve	24.10	1.14
Nature sanctuary	5.16	0.24
Residential area	145.22	6.84
Transportation	27.62	1.30
Water body (Lake & pond)	48.79	2.30
Water body (Reservoir)	3.16	0.15
Total area	2,122.90	100.00

Source: Land use in GIS

The present city of Baku originated from the old town. Probably because of the natural topography of Baku, the city has expanded towards the east. Nizami district and Khatai district of the industrial zone used to be outside the Baku residential area. However, as the city sprawled towards the east, another residential area was developed ,further east beyond this industrial zone. As a result the industrial zone was sandwiched by two major residential areas. At present a considerable amount of housing development is going on in the area further east of Nizami district and Khatai district and in the west side of Surakhan district,

The configuration of the industrial zone, which cuts the residential area in two, was formed in the course of the development process of the city. However, at the same time from the viewpoint of land use, it was probably a due consideration of the effect of the north wind which prevails throughout the year in Baku, trying to reduce the effect of industrial emission gas over the residential area.

The characteristic of land use of Baku is the vast oil fields surrounding the residential area. The abandoned oil field with scattered pipes, oil rigs and electric poles are environmentally ugly. Flow-out oil and tar mixed with water has created many lakes and ponds of tar. How to treat this abandoned oil field is one of the main issues to consider for improving the environment of Baku.

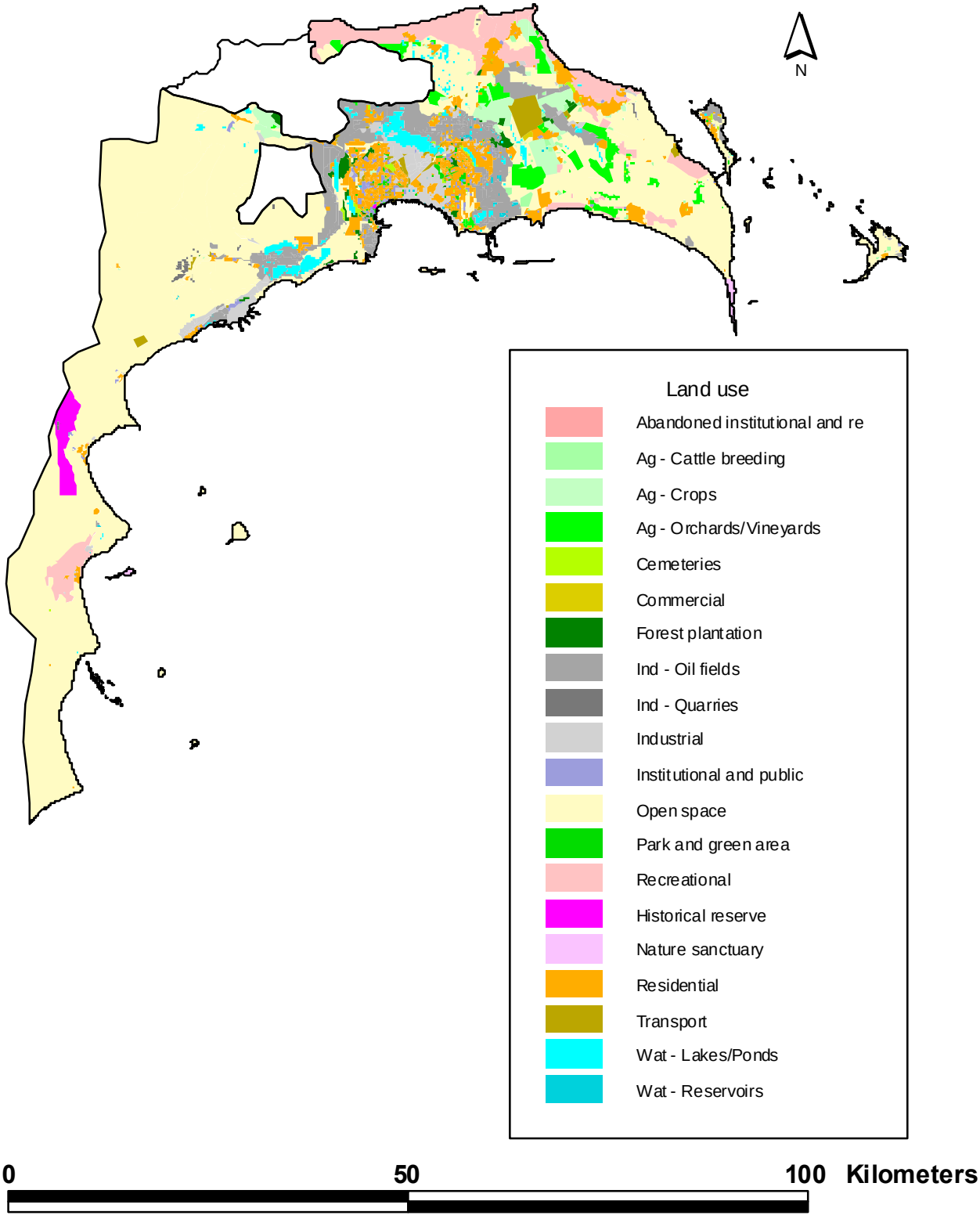


Figure 2-5: Current Land Use of Baku

On the other hand beyond this belt of oil fields there are vast open spaces. This area is not far from the city centre. Good roads will enable this area to be reached within 20 to 30 minutes by car from the city centre. The possibility of developing this area to a residential area is technically quite high. It will be more economical to develop this open space to residential area, compared to redeveloping the abandoned oil field. One of the good uses of the abandoned oil field may be to make it a buffer green belt which will protect the central area of the city from the prevailing north wind and external industrial activities.

Regarding the residential area, Yasamal district which is located on the west side of the central part of Baku, not far from the old town, is a fast growing residential area. This is one of the most densely populated districts in Baku. The most densely populated district is Nasimi (22,160 person/km^2), just to the east side of Yasamal, where many high rise residential blocks have been constructed.

In Baku the commercial area is generally integrated with the residential area, just like Rome or Paris. It is rather difficult to separate the commercial area from the residential area clearly. Ground levels of housing blocks are, in general, used for a commercial purpose.

c. Direction of Future Land Use in Baku

"An international city" will be the key words for future development of Baku. The development direction of land use shall be to encourage Baku City to offer a comfortable place for people to live and to work as an international city.

Unfortunately in the past the city was developed with the priority of industrial productivity, rather than the well-being of the citizens. To create a city for citizens to live in comfort seemed to have low priority in the past. Now, it is the time to change this idea of development.

The economic decline after the collapse of the FSU has resulted in closure of many industrial establishments. What remain are obsolete facilities that are disintegrating rapidly. Hundreds of hectares of this kind are awaiting either renovation for industrial purpose or redevelopment for housing or some other purpose. This is a very precious occasion for Baku to be reformed as an international city. It will also contribute to the improvement of the environment of Baku in the longer term.

Below are some ideas the team believes denote preferable land use transformation in future.

c.1 Oil fields

The oil fields surrounding the central part of the city should be converted to a green belt park with trees as a buffer zone to protect the central part of the city.

The most part of the vast oil fields surrounding the central residential area has been abandoned with thousands of abandoned oil rigs and electric poles and pipes on the ground with many ponds of oil and tar mixed with water. These are extremely damaging to the appearance of the city. If these are redeveloped as a green belt, it will protect the central part of the city from external industrial activities and also from the constantly prevailing wind. It may be possible to redevelop this area partially for a residential area, but since this oil fields have been environmentally degraded in several ways, it will be costly to redevelop this area for residential use.

c.2 Industrial zone

The industrial zone in Nizami district and Khatai district should be relocated. This industrial zone is dividing the residential area in the central part of the city into two at present. Fortunately, in this regard, most of factories in this industrial zone are either closed or have seriously cut down their production. Now is a good chance for Baku to introduce the concept of the relocation of industries from the central part of the city. It will be desirable to relocate industries outside the green belt. Heavy industries are in Karadag district in particular.

c.3 Residential area

Large-scale residential development is ongoing around the border areas of Nasimi district and Yasamal district. However, it is desirable to keep these areas untouched from construction, and keep them as green areas, because these areas are hilly and vulnerable to rain. The constructions are going on by cutting these hills. Some housing blocks are constructed on top of a steep hill. They are in danger of land slides as the foot of the hill was cut for another housing development. Such insensible development takes away the opportunity for Baku citizens to enjoy the pleasant green hills surrounding the city.

For residential area development there are vast lands left in the periphery of the central part of the city. These areas can be reached within 20 – 30 minutes by car, if good roads are constructed. The areas are wide open and rather flat, and have a good potential for housing sites in terms of proximity from the central area. In Azizbekov district towns and settlements has been already fairly well developed for residential areas. It will be advantageous to develop this area as a satellite town further.

c.4 Recreational area

Baku is surrounded by the Caspian Sea. Taking the advantage of this location of the city, a concept of developing the recreational area of Baku along the Caspian Sea shore is quite acceptable. Unfortunately, at present the coast is contaminated by the spill out oil from the oil industries. The city should seek a way to maintain existing recreational areas and create new ones by cleaning up these oil contaminated coastal areas.

c.5 Natural reserve

The city is not for total development. Some areas should be left for a natural reserve. The tip of the Absheron peninsula and an island off the Alat cape have been kept intact as sanctuaries. This policy should be enhanced by introducing a prudent use of the natural reserve.

c.6 Public infrastructure

Baku as a whole is a vast gently undulating land thrust out to the Caspian Sea. The area has a great potential to be a good habitat, if the public infrastructures are well developed. The infrastructure is the key to Baku's development. To ensure sufficient drinking and irrigation water with an efficient distribution system, and to provide an efficient road network and transportation are essential. The northern part of Baku, along the seashore of Sabunchi district will be a good recreational area for many citizens of Baku, if a good road is developed connecting the area with the central part of Baku. Azizbekov district will be a comfortable residential area, if the connecting

highway is constructed. It is also important to have an appropriate waste disposal system for the city. These may not be accomplished in a few years, but the city should have a directive aim for the land use of the city.

2.2.4 Socio-economic Conditions in Baku

a. Population

The State Committee for Statistics is in charge of the population matters in the Republic of Azerbaijan. This agency is responsible for taking the census, which is taken every 10 years. The latest census was taken at the end of January1999.

State committee for Statistics publishes the "Statistical Year Book"

There is Baku statistics office of the State Committee for Statistics. Under Baku statistics office there are 11 regional statistics office, one in each district. Between the census years the annual population was estimated, based on natural and social increase and decrease rates.

The census population of Baku city by district in 1989 and 1999, which is obtained from the State Committee for Statistics is as Table 2-20.

Table 2-20: Population of Baku, 1989, 1999

District		Area (km^2)	1989 Population (1,000)	1999 Population (1,000)	1999 Density (Person /km^2)
1	Sabail	28	90.5	74.3	2,654
2	Yasamal	16	218.7	221.5	13,844
3	Nasimi	10	216.8	195.8	19,580
4	Narimanov	25	171.7	147.9	5,916
5	Nizami	20	170.2	159.1	7,955
6	Khatai	32	231.4	215.5	6,734
7	Karadag	1,137	84.7	94.3	83
8	Binagadi	162	179.8	209.3	1,292
9	Sabunchi	244	191.9	188.6	773
10	Surakhani	122	127.2	165.8	1,359
11	Azizbekov	396	112.0	116.4	294
Baku		2,192	1794.9	1788.5	816

Source: State Committee for Statistics, based on census data at the beginning of year, 1989 and 1999

The population density of Baku is 816 persons per square kilometre, while that of Azerbaijan is 92. The most densely populated area is Nasimi, 19,580 person/km^2. The second is Yasamal, 13,844 person/km^2. Yasamal is located on the west side of the central part of Baku, and it is situated on a slope of bare land. Many large housing blocks have been constructed on this slope. Surakhani is also a fast growing district, which is located on the east side of the central part of Baku. In the area to the west side of Surakhani, sandwiched by the vast oil field of Surakhani and Nizami and Khatayi, a great number of new houses have been under development.

There was a war during 1990 and 1992. Accordingly a considerable number of the population left Baku, which caused the decrease of population in Baku in the early 90s. However, after the war people begin to come back to Baku, and the population

of Baku has been gradually increasing since 1995 (the increase from 1995 to 1998 is about 1.0%).

Another factor which affects the population of Baku is the refugees and internally displaced people. The numbers of refugees and internally displaced population in Azerbaijan in 1998 are 220.0 thousand and 568.4 thousand respectively (Statistical Year Book, 1999), while the ones in Baku are 91.2 thousand and 145.2 thousand (source: State Committee for Statistics). In these statistics, *refugee* means population who moved into Azerbaijan from foreign countries, e.g. Armenia, Uzbekistan, Kazakhstan and Russia, while *internally displaced population* means an Azerbaijani who moved within the country because of the war.

This population is not included in the Baku population of the census figure. However, the current situation of these refugees and internally displaced population in Baku are already integrated into the daily lives of the population of Baku. They are living in the city like a normal population. They are not living in temporary housing, but they are living in normal housing in Baku. Some of them are living in their own apartments and some are with their relatives. They have a better chance of finding jobs and of making their living in Baku than elsewhere. Some of them are inviting their families to Baku to live together as a family unit.

Accordingly it is more appropriate to consider that those refugees and internally displaced population will stay in Baku, rather than that they will leave Baku for their original homes. Of course, there is a possibility that some of them will leave Baku, but at the same time it is possible that some more refugees and internally displaced population will come in to Baku, which would compensate for the emigrating population

Therefore, for the purpose of this study refugees and internally displaced population are counted as a population of Baku.

The integrated population, including refugees and internally displaced population, of Baku in each district is as Table 2-21.

Table 2-21: Number of Refugees and Internally Displaced Population by District, 1999

	District	Area (km^2)	Population (1,000)	Refugee (1,000)	Internally displaced (1,000)	Total (1,000)	Density (person/km^2)
1	Sabail	28	74.3	4.6	6.9	85.8	3,064
2	Yasamal	16	221.5	1.2	14.8	237.5	14,844
3	Nasimi	10	195.8	14.5	11.3	221.6	22,160
4	Narimanov	25	147.9	17.2	11.9	177.0	7,080
5	Nizami	20	159.1	7.4	12.9	179.4	8,970
6	Khatai	32	215.5	10.2	15.1	240.8	7,525
7	Karadag	1,137	94.3	2.4	8.9	105.6	93
8	Binagadi	162	209.3	15.6	22.2	247.1	1,525
9	Sabunchi	244	188.6	8.3	16.2	213.1	873
10	Surakhani	122	165.8	8.1	12.9	186.8	1,531
11	Azizbekov	396	116.4	1.7	12.1	130.2	329
	Baku	2,192	1,788.5	91.2	145.2	2,024.9	924

Source: State Committee for Statistics, based on census data at the beginning of year 1999

The population of the entire population of Azerbaijan is as Table 2-22.

Table 2-22: Population of Azerbaijan from 1989 to 1999

Year	Population (1,000)	Rate of Increase
1989	7,014.2	
1990	7,218.5	2.9%
1991	7,234.1	1.5%
1992	7,440.0	1.6%
1993	7,549.6	1.5%
1994	7,643.5	1.2%
1995	7,726.2	1.1%
1996	7,799.8	1.0%
1997	7,876.7	1.0%
1998	7,949.3	0.9%
1999	8,016.0*	0.8%

Source: Statistical Year Book of Azerbaijan, 1999. *1999 figure from State Committee for Statistics

b. GRDP and Industry

b.1 GRDP (Gross Regional Domestic Product)

Azerbaijan estimates the GDP but not the Gross Regional Domestic Product (GRDP). Further, data on production and income by region are not published. It is also extremely difficult to determine regional economic conditions, as the country is currently in a period of transition.

Based on limited statistical data, the concentration of every industry is assumed and used together with the GDP by industry to estimate the GRDP of Baku City. The table below shows the industrial classification and data sources.

Table 2-23: Concentration by Industry & Data Source

Items / Industry	Indices applied	Whole Country	Baku	Portion of Baku (%)	Reference
Mining & Manufacturing	Industrial production by cities (%)	n/a	n/a	71.0	Main Macroeconomic Indices, 1999
Agriculture	Cultivation Area (ha)	920,429	1,463	0.2	Statistical Yearbook of Azerbaijan 1999 p.344
Construction	Investment submitted into use (million manat)	5,347,899	4,697,119	87.8	ibid p.361
Transport & communication	Passenger motor-car	262,433	101,245	38.6	Calculated based on the passenger motor car per 1000 population (p.388) multiplied population in 1999 census
Trade	Retail trade by all types of trade (%)	n/a	n/a	43.8	Statistical Yearbook of Azerbaijan 1999 p.194
Business services*	Basic fixed assets submitted into use (million manat)	1,779,071	1,333,310	74.9	ibid p.361

Items / Industry	Indices applied	Whole Country	Baku	Portion of Baku (%)	Reference
Communal & Personal services**	Population (1,000)	7,952.5	2,024.9	25.5	ibid p.25+SCS interview
Health care	Hospital beds	66,580	21,435	32.2	ibid p.158
Education, etc.***	General education schools	4,536	328	7.2	ibid p.107
General administration	Population (1,000)	7,952.5	2,024.9	25.5	ibid p.25+SCS interview

Notes: * Total of data processing, operation on real estate and credit, insurance and pension security
** Total of communal services & living subsistence and non-profit institutions serving household
*** Total of education, culture and art, science and scientific services

The result of the calculations made based on the above premise shows that GRDP of Baku is 44% of GDP.

Based on the "Water and Wastewater Master Plan for Greater Baku" (Montgomery Watson), Greater Baku (including Sumgait) constitutes 60% of the GDP.

Table 2-24: Baku GRDP

(unit: billion manat)

	GDP in 1997*	Contribution of Baku (%)	GRDP of Baku
Industry	3,980.6	71.0	2,826.2
Agriculture	3,178.4	0.2	5.1
Construction	1,842.4	87.8	1,645.3
Transport & communication	1,657.7	38.6	639.9
Trade	1,021.8	43.8	447.5
Business services	562.1	74.9	421.0
Communal & Personal services	1,299.3	25.5	331.3
Health care	194.2	32.2	62.5
Education, etc.	666.1	7.2	48.0
General administration	272.9	25.5	69.6
Sub-total	14,675.5	44.3	6,496.4
Net tax	1,115.9		494.3
Total	15,791.4	44.3	6,990.7

Source: Statistical Yearbook of Azerbaijan 1999, SCS

If divided by the Baku City 1997 population of 2,022,100 (including refugees and internally displaced population), the per capita GRDP would be 3,457,000 manat (US$867). (1997 exchange rate: US$1 = 3,986.8 manat)

b.2 Industry

There are no statistical data on the industrial activities in Baku City. The list of enterprises in "Baku Today 2000" (Zaman-i company) was therefore used to determine the industrial activities in Baku City in 1999.

The type of enterprises that mostly predominate are media, construction and

transportation (combined total of over 200), followed by enterprises manufacturing petroleum and consumer goods. As the national capital, the city also receives a lot of support in bank, insurance, and businesses. The following are limited in scale: manufacturing industry, production of construction materials, petroleum related products, equipment and machinery, processing of agricultural produce, consumer goods, furniture, etc.

Table 2-25: Industrial Economic Activities in Baku

	No. of companies	Extraction or fundamental service supply	Manufacture	Commerce	Other services
Oil sector	196	34	35	6	121
Energy sector	33	1	6	6	20
Equipment	107	-	32	42	33
Goods for office	82	-	-	82	-
Consumer goods	195	-	20	175	-
Furniture	128	-	17	111	-
Agricultural business	123	-	25	98	-
Bank	80	80	-	-	-
Insurance	65	65	-	-	-
Advertisement	74	74	-	-	-
Business support	84	-	-	-	84
Construction	267	107	56	68	36
Transportation	233	167	-	46	20
Communication	102	42	-	38	22
Media	298	267	-	-	31
Total	2,067	837	191	672	367

Source: "Baku Today 2000", Zaman-i company

c. Employment

Baku City employment statistics are not published. At the time the study team interviewed the Ministry of Economics, the city's unemployment rate was rising to 25%, higher than the national level.

d. Income Level

Baku City household income statistics are also not published. The "Water and Wastewater Master Plan for Greater Baku" (Montgomery Watson) calculates a monthly income of US$437 for a household averaging 4.7 persons, assuming a 1997 per capita GRDP of US$1,115 per annum.

Calculations based on the GRDP estimated by the study team, however, indicate a monthly income level of US$340.

2.2.5 Urban Services

a. Water Supply

A master plan of water supply, "Water and Wastewater Master Plan for Greater Baku, March 1999", was formulated by the World Bank (WB). Most of the information here was an extraction from that master plan report.

a.1 Served Population

The water master plan covers the area, which includes Sumgayit city, the Absheron district and Baku city (the area of the present JICA study). The level of served population in 1997 compared to 2015 is 89.3% as shown in the table below. The rate obtained by POS (public opinion survey, see Section 3.5 of the Supporting Report) of our study is 93.7%, which well coincides the figure above.

Table 2-26: Present and Future Population Served City Water in Greater Baku

	1997	2015
Population in Baku	1.956 million	2.565 million
Population in Greater Baku	2.420 million	3.136 million
Served Population - Greater Baku	2,161,683 (89.3%)	3,136,129 (100%)

Source: Water and Wastewater Master Plan for Greater Baku, March 1999

a.2 Water System

For Greater Baku there are the following three water systems according to the water resources:

- the **Jeiranbatan Water System** draws raw water from the Samur River, which flows on the border of Russia and Azerbaijan, to the Absheron peninsula via the Samur Absheron canal and the Jeiranbatan reservoir. The raw water is treated at the Jeiranbatan Water Treatment Works, which is located in the Absheron district next to the JICA's study area. The treatment capacity of the works is 7.5 m^3/sec for drinking water and 2.35 m^3/sec for industrial water. After being treated, the water is pumped to other parts of the Greater Baku area;
- the **Kura Water System** has a water intake on the Kura River and treats it at the Kura Water Treatment Works (Hagikabul Raion), the capacity of which is 9.6 m^3/sec. From Kura, the treated water is pumped to the Greater Baku area via the Sangachal Pump Station in Karadag District;
- **Baku 1 and 2 Water System** extract ground water of good quality from Baku 1 and Baku 2 well fields, which are located in Xachmaz and Devechi districts. Pumped water flows to the Tagiv Pump Station, where it is chlorinated before distribution.

The existing raw water resources for Greater Baku area is summarised as shown in Table 2-27.

The team input the existing main facilities of city water into the GIS database constructed in the BCE office, which presents a map and important data of the facilities as shown in Figure 2-6.

Table 2-27: Existing Water Resources in Greater Baku

Source	Type	Water Quality	Water Supplied (m^3/sec)	Reliable Yield (m^3/sec)	Constraint (Yield, Quantity & Source Security)
Samur River – Jeiranbatan Reservoir	Surface Water	Good	9.2	9.4	Samur River future water allocation & ecological flow requirements, Infrastructure condition
Kura River Intake	Surface Water	Poor	9.1	9.1	Water quality, Infrastructure condition
Baku 1 & 2 Well Fields	Ground-water	Good	4.0	4.0	Pollution risk, Environmental concerns, Infrastructure condition
Total			22.3	22.5	

Source: Water and Wastewater Master Plan for Greater Baku, March 1999

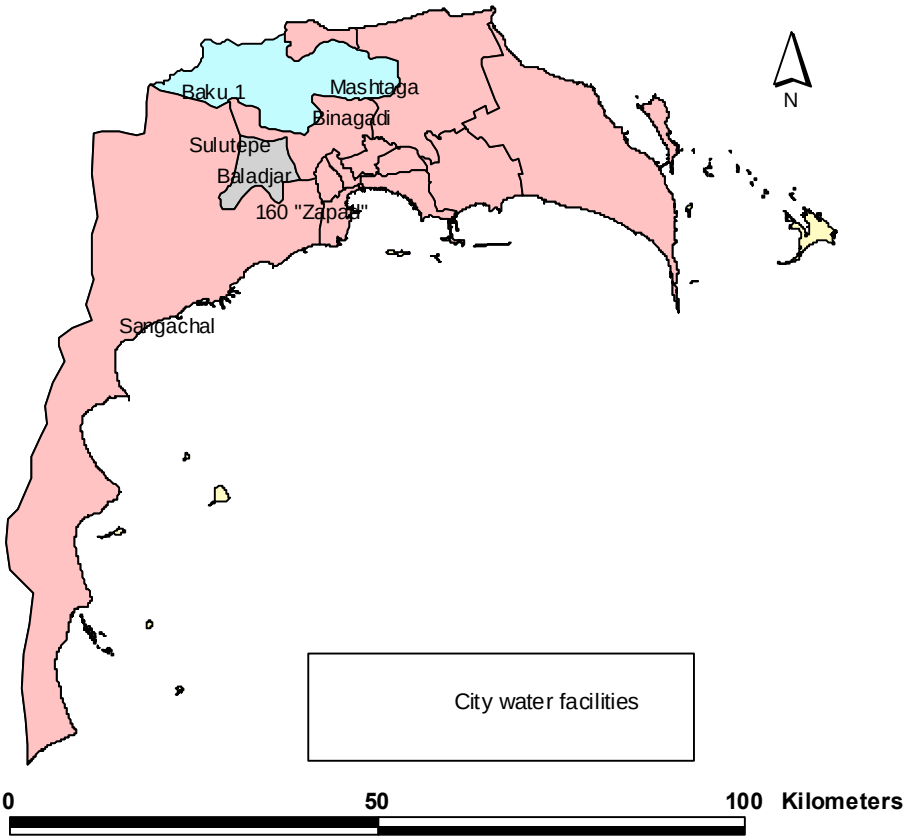


Figure 2-6: City Water Facilities

a.3 Key Issues

The Greater Baku area is located in the semi-arid region of the country and almost all of its water is supplied from outside the area, except for personal use wells in the Absheron peninsula. In spite of this situation, the city water supply system appears to be well established. However, according to the POS (public opinion survey) carried out by the team in April and May 2000 and covering 300 families, the most serious problems in the study area regarding urban service, is water supply. A water problem was raised by 48% of the interviewees (144 families) followed by an electricity supply problem which was pointed out only by 13%. The water M/P report points out the following issues for improvement.

1. Levels of Water Supply Services

Levels of water supply services differ from area to area. Areas where adequately pressured water is only available for a few hours in a day have such problems as:

- insufficient water supply due to the closure of Kura Water Treatment Works or the breakdown of pumps;
- difficulties in controlling pumping due to the present system;
- breakdown or inappropriate operation of a building's booster pumps.

2. Distributed Water Quality:

Although the data on water quality are very limited, they indicate that the bacteriological quality consistently fails to comply with the WHO guideline figures. This is a serious cause for peoples' concern, coupled with the high turbidity reported

3. Water Demand and Losses

The past assumption of daily per capita consumption was 400 litres while more realistic figure is in excess of 500 litre/person/day. A more detailed analysis of the 1996 ARWC (Absheron Regional Water Company) consumption data indicates domestic consumption levels of 580 litre/person/day (for comparison, 391 litre/person/day[4] in 1996 in Japan) and unaccounted-for-water (UFW) at 50 % of water produced. Such very high domestic water consumption is due to large volume of water wasted by consumers mainly because water is not priced at realistic levels, but secondly due to the poor quality of domestic, private and communal plumbing systems.

The above-mentioned issues shall be improved by the implementation of the water M/P. However although the water M/P does not indicate this, the team considers the conservation of Jeiranbatan reservoir water is one of the most important issues in the study area regarding city water. The Jeiranbatan reservoir, which supplies more than half the potable water consumed in the study area, has a large catchment area. Within the catchment area there are likely pollution sources such as residential areas and oil ponds.

[4] Annual Report on Health and Welfare 1998 – 1999, Ministry of Health and Welfare of Japan, March 2000

b. Wastewater Management

The World Bank (WB) formulated a master plan of wastewater management, "Water and Wastewater Master Plan for Greater Baku, March 1999". Most of the information here is an extraction from the master plan report.

b.1 Served Population

The wastewater master plan covers the Greater Baku, which is divided into Sumgayit city, the Absheron district and Baku city. The population connected to the sewage collection system is estimated to be 1,866,333, which is about **78%**. The rate obtained by POS of our study is 89.3%, which does not largely differ from the figure above.

b.2 Wastewater System

There are four authorities responsible for wastewater systems in the Greater Baku area, as follows:

- Bakkannalizasiya (BSD: Baku Sewage Department)
- Sumgayit Vodokanal (SVK)
- Absheron Vodokanal (AVK)
- Karadag Sewerage Office (KSO)

Among the above four the BSD is responsible for the wastewater system in the study area and the BSD system comprises three drainage areas, each of which drains wastewater to a different treatment plant as shown in the table below.

Table 2-28: Wastewater Treatment of BSD Service Area

Items Sewage Treatment Works	% in total volume	Method of Treatment	BOD_5 in Influent	BOD_5 in Effluent	Service Districts
Govsani	51	Secondary*2	75 mg/l	10 mg/l	The city centre of Baku and parts of the Sabunchu, Surakhany
Zikh	5	Primary*1	136 mg/l	78 mg/l	Small parts of Natimanov and Khatayi
Mardakan	1	Primary*1	182 mg/l	103 mg/l	Parts of the cities of Mardakan, Shuvelan and Buzovna
Direct Discharge to Sea	43	No treatment	NA	NA	

Source Water and Wastewater Master Plan for Greater Baku, March 1999
Note *1: Primary treatment is mechanical treatment that consists of raked screens and grid removal, followed by primary sedimentation.
*2: Secondary treatment has biological treatment in addition to the primary treatment.

The team input the existing sewage treatment facilities into the GIS database being constructed in the BCE office, which presents a map and important data of the facilities as shown in Figure 2-7. In the figure there are several sewage treatment facilities, which are not presented in the above table. Haji Hassan Sewage Treatment Works (STW) is located in the study area but receives the majority of wastewater from Khirdalan city in the Absheron district. The capacity of Sahil and Pirallahi STWs is negligible, and Sangachal and Alat STWs are not operating at present.

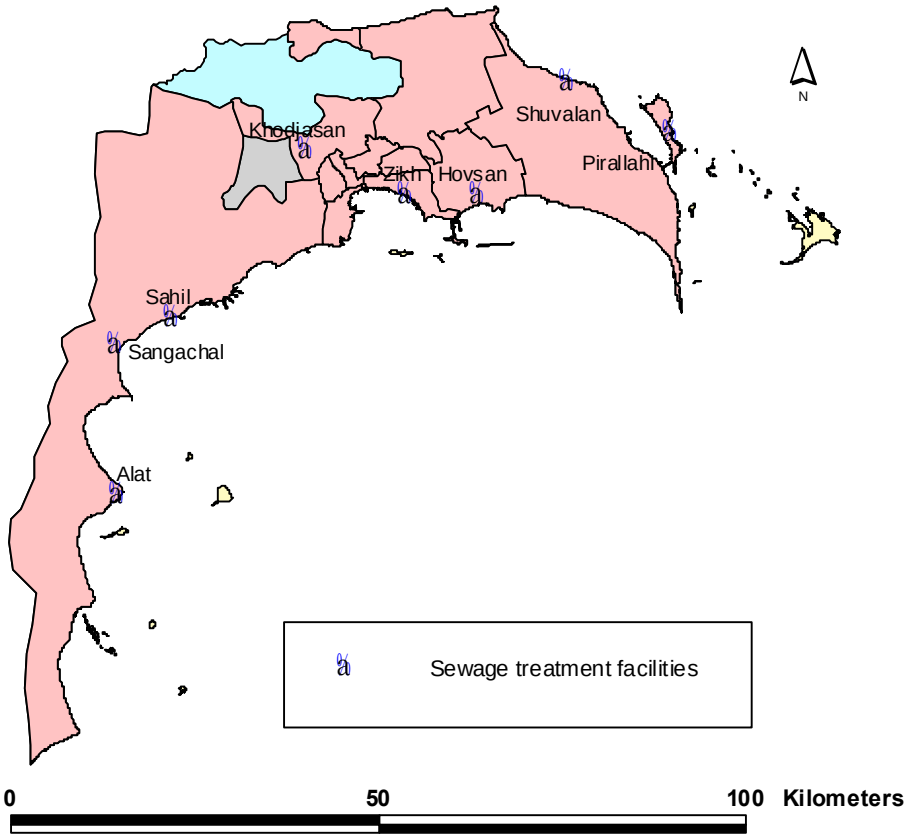


Figure 2-7: Sewage Treatment Facilities

b.3 Key Issues

b.3.1 Sewage

According to the wastewater M/P, 78% of the population in the Greater Baku area are connected to the sewage collection system, but only 44 % of the wastewater generated by the population is treated (sewage collection coverage rate 0.78 x sewage treatment rate 0.57 = 0.44). Consequently the great bulk of wastewater in the study area is being discharged untreated either to bodies of surface water, such as the Caspian Sea or lakes, or to groundwater through cesspools or latrines.

The Wastewater M/P aims to raise sewage (domestic wastewater and industrial wastewater treated to an acceptable level) treatment rate from the present 44 % to 100 % by the target year 2015. Once the M/P is implemented thoroughly, water pollution problems caused by sewage, which is currently discharged into natural water bodies, will be resolved.

The M/P report estimates that the total capital investment required is US$ 1,131 million. However, the report points out the following:

- the total capital expenditure required is much greater than is affordable given the current levels of wastewater tariffs and revenue collection;
- it will therefore be necessary to curtail significantly the programme shown in the M/P and to prioritise investment over the next 15 years;
- capital expenditure should therefore be concentrated on measures that will eliminate flooding in Baku city and the current gross pollution of the harbour.

b.3.2 Industrial Wastewater

The Wastewater M/P concludes that it is the responsibility of industry to treat its wastewater to an acceptable level. The M/P supposes 100% of industrial wastewater will be treated to an acceptable level for the sewerage system by dischargers. However the M/P does not include an industrial wastewater treatment plan for dischargers but addresses the following topics:

- existing industrial wastewater discharges;
- extent of pre-treatment of industrial wastewater;
- policy for the pre-treatment of industrial wastewater.

Finally the M/P study presents the following policy for industrial wastewater pollution control:

- the review of the current industrial wastewater situation and the relevant legislation revealed an urgent need for action. However, given the current economic situation, there is likely to be resistance to some of the more costly improvements that might be proposed under such a plan. These may be hard to justify in economically difficult times when there are apparently more important issues to be confronted;

- the effective implementation of the above policy requires the setting of strategic goals. For simplicity these have been identified for a number of key areas, although there are close links between them:

    - monitoring inspection and regulations;
    - integrated pollution prevention control;

- institutional strengthening and environmental awareness;
- finance.

c. Waste Management

c.1 Municipal Solid Waste

c.1.1 Current Situation

Municipal solid waste (MSW) in this report is defined as non-hazardous solid waste that can be disposed of at a municipal landfill.

UP Azerbaijan (UPA) and KASCO Waste Service (KASCO-RCP) developed municipal solid waste management (MSWM) M/Ps for the districts under their service, but their reports have not been disclosed to the team. There are no MSWM M/Ps for the whole study area or for the other districts. In addition, no authorities identify factors crucial for proper MSWM, such as generation and disposal amounts of MSW.

The team received information on monthly disposal amounts from Sabayil and Yasamal districts from KASCO-RCP. Using this information, the team estimated the refuse generation rates per capita of these two districts with the following assumptions:

- a unit weight of refuse is 0.5 ton/m^3;
- refuse collection service coverage rate is 100 % in the two districts;
- refuse disposal amount is equal to refuse generation amount.

The daily refuse generation rates per capita were calculated at 3,019g and 1,684g for Sabayil and Yasamal districts respectively. These are enormously higher than those of Adana and Mersin in Turkey.

Table 2-29: Comparison of MSW Generation

Items / District or City	Disposal Amount in Volume (m^3/day)	Disposal Amount in Weight (ton/day)	Population Living	Generation (Disposal) Rate per Capita (g/person/day)	Refuse Collection Coverage Rate (%)
Sabayil District in 1999*1	517	259	85,800	3,019	?
Yasamal District in 1999*1	800	400	237,500	1,684	?
Adana in Turkey in 1999*2	-	803	1,196,620	671	97
Mersin in Turkey in 1998*2	-	425	634,850	669	91

Source *1: KASCO-RCP
*2: The Study on Regional Solid Waste Management for Adana-Mersin in the Republic of Turkey, January 2000

There are five authorised but non-sanitary disposal sites in the study area (see sub-section c.4). Balahani and Lokbatan disposal sites, operated by UPA and KASCO-RCP respectively, charge for tipping and others are free. There are, however, 800 to 850 illegal dumpsites (the area of which is 200 to 250 ha in total) according to a report made by an inspector of the BCE. It is clear that this large

number of illegal dumping sites results not only from a reluctance to pay for tipping and transportation to the disposal site, but also insufficient refuse collection services.

Except in the city centre, illegal dumping is found everywhere, including in a natural monument area such as Yasamal valley. It denigrates the landscapes of the city and even threatens the health of citizens, because some illegally dumped waste may contain hazardous substances. The inspectors of BCE know the sites, but in practice, all they can do is to ask the district offices to clean them up.

Baku EP intended to strengthen MSWM capacity through the privatisation of collection and disposal operations. UPA obtained the concession for nine districts in 1998 but they are operating only in Narimanov district as at May 2000, due to financial problems mainly caused by an insufficient refuse collection fee. KASCO-RCP, the contractor of Yasamal and Sabayil districts, cannot provide sanitary landfill operations due to financial constraints as well.

There were well-established recycling systems and markets for recyclable wastes before 1991 in the former Soviet Union (FSU). However, the collapse of the FSU resulted in the absence or insufficiency of final users of recycled materials in Azerbaijan. Without sufficient final users, the recycling system and market for recycled materials such as paper, plastics, textiles and metals were seriously damaged, although recycling of waste is the most desirable method of MSW disposal.

c.1.2 Team's View

In order to establish a sound MSWM system in the study area, the team recommends formulating a MSWM M/P. The M/P should be formulated paying attention to the following aspects:

- identification of current waste flow that shows how much waste is generated, discharged, illegally dumped, and disposed of at landfills;
- establishment of sustainable financial system;
- elimination of illegal dumping;
- reestablishment of the recycling system.

c.2 Hazardous Waste

In general, hazardous waste management (HWM) is not established in the study area and is not even planned. Since improper HWM is a direct threat to human life, the Urgent Environmental Investment Project (UEIP) financed by the World Bank (WB) includes a HWM project as a sub-component of the Environment Management Component. The HWM study commenced in July 2000 and will end by June 2002.

This HWM study will develop a "cradle-to-grave" management system for hazardous waste (HW). The study includes the development of a classification system and inventory for HW, a register for producers of HW, the development and implementation of regulations for storage, handling and transportation of HW and site design.

The WB UEIP has another component important to HWM - Mercury Cleanup Component, which is due to commence shortly and will end in 2003. The component includes the construction of a safe, new landfill. The Project Implementation Unit

(PIU) of UEIP intends to construct a HW landfill not only for mercury-contaminated waste but also for other HW.

c.3 Medical Waste

This study defines medical wastes as infectious/hazardous wastes generated from medical care. There is neither a medical waste management plan in the study area nor a plan to formulate one. Therefore the team conducted an opinion survey of 40 medical institutions in the study area, in order to understand the generation amounts of medical waste and their waste management practices in terms of segregation, storage, discharge, collection, treatment and final disposal.

The survey was contracted out to a local consultant. Based the results of the survey the team presented key environmental issues on current medical waste management as follows:

- based on the unit generation rate obtained by the survey, the team estimates that the amount of medical waste generated each day in all the medical institutions (239 institutions in total) of Baku city is 12,892 kg and of general waste is 20,588 kg in 1999;
- the forecast generation amount of medical waste and general waste for 2010 (target year) is estimated at 15.0 ton/day and 23.9 ton/day respectively, assuming an increase in the total number of beds proportional to the population increase;
- medical waste management is based on the recognition of the risks of contamination posed by medical waste to people and the environment. However, there are still medical institutions in Baku city that mix medical waste and general waste because it is troublesome to separate them, and the efforts of preventing the spread of toxic chemicals and pathogens are insufficient;
- a standard system for in-house collection is adopted in approximately 20% of the institutions, but other institutions use non-standard containers and plastic bags. In-house collection is carried out daily, and in many cases, waste is stored in a central collection point. However, few institutions have a cool storage system for decaying waste, and a great number of central collection points are neither locked nor even fenced. Also, the disinfection system for these central collection points is insufficient;
- the fact that at the discharge stage, many institutions mix medical waste which had been separated during in-house collection is a cause for concern. Sterilized materials might end up being mixed with untreated medical waste, which carries the risk of increasing contaminated waste;
- even though the collection frequency is high, collection is carried out only once or twice at some institutions. As medical waste contains materials which putrefy rapidly, a daily collection system should be established;
- even though there are institutions, which treat infectious and hazardous waste on-site or off-site, some do not apply any treatment. Therefore, identifying the disposal sites of this untreated waste is essential in preventing the risks of a spread of contamination;

- 50% of the surveyed medical institutions pay a collection fee for medical waste, and 73% for general waste. However, based on calculation results, the standard usages for fixing the collection fees are unclear. It would be natural to have a higher fee for the collection of medical waste, which entails risks, but this trend does not appear in the survey results;
- the willingness to pay a fee corresponding to appropriate collection, treatment and disposal of medical waste is extremely low. In addition, the fee that some institutions are willing to pay for this service is even lower than the fee that they are currently paying.

c.4 Solid Waste Disposal Sites

Solid waste disposal sites that have been officially approved in Baku city are shown in Table 2-30 and in Figure 2-8. None of these are sanitary disposal sites.

Table 2-30: Solid Waste Disposal Sites in Baku City

ID	Name	Type	Capacity	Service District
1	Shuvelan	Urban waste	Information absent*	Azizbeyov
2	Torpagli Akhtarma	Hazardous drill cutting from oil industries	43,039 ton for 1985-1999	Oil industry of all areas
3	Balakhani	Urban waste	869,795 m^3 for 1999	Narimanov, Sabunchu, Nasimi, Nizami, Khatai, Binagadi
4	Surakhani	Urban waste	Information absent*	Surakhani
5	Lockbatan	Urban waste	401,500 m^3 for 1999	Sabayil, Yasamal, Garadag
6	Pirekushkul	Radioactive waste	6 ha for 1999	All study area

Note: *Information absent because not registering

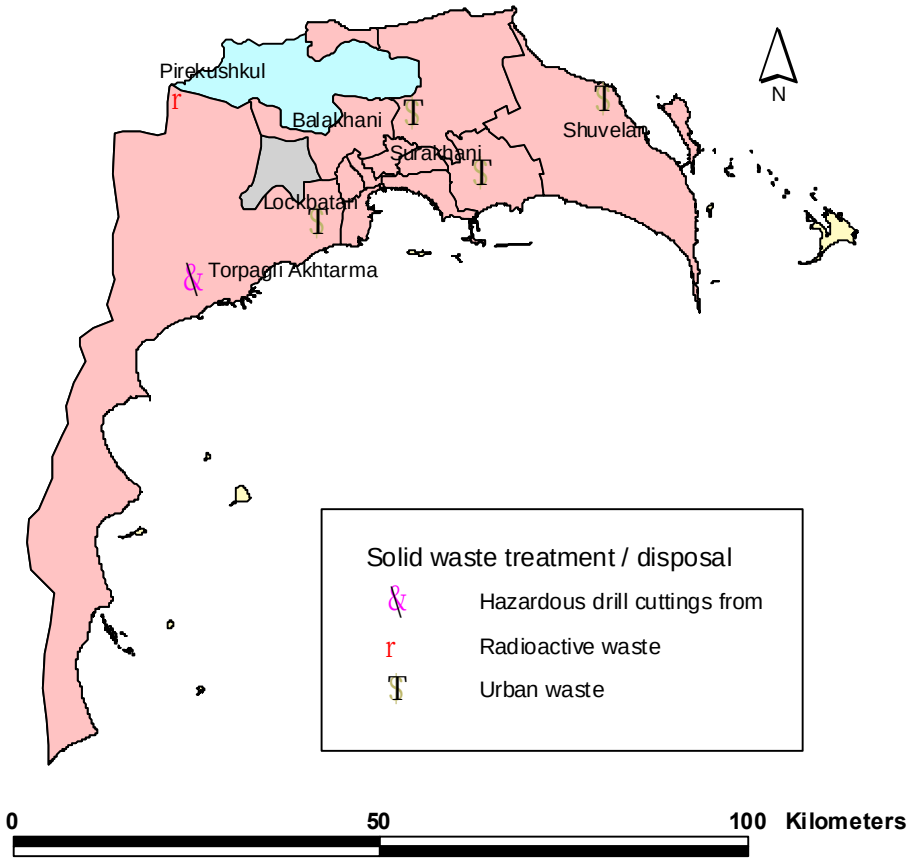


Figure 2-8: Solid Waste Disposal Facilities

d. Transportation

In major cities of FSU countries, a public transport system has been generally well developed. That is the case for Baku, which has bus, tram, trolley bus and metro services. The fares are reasonable and the network is widespread, though the comfort, quality and reliability of the services are not always satisfactory.

The fare is fixed inside the city. There are no explicit time schedules, but the routes are posted on car windows and at stops or stations. Services are provided from 5 or 6 am to 11 pm or midnight.

The trams and trolley buses were running actively in the FSU period. At present, however, the cars are outdated, the electric lines are not adequately maintained and they are often stuck in the streets. Nowadays they do not have many passengers. Buses have been placed first as a primary public transport means in Baku[5]. This is unfortunate from the environmental point of view since LRT (light rail transport such as trams and trolley buses) is being introduced in other countries as an environmentally clean mass transport system that does not pollute air, unlike buses.

Railways are mostly utilised for long distance transportation, not particularly for passengers but for oil products. Maritime transportation is another major means for freight and Baku port serves as the principal port of the country.[6]

Baku is the only city in Azerbaijan with a metro service. Baku metro is in general clean and effective. Trains run every two or three minutes. There are two main lines, one going around the city centre and another roughly in a northwest-southwest axis plus two small appendices. The two main metro lines meet beneath the Baku central railway station, where 28th May stations and Jafar Jabbarly station are adjacent. The old town is served by the Bak-Soviet station. The other downtown station is Sahil, near the 26 Commissars square.

Almost all the roads and streets in Baku are paved. Except some avenues and main streets, however, the road surfaces are very rough. Some roads, even in the city centre, are not well marked or lit.

Road maintenance has been ignored since independence in 1991 and it is estimated that more than half of the main highways were in bad conditions, resulting in excessive wear on vehicles and tyres and in excessive fuel consumption.

The NEAP reports that the number of private vehicles in Azerbaijan is low compared to OECD countries: 65 persons per car in Azerbaijan while 2.5-3.5 persons per car in OECD countries. The statistics shows that number of passenger automobiles per thousand population is 50 in Baku (equivalent to 20 passengers per car) and 33 for the whole country (equivalent to 30 passengers per car) in 1998, and those figures have been rather stable since 1995.

Although this is a low vehicle density, road transport tends to be congested in the city. This is partly because most roads are one-way and left turns are generally forbidden. One has to make a long detour to go to the left at a corner. Such systems

[5] For reference, total passenger of public transport in the country in 1998 was 804 million, out of which 628 million (78%) traveled by bus.

[6] For reference, total freight of the country in 1998 was 11,167 million ton-km, out of which 4,613 million ton-km was by railway and 4,447 million ton-km was by sea.

induce extra emissions of exhaust gas from vehicles. Furthermore, traffic signals are not synchronized properly, thus causing traffic jams.

Chapter 3

Findings in Field Investigations

3 Findings in Field Investigations

3.1 Mobile Pollution Source Survey

In order to grasp the volume of pollutants from mobile sources, traffic volume and the percentage of large vehicles in traffic volume should be known. The ratio of large petrol and diesel vehicles should also be surveyed, because the quantity and quality of gas emitted from large vehicles largely depend on the types of fuel, i.e. petrol or diesel.

As the study team could not get information on vehicle exhaust from the BCE or any other environment-related agencies, vehicle exhausts were measured in the street to develop the policy of vehicle emission control.

3.1.1 Traffic Volume Survey

The traffic volume survey was carried out as follows:

1. Large vehicles were counted separately, since they emit more gas than small vehicles.
2. There were a total of 27 survey points. Ten of them were sections of roads in an east-west direction and another ten were in a north-south direction. In case of one-way roads, another survey point was set on the corresponding road in the opposite direction in order to know the traffic volume of both ways. In doing so, the team considered that the survey could cover the half of total traffic volume in the city, recognising the city road network and the visual observation of road traffic.
3. Traffic volume to and from the suburbs was surveyed at the other seven survey points. Since those are along the major roads connecting the city centre and the suburbs, the team considered that the survey covered most of the traffic flow between the city and the suburbs.

a. Traffic Volume in the Central District

The distribution of traffic volume in the central district is shown in Table 3-1.

The total number of vehicles for 24 hours was 292,097 on roads in the north-south direction and 321,935 in the east-west direction. As this is assumed to be half, we can say that more than a total of 600,000 vehicles are running within the city centre of Baku each day.

Table 3-1: Distribution of Traffic Volume in the Centre of Baku

Direction of Roads	Traffic Volume (vehicles/24 hr)	Survey Point
North-South	292,097	Major 10 roads
East-West	321,935	Major 10 roads

b. Traffic Volume To and From the Suburbs

The traffic volume to and from the suburbs of Baku is shown in Table 3-2. According to this survey, approximately 90,000 vehicles enter the city centre of Baku each day from the suburbs. The combined number of inbound and outbound vehicles is about 180,000 per day. When considering the number of taxis operating in the central district, it is unlikely that they would pass the survey points so frequently. Therefore, we can assume that, out of the approximately 600,000 vehicles crossing the city centre each day, 30% are represented by vehicles coming from the suburbs. Consequently, restriction of inbound traffic can be considered as a means of reducing exhaust gas from mobile sources in the city.

Table 3-2: Traffic Volume To and From the Suburban Area of Baku

Direction of Traffic flow	Traffic Volume (vehicles/24 hr)	Survey Point
To City Centre	90,744	Major 7 points
From City Centre	92,926	

c. Ratio of Large Vehicles

The ratio of large vehicles to traffic volume is shown in Table 3-3. The ratio of large vehicles to and from the suburbs is as high as 10.3%. We can guess that this includes many trucks carrying cargo and large buses transporting passengers toward the city centre.

In comparison, there are much more small vehicles in the central district, large vehicles accounting for only approximately 4%. As a whole, there are relatively few large vehicles, with approximately 5.5%. Consequently, to reduce air pollution from mobile sources, it will be necessary to target emission countermeasures on small vehicles rather than large vehicles.

Table 3-3: Ratio of Large Vehicles to Traffic Volume

Unit: Vehicles/24 hr

Roads	Traffic Volume	Large Vehicles	Ratio of Large Vehicles
North-South (10 roads)	292,097	12,452	4.3%
East-West (10 roads)	321,935	12,701	3.9%
From and To the Suburban Area	183,670	18,911	10.3%
Total of all points	797,702	44,064	5.5%

d. Hourly Fluctuation of Traffic Volume

As traffic volume varies with human activities, there are generally two distinctive peaks in the morning and late afternoon corresponding to commuting. In Baku peaks can be observed at 10:00 am and 05:00 pm, although they are not very distinct.

3.1.2 Type of Fuel used by Large Vehicle

The interview survey covered 21 shipping and bus companies distributed in 10 districts in the study area. Surakhani District was excluded because there is neither shipping nor bus company there.

Large buses, microbuses and minibuses were included in the bus category, and the survey showed that large buses and microbuses represented approximately 50% of the bus traffic respectively. Apart from 2 auto cranes, the truck category of vehicles consisted of trucks only.

Table 3-4: Details of Large Vehicles

Vehicle	Type	Qty	Share (%)
Bus	Bus	258	45.6
	Microbus	302	53.4
	Minibus	6	1.1
	Total	566	100.0
Truck	Auto crane	2	0.5
	Truck	390	99.5
	Total	392	100.0

a. Fuel Used by Large Vehicles

The ratio of buses using petrol and diesel is almost the same, i.e. about 50% each. However, concerning trucks, petrol vehicles account for 60.5% and diesel vehicles for approximately 40%. This is extremely remarkable, in comparison with Japan, Europe and North America where most trucks run on diesel. This is a common characteristic of FSU, as petrol engines for large trucks used to be manufactured in FSU.

Based on the results of this survey, we will consider that approximately 50% of exhaust gas from buses are diesel, and 40% of exhaust gas from trucks are diesel.

b. Ages of Large Vehicles

The number of 4-, 5-, 6- and 7-year-old trucks is extremely small, which probably reflects the economic slump of those years, but for some reason, the number of buses purchased during the same period is relatively high. This increase of bus purchase starting about 6 years ago shows that the bus transport business was flourished.

Concerning trucks, after the large volume of purchases 9 and 8 years ago, there were almost no purchases during a 4-year period. It could be viewed as a business switch, from carrying cargo to transporting passengers. Undoubtedly, buses have become an essential means of transportation for the residents, and microbuses are especially popular.

When comparing the ages of buses and trucks, many trucks have been bought 8 years ago or more, accounting for 80.5%, including trucks aged 16 years and over (15.8%). On the other hand, there are only 34% of buses aged 8 years or more. The fact that there are few old buses is good in view of the fact that safety is extremely important for buses transporting people compared with trucks carrying cargo.

c. Mileage

The average distance travelled within a month by large vehicles, as shown in Table 3-5 is 3,116.57 km/month for trucks, whereas buses travel 5,202.37 km/month, that is to say over 2,000 km more.

The distance travelled by fuel is shown Table 3-6. Petrol and diesel trucks cover about the same distance, approximately 3,000 km/month on average. However diesel buses travel an average of 6,477.39 km/month, which is 1.7 times more than petrol buses that travel 3,841.71 km/month. Supposing that the amount of exhaust gas is proportional to the distance travelled, we can determine that diesel buses produce 1.7 times more emission than petrol buses.

Table 3-5: Mileage of Large Vehicles (km/month)

Vehicle	Qty	Minimum (km/month)	Maximum (km/month)	Average mileage (km/month)
Bus	554	1,134	15,000	5,202.37
Truck	387	82	6111	3,116.57

Table 3-6: Mileage of Large Vehicles by Fuel

Vehicle	Fuel	Qty	Minimum (km/month)	Maximum (km/month)	Average mileage (km/month)
Bus	Petrol	268	1134	8156	3841.71
	Diesel	286	2297	15000	6477.39
Truck	Petrol	233	133	6111	3001.70
	Diesel	154	82	6100	3290.38

d. Fuel Consumption

The fuel consumption by large vehicles for 100 km is shown in Table 3-7.

The average fuel consumption of buses and trucks was determined by the following calculations. Fuel consumption of trucks is high, at 1.5 times more than that of buses. Consequently, when estimating the environmental impact of vehicles according to their emissions, if we suppose that the volume of exhaust gas is proportional to fuel consumption, it is necessary to fix the exhaust gas volume of trucks at 1.5 times that of buses.

Bus：23.2 *l* /100km

{15x122+(15+30)/2x359+(30+45)/2x81+45x4}/566=23.2 *l* /100km

Truck：34.4 *l* / 100km

{15x28+(15+30)/2x89+(30+45)/2x173+45x102}/392= 34.4 *l* /100km

Table 3-7: Fuel Consumption by Large Vehicle

Vehicle	Specific Fuel Consumption	Number of Vehicles	Share (%)
Bus	Up to 15 *l* for 100 km	122	21.6
	15-30 *l* for 100 km	359	63.4
	30-45 *l* for 100 km	81	14.3
	More than 45 *l* for 100 km	4	0.7
	Total	566	100.0

Vehicle	Specific Fuel Consumption	Number of Vehicles	Share (%)
Truck	Up to 15 / for 100 km	28	7.1
	15-30 / for 100 km	89	22.7
	30-45 / for 100 km	173	44.1
	More than 45 / for 100 km	102	26.0
	Total	392	100.0

3.1.3 Measurement of Vehicle Emissions

Three sites among the major roads, where traffic volume exceed 40,000 vehicles per day were selected, and exhaust gas of vehicles coming into the city centre was analysed by mobile equipment. Since most vehicles emit much carbon monoxide (CO) in Baku area, the concentrations of CO were measured. The concentrations of SOx and NOx were measured for reference.

The results are in Table 3-8. The emission standard of CO in Azerbaijan is 2%. The ratio of vehicles exceeding this standard in each vehicle type is also shown. The comparison among ordinary vehicles, taxis, microbuses, buses and trucks shows that buses have the highest ratio of vehicles exceeding the standard (90%). Taxis has the lowest, but it is still high (63%). As a whole, 74.6% of vehicles measured in this study do not comply with the standard.

NOx and SOx were measured only when the concentration of CO was below 2%. Nevertheless, the concentrations of NOx and SOx were 50.3 ppm and 12.0 ppm respectively, both of which were found to be low.

Table 3-8: Result of Vehicle Emission (CO)

Vehicle	Vehicles measured (vehicles)	Vehicles exceeding 2% of CO concentration (vehicles)	Ratio of vehicles exceeding standard (%)
Ordinary car	130	95	73.1
Taxi	73	46	63.0
Microbus	78	61	78.2
Bus	60	54	90.0
Truck	107	78	72.9
Total	448	334	74.6

3.2 Factories (Point Pollution Sources) Survey

3.2.1 Objectives

An environmental passport contains data on pollution caused at the factory in such forms as air, water, solid waste, and energy (i.e. noise and vibration) and it should provide a vital information source for the study. Since the rate of operation of factories in Azerbaijan has been dropped due to depressed economy, it is uncertain whether the data in the environmental passport are still valid to describe the current condition.

The purpose of this survey is to obtain the current data of the point pollution sources (factories) in the study area, the area under control by the BCE. The survey consists of two components; i.e. review of environmental passport and opinion survey for factories.

The objective of the environmental passport review is to identify the current status of the point pollution sources (factories) in the study area through the visits of factories and the checks of the passports submitted.

The opinion survey for factories is to understand the opinion of factories regarding improvement of the environment, willingness to pay (WTP) for the environmental conservation, needs for administrative supports for pollution control, etc.

3.2.2 Review of Environmental Passport

a. Applicability of the Survey Results

JICA team could not get any authorised or official list of factories. Therefore the local consultant employed by the team prepared a list of 775 enterprises in the study area as shown in Data Book Chapter 3.2. Based on this list we selected 250 factories for the study and conducted the survey. Factories selected are shown in Data Book Chapter 3.3.1. Since a list of enterprises that may affect the environment is essential material for proper environmental management of the study area, we strongly recommend that BCE prepare an official list of factories if available or complete a list based on the list of 775 enterprises.

We conducted the factory survey at major point pollution sources in the study area. The structure of industrial category of interviewees and the whole structure of industry in the study area are compared in the following table.

Table 3-9: Rate of Surveyed Factories

Category of Industry	Number of Surveyed Enterprises	Number of Enterprises in the Study Area	Rate of Surveyed Enterprises (%)
Mining	8	19	42.1
Energy	16	17	94.1
Manufacturing	184	432	42.6
Others	42	307	13.7
Total	250	775	32.3

b. Energy Consumption

The seven items of energy (electricity, gas, coal, LPG, petroleum, heavy oil and thermal energy) consumption were surveyed. Of five items (electricity, gas, LPG, petroleum and heavy oil), current energy consumption is much less than it reported in the passport, especially electricity is only 14.3 % of the passport. This proves the fall in operation rate.

By reviewing all of the energy use, JICA team understands that gas consumption is much more than the other energy sources. Amount of gas consumption converted to weight unit is from 1,250,000 tons/year to 1,450,000 tons/year depending on the gas

composition (1,250,000 tons/year in case of 100% methane, 1,450,000 tons/year in case of 80% methane and 20% ethane).

This amount of gas consumption is about 75% of primary energy use of total (200,000 tons/year of kerosene, 160,000 tons/year of heavy oil, 20,000 tons/year of LPG). On the top of that, the survey result shows that sulphur content of gas is very low. As to nitrogen oxide and particulate matter, generation of them by gas combustion is 20% to 40% lower than oil and coal combustion.

From these reasons, structure of energy use in Baku, which is largely depending on natural gas with low sulphur content, is in very favourable situation to prevent air from pollution. In general, coal burning is a serious pollution source in many developed countries since it generates sulphur oxide and soot very much. In Baku however only one factory uses coal and this is another favourable reason for air environment.

Fossil energy consumption per capita except electricity is roughly 0.9 tons/year/person. This level is less than half of ones in major European countries and Japan. Accordingly energy consumption in Baku will probably increase in the future along with economic growth.

c. Current Pollutant Emission

The team examined current pollution emissions from factories regarding 7 items for air pollutants, 5 for wastewaters and 9 for industrial wastes. However, these numbers do not cover all pollutants. There were some cases where the interviewer could not get enough information from factories. In addition all data were informed by the factories and none of quantitative ones measured by the public institutions including the BCE. Taking these limitations into consideration, the team presents the following findings regarding current pollutant emission from factories.

c.1 Air Pollutant Emission

The three items of air pollutants (SOx, NOx and particulate matter) emission were surveyed. All of current air pollutants emissions are less than it reported in the passport, especially NOx is only 15.9 % of the passport while SOx and particulate matter are 97.7 and 79.4 respectively. This proves the fall in operation rate.

c.1.1 Sulphur Dioxide

The maximum concentration of SOx emission is 309mg/Nm^3 (108ppm) and the average concentration is 67mg/Nm^3 (23ppm). In Japan, general emission standard of SOx is from 1,000 mg/Nm^3 (350ppm) to 172mg/Nm^3 (60ppm) depending on the area in case that the gas volume is 500,000 Nm^3/hour and effective height of the stack is 100 meter.

From this comparison, JICA team understands that SOx concentration of the waste gases in Baku is very low. This low level of concentration without any sulphur removal facilities is largely due to low sulphur content in fuel oil (less than 0.5%) and fuel gas.

Accordingly, if SO_2 concentration of ambient air is under the air quality standard, installation of sulphur removal facilities is not necessary. On the other hand, if SO_2 concentration of ambient air is over the standard, it is favourable to install flue gas de-sulphurisation units to 3 emission sources with high concentration of SOx.

c.1.2 Nitrogen Dioxide

The maximum concentration of NOx emission is 160mg/Nm^3 (110ppm) and the average concentration is 17mg/Nm^3 (12ppm). In Japan, general emission standard of NOx is190mg/Nm^3 (130ppm) for oil boilers with big capacity and 88mg/Nm^3 (60ppm) for gas boilers with big capacity. From this comparison, JICA team understands that NOx concentration of the waste gases in Baku is relatively low.

Accordingly, if NO_2 concentration of ambient air is under the air quality standard, NOx control is not always necessary. On the other hand, if NO_2 concentration of ambient air is over the standard, it is recommendable to install NOx control facilities to 2 emission sources with high concentration of NOx.

c.1.3 Particulate Matter (Dust and Soot)

From the factory survey JICA team received concentration data of particulate matters on 18 waste gases. The volume of these 18 gases is 22% of the total. The maximum concentration is 207mg/Nm^3 and the average concentration is 14mg/Nm^3.

Comparing these data to the emission standard applied in Japan, only one data exceed the standard and others are all under the standard level. Therefore except one waste gas there is no need to install dust collectors.

These 18 waste gases however only cover 22% of total waste gases. Besides pollution sources of particulate matters in general are factories processing powdery materials even though the waste gas volume is not so large. It is, therefore, recommendable to collect information with focus on factories treating powdery materials and consider the necessity of the countermeasures.

c.2 Industrial Wastewater Discharge

The current discharge volume of industrial wastewater is only 66.7 % of it reported in the passport. This may be due to the fall in operation rate. The three items of pollutants (BOD, COD and SS) were surveyed and average concentrations of them are also less than those reported in the passport.

Survey shows that there are 199 wastewater discharge sources (factories) and the total volume is 17,800 tons/hour except cooling water with no pollution. Among this volume, 33% of it (107 wastewater, 5,800 tons/hour) is sent to sewage plants. Maximum concentration of pollutants of the water is 381mg/litter for BOD, 513mg/litter for COD and 535mg/litter for suspended solid.

A common sewage plants with biological treatment process can treat this concentration level if the wastewater does not contain harmful materials. The 33% of wastewater, therefore, does not have any problems if the capacities of the sewage plants are enough and wastewater does not contain harmful materials for the plants. A technical paper describing the performance of a big sewage plant in Baku shows that BOD of the effluent water is about 10mg/litter. Comparing emission standard of BOD applied to sewage plants in Japan, which is from 20mg/litter to 30mg/litter, discharge level of BOD in Baku is very low.

On the other hand, 60% of wastewater discharge sources (46 wastewater, 10,700 tons/hour) are discharged to public water bodies. JICA team through the survey got BOD data of 5 wastewater discharge sources, among which maximum value is 10.9 mg/litter. Since this numerical value is the same level of effluent water from the

sewage plant mentioned above, there may be no problems for this 5 wastewater discharge sources.

As for the 41-wastewater discharge sources without BOD data, it is essential to know their BOD concentration. If the BOD concentration is higher than discharge standard, the wastewater should be sent to sewage plants or treated in the factory to meet the standard.

As for the COD concentration JICA received data on 2 wastewater and both of them show very low pollution level (larger one is 32mg/litter). So no problem is on this 2 wastewater. But for other 44-wastewater discharge sources without COD data, it is necessary to identify the COD concentration. If the COD level is higher than discharge standard, the wastewater should be sent to sewage plants or treated in the factory to meet the standard.

For suspended solid (SS), JICA got concentration data on 6 wastewater discharge sources among 46. The maximum concentration of them is 122 mg/litter and average concentration is 34 mg/litter. Comparing this concentration to the discharge standard of Japan, even the maximum data is lower than the standard and it may not cause any problems.

For remaining 40 wastewater discharge sources without SS data however, it is essential to identify their SS concentrations. If the SS concentration is higher than discharge standard, the wastewater should be sent to sewage plants or treated in the factory to meet the standard.

This factory survey did not identify whether remaining 7% of wastewater (46 wastewater) go to sewage plants or discharge to public water bodies. On this wastewater the confirmation of the discharge destination is required and if the wastewater with high pollutants discharges into public water bodies, appropriate countermeasures should be taken.

c.3 Industrial Wastes Generation

The 8 items of industrial wastes (waste oil, oil sludge, non-oily organic sludge, inorganic sludge, waste chemical, burnable solid waste, non-burnable solid waste and other wastes) generation were surveyed. The amount of industrial waste generated in the surveyed factories is 140,000 ton/year in total and 71.5 % of the amount reported in the passport. This may prove the fall in operation rate. 57% of generated waste, 80,000 ton/year, is non-burnable solid waste and 31% 43,000 ton/year is non-oily organic sludge. Waste chemical generation is 9934 tons/year (7.1% of total) and is disposed or accumulated in the factory because of the toxicity. There are very limited waste oil (0.07% of total) and oil sludge (0.38%) generation. This may be because most of these categories of waste are discharged into the natural environment in the form of wastewater without treatment

3.2.3 Opinion Survey for Factories

a. Efforts for Pollution Control

Most of factories (85.6%) surveyed make effort to reduce adverse impacts to the environment; i.e. they do their best (63.6%) or make a certain efforts (22.0%). However, the local consultants conducted the survey are doubtful of the answers

because majority (68.4%) of the factories surveyed are state owned and they have paid little attention on environmental conservation measures since the Soviet period.

b. Environmental Conservation Measures

More than half of the factories (55.6%) apply the air pollution measures but those seem to be very primitive ones, because measures they replied were ventilation, dust-filters, etc. The water pollution measures are taken by 20.4% of factories following air pollution, and noise and vibration measure are taken by 17.6 %. The environmental conservation measures on the other aspects are very limited.

Regarding the problems on environmental conservation lack of financial supports especially from the government is the highest (27.2%), followed by high cost of measures (22.8%), lack of information on technology (14.0%).

Majority of the factories (73.6%) have a plan to implement environmental conservation measures.

c. Environmental Fund

About half of factories (48.9%) pay environmental fund for compensation of pollutant emission. The total amount of environmental fund paid by factories surveyed is 531 million manat and average amount of payment is 4,828 thousand manat/year. There are many factories (34%) that do not pay environmental fund due to financial difficulties.

d. Cleaner Production Technology (CPT)

More than half of factories (56.9%) do not know CPT. Factories that introduced the CPT are limited (16.6%). Among them majority (53.6%) introduced it after independence of the country.

e. Needs for the Government Assistance

For the implementation of environmental conservation measures or improvement of existing facility the majority (71.2%) need to have financial support from the government (full support 38.4% and partial 32.8%). Regarding the governmental support for the improvement of environmental conservation facility the most important issue is technical assistance and advice for the improvement; as half of factories (49.6%) indicated. Following the technical assistance and advice, 34.0% pointed out soft loan and 28.4% provision of technical information for the improvement.

f. Hazardous Waste Management (HWM)

The most of the factories (77.9%), which produce HW, treat/dispose HW within their compound. According to the answer for future HWM, most of the factories (72.6%) that produce HW will continue to treat/dispose HW within their compound. Very limited number of factories (14.4%) expressed that they may entrust treatment/disposal works to waste disposal agents. Although number of factories that may entrust is very limited (only 5 among 250), in average they may pay 2.6 million manat/ton for treatment/disposal of HW.

g. Others

About 2/3 of surveyed factories are state owned and only 1/4 are private company.

Since Majority of the factories (69.6%) anticipate better futures, 71.6% of factories have a plan to increase the production scale in future.

Most of the factories (91.2%) express that they do not want to move the factory out side the central part of the city.

3.3 Environmental Quality Survey

3.3.1 Assessment of Reliability and Accuracy of Data

Environmental quality was studied in order to assess the reliability and accuracy of environmental data obtained by the local monitoring organizations. The team observed their facility and analysis practices.

a. Air

The result of air quality analysed by Hydromet routine work was compared with the result of the JICA Team as shown in Table 3-10.

As for the dust and CO, the figures of Hydromet and the team are more or less the same. As for the figures of Hg, there is a difference but it is difficult to assess because the number of sampling is very limited and concentration is very low. But as for the NO, there is a quite large difference between them. The analytical procedure should be carefully reviewed.

Table 3-10: Comparison of the Results by Hydromet and by JICA Team

(Unit: mg/m^3)

Date		Dust		CO		NO		Hg	
		Hydromet	JICA	Hydromet	JICA	Hydromet	JICA	Hydromet	JICA
23 May	Max	0.1	0.1	2	3	0.03	0.14	0.000	-
	Average	0.1	0.1	1	3	0.02	0.14	0.000	-
24 May	Max	0.2	0.1	2	3	0.05	0.14	0.000	-
	Average	0.1	0.1	1	2	0.02	0.14	0.000	-
25 May	Max	0.0	0.1	2	2	0.04	0.42	0.000	-
	Average	0.0	0.1	1	2	0.03	0.23	0.000	-
26 May	Max	0.2	0.3	2	2	0.03	0.21	0.000	0.0008
	Average	0.1	0.3	1	1	0.02	0.21	0.000	0.0003
27 May	Max	0.4	0.3	1	1	0.03	0.21	0.000	0.0000
	Average	0.3	0.3	1	1	0.02	0.18	0.000	0.0000
28 May	Max	-	0.7	-	3	-	0.21	-	0.0000
	Average	-	0.4	-	2	-	0.16	-	0.0000
29 May	Max	0.3	0.3	1	1	0.04	0.21	0.000	0.0000
	Average	0.2	0.2	1	1	0.03	0.16	0.000	0.0000
30 May	Max	0.1	0.2	1	0.3	0.04	0.07	0.005	-
	Average	0.0	0.20	1	0.3	0.03	0.07	0.003	-

b. Water

In order to assess the reliability and accuracy of water quality data obtained by the Hydromet, the JICA team compared the water quality data as shown in Table 3-11.

Based on the results, as for the suspended matter, Zn and Cr, there are considerably large difference between the two. In general, it is quite rare to have such high concentration of Zn and Cr as measured by the Hydromet. There might be some mistakes during the process of analysis.

Table 3-11: Evaluation of Water Quality Analysis at Lake Beyuk-Shor

(mg/l)

Items	Hydromet	JICA Team
BOD	6.60	18
pH	8.80	8.94
Dissolved Oxygen	3.43	5.5
Suspended matter (SM)	25.77	13.63
Cd	-	0.00023
Pb	-	0.0061
Zn	1.90	0.0658
Hg	0.00	0.0003
Cr	2.70	0.0023
As	-	0.0108
Oil Hydrocarbons	8.70	7.65

c. Sediment

In order to assess the reliability and accuracy of sediment quality data obtained by the Hydromet, the JICA team compared the sediment data as shown in Table 3-12.

Based on the results, there is no significant difference between them except oil hydrocarbons, As and Cr. For the items analysis of which resulted in a large difference, the procedures of pre-treatment and analysis need a thorough review.

Table 3-12: Evaluation of Sediment Analysis at Baku Bay Area

(mg/kg)

Items	Hydromet	JICA Team
Cd	-	2.3
Pb	8.2	10.3
Zn	41	46
Hg	0.07	0.085
Cr	80	134
As	1.5	9.5
Oil Hydrocarbons	334.7	7874

d. Assessment

The result from the series of environmental analysis presented in this section implies that the reliability and accuracy of analysis of the local monitoring body are not sufficiently high and its practice of pre-treatment and analysis has to be improved.

3.3.2 Data Verification

It is an obligation of a factory to submit an environmental passport to start its productive activity. Since the rate of operation of factories in Azerbaijan has been dropped due to depressed economy, it is uncertain whether the data in the

environmental passport are still valid to describe the current condition. Therefore, three factories were selected and pollutants generated at factories including industrial waste, gas emission and wastewater were sampled and measured to assess the data validity.

The waste generation amount has reduced in recent years presumably due to the drop of operation ratio, but current concentrations of BOD in wastewater from factories are higher than those declared in environmental passport.

a. Waste from Factories

Azerneftyanajag is the oil refinery plant, which has 8 million tons capacity, and its current operation rate is only 55%. They told that 3 – 5 kg of sludge per one ton of crude oil is generated during the refinery process. According to the team's study, contents of heavy metals such as Pb, Zn, Cr, As, Cu and others are relatively higher than other factories.

The Baku iodine factory has declared in the environmental passport that 9,900 ton of wasted coal was generated annually. Although these wasted coal is not generated now because plant operation was stopped sometime in past, previously generated wasted coal has been accumulated in the stock and appears to be a small mountain. The team was told that the coal contains heavy metals and radioactive materials, but according to the team's study, the content of the heavy metals were not significant. It is not reported that physical damages to the human beings have ever occurred. However, a problem of radioactivity still remains, thus proper treatment of these waste shall be required.

The machinery plant has declared in the environmental passport that steel chips (426 t/year), cast-iron chips (8 t/year), ash (387 t/year), galvanic slag (0.03 t/year), waste oil (15 t/year) and others were generated but they were not observed on the visit of the team.

As stated above, the waste generation amount has tremendously reduced in recent years presumably due to the drop of operation ratio.

b. Gas Emitted from Factories

Comparisons of the NOx concentrations emitted from three factories are shown in the Table 3-13. It is impossible to compare the figures in the environmental passports and those obtained from the factory survey in cases of Azerneftyanajag and the Baku Steel Casting Plant, because the former figures are in volume and the latter figures are in concentration. As for the figures in HES-1 named after Bayramzade, the Team's figure (NOx concentration in actual emission) is less than that of the passport. Both figures are lower than the NOx concentrations of similar factories.

Table 3-13: Comparison of Gas Emitted from Factories

Factory / Item	Azerneftyanajag		HES-1 named after Bayramzade		Baku Steel Casting Plant	
	Passport	JICA	Passport	JICA	Passport	JICA
NOx	160 ton/year	27 ppm	88.8 mg/m^3 52ppm	33 ppm	1.669 ton/year	80 ppm

c. Wastewater from Factories

Comparisons of the figures of BOD and SM (or SS) in wastewater from factories are shown in the Table 3-14. Generally, team's figures of BOD (actual figures analysed by the team) show higher than the figures in the passports. The content of the SM at three factories is lower than that in the passports.

Table 3-14: Comparison of Wastewater from Factories

(mg/l)

Factory / Items	Azerneftyanajag		NGDU "Balakhanineft"		Baku Wine Plant No.1	
	Passport	JICA	Passport	JICA	Passport	JICA
BOD	0.646	20	12.0	14	12	38
Suspended matter (SM)	15.7	2.4	21	9.5	10	1.1

3.3.3 Environmental Quality Survey

a. Monitoring of Pollutants Vehicle Exhausts

There are nine air monitoring stations in the study area, but only one of them can monitor vehicle exhaust gas pollution. Therefore, the significance of pollution caused by exhaust gas cannot be fully assessed. In order to understand the extent of impacts of vehicle emission and to examine the necessity of monitoring vehicle exhaust gas pollution, a pilot monitoring was executed.

The team decided two locations in the city centre, Station 1 and Station 2, which are close enough to heavy traffic. Station 1 is located in front of Baki soveti metro station on Istiglaliyyat street and Station 2 is near the conservatory on Rashid Beybutov street. The result is in Table 3-15. The average figures are more relevant than the maximum figures to the health impact and the averages of dust, NO, NO_2 and SO_2 at both stations exceeded the MPE. Overall, air quality at Station 2 is worse than that at Station 1 probably because Station 2 is closer to more clouded street than Station 1 and the wind direction was from the street to the station at Station 2. The high SO_2 values seem to contradict the fact that the sulphur content in oil used in Azerbaijan is fairly low, but it can be attributed to the use of imported cheap oil with high sulphur content.

The results suggest that the adverse impact by vehicle exhausts may be significant, and the team strongly proposes the expansion of vehicle exhausts monitoring network by installing new stations.

Table 3-15: Air Quality polluted by Vehicle Exhaust Gas

St.		Dust	HC	CO	NO	NO2	SO2	Phenol	Pb
1	Max	0.38	0.88	6.25	0.80	0.21	0.43	0.002	1.93
	Average	0.28	0.58	1.52	0.33	0.13	0.28	0.001	1.25
2	Max	0.62	4.10	23.8	2.68	2.05	2.86	0.002	2.54
	Average	0.37	2.63	10.7	1.17	0.76	1.27	0.001	1.71
MPE	Maximum	0.5	-	5.0	0.4	0.085	0.5	0.01	-
	Average	0.15	-	3.0	0.06	0.04	0.05	0.003	-

Note: the shaded figures are exceeding the standard (MPE).

b. Sediment of Lakes

Many lakes in and around the city are severely contaminated due to their history of being used as wastewater receptors from households, industries and oil fields. Hydromet has undertaken regular lake water monitoring. It is fortunate that most of those polluted lakes are not used for domestic or agricultural purposes and major health effects are not reported. However, since accumulation of pollutants in lake sediments can cause future incidents, sediment monitoring is necessary.

The sediment quality measurement was carried out to understand the current status and decide the necessity of regular sediment monitoring.

The concentration of Pb in Lake Bul-bul is considerably high. The concentration of As(arsenic) is high in most lakes. Oil content is high in Lakes Beyuk Shor and Zykh.

The concentrations of Pb and As in Lake Bul-bul are outstanding and should be taken seriously because people may catch fish there to eat.

c. Water of Jeiranbatan

Although the Jeiranbatan reservoir is out of the BCE's jurisdiction area, the BCE should understand its water quality, considering the importance of the reservoir as a major drinking water source.

The Study Team conducted water quality analysis of the Jeiranbatan reservoir and waterways around it.

The main analysis targets were heavy metals, but as far as the study results suggest, the water contamination is not very serious. The current land use in its watershed is, however, threatening the water quality. For example, housing development without adequate sanitation facility is proceeding although housing development is restricted. Water quality monitoring in and around the reservoir should be started.

d. Water in Lakes

Some of lakes in Baku city have been regularly monitored by Hydromet, but most of them have never been monitored. The Study team and BCE conducted an analysis of water quality of them in order to know the existing situation and take it into consideration for master plan formulation.

If compared with the Russian standard for fishery water, BOD and COD are acceptable, but SS and oil content are highly excessive. In particular, oil content is much higher than the standard in all the lakes studied, even 100 times. Lake Bul-bul, where people catch fish, contains oil content 45 times higher than the standard and a negative health impact is anticipated.

3.4 Opinion Survey for Medical Institutions

3.4.1 Objectives

This study defines medical wastes as infectious/hazardous wastes generated from medical care. There is neither a medical waste management plan in the study area nor a plan to formulate one. Therefore the team conducted an opinion survey of 40 medical institutions in the study area in order to understand the generation amounts of

medical waste and their waste management practices in terms of segregation, storage, discharge, collection, treatment and final disposal.

The survey was contracted out to a local consultant. Based the results of the survey the team presented key environmental issues on current medical waste management below.

3.4.2 Medical and General Waste Generation from Medical Institutions

a. Medical Waste

The results of the evaluation of the amount of medical waste generated by medical institutions in Baku city are shown in the following table. The unit generation rate is lower than in other countries. We computed the amount of medical waste generated in Baku city by applying the results of this survey to 239 medical institutions in the city. Based on this calculation, we estimated that the amount of medical waste generated each day in all the medical institutions of Baku city was 12,892 kg.

Table 3-16: Medical Waste Generation Amount

Generation Source	Base of Calculation	Unit Generation Rate	Generation of Medical Waste (kg/day)
1. General Hospital	11,480 beds	0.42 kg/bed/day	4,822
2. Hospital	5,152 beds	0.34 kg/bed/day	1,751
3. Clinic	108 institutions	14.00 kg/institutions/day	1,512
4. Others	6,969 beds	0.69 kg/bed/day	4,807
Grand Total	---	---	12,892

Table 3-17: Medical Waste Generation in Other Countries

Country (City)	Type of Institution	Generation of General Waste	Generation of Infectious Medical Waste
Latin America[1)]		3 kg/bed/day	0.60 kg/bed/day (=20%)
Chile (Santiago)[2)]	Hospitals	2.74 kg/bed/day	1.25 kg/bed/day
	Clinics	2.83 kg/bed/day	1.55 kg/bed/day
	Rural health centres	12.0 kg/unit/day	3.0 kg/unit/day
Latin America[1)]		3 kg/bed/day	0.60 kg/bed/day (=20%)
Turkey (Adana)[3)]	Hospitalising institution	1.67 kg/bed/day	0.82 kg/bed/day
	Non-hospitalising institution	42.2 kg/institution/day	10.6 kg/institution/day
Turkey (Mersin)[3)]	Hospitalising institution	2.62 kg/bed/day	0.59 kg/bed/day
	Non-hospitalising institution	25.5 kg/institution/day	9.25 kg/institution/day
El Salvador (San Salvador)[4)]	More than 200 beds	2.83 kg/bed/day	0.55 kg/bed/day
	50 to 200 beds	3.87 kg/bed/day	0.68 kg/bed/day
	Less than 50 beds	2.96 kg/bed/day	0.33 kg/bed/day

Notes:
1) Average assumed generation for Latin America according to *Pan American Health Organization* and *World Health Organization* (/NK3/).
2) The Master Plan Study on Industrial Solid Waste Management in the Metropolitan Region of the Republic of Chile, March 1996, JICA
3) The Study on Regional Solid Waste Management for Adana-Mersin in the Republic of Turkey, January 2000, JICA
4) The Study on Regional Solid Waste Management for San Salvador Metropolitan Area in the Republic of El Salvador, September 2000, JICA

b. General Waste

The results of the evaluation of the amount of general waste generated by medical institutions in Baku city are shown in the following table. As for medical waste, the unit generation rate is lower than in other countries. We computed the amount of general waste generated in Baku city by medical institutions by applying the results of this survey to 239 medical institutions in the city. Based on this calculation, we estimated that the amount of general waste generated each day in all the medical institutions of Baku city was 20,588 kg.

Table 3-18: General Waste Generation Amount

Generation Source	Base of Calculation	Unit Generation Rate	Generation of General Waste (kg/day)
1. General Hospital	11,480 beds	0.58 kg/bed/day	6,658
2. Hospital	5,152 beds	1.14 kg/bed/day	5,873
3. Clinic	108 institutions	27.50 institutions	2,970
4. Others	6,969 beds	0.73 kg/bed/day	5,087
Grand Total	---	---	20,588

c. Forecast Generation Amount of Medical Waste and General Waste

The forecast generation amount of medical waste and general waste for 2005 and 2010 (target year) was computed, assuming an increase in the total number of beds proportional to the population increase. As shown in the following table, the generation amount of medical waste is estimated at 13.9 ton/day in 2005 and 15.0 ton/day in 2010.

Table 3-19: Forecast Generation Amount

Year	Medical Waste (ton/day)	General waste (ton/day)	Total (ton/day)
1999	12.9	20.6	33.5
2005	13.9	22.2	36.1
2010	15.0	23.9	38.9

3.4.3 Current Medical Waste Management

a. Storage

Medical waste management is based on the recognition of the risks of contamination posed by medical waste to people and the environment. However, there are still medical institutions in Baku city that mix medical waste and general waste because it is troublesome to separate them, and the efforts of preventing the spread of toxic chemicals and pathogens are insufficient.

Concerning in-house collection, the increase of medical waste, which needs to undergo proper treatment is a serious concern in view of the practice of mixing infectious waste, and hazardous waste, which had been previously separated, together with general waste for storage. Consequently, it will be necessary to establish a storage system for medical waste.

b. Treatment and Recycling

Even though there are institutions, which treat infectious and hazardous waste on-site or off-site, some do not apply any treatment. Therefore, identifying the disposal sites of this untreated waste is essential in preventing the risks of spread of contamination.

Concerning recycling, it will be necessary to develop the recycling trade and properly market recycled products. However, the reality is that almost no recycling is carried out on recyclable materials among general waste and medical waste generated by medical institutions in Baku city. Some institutions recycle some types of medical waste, but the handling system of these materials is lacking in terms of safety, and some appropriate standards will have to be set.

c. Waste Discharge

The fact that, at the discharge stage, many institutions mix medical waste which had been separated during in-house collection is a cause for concern. Sterilized materials might end up been mixed with untreated medical waste, which carries the risk of increasing contaminated waste.

d. Collection

There are several types of collection, whether by private companies or the municipality. Some waste is transported to an off-site treatment facility, but it seems that most of the waste is carried directly to a disposal site. Even though the collection frequency is high, collection is carried out only once or twice at some institutions. As medical waste contains materials, which putrefy rapidly, a daily collection system should be established. Such a reliable system should be requested to the municipality or other operators in charge of collection.

Some institutions have their own disposal site, but the supervising government office should offer guidance and appropriate advice on the operation & management of these sites. The opinions on this type of disposal should be unified all over Baku city.

e. In-house Collection System

A standard system for in-house collection is adopted in approximately 20% of the institutions, but other institutions use non-standard containers and plastic bags.

Colours of containers and plastic bags and symbol marks used for the collection of medical waste are standardized by WHO. It is essential that medical institutions in Azerbaijan establish a system referring to these standards.

In-house collection is carried out daily, and in many cases, waste is stored in a central collection point. However, few institutions have a cool storage system for decaying waste, and a great number of central collection points are neither locked nor even fenced. Also, the disinfection system for these central collection points is insufficient.

Many institutions do not have a special storage area for hazardous (chemicals, medicine) or radioactive waste. Central collection points should be improved to prevent the spread of contamination from medical waste.

f. General Waste Collection

General waste is also collected by private companies or the municipality, with a rather high frequency. This collection system should be completely separate from medical waste.

3.4.4 Financial Matters

50% of the surveyed medical institutions pay a collection fee for medical waste, and 73% for general waste. However, based on calculation results, the standard usages for fixing the collection fees are unclear. It would be natural to have a higher fee for the collection of medical waste, which entails risks, but this trend does not appear in the survey results.

When all medical waste in Baku city is appropriately treated according to a unified system (disposal in landfill after incineration or chemical disinfection), the collection fee will have to be standardised.

However, the willingness to pay a fee corresponding to appropriate collection, treatment and disposal of medical waste is extremely low. In addition, the fee that some institutions are willing to pay for this service is even lower than the fee that they are currently paying.

To establish a proper medical waste management system, this issue should be understood and addressed not only by the medical institutions, but also by the Ministry of Health (of Azerbaijan), the municipality and Baku city together.

3.5 Public Opinion Survey

3.5.1 Objectives

Being aware of how much the whole society of Baku is concerned about the environment of Baku and how much it is interested in environmental improvement is fundamental for environmental management planning. In particular, willingness to pay (WTP) for the environmental has to be understood since WTP is a key element to make the environmental management M/P practicable and financially sound. Therefore, a public opinion survey (POS) on the environment was carried out with a target of households in the study area.

3.5.2 Survey Method

400 Samples for the POS were chosen so that they well represent the whole city population. A questionnaire sheet was prepared and samples were directly interviewed.

3.5.3 Findings

a. Households

a.1 Basic aspects of living environment

- Around 80 % of the people in Baku stayed at apartment and average 4 persons in their premises. In nearly half of the families, mothers also worked to obtain more income. Monthly expenditure for around 70 % of the families is less than 400,000 manat (around 90 US$/month), which merely covers minimum daily cost.

a.2 Problems of public services at residence

- Basic infrastructure such as water, sewerage, flush toilet and waste collection were serviced around 90 %. 100 % of the premises are supplied with electricity.

- Around 20 % of peoples were not paying service fees for water, sewerage and waste collection. There are several reasons for not paying but majority is that it is exempted due to pensionary, war participants and so on.
- Stable water supply and uninterrupted electricity supply are the most concern for the people. And they think responsibilities of those services lies in the Government especially in each executive powers.
- They are most concerned about air and water pollution in Baku city. Next to them are wastes and insects. In opinion of the people, government and local executive power should bear high responsibilities for pollution of air and water. As for the wastes and lack of green area, the responsibilities should rest on local government bodies.
- In order to improve environmental problems in daily life, more than half of the people think that the institutional strengthening of nature protection measures such as laws, regulations and guidelines is required.

a.3 Perception concerning cost of services

- The majorities of people (80 %) are willing to take part in solving those ecological problems which has negative impact on their life. More than half of the people consider that they would participate in activities for greenery in their living area. 20 % of the people would agree to pay more for the improved environmental conservation services.
- Regarding water supply, about 50 % of the people think that the service charge is expensive and 30 % think that it is reasonable. If the quality of services improved, about 40 % of the people agreed to pay more and 50 % of the people did not agree to pay more.
- Regarding sewerage services, about 33 % of the people think that the service charge is expensive and 42 % think that it is reasonable. If the quality of services improved, about 30 % of the people agreed to pay more and 54 % of the people did not agree to pay more.
- Regarding waste collection services, about 33 % of the people think that the service charge is expensive and 42 % think that it is reasonable. If the quality of services improved, 31 % of the people agreed to pay more and 55 % of the people did not agree to pay more.

a.4 Willingness to participate in improving the living conditions

- 82 % of the people is familiar with environmentally conscious products. The majority of the people (68 %) may purchase them but half of them only do so if the price is the same with that of ordinal products.
- Most of people in Baku (83 %) would follow the new rules for waste collection system such as separated collection in case they were imposed. The reasons why the people not follow the new system are that “it will take more time” and “it may need to pay more fee”.

a.5 Budget allocation

- Regarding government budget allocation to be increased, in the opinion of the people, the budget for supporting of the state staff and national security are the top second priority. Social welfare is the third.

b. Enterprises

b.1 Basic aspects of working conditions

- Average numbers of employees are 17. these enterprises can be considered as small to medium size except for four hotels which have more than 100 employees.
- Around 40 % of these enterprises are retailers followed by restaurants (18 %). Others are hairdressing saloon, Sauna, hotel, ceremony house and auto services.

b.2 Problems of public service at the enterprises.

- Basic infrastructure such as water, sewerage, flush toilet and waste collection were serviced at around 80 % of the enterprises. 100 % of the enterprises are supplied with electricity.
- Average fee for the public services are as follows.

Table 3-20: Fee for Public Services

	Average Fee (manat/month)	Average Fee (US$/month)
Water	1,082,820	237
Sewerage	381,822	84
Waste collection	218,379	48
Electricity	787,612	173

- Stable water supply and uninterrupted electricity supply are the most concern for the enterprises. And they think responsibilities of those services lies in the Government especially in each executive powers.
- They are most concerned about air and water pollution in Baku city. Next to them are wastes and insects. In opinion of the people, government and local executive power should bear high responsibilities for pollution of air and water. As for the wastes and lack of green area, the responsibilities should rest on local government bodies.
- In order to improve environmental problems in daily life, more than half of the people think that the institutional strengthening of nature protection measures such as laws, regulations and guidelines is required.

b.3 Opinion concerning the improvement of services and their cost

- The majorities of enterprises (89 %) are willing to take part in solving those ecological problems which has negative impact on their life. Preferred form of participation is activities for greenery in their area (61 %) and realization of public control (40 %).
- Regarding water supply, about 45 % of the enterprises think that the service charge is expensive and 32 % think that it is reasonable. If the quality of

services improved, about 35 % of the enterprises agreed to pay more and 50 % of the people did not agree to pay more.

- Regarding sewerage services, about 36 % of the enterprises think that the service charge is expensive and 40 % think that it is reasonable. If the quality of services improved, about 33 % of the enterprises agreed to pay more and 52 % of the people did not agree to pay more.
- Regarding waste collection services, about 34 % of the enterprises think that the service charge is expensive and 45 % think that it is reasonable. If the quality of services improved, 31 % of the enterprises agreed to pay more and 58 % of the people did not agree to pay more.

b.4 Willingness to participate in improving the living conditions

- 86 % of the enterprises is familiar with environmentally conscious products. 58 % of them would buy them even if they are slightly more expensive than ordinal products. This rate is higher than that of households.
- Most of people in Baku (85 %) would follow the new rules for waste collection system such as separated collection in case they were imposed. The reasons why the people not follow the new system are that “it will take more time”

b.5 Budget allocation

- Regarding government budget allocation, in the opinion of the people, the budget for supporting state staff, national security and social welfare are the top three priorities to be increased.

3.6 Waste Amount and Composition Survey (WACS)

3.6.1 Objectives

The Waste Amount and Composition Survey (WACS) intended to provide an overview of the solid waste situation in the target area, based on data from sample representative sectors. The sectors subject to the study were households, which were divided further into three income groups (low, middle and high), commercial units, markets and streets, which compose the cross-section of waste generators in the municipality. They are also considered the major contributors to the city’s day-to-day waste generation.

The survey sought to find out the types, amount and composition of wastes generated by those representative sectors. The results of the survey is expected to be used to clarify the waste stream in the target area and to formulate an appropriate system of solid waste management, specifically in formulating effective collection and disposal systems, developing waste utilisation plans and strategies, planning multi-sectoral involvement and designing a workable mechanism for managing the system.

3.6.2 Results of the Survey

a. Waste Amount

a.1 Household Waste

The summary of the waste amount survey is shown in Table 3-21.

Table 3-21: Household Waste Discharge rate in the Target Area

Unit: g/person/day

Item	High Income	Middle Income	Low Income
Average value	298	196	243
95% confidence	±51	±34	±45
Maximum value	529	400	457
Minimum value	131	96	86

Due to the fact that most of the residents in the study are living in apartments or condominiums, household waste rarely contained garden waste. Probably for this reason, the waste discharge rate in the target area is low.

a.2 Commercial, Market and Street Sweeping

The results of the waste amount survey are shown in the following table.

Table 3-22: Discharge Rate of Other Types of Waste

Item		Unit	Discharge Rate
Commercial waste	Restaurants	g/table/day	1,770
	Other shops	g/shop/day	540
Market waste		g/stall/day	1,110
Street sweeping waste		g/km/day	70,600

3.6.3 Waste Composition Analysis

a. Physical Composition

The results of the waste composition survey are summarised in Table 3-23.

a.1 Household Waste

The characteristics of the composition of the household waste are described as follows.

- Kitchen waste is the most dominant constituent in all the generation sources of household waste, which occupies 59% of the total. This is possibly because the housing style in the target area is mainly apartment and people take a lot of vegetables and fruits. In addition, the use of package for sales is not so popular in the target area. Therefore, waste from kitchen after food preparation shares much more than the other types of waste. On the other hand, waste from another activities such as sweeping, cleaning and gardening is quite small.

- Glass and paper constitute the second and third large percentages of waste in household waste. Glass and paper in household waste were 9.1% and 8.9%, respectively.

- Plastic is also the main component in household waste, which occupies 8.7% calculated from the study result of recycling activities in the three household groups and their population ratio.

- Households in Baku consume a large volume of bread, but bread was hardly found in household waste.

a.2 Commercial Waste

The general result of waste composition from commercial units is as follows:

- Kitchen waste accounts for about 60% of waste from the restaurants.
- Paper was about 70% of waste from “other shops”.

a.3 Market Waste

- Kitchen waste, paper and glass account for 63.9%, 19.6% and 6.0 % respectively in market waste.

a.4 Street Sweeping Waste

- Overall, glass and wood is the most common items in street sweeping waste, accounting for 24.7% of the street sweeping waste, followed by paper (19.2%), miscellaneous (19.0%) and plastics (13.6%).

Table 3-23: Results of Waste Composition Survey and MSW

Classification				Household				Commercial		Market	Street Sweeping	MSW*1
				High Income	Middle Income	Low Income	Weight Average	Restaurant	Other Shop			
Physical Composition (Wet Base)	Apparent Specific Gravity (ASG)		Kg/l	0.25	0.29	0.24	0.26	0.49	0.07	0.31	0.20	0.25
	Combustible Wastes	Kitchen Waste	(%)	55.1	63.2	57.9	59.4	61.0	8.2	63.9	6.9	51.8
		Paper	(%)	11.7	7.8	9.1	8.9	9.7	70.6	19.6	19.2	11.1
		Textile	(%)	2.8	4.3	2.7	3.2	1.3	0.8	0.3	5.1	3.3
		Grass and Wood	(%)	2.5	1.1	1.5	1.5	1.7	0.0	2.6	24.7	4.5
		Plastic	(%)	8.0	11.7	7.1	8.7	5.3	15.5	4.6	13.6	9.2
		Leather and Rubber	(%)	1.6	1.2	0.8	1.0	0.2	1.1	0.1	0.0	0.9
		Sub-total	(%)	81.7	89.3	79.1	82.7	79.2	96.2	91.1	69.5	80.8
	Incombustible Wastes	Metal	(%)	4.4	1.9	2.2	2.3	2.4	2.9	1.7	3.5	2.5
		Bottle and Glass	(%)	8.4	4.6	11.9	9.1	8.5	0.9	6.0	4.8	8.7
		Ceramic and Stone	(%)	4.4	4.2	6.7	5.7	8.9	0.0	0.1	3.2	5.3
		Miscellaneous	(%)	1.1	0.0	0.1	0.2	1.0	0.0	1.1	19.0	2.7
		Sub-total	(%)	18.3	10.7	20.9	17.3	20.8	3.8	8.9	30.5	19.2
	Total		(%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note : *1. Waste Composition of MSW is calculated as composition ratio multiplied by total amount of waste in each category divided by total amount of waste generation, i.e. [Σ[(composition rate of waste from each category) x (total waste amount of each category)]] / total waste amount, where Σ means the sum for all the categories.

b. Apparent Specific Gravity (ASG)

ASG of household wastes ranged from 0.24 to 0.29, and the weighted average was 0.26. ASG of the other wastes excluding household ranged from 0.07 to 0.49.

c. Chemical Analysis

The results of chemical analysis for kitchen, paper and grass/wood wastes are shown in Table 3-24.

Table 3-24: Results of Chemical Analysis

(unit : %)

Classification for Chemical Analysis		Analysis Types						
		Three Components				Ultimate Analysis		
		Combustible	Moisture	Ash	Total	Carbon	Nitrogen	C/N Ratio
RESULT								
1. Kitchen Waste	High income	22.4	76.3	1.3	100	---	---	---
	Middle income	26.4	72.7	0.9	100	30.8	2.5	12.3
	Low income	24.4	74.9	0.7	100	---	---	---
	Restaurant	32.3	65.8	1.9	100	31.4	2.6	12.1
	Shop	38.6	59.3	2.1	100	---	---	---
	Market	37.9	61.1	1.0	100	30.4	2.2	13.8
	Sweeping	39.8	59.0	1.2	100	---	---	---
2. Paper Waste	High income	55.7	39.8	4.5	100	---	---	
	Middle income	50.3	42.6	7.1	100	40.9	0.3	136
	Low income	43.7	50.8	5.5	100	---	---	---
	Restaurant	42.8	52.8	4.4	100	41.9	0.2	210
	Shop	77.4	16.7	5.9	100	---	---	---
	Market	40.8	47.6	11.6	100	66.4	0.2	332
	Sweeping	43.7	48.0	8.3	100	---	---	---
3. Grass/wood Waste	High income	46.2	44.6	9.2	100	---	---	---
	Middle income	48.4	42.9	8.7	100	71.8	0.2	359
	Low income	46.5	47.5	6.0	100	---	---	---
	Restaurant	46.6	39.1	14.3	100	28.1	0.1	281
	Shop	---	---	---	---	---	---	---
	Market	46.8	45.7	7.5	100	64.5	0.1	645
	Sweeping	39.0	50.0	11.0	100	---	---	---

3.6.4 Waste Stream

a. Waste Discharge Amount

a.1 Household Waste

The results of the WACS and data obtained from district authorities regarding population by income level are shown in Table 3-25.

Table 3-25: Population by Income Level & Household Waste Discharge Rate

Item	Population by Income Level*1	Discharge Rate (g/person/day)
High Income Household	9.7%	298
Middle Income Household	33.6%	196
Low Income Household	56.7%	243
Weight Average	---	233

Note : Population census (January – February 1999)

At households, glass bottles are mainly recycled. The recycled amount is as below.

Table 3-26: Amount of Bottles Recycled at Households

Item	Total Amount (g/day) *1	Nos. of Person (person) *2	Average Amount per person (g/person/day)
High Income Household	300	74	4
Middle Income Household	800	81	10
Low Income Household	1,100	72	15
Weight Average	---	---	12

Note *1 : sum of the amount of bottles recycled at the sampled 20 households.
*2 : total number of persons in the sampled 20 households.

The study team calculated the recycling amount of household income as shown below:

$2{,}051{,}600 \times 12 \times 10^{-6} = 24.6$ ton/day

a.2 Commercial, Market and Street Sweeping

The total waste generation amount of the other categories was calculated by multiplying discharge rate of each category by the number of units of that category.

Table 3-27: Daily Waste Discharge Amount (2000)

Discharge Source	Unit	Number of Discharge Sources	Discharge Rate	Daily Discharge Amount (ton/day)
Household Waste	g/person/day	2,051,600*1	233	478.0
Commercial Waste (Restaurant)	g/table/day	4,035	1,770	7.1
Commercial Waste (other shops)	g/shop/day	11,438	540	6.2
Institution*2	---	---	---	6.2
Market Waste	g/stall/day	3,393	1,110	3.8
Street Sweeping Waste	g/km/day	1,105	70,600	78.0
General waste from Medical Institutions*3	---	---	---	24.5
Total				603.8

Note: *1. population forecast for the year 2000 (refer to Main Report 2.2.4.a: Population)
*2. assuming that the discharge amount of institutions is same as that of other shops.
*3. from the result of the medical Institution survey.

c. Self-disposed Waste Amount

The study team calculated self-disposed waste amount as shown below:

$$2{,}051{,}600 \times 0.127 \times 0.45 \times 233 \times 10^{-6} = 27.3 \text{ ton/day}$$

d. Illegally Dumped Waste Amount

The study team calculated the amount of illegally dumped waste as shown below:

$$2{,}051{,}600 \times 0.127 \times 0.55 \times 233 \times 10^{-6} = 33.4 \text{ ton/day}$$

e. Collected Waste Amount

The data from UP Azerbaijan or KASCO were not used as collected waste amount. Instead, the results of the current study were applied, although waste is limited to waste from households, commercial units, markets and street sweeping.

f. Recycled Waste Amount

The outcome from the survey is concluded as the following table.

Table 3-28: Daily Recycled Waste Amount*[1]

Recycling Source	ton/day
Generation Sources	24.6
Street Waste Pickers	5.4
Site Waste Pickers	8.9

Note : *1. from the result of the recycling market survey

g. Final Disposal Amount

The final disposal amount was calculated from data on collected waste amount, other wastes and recycled amount at disposal site. In conclusion, the study team estimated final disposal amount at 504.2 ton/day.

h. Waste Stream

In final conclusion, the waste stream is tabulated in Table 3-29.

Table 3-29: Waste Stream

Waste Stream Component	ton/day
Waste Generation Amount	603.8
Recycling by Discharge Source	24.6
Discharge Amount	579.2
Illegally Dumped Waste Amount	33.4
Self-Disposed Amount	27.3
Recycling by Street Waste Pickers	5.4
Waste Collection Amount	513.1
Recycling by Site Waste Pickers	8.9
Other Wastes	?
Final Disposal Amount	504.2 + ?
Total Recycled Amount	38.9

3.6.5 Waste Discharge Amount Forecast

In order to formulate a master plan with a target year 2010, future waste discharge amount needs to be predicted.

a. Forecast Frame

The results of the WACS were used as a basic reference to forecast MSW discharge amount in the target area.

The forecast frame included estimation for the years 2000 and 2010 in the planning period of the master plan.

b. Factors in Waste Discharge Amount Increase

In order to estimate future waste amount, it is necessary to take the key indicators as the following into account:

- population growth;
- economic growth rate;
- social welfare and purchasing power of the consumers/families.

b.1 Population Forecast

The population was forecast by the study as shown in the table below.

Table 3-30: Baku Population Projection

Year	Population (1000)	Ratio (2000=1.000)
2000	2,051.6	1.000
2001	2,078.3	1.013
2002	2,105.3	1.026
2003	2,132.7	1.040
2004	2,160.4	1.053
2005	2,188.5	1.067
2006	2,221.3	1.083
2007	2,254.6	1.099
2008	2,288.5	1.115
2009	2,322.8	1.132
2010	2,357.6	1.149

b.2 Economic Growth Rate

The team forecasted the economic growth rate, GDP and GRDP, as follows:

- 8.5 % per annum, the growth rate in the first half of 2000, is assumed until 2004.
- 10 % per annum growth rate from 2005 to 2010.

b.3 Waste Amount Forecast

The future waste discharge amount is calculated by multiplying the discharge rate (DR_x) at that point by the future population (P_x) ($WD_x = P_x \times DR_x$).

The future waste discharge rate is deemed to increase in proportion with economic growth. Accordingly, based on the relationship between the GNP and the increase in waste discharge (obtained in Japan), the future waste discharge increase rate is forecast as shown below. (The growth rates of the GNP, GDR, and GRDP are assumed to be exactly linked, i.e., increase by the same rate.)

- Phase 1 (2000 - 2003) 4.7%/year
- Phase 2 (2004 - 2006) 5.2%/year
- Phase 3 (2007 - 2010) 5.5%/year

c. Forecast on Waste Amount

Based on the above-mentioned assumption, the forecast of MSW and other wastes amounts in Baku is described below.

c.1 Forecast of Waste Discharge Rate

The result of forecast of waste discharge rate is shown in the following table.

Table 3-31: Forecast of Waste Discharge Rate

Category	Unit	2000	2010
MSW			
Household	g/person/day	233	385
Restaurant	g/table/day	1,770	2,940
Other Shops	g/shop/day	540	900
Market	g/stall/day	1,110	1,840
Street Sweeping	g/km/day	70,600	70,600

c.2 Forecast of the Number of Discharge Sources

The team assumes that the number of waste discharge sources will increase in accordance with the population as shown in the following table.

Table 3-32: Forecast of Number of Waste Discharge Sources

Discharge Source	Unit	2000	2010
Population	person	2,051,600	2,357,600
Restaurant	table	4,035	4,636
Other Shops	shop	11,438	13,142
Market	stall	3,393	3,899
Street Sweeping	km	1,105	1,270

c.3 Forecast of Waste Discharge Amount

From the results of the above tables, finally, the study team calculated future waste discharge amount and presented in the following table.

Table 3-33: Forecast of Waste Discharge Amount

unit : ton/day

Category	2000	2010
Household	478.0	907.7
Commercial (Restaurant)	7.1	13.6
Commercial (Other Shops)	6.2	11.8
Institution	6.2	11.8
Market	3.8	7.2
Street sweeping	78.0	89.7
General Waste from medical institutions	24.5	28.2
MSW Total	**603.8**	**1,070.0**

3.6.6 Waste Composition Forecast

The team forecast future waste composition as follows:

- the composition rate of kitchen waste will decrease every year from 51.8% in 2000 to 41.8% in 2010.
- the discharge rates of textile, grass and wood, leather and rubber, ceramic and stone, and miscellaneous wastes will not change.

Waste composition forecast is resulted as in Table 3-34.

Table 3-34: Future Waste Composition Forecast

Type of Waste	Year 2000			Year 2010		
	MSW (%)	Total Discharge Amount (ton/day)	Discharge Ratio Per Capita (g.)	MSW (%)	Total Discharge Amount (ton/day)	Discharge Ratio Per Capita (g.)
Population (person)	2,051,600			2,357,600		
Kitchen Waste	51.8	312.9	152.5	46.8	500.8	212.4
Paper	11.1	67.0	32.6	15.0	159.6	67.7
Textile	3.3	19.9	9.7	2.1	22.9	9.7
Grass and Wood	4.5	27.2	13.3	2.9	31.4	13.3
Plastic	9.2	55.5	27.1	12.4	132.4	56.2
Leather and Rubber	0.9	5.4	2.6	0.6	6.1	2.6
Combustibles	**80.8**	**487.9**	**237.8**	**79.8**	**853.2**	**361.9**
Metal	2.5	15.1	7.4	3.4	36.3	15.4
Bottle and Glass	8.7	52.5	25.6	11.7	125.1	53.1
Ceramic and Stone	5.3	32.0	15.6	3.4	36.8	15.6
Miscellaneous	2.7	16.3	7.9	1.7	18.6	7.9
Non-combustibles	**19.2**	**115.9**	**56.5**	**20.2**	**216.8**	**92.0**
Total	100.0	603.8	294.3	100.0	1,070,0	453.9

3.6.7 Forecast of Waste Stream

The study team estimated a future waste stream in Baku as below.

a. Assumptions

a.1 Conditions of MSWM M/P

- Targets of MSWM M/P as in Table 3-35, serve as conditions for waste stream forecast.

Table 3-35: Targets of MSWM M/P

Items	Present (2000)	Phase I (2003)	Phase II (2006)	Phase III (2010)
Refuse Collection Rate	87.3 %*[1]	95 %	100 %	100 %
Ratio of Improper Disposal to Generation Amount	10.6 %*[1]	6.4 %	0 %	0 %
Recycle Rate of Metal Scrap	0 %	14 %	35 %	70 %
Recycle Rate of Waste Paper	0 %	10 %	25 %	50 %

Note *1: The figure is estimated based on the results of the POS

a.2 Other Assumptions

The other assumptions are that:

- the recycle amount by waste pickers on streets and at the final disposal site is stable;
- the rate of recycle amount at the discharge sources (eg households) to the total waste does not change.

b. Results of Forecast

The forecast of the amount of each waste stream was resulted as in Table 3-36, followed by the estimated waste stream in 2000 and 2010. “Recycling activities” refers to recycling of metal and paper that will newly start.

Table 3-36: Forecast Waste Stream

Unit : ton/day

Waste Stream Component	Present (2000)	Phase III (2010)
Waste Generation Amount	603.8	1,070.0
Recycling by Discharge Source	24.6	43.9
Discharge Amount	579.2	1,026.1
Illegally Dumped Waste Amount	33.4	0.0
Self-Disposed Amount	27.3	0.0
Recycling by Street Waste Pickers	5.4	5.4
Waste Collection Amount	513.1	1,020.7
Recycling activities	---	105.2
Recycling by Site Waste Pickers	8.9	8.9
Other wastes	?	?
Final Disposal Amount	504.2 + ?	906.6 + ?
Total Recycled Amount	38.9	163.4

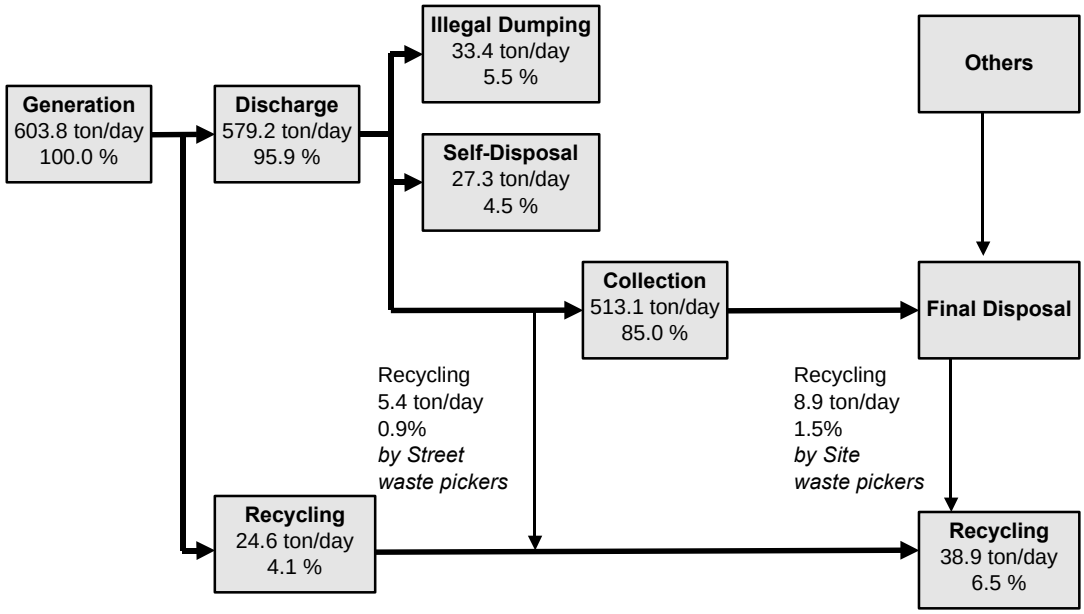


Figure 3-1: Present Waste Stream (2000)

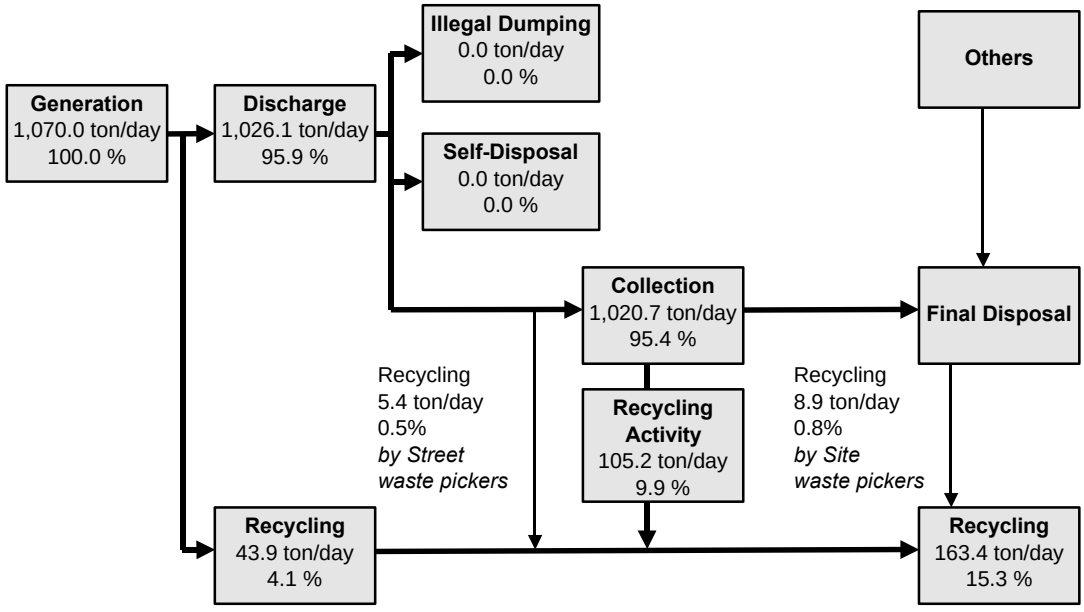


Figure 3-2: Waste Stream (2010)

3.7 Survey of Recycling Activities

3.7.1 Survey of Recycling System

a. Objectives of the Survey

This section of the Survey of Recycling Activities intends to find the present situation of recycling in the study area, based on data obtained by questionnaire survey and interview survey with stakeholders related to recycling activities from waste generation sources to the disposal site.

The objectives of this survey are:

- to outline the current recycling system and the market for the recyclable items;
- to evaluate volumes of various gathered materials and their treatment;
- to examine the required and forecast volume of treated materials;
- to check the current recycling system and the market.

To achieve the given objectives, the survey included all necessary works, such as interview with two categories of recycling facilities (intermediary and end users) and waste pickers (on the present sites for garbage utilisation in the city), literature survey, collection and analysis of data, and compilation of report.

b. Results of the Survey

b.1 House owners/Generation Sources

The primary recycling activity starts at the generation source. While they discharge waste, they also practice recycling activities by sorting out valuable/reusable waste for sale or reuse. Therefore, representatives of each of the WACS sampling points were investigated by the study team using a questionnaire whether they recycle any waste items.

From outcomes of the questionnaire survey, the practice of reuse/recycling of items within the premises of the sources, or sale of recyclable wastes to middlemen is not active. However, among household samples for WACS, 15% of the middle income households and 35% of the low income households were found engaged in recycling activities. While only 5% of the high income household samples practised recycling (refer to Table 3-37). Therefore, among the low income families higher level of generated waste processing is observed.

Table 3-37: Questionnaire Survey Results (Recycle Activity)

Do you recycle waste in your house?	High income		Middle income		Low income		Total	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%
Yes	1	5	3	15	7	35	11	18
No	19	95	17	85	13	65	49	82
Total	20	100	20	100	20	100	60	100

All the 11 families that answered that they do recycling only recycle glass wastes (bottles). After sorting bottles, they mainly sell them to middlemen.

The daily total quantity of recyclable materials sorted by sampling points for the WACS was between 0.1 and 0.4 kg/family/day (0.2 kg/family/day in average).

Since the recycling amount differs much by income level, the study team considered the recycled amount by income level. The amount of recycled materials by each income level is shown in the following table.

Table 3-38: Amount of Recycled Materials by Income Level

(unit: g/day)

Household income	Total Amount (g)	Nos. of Person	Average Amount per Person
High	300	74	4
Middle	800	81	10
Low	1,100	72	15

Finally, the total amount of recyclable materials sorted at all the generation sources in the city is calculated as shown below.

{(4 x 0.097) + (10 x 0.336) + (15 x 0.567)} = 12 g/person/day

12 x 2,051,600/1,000,000 = 24.6 ton/day

b.2 Street Waste Pickers

While the recycling activities of the public sector are dormant, those by the private sector are very active, particularly by street waste pickers who are often seen in the study area from the morning to the evening.

The questionnaire survey of street waste pickers was carried out for 10 persons from four districts, namely Sabail, Nasimi, Yasamal and Narimanov by local consultants. The result of the questionnaire survey states that most street waste pickers mainly sort out glass and non-ferrous metals (e.g. aluminium, copper, duralumin and lead). The total amount of recyclable material sorted by those street waste pickers is estimated to be 270 kg/day. The results are detailed in section 3.7.2, *Survey of Waste Pickers*. It can be presumed that the street waste pickers are mainly working in the said four districts, where much waste is generated, but the their total number in the city is unknown. Assuming that they are 200, the total amount of recyclable materials sorted by the street waste pickers in the city is calculated as shown below.

270 kg/day / 10 x 200 / 1,000 = 5.4 ton/day

c.3 Site Waste Pickers

Approximately 100-150 waste pickers work daily full time at the existing landfill site to sort out recyclable materials. They mainly collect bottles, glass and non-ferrous metals (e.g. aluminium, copper, duralumin and lead). From the interview survey of the 10 waste pickers, it is estimated that the total amount of recyclable materials sorted by those at the final disposal site is approximately 590 kg/day. The result is detailed in section 3.7.2, *Survey of Waste Pickers*. Assuming that there are 150 waste pickers at the site, the total amount of sorted recyclable materials sorted by them is calculated as shown below.

590 kg/day / 10 x 150 / 1000 = 8.9 ton/day

c.4 Middlemen

The questionnaire survey was conducted to 10 middlemen but they were not cooperative to the survey. Most of the middlemen purchase recycled materials from waste pickers and some house owners who bring collected items to them. The materials are stored and subsequently sold to final users or even to middlemen again depending on the types of material and the business scale of the middlemen. After purchasing sorted items some small middlemen resell them to bigger middlemen.

Table 3-39 shows the number of middlemen surveyed and the amount of recyclable materials they purchase.

Table 3-39: Monthly Quantity of Recyclable Materials Purchased by Middlemen

Item	Metal	Bottles and Glass
Nos. of middlemen	2	8
Quantity purchased (kg/month)	0.4 – 1.7	0.9 – 13,100

c.5 Producers/End Users

The questionnaire survey was conducted to 10 end users but they were not cooperative to the survey, a large-scale end user dealing with metals in particular, who was not cooperative at all. The rest 9 companies answered that their main products are bottles and glass (refer to Table 3-40).

Table 3-40: Categories and Main Products of End Users

No.	Name of companies	Main products or services
1	Winemaking factory ¹1	Production of spirits
2	Winemaking factory ¹2	Production of spirits
3	Workshop for production of lemonade	Production of lemonade
4	Workshop for production of hunt belongings	Production of small shots
5	Workshop for production of lemonade	Production of lemonade
6	Workshop for production of lemonade	Production of lemonade
7	Workshop for production of lemonade	Production of lemonade
8	Hayal	Production of lemonade
9	ALCO-Ltd	Production of spirits
10	Azeri-Castel	Production of beer

Regarding the reuse of non-ferrous metal in the survey target companies, only one final user was found in the target area. Table 3-41 shows the number of final users surveyed and the amount of recyclable materials they purchase.

Table 3-41: Monthly Quantity of Recyclable Materials Purchased by End Users

Item	Metal	Bottles and Glass
Nos. of end users	1	9
Quantity purchased (kg/month)	460	880 – 2,330,000

d. Findings of the Survey

Following the first survey objective "understanding the present recycling system" the study team considered the next key objective: estimation of the present waste amount recycled. From the results of the survey, the present recycling flow diagram of all recovered materials can be drawn as shown in the following figure. The total waste amount recycled is then estimated as shown in Table 3-42.

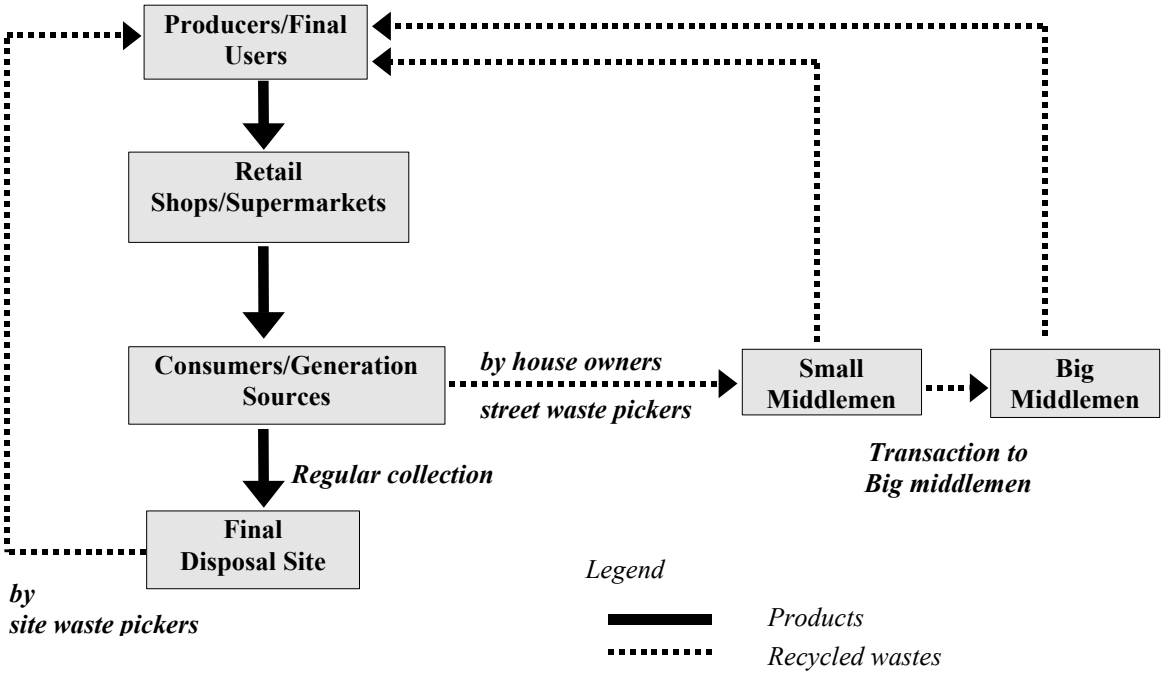


Figure 3-3: Recycling Flow Diagram for Recovered Materials

Table 3-42: Total Amount of Recycling

Unit : ton/day

Recycling Activity	Amount of Recycled Materials
Recycling at Generation Sources	24.9
Recycling by Street Waste Pickers	5.4
Recycling by Site Waste Pickers	8.9
Total Recycling Amount	39.2

d.1 Ferrous and Non-Ferrous Metals

It was found that non-ferrous metals, i.e. aluminium, copper, duralumin and lead, are recycled actively, forming a large market. On the other hand, ferrous metals such as car bodies and tin cans are not recycled by the waste pickers either on the streets or at the waste disposal site. This difference derives from the fact that the market price of ferrous metals is much lower than that of non-ferrous metals. In addition, it is anticipated that there is no metal furnace plant close enough to recover the cost for transportation. Large machinery left abandoned in a number of factories that finished or ceased operation seems to be recycled by the other recycling route that is not identified in the present survey.

d.2 Bottles and Glass

Bottles including jars are also actively recycled in the study area similarly to the non-ferrous metals. The market price of bottles depends on the size and/or the manufacturer of them. The middlemen store standard-shaped glass bottles that are commonly used in a beverage industry by types (see the picture below), then pack a certain number of bottles in a plastic bag or other package for the transfer to the other middlemen or the end users. Non-standard bottles, which are rather rare in shape, are stored separately from standard-shaped bottles. As far as the survey shows, the middlemen do not deal with cullet (e.g. broken bottles) since is does not have market value. Some of the site waste pickers were found recycling cullet, but its next destination is unknown.

d.3 Other Recyclable Items

Paper (including cardboard) or plastic film is not major recycling item and recycled only by a limited number of the site waste pickers. It was found that paper is reprocessed to carton.

PET bottles, textiles or batteries are not recycled at any stages. The team heard, however, that in the Soviet time a large volume of cardboard and batteries were collected from several republics and recycled.

A compost plant was constructed in Baku in the Soviet time, but did not succeed because mixed waste was fed and compost product contained impurities such as glass and metals.

3.7.2 Survey of Waste Pickers

a. Objectives of the Survey

The survey aimed to attain the following:

- to understand the present role of waste pickers in SWM;
- to understand the present working condition and environment;
- to obtain recycling amount through waste picking activities.

b. Characterisation of Survey Categories of Collectors Interview

b.1 Age Structure of Waste Pickers

The number of surveyed garbage collectors includes 10 working on the suburban dumps (site waste pickers) and 10 within the city (street waste pickers). The ages vary widely, as shown in Figure 3-4. The average age of the site waste pickers was 27.8, while that of the street waste pickers was 55.0.

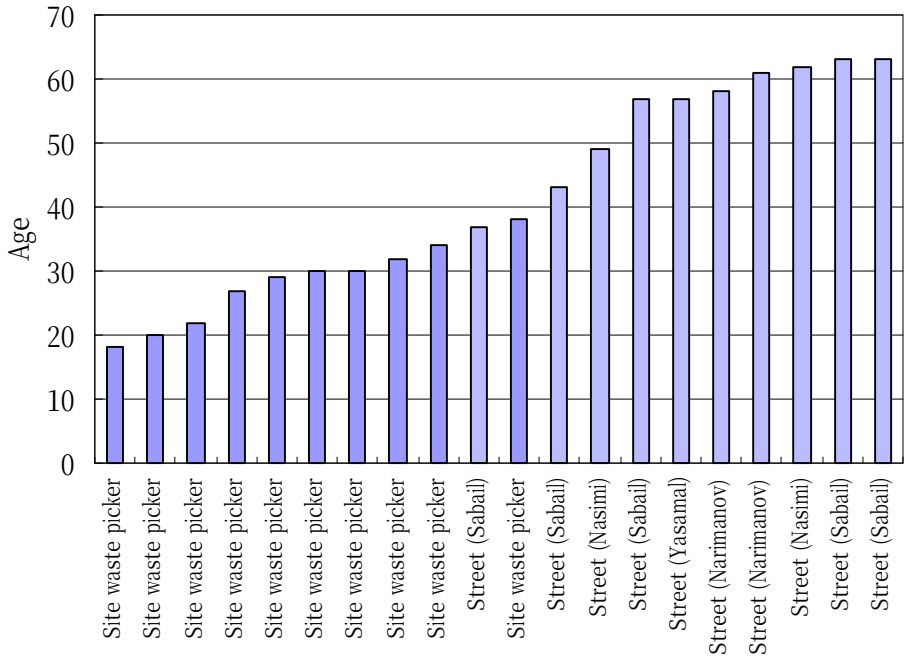


Figure 3-4: Respondents distributed to the Districts in compliance with age

As shown in the diagram, the site waste pickers of Baku (e.g. Sabunchi) are relatively young while site waste pickers are old.

Four out of 20 interviewed respondents were women.

b.2 Types of Waste Pickers

The street waste pickers are individual who collect recyclable materials from communal waste containers. Most street waste pickers have only plastics bags and small sacks to store collected wastes as their collection tool.

The waste pickers at the final disposal site work as a kind of cooperative but the present survey could not explore its structure and mechanism.

b.3 Monthly Income of Waste Pickers

Monthly income of the waste pickers were found to be as in Table 3-43.

Table 3-43: Monthly Income

	Nos. of Answer	Monthly income in manat		
		min	max	Average
Site waste pickers	10	200,000	500,000	308,000
Street waste pickers	10	120,000	180,000	143,000

b.4 Working Years of Waste Pickers

Table 3-44 shows working years of the interviewed waste pickers.

Table 3-44: Working Years

Base : All interviewees (20)									
years	3	4	5	6	7	8	9	10	15
Nos. of Answer	2	1	2	3	1	3	1	6	1

c. Showings of Collection and Realization of wastes

c.1 Types of Recycled Materials

Main materials collected by the waste pickers were glass and non-ferrous metals (refer to Table 3-45)

Table 3-45: List of Main Collected Materials

Base : All interviewees (20)		
Items		Nos. of Answer
Glass	bottles	20
	cullet	5
	other types of glass	12
	jars	12
Non-ferrous metals	aluminium	13
	lead	10
	copper	12
	other non-ferrous metals	9

c.2 Main Buyers

The interview showed that the main buyers of recycled materials are private companies.

Table 3-46: Main Buyers

Base : All interviewees (20)	
Items	Nos. of Answer
Glass for private company	20
Non-ferrous metal for private company	13
Plastic for private company	2

c.3 Annual Sales of the Recycled Materials

Handling volume of materials recycled by the waste pickers is as shown below. That by the waste pickers at the final disposal site is larger than that by the waste pickers on streets. This is probably because recycling at the final disposal site is systematically organised by a group while recycling on streets is done by individually.

Table 3-47: Annual Sales of the Recycled Materials

Items	Waste pickers at the final disposal site			Street waste pickers		
	Mean	Max	Min	Mean	Max	Min
Glass (number of pieces)	53,700	70,000	17,000	24,500	90,000	11,000
Non-ferrous Metal (kg)	199	300	140	120	50	170

c.4 Market Price of Recycled Materials

Price of recycled materials sold to the middlemen is same for the waste pickers at the disposal site and for the street waste pickers. Instead, difference of price is considered to occur according to the business size of the middlemen.

Table 3-48: Price of Recycled Materials

Unit : manat/kg

Items		Waste pickers at the final disposal site	Street waste pickers
Glass	Bottle	125 - 150	250 - 375
	Cullet	250 - 500	---
	Other types of glass	90 - 275	200
Non-ferrous metals	Aluminium	1500 - 2000	2000 - 2500
	Lead	1000 - 1500	2000 - 2500
	Copper	1500 - 2500	2500
	Other types of non-ferrous metals	400 - 2000	2000

d. Perception of Waste Recycling

d.1 Knowledge about the Usage of Recycled Materials

High proportion of the waste pickers know what is made from materials recycled by them.

Table 3-49: Usage of Recycled Materials – Known or Unknown

Base : All interviewees (20)			
Items		Waste pickers at the final disposal site	Street waste pickers
Glass	yes	6	9
	no	4	1
Non-ferrous metals	yes	8	5
	no	2	5

d.2 Concerns of Waste Pickers

The waste pickers were found to be concerned with the market price and volume of recycled materials. Those who care their health were more among the street waste

pickers, probably because they are generally older than the waste pickers at the disposal site.

Table 3-50: Concerns of Waste Pickers

Base : All interviewees (20)		
Items	Waste pickers at the final disposal site	Street waste pickers
Cost of materials	8	9
Volume of materials	8	8
State of health	2	7

d.3 Future Collection Amount

The waste pickers at the disposal site are more optimistic in terms of future recycling amount than the street waste pickers who tend to consider that it is rather stable.

Table 3-51: Future Collection Amount

Base : All interviewees (20)		
Items	Waste pickers at the final disposal site	Street waste pickers
Increasing	8	1
Stable to a certain degree	1	6
Decreasing	2	3

e. Conclusion

- Recycling activities by waste pickers were found to be limited to recycling glass bottles and non-ferrous metals. Paper and plastics are the minor items, which are recovered by the site waste pickers only in a small scale. These will be recycled more actively if a market is created and they are purchased at a reasonable price for the waste pickers. Ferrous metals are merely recycled and also need a market and a price setting system to be efficiently recycled.
- The street waste pickers are generally old and working individually, while the site waste pickers are mostly young and their activities are organised, attaining more recycled amount per person than the street waste pickers.
- It was found that waste contains glass bottles and non-ferrous metals in a large enough quantity for the waste pickers to maintain their lives. Therefore, it is presumed that the recycling of those materials at generation sources is not active.

3.7.3 Survey of Recycling Companies/Unions

a. Objectives of the Survey

This survey aimed to attain the following:

- to understand the present role of recycling companies/unions in SWM;
- to obtain recycling amount through recycling activities.

b. Analysis of Data from Recycling Companies Interview

b.1 Target of Interview

20 companies were selected for the survey, out of which 10 were intermediary and 10 were end users. It was found that there are no specialized companies to receive plastics; in spite of the presence of companies to receive wastepaper, there were no collectors of wastepaper; and in general there are no collectors as well as processors of textile. Among the 20, 16 were private and 4 were public companies, and they were located in 7 districts, out of 11.

Table 3-52: Types of Business and Property of Surveyed Companies

Category	Type	Name of Company
Middleman	Private	Non-ferrous metal receiving point
		Glass receiving point
		Glass receiving point
		Glass receiving point
		Glass receiving point
		Glass receiving point
		Glass receiving point
		Glass receiving point
		Non-ferrous metal receiving point
	Public	"Vtorresources" JS
End user	Private	Workshop for production of lemonade
		Workshop for production of lemonade
		Workshop for production of lemonade
		Workshop for production of lemonade
		Hayal (production of non-alcoholic drinks)
		ALCO-Ltd
		AZERI-CASTEL
	Public	Workshop for production of hunt belongings
		Wine making factory No.2
		Wine making factory No.1

Table 3-53: Location of Companies

District	Companies
Binagadi	4
Narimanov	1
Nasimi	7
Nizami	4
Sabail	1
Khatai	1
Yasamal	2
Total	20

b.2 Number of Workers

The number of workers varies among the companies. Half of them have 1 to 5 workers, and 4 companies by legal qualification can be referred to as middle and large (more than 50 workers).

Most of the companies (65%) are still young (less than 3 years after established):

Table 3-54: Number of Workers and Working Years

Category	Type	Nos. of worker	Working years
Middleman	Private	1	1
		2	1
		2	1
		2	1
		2	2
		2	2
		2	3
		3	1
		3	3
	Public	27	35
End user	Private	5	7
		6	2
		6	2
		6	2
		23	2
		90	2
		200	1
	Public	15	5
		400	35
		480	37

b.3 Categories and Main Products of Companies

Main products of the 8 middlemen type companies were glass (bottles) and those of the other two were non-ferrous metals. Among the end-user type companies, 9 of them mainly deal with glass and only one enterprise deals with non-ferrous metals. This result is, however, questionable because it was difficult to ask for cooperation to the interview to middlemen and end users of metals.

Table 3-55: Categories and Main Products of Companies

Category of enterprise		Name of enterprise	Main products or services
Middleman	1	"Vtorresources" JS	Preparation of secondary resources
	2	Glass receiving point	Collection of bottles
	3	Glass receiving point	Glass receiving
	4	Glass receiving point	Glass receiving
	5	Glass receiving point	Glass receiving
	6	Non-ferrous metal receiving point	Non-ferrous receiving
	7	Non-ferrous metal receiving point	Non-ferrous receiving
	8	Glass receiving point	Glass receiving
	9	Glass receiving point	Glass receiving
	10	Glass receiving point	Glass receiving

Category of enterprise		Name of enterprise	Main products or services
End-user	1	Winemaking factory ¹1	Production of spirits
	2	Winemaking factory ¹2	Production of spirits
	3	Workshop for production of lemonade	Production of lemonade
	4	Workshop for production of hunt belongings	Production of small shots
	5	Workshop for production of lemonade	Production of lemonade
	6	Workshop for production of lemonade	Production of lemonade
	7	Workshop for production of lemonade	Production of lemonade
	8	Hayal	Production of lemonade
	9	ALCO-Ltd	Production of spirits
	10	Azeri-Castel	Production of beer

Note *1: End-user 4 deals with non-ferrous metals mainly and non-ferrous metals in a small scale.

c. Characterization of Products and Transportation

c.1 Middlemen

Intermediary companies mostly (7 out of 10) deal with the collection of glass wastes.

The middlemen often do not consider broken glass valuable, but there were found some middlemen that handle it. “Jar” in the table below refers to a bottle with a wide mouth.

Table 3-56: Type of Glass Deal with by Middlemen

Base : All middlemen interviewees (10)	
Items	Nos. of Answer
Glass-bottle	7
Broken glass	2
Other glass (jars)	2
All types	7

c.2 Products of End User Company

One company specialises in non-ferrous metals (aluminium, lead, copper and others), and one receives newspapers, magazines, carton and other paper products. It is interesting that 9 out of 10 are dealing with the production of drinks (including 3 – alcoholic drinks).

Table 3-57: Products of End User Companies

Base : All end users interviewees (10)	
Items	Nos.
Production of lemonade	5
Production of beer	1
Production of wine and vodka	3
Production of small shots	1
Total	10

c.3 Main Types of Supplies and Clients for Middlemen

The following table shows what types of material the middlemen supply to which clients. It is clear that they supply various items to private companies, less variety of items to public companies and only bottles to households.

Table 3-58: Main Types of Supplies and Clients

Base : All middlemen interviewees (10)			
Items	Client – private companies	Client – public companies	Client – others
	Nos. of Answer	Nos. of Answer	Nos. of Answer
1 Bottles regardless types	7	1	2
2 Non-ferrous	2	1	0
3 Bottles of wine and vodka	3	2	0
4 Paper	1	0	0
5 Bottles of lemonade	5	0	0
6 Bottles of beer	1	0	0
7 Small bottles for shots	1	0	0

c.4 Annual Transportation on Surveyed Companies

The amount of annual transportation differs from company to company, depending on its business scale. Transportation of most materials is by the private companies.

Table 3-59: Volumes of Transportations by Categories of Companies (1999)

unit: number of item/year

Category of company (union)	[1]	Name of enterprise	Volume of transportation – private companies (number of items/year)	Volume of transportation – public companies (number of items/ year)
Middleman	1	"Vtorresources" JS	7 (ton)	4 (ton)
	2	Glass receiving point	75,000	290,000
	3	Glass receiving point	350,000	-
	4	Glass receiving point	380,000	-
	5	Glass receiving point	250,000	-
	6	Non-ferrous metal receiving point	20 (ton)	-
	7	Non-ferrous metal receiving point	5 (ton)	-
	8	Glass receiving point	300,000	-
	9	Glass receiving point	450,000	-
	10	Glass receiving point	290,000	-
End-user	1	Winemaking factory [1]1	60,000,000	20,000,000
	2	Winemaking factory [1]2	50,000,000	10,000,000
	3	Workshop for production of lemonade	50,000	-
	4	Workshop for production of hunt belongings	3 (ton)	-
	5	Workshop for production of lemonade	30,000	-
	6	Workshop for production of lemonade	70,000	-
	7	Workshop for production of lemonade	450,000	-
	8	Hayal	150,000	-
	9	ALCO-Ltd	1,800,000	-
	10	Azeri-Castel	900,000	-

d. Main Suppliers

Main suppliers of materials to the intermediary are mainly private persons including citizens, mediators and garbage collectors. On the other hand the end users are supplied by other suppliers.

Table 3-60: Main Suppliers to Companies

Base : All interviewees (20)		
Supplier	Category of company	
	Middleman	End user
	Cases	Cases
Citizen	9	1
Industry	---	1
Mediator	4	1
Collector of wastes	5	1
Garbage collector	5	1
Other supplier	3	9

e. Business Performance

e.1 Annual Sales

Both categories of companies were requested to disclose data about annual sales. The annual sales of the intermediary companies are relatively in a small range (standard deviation = 14733 manat), while those of the end users are significantly diverse.

Table 3-61: Annual Sales Volumes (in the manat)

Category of company	Number of companies	Min.	Max.	Mean	Std. Deviation
Middleman	10	16,000	65,800	43,080	14,733
End user	10	15,000	396,000,000	67,735,800	142,9500,000

e.2 Cost of Transportation

Among the surveyed companies, it seems that only the end users transport the materials: there was not clear answer from the middlemen that they do transport the materials. Nine out of ten end users pay from 5 to 10 manat/kg to transport companies. The rest company answered zero as it has its own transport means and does not pay to a transport company. The amount of payment does not depend on the size of the end users and, in turn, the size of transport load.

Table 3-62: Cost of Transportation

Category of company (union)	Cost (manat/kg)	Nos. of Answer
End user	0	1
	5	2
	6	1
	8	2
	9	1
	10	3
	Total	10

e.3 Annual Volumes of Supplies from Various Sources

Volumes of materials supplied in a year to the two categories of companies by sources are as in Table 3-63.

Table 3-63: Annual Supply Volumes by Sources

unit : number of item/year

Base : All interviewees (20)					
Category of company	Supplier	Nos. of Answer	Minimum	Maximum	Mean
Middleman	Citizen	9	1 (ton)	450,000,0	146,700
	Industry	0			
	Moderator	4	2 (ton)	250,000	80,000
	Collector of wastes	2	90,000	100,000	95,000
	Garbage collector	5	1 (ton)	110,000	48,000
	Other suppliers	3	100,000	120,000	111,700
	Total	10	---	---	240,500
End user	Citizen	1	0.5 (ton)	0.5	0.5
	Industry, volume	1	1 (ton)	1.0	1.0
	Moderator, volume	1	1 (ton)	1	0.8
	Collector of wastes, volume	3	1 (ton)	80,000	26,700
	Garbage collector, volume	5	-	80,500,000	16,304,000
	Other suppliers, volume	5	10,000	60,000,000	12,422,000
	Total	10	---	---	14,371,000

e.4 Material Prices

The price of collected materials was almost same for the middlemen and end users.

Table 3-64: Material Prices

Category of company	Glass (manat/item)	Non-ferrous metals (manat/kg)	Paper (manat/kg)
Intermediary	120 - 250	2250 - 2700	500
End user	60 - 225	2000	---

c. Treatment Process

Treatment of materials by the intermediary companies is only sorting them into three types (ie glass, non-ferrous metal and paper). The end users are mostly engaged in packing rather than sorting.

Table 3-65: Number of Companies with Various Types of Treatment Process

Category of company	Type of treatment	Type of production		
		Glass	Non-ferrous metal	Paper
Middleman	Sorting	7	2	1
	Pressing			1
	Tampering			
	Washing			
End user	Sorting	4		
	Pressing			
	Tampering	9		
	Washing		1	

g. Relation to the Activity and Opinion on Tendencies

g.1 End Product

Most of the middlemen understand how materials that they handle are going to be processed.

Table 3-66: End Product – Known or Unknown

Base : All Middlemen interviewees (10)		
Answer	Final Product	Nos. of Answer
Yes	Drinks	7
	Various utensils	1
	Carton	1
No	---	1
Total		10

g.2 Governmental Support

The numbers of companies that are in favour of governmental support and that are against governmental support were same in the middlemen and in the end users.

Table 3-67: Governmental Support – For or Against

Base : All interviewees (20)		
Category of company	Answer	Nos. of Answer
Middleman	yes	3
	no	3
	Do not know	4
	Total	10
End user	yes	4
	no	4
	Do not know	1
	Others	1
	Total	10

g.3 Collection Amount Forecast

The majority of the middlemen and the end users consider that the collection amount is constant in future and the rest expect the increase of materials.

Table 3-68: Volume Tendency of Products

Base : All interviewees (20)		
Category of company	Answer	Nos. of Answer
Middleman	Growing	4
	Relatively stable	6
	Total	10
End user	Growing	2
	Relatively stable	8
	Total	10

h. Conclusions and Recommendations

The results of this survey will serve as a base to examine the present condition on the recycling market in Baku and its future. The conclusions and recommendations drawn from this survey are as follows.

- Recycling activities are largely limited to the recycling of glass bottles and non-ferrous metals, market of which has been established. Glass bottles are categorised by type and returned to the original manufacturers. The price of recovered non-ferrous metals is high enough to raise economic benefit even though they need to be transported to recycling plants in the distance.
- The price of recovered ferrous metals is too low to be beneficial. This is because there is no ferrous metal recycling plant close enough to the city and cost for transportation to the nearest one is high.
- The team considers that it is possible to create a recycling market in future for items other than glass bottles and non-ferrous metals, such as ferrous metals and paper (mainly cardboard). However, the cost for transport of those per unit volume is high. Therefore marketability depends on whether recycling plants for them are constructed in the study area or its vicinity. Recognising that the market of those materials existed in the former soviet time, the consumers, middlemen and end users will include them into their recycling activities once the market emerges.

Chapter 4

Environmental Management of Study Area

4 Environmental Management of Study Area

4.1 Environmental Status

4.1.1 Air

Air qualities have been monitored continuously at 9 stations in Baku City by Hydromet. Air quality data at each station for 5 years from 1995 to 1999 are shown in Table 4-2 - Table 4-10. The location of the stations is shown in Figure4-1.

The concentrations of air pollutants except dust generally have a gentle downward trend. However, even the annual average concentrations exceeded the MPE (Maximum Permissible Emission), which set the limit of daily average, at some stations (Table 4-1) (it is to be noted that a standard based on annual average should be more relaxed than a standard based on daily average). The result of NO_2 is the worst: its concentration exceeded the MPE at the 8 stations out of 9 stations. Four stations had SO2 over the MPE, although sulphur content in fuel used in Baku is low.

Table 4-1: Number of Monitoring Points Exceeding MPE (1999)

Pollutant	Monitoring points where pollutant exceeds MPE
NO_2	8
SO_2	4
Dust	4
HCHO	2
Hg	1

MPE: Maximum Permitted Emission (daily average)

Table 4-2: Air Quality at the Monitoring Station No.5

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	-	0.110	0.127	0.127	0.142	0.15
SO_2	0.075	0.064	0.059	0.058	0.059	0.05
NO_2	0.084	0.075	0.062	0.059	0.059	0.04
NO	0.022	-	-	-	-	
H_2S	-	-	0.004	0.004	0.004	0.008[1)]
Cl_2	-	-	0.049	0.054	0.051	

MPE: Maximum Permitted Emission (daily average)
1) not daily average, but maximum
Data from State Committee for Hydrometeorology

Table 4-3: Air Quality at the Monitoring Station No.15

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	0.017	0.036	0.117	0.127	0.100	0.15
NO_2	0.058	0.063	0.062	0.060	0.058	0.04
H_2S	0.003	0.004	0.003	0.003	0.003	0.008
Black carbon	0.023	0.018	0.013	0.013	0.010	
Hg	0.0001	0	0	0.000	-	0.0003
H_2SO_4	0.010	0.009	0.048	0.013	0.016	
C_5H_3O ・	0.038	0.046	0.048	0.047	0.040	0.05

Table 4-4: Air Quality at the Monitoring Station No.17

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	0.017	0.042	0.118	0.118	0.136	0.15
CO	1	-	5.600	5.909	2.636	3.0
NO_2	0.083	0.077	0.085	0.082	0.075	0.04
NO	0.023	0.023	0.026	0.025	0.027	
Black carbon	0.078	0.053	0.015	0.025	0.043	
Hg	0.0001	0	0.000	0.000	0.005	0.0003
H_2SO_4	0.008	0.010	0.010	0.015	0.019	
HCHO	0.005	0.005	0.005	0.005	0.005	0.003
C_5H_3O・CHO	0.046	0.048	0.054	0.048	0.049	0.05

Table 4-5: Air Quality at the Monitoring Station No.19

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	0.025	-	0.200	0.192	-	0.15
NO_2	0.052	-	0.061	0.059	-	0.04
Black carbon	0.005	-	0.021	0.016	-	
HF	0.002	-	0.002	0.002	-	
Cl_2	0.010	-	0.040	0.039	-	
HCHO	0.004	-	0.005	0.005	-	0.003

Table 4-6: Air Quality at the Monitoring Station No.37

Unit: mg/m^3

	1994	1995	1997	1998	1999	MPE
Dust	0.100	0.058	0.170	0.145	0.188	0.15
SO_2	0.054	0.051	0.055	0.056	0.054	0.05
NO_2	0.060	0.059	0.058	0.058	0.057	0.04
H_2S	0.002	0.003	0.004	0.003	0.003	0.008

Table 4-7: Air Quality at the Monitoring Station No.38

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	0.050	0.082	0.133	0.127	0.157	0.15
SO_2	0.075	0.072	0.073	0.073	0.067	0.05
CO	1	-				3.0
NO_2	0.080	0.080	0.074	0.069	0.072	0.04
H_2S	0.004	0.005	0.004	0.004	0.004	0.008
NH_3	0	0	0	0.000	0.000	
$C_5H_3O \cdot CHO$	0.055	0.056	0.057	0.048	0.047	0.05

Table 4-8: Air Quality at the Monitoring Station No.39

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	0.033	0.082	0.109	0.109	0.100	0.15
NO_2	0.062	0.066	0.060	0.058	0.057	0.04
H_2S	0.003	0.005	0.004	0.004	-	0.008
HCHO	0.004	-	-	-	-	0.003

Table 4-9: Air Quality at the Monitoring Station No.40

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	0.058	0.109	0.164	0.188	0.171	0.15
SO_2	-		0.110	0.057	0.049	0.05
CO	1	-	-	-	-	3.0
NO_2	0.065	0.069	0.062	0.059	0.052	0.04

Table 4-10: Air Quality at the Monitoring Station No.48

Unit: mg/m^3

	1995	1996	1997	1998	1999	MPE
Dust	0.029	0.070	0.136	0.100	0.155	0.15
SO_2	0.072	0.072	0.071	0.072	0.066	0.05
NO_2	0.076	0.078	0.072	0.068	0.072	0.04
Black carbon	0.056	0.046	0.023	0.017	0.025	
HCHO	0.005	0.006	0.005	0.005	0.005	0.003
$C_5H_3O \cdot CHO$	0.048	0.059	0.052	0.046	0.047	0.05

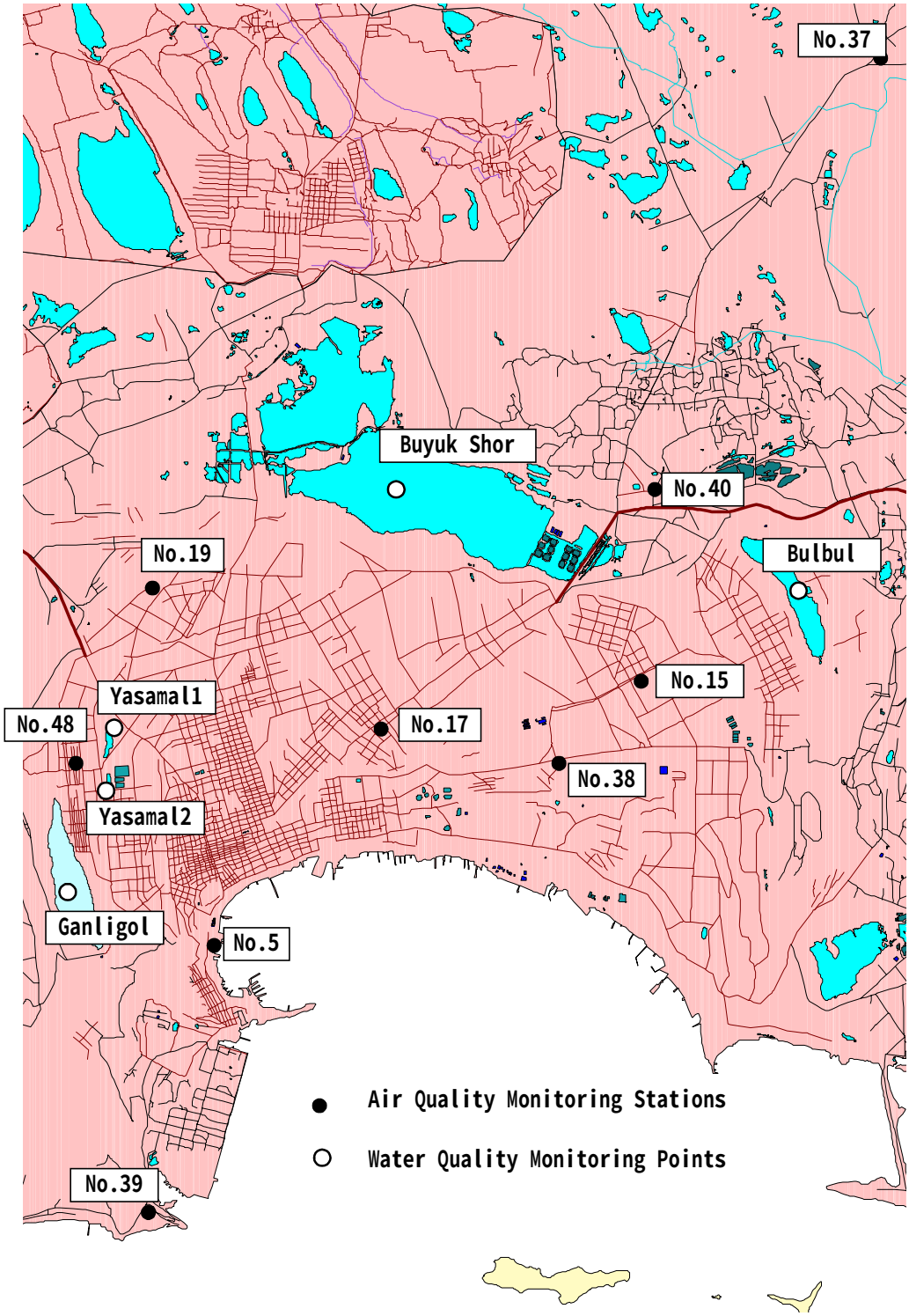


Figure 4-1: Location of Monitoring Stations

4.1.2 Water

The water quality of lakes, namely Yasamal 1, Yasamal 2, Ganli-Gol, Beyuk-Shor and Bul-Bul in Baku City is continuously monitored by Hydromet. Water quality data at each lake for 5 years from 1995 to 1999 are shown in the Table 4-11- Table 4-15 and the location of the lakes is shown in Figure 4-1.

The pH values have rarely changed for 5 years at every lake. The concentration of O_2 is also stable except at Lake Bul-Bul, which shows a downward trend. The concentration of NO_3^- generally tends to go down and that of NH_4^- increased only at Lakes Ganli-Gol and Bul-Bul. As for the concentrations of Hg and Pb, it is rarely detected except at Lakes Ganli-Gol and Beyuk-Shor in 1999 and attention has to be paid to this phenomenon. As for the concentration of petrochemical, it has rarely changed for 5 years.

Annual average values of each parameter in 1999 were compared with the EQS (Environmental Quality Standard). The concentration of phenol appeared excessively in all monitoring points, and the concentrations of NO3, NH4 and oil content exceeded the EQS at some monitoring points.

From a general point of view, water of these lakes is not seriously polluted in spite of the history of these lakes in that they were used as places to store water discharged from oil fields, factories and households.

Table 4-11: Water Quality in Lake Yasamal 1

Unit: mg/l

	1995	1996	1997	1998	1999	EQS
PH	8.4	8.1	8.1	8.2	8.0	
O_2	8.2	6.6	5.6	7.5	8.3	＞4.0
NH_4^-	0.09	0.17	0.23	0.30	0.03	2.0
SO_4^-	2033	1336	1447	1155	1470	
NO_3^-	2.19	2.93	2.47	1.11	0.73	1.0
Hg	-	-	-	-	-	
Pb	0	0	0	0	0	
Phenol	0.009	0.080	0.005	0.004	0.005	0.001
Petrochemical	0.13	0.09	0.17	0.14	0.19	0.3

EQS: Environmental Quality Standard for Social-Sanitary Use in Azerbaijan

Table 4-12: Water Quality in Lake Yasamal 2

Unit: mg/l

	1995	1996	1997	1998	1999	EQS
PH	8.38	8.09	8.23	8.32	8.16	
O_2	8.35	7.52	6.06	7.34	8.11	＞4.0
NH_4^-	0.12	0.15	0.21	0.29	0.05	2.0
SO_4^-	2025	1193	909	1076	1017	
NO_3^-	2.55	2.14	2.24	1.40	0.53	1.0
Hg	0	0	0	0	0	
Pb	0	0	0	0	0	
Phenol	0.010	0.012	0.003	0.004	0.004	0.001
Petrochemical	0.27	0.17	0.21	0.20	0.20	0.3

Table 4-13: Water Quality in Lake Ganli-Gol

Unit: mg/l

	1995	1996	1997	1998	1999	EQS
PH	8.42	8.13	8.11	8.40	8.37	
O_2	7.33	6.20	5.18	6.29	6.40	＞4.0
NH_4^-	0.10	0.22	0.31	0.64	1.25	2.0
SO_4^-	810	1097	924	557	721	
NO_3^-	0.58	1.82	2.67	1.29	1.45	1.0
Hg	0	0	0	0	0	
Pb	0	0	0	0	0.3	
Phenol	0.012	0.015	0.012	0.008	0.011	0.001
Petrochemical	0.11	0.17	0.20	0.10	0.21	0.3

Table 4-14: Water Quality in Lake Beyuk-Shor

Unit: mg/l

	1995	1996	1997	1998	1999	EQS
PH	8.40	8.34	7.90	8.64	8.53	
O_2	4.9	4.8	4.6	4.1	4.1	＞4.0
NH_4^-	0.35	1.23	0.85	0.84	0.34	2.0
SO_4^-	5312	2625	6008	3432	2892	
NO_3^-	2.66	2.35	1.74	1.34	8.98	1.0
Hg	0	0	0	0	0	
Pb	0	0	0	0	0.5	
Phenol	0.020	0.028	0.018	0.015	0.031	0.001
Petrochemical	0.66	0.64	0.44	0.49	0.47	0.3

Table 4-15: Water Quality in Lake Bul-Bul

Unit: mg/l

	1995	1996	1997	1998	1999	EQS
PH	8.51	8.12	8.04	8.10	8.37	
O_2	5.89	7.10	5.68	5.20	3.31	＞4.0
NH_4^-	0.29	0.49	0.54	0.65	3.38	2.0
SO_4^-	394	2004	2253	619	533	
NO_3^-	1.95	1.74	1.77	1.73	0.97	1.0
Hg	0	0	0	0	0	
Pb	0	0	0	0	0	
Phenol	0.014	0.015	0.011	0.009	0.019	0.001
Petrochemical	0.40	0.27	0.32	0.25	0.22	0.3

In the present study, the JICA team carried out a sediment quality survey. As the result shows in Section 3.3, the concentration of As in sediments in most lakes were found high. Sediment quality in Lake Bul-bul is particularly poor with high concentrations of Pb and As. Due attentions should be paid to this fact, since people may consume fish caught in this lake.

Therefore in addition to water monitoring, sediment monitoring should be carried out at major lakes.

4.1.3 Soil

Various organisations in Azerbaijan have been engaged in soil studies. Their previous studies are summarised in Table 4-16.

State Committee for Land Resources and Agrochemistry conducted a soil survey contaminated by oil by measuring oil content in soil at 257 points at three soil layers. Figure 4-2 is the result of soil categorisation by oil content at the highest layer.

There are a number of points in the oil field where oil content is as high as 30%.

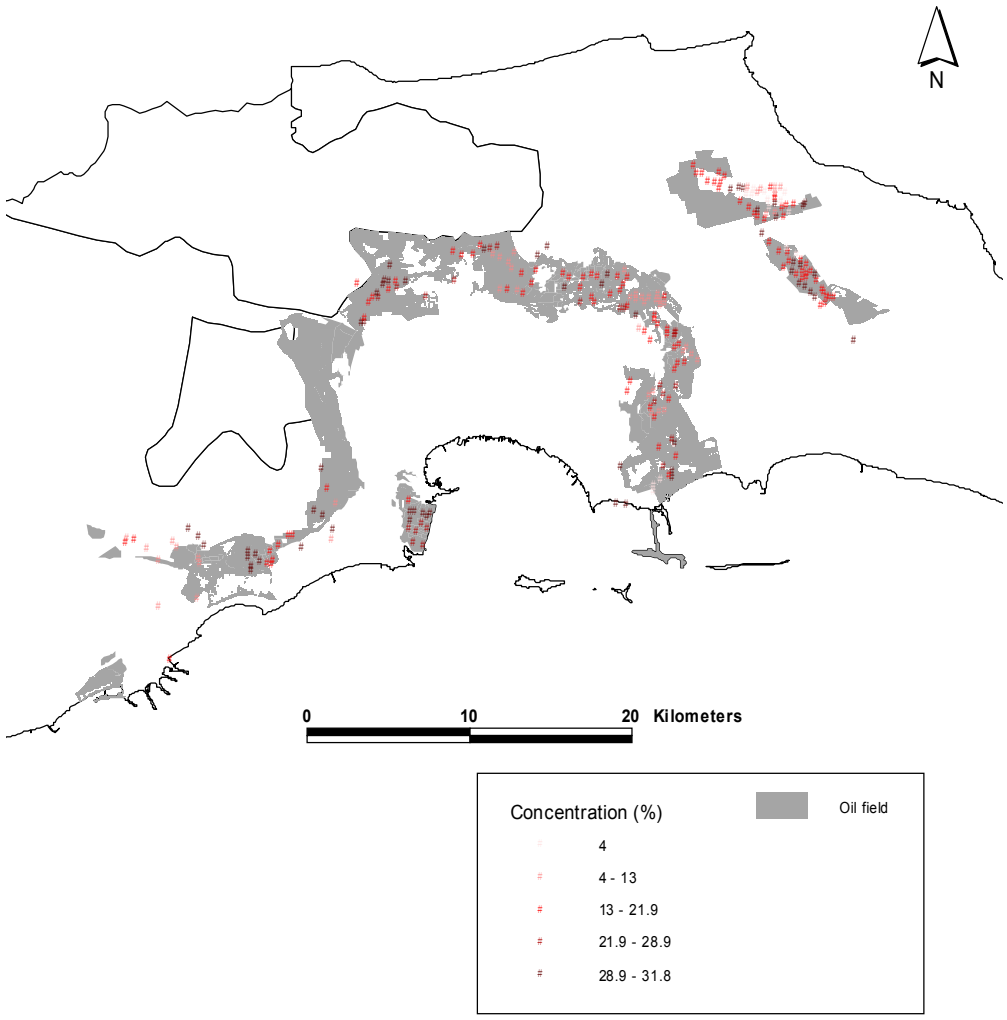


Figure 4-2: Oil Contamination Map

Table 4-16: Information of Soil Contamination

	Organisation	Items	Points
1	State Committee for Land Resources and Agrochemistry	Oil contaminated map	257 points x 3 layers
2	Instituite of Geography in Academy of Sciences	Chemicals in soil (pH, Ni, Co, Pb, Mn, Cr, Zn, Cu, Sn, Mo, Cd, V, F)	134 points
3	Institute of Soil and Agrochemistry in Academy of Sciences	Chemicals in soil (B, Mn, Zn, Cu, Co, Mo)	114 points x 2 layers
4	State Committee for Land Resources and Agro-chemistry	Metals in soil (Sr, Mo, Pb, V, Ni, Cr, Co, Zn, Cu, Ba, Mn, Ti, Ag, Ga, Zr, Sn, Y, Sc, Li, Nb)	200 points

Using "Clark rate" applied in the study by the State Committee for Land (numbered 4 in the table above), data obtained by the studies numbered 2 and 3 were evaluated. The number of sampling points where metal concentrations exceeded the average concentrations in lithosphere were: 19 for Co, 16 for Mo, 15 for Ni and 9 for Pb in Study 2; 43 for Mo in Study 3; and 36 for Mo and 11 for Sr in Study 4. As a whole, the concentrations of metals such as Mo, Co and Ni are high in some places.

Looking at the data of Study 2 more closely and using the GIS, it is obvious that most of the sampling points where metal concentrations are 5 times more than the average concentrations in lithosphere are corresponding to the industrial zones within the urbanised area. Metals such as Ni, Co, Pb, Mn and Cr are those whose concentrations are high. The team considers that such contamination was caused by human's economic activities.

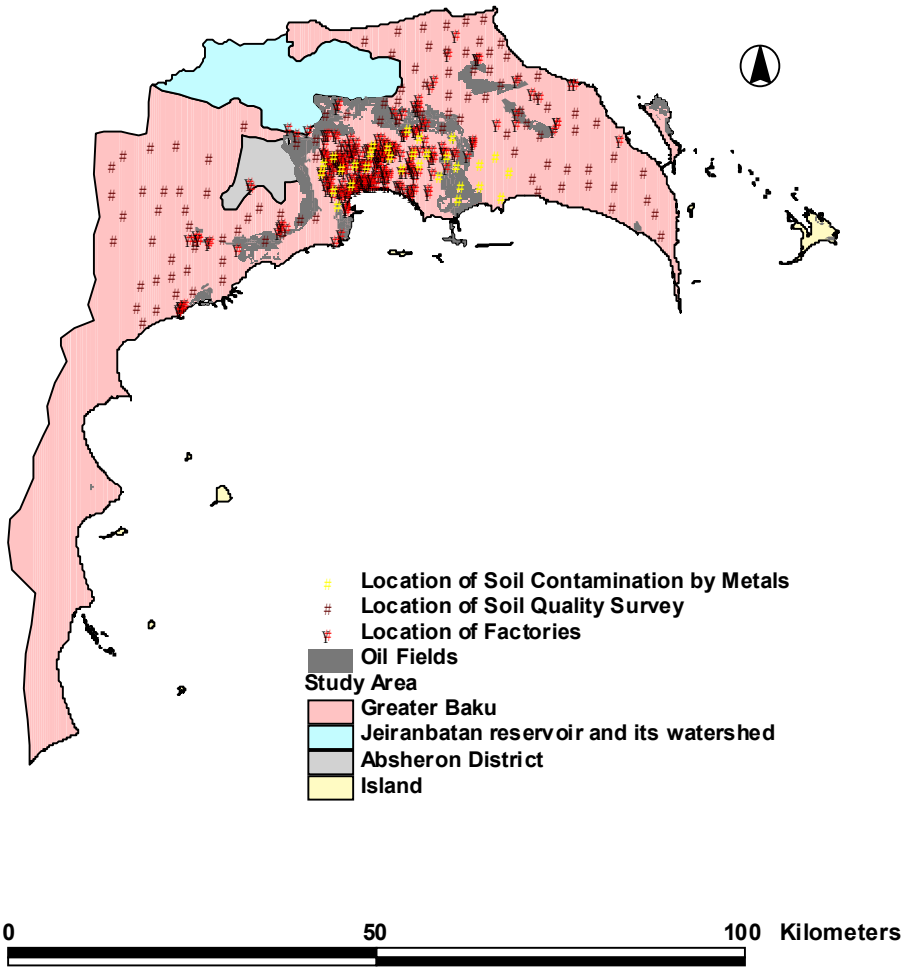


Figure 4-3: Location of Soil Contaminated by Metals

4.1.4 Others

Clean air, water and soil are fundamental for the human beings to produce safe food and to live healthily. In addition to those three, there are other environmental elements that are influential to human lives, such as noise and landscape.

On every street in the centre of Baku City, engines and horns of vehicles are causing a noise nuisance, although most people consider that it is a normal, usual situation and do not take it seriously. Large noise from construction machinery, large vehicles and others is anticipated to be negatively affecting the living environment of the citizens, particularly children, the senior, and patients. It is important for the general public to recognise and claim that it is "a nuisance".

Although the Absheron peninsula is arid in nature, the city has much greenery due to an enthusiastic effort in the former generations. City beauty is, however, heavily spoiled by a huge number of abandoned oil derricks and illegally tipped waste. The clearance of oil derricks will be a tough work because it necessitates the development of a steep scrap recycling system. The problem of illegal dumps should be tackled by the BCE, BEP and district EPs as proposed by the JICA team elsewhere.

4.2 Environmental Policy

4.2.1 Environmental Policy

The State Committee for Ecology is the body formally responsible within the Azerbaijan Republic for the formulation of environmental policy. However, this responsibility has, in practice, been neglected as, since independence, short-term economic pressures have taken greater importance within the country.

There has never been an environmental policy in the real sense of the word. The nature protection and environmental laws have always made clear (including those of Soviet times) that the environment has a prime place in human development, as does the current Constitution of the Republic. The purpose of the law is currently expressed as being "to ensure environmental protection through the preservation of ecological balance, prevention of harmful impact of economic and other activities on natural ecological systems, the conservation of biological diversity and rational organization of nature utilization". This alone has been the policy and the team is not aware of any other policy directives ever or now being in force.

The managers at the SCE refer to their policy making role. However, policy-making activities at State and Baku Committee levels are inefficient and ineffective, but it is important to recognise that there are several causes for this:

- there is a lack of reliable, relevant and consistent data concerning the environment. The information which is received is typically late[1], restricted[2] or suffers from inadequate measuring equipment;
- the State Committee (and by inference the Baku Committee) is not strong enough compared with the sectoral ministries (although this may be improving whilst the SCE Chairman is a deputy prime minister);

[1] The State Statistical Committee provides data only annually
[2] Hydromet (for example) does not share all the relevant data it collects

- there is an unclear regulatory framework and a lack of effective enforcement at local levels;
- policy, production and enforcement are frequently vested in one organisation[3], posing conflicts of interest;
- there is a real imbalance between short term economic pressures within those organisations in the Baku area which are still working and longer term environmental considerations;
- there are many instances of shared, duplicated, absent or unclear responsibilities, for example with Hydromet, State Geology Committee, Ministry of Health, Ecological Company of Republican Road Police and others;
- there is an insufficient budget to permit the formulation *and implementation* of any new environmental policies;
- the potential for NGOs[4] and other organisations to assist in environmental management has not been fully used within the Baku committee area.

It is also important to note that the Baku committee has no experience of policy formulation and implementation. The administrative and governmental systems have not encouraged this approach but only a tactical, responsive style of environmental management, dealing with problems after they occur.

4.2.2 National Environmental Action Plan

The National Environmental Action Plan (NEAP) was largely conducted at SCE level, although there was some involvement of regional staff in order to identify the problem areas, of which the oil pollution was a key factor, and predominant in the BCE area. This was a worthwhile start to defining the key issues and determining what environmental policies might be in the future.

The NEAP was published in 1998. The preparation of the document was funded in part by a grant from the World Bank, initiated in 1996. A high level steering group was established to guide its development and an expert team, comprising representatives from different government agencies and NGOs were active in its development.

The NEAP identifies:

- the main environmental problems;
- their causes;
- their impacts;
- possible solutions.

Problems and mitigation measures were reviewed and prioritised in accordance with three criteria:

- impact on public health and productivity;

[3] for example, Azerbmeshe (the State forestry concern) has responsibility for timber production, forestry management, tree planting and enforcement of regulations. Similar conflicts arise within Azerbaliq (State fisheries concern) and SOCAR (State Oil company)

[4] for example, the Society for the Protection of Nature is moribund and there is little structured or formal contact with others

- economic impacts;
- risk of irreversible damage to natural resources.

Actions were recommended on the basis of their urgency, importance for current and future economic development and availability of affordable solutions.

The key environmental problems and action priorities identified were:

- severe pollution damage caused by industries, oil exploration and production, and energy;
- the threat of irreversible collapse of the sturgeon stock triggered by the loss of reproductive capacity, pollution and overfishing;
- deteriorating water quality, especially of drinking water in both rural and urban areas, causing an increase in water borne diseases;
- loss of fertile agricultural land from erosion, salination, pollution with heavy metals and chemicals, and deteriorating irrigation systems;
- loss of forestry cover (mainly in war affected areas);
- threats to protected areas leading to a loss of biodiversity;
- damage to the Caspian costal zone caused by flooding from sea level rise and pollution;
- deterioration of the cultural heritage due to natural causes, aggravated by modern environmental problems such as acid rain and uncontrolled development.

Significant constraints on environmental management were also indicated:

- lack of integrated environmental and economic policies;
- a need for environmental policy reform;
- a need for strong education and enforcement mechanisms.

The NEAP was approved by the Cabinet of Ministers and individual ministries and recommended the instigation of the Urgent Environmental Improvements Project (UEIP). This project was initiated in November 1998 and approved four components:

- restoring the capacity within Azerbaijan to produce sturgeon fry by building a new hatchery in the Kyur river delta;
- preventing and mitigating environmental pollution in on-shore fields near Baku and developing a programme of best environmental practice for exploration of these fields;
- cleaning up and decontaminating areas heavily polluted by mercury in the Absheron peninsula at Sumgayit;
- strengthening the institutional capacity of the government to develop environmental management systems, including regulations, performance monitoring and improved performance of economic instruments.

This work has now been commenced (although all aspects except the last are at least twelve months delayed) and are funded by WB and bilateral donors, including the UK government and the Japanese government.

A review of the NEAP in detail is shown in below, describing how the NEAP findings relate to the BCE area.

Paragraph numbers refer to the NEAP document.

Economic transition and the environment

Paragraph 7 The economy of Azerbaijan depended heavily during soviet times on the oil, gas and petrochemical sectors, with an agricultural sector specialising in cotton, grains, fruits and vegetables. Heavy industry was concentrated in the Absheron peninsula, much of it in Sumgayit with on and off shore oil and gas facilities within the Baku committee area.

Paragraph 8 Little environmental consideration was given to the industrial developments at that time and the population of Baku has suffered from high levels of air pollution, occupational health risks, exposure to highly toxic waste and water pollution. Oil production has left behind vast areas of standing oil ponds and severely contaminated soil, a shoreline which is black with oil residues and high levels of pollution in the Caspian Sea.

Paragraph 9 Since the break up of the Soviet Union, economic output has declined dramatically. Many heavy industry complexes in the area are now either not operating or are reduced to a small proportion of their maximum output.

Paragraph 10 This decline in production has brought some environmental benefit as air pollution has been reduced (although it remains a concern); industrial water discharges and pollution from agro-chemicals have also declined. The accumulation of toxic industrial waste, heavy metals, pesticide residue and oil pollution remain. Air pollution from road transport is increasing due to the highly polluting and poorly maintained urban bus and Baku taxi fleet[5], an aging vehicle fleet (although casual observation suggests this may now be slowly improving with many newer Japanese and western vehicles being seen) and import of older Russian made vehicles with limited or absent pollution controls.

Paragraph 11 Lack of funding prevents proper management of all aspects of environmental performance.

Paragraph 12 The economic conditions within the country make it difficult to allocate appropriate levels of environmental financing.

Paragraph 13 The Baku committee expenditure issues are addressed elsewhere.

Health impacts

Paragraph 15 The negative health impacts will be concentrated in the Absheron peninsula as this is the major source of much pollution and Baku the predominant centre of population.

Paragraph 16 The war with Armenia has resulted in a large population of displaced persons (IDPs) living in areas where public services have become overburdened, giving rise to a greater incidence of disease.

Paragraph 17 Air quality is the area of highest concern at present.

Paragraph 18 Baku is the area with the greatest pollution problem, caused by large point sources and the increase in vehicular traffic. In Baku during 1993 to

[5] many of the newer yellow and white taxis in the city are poorly maintained, although in general they appear in a better state of repair than the "private" Volga and Zhiguli taxis

1995 the annual air concentration of soot averaged about 95 μg m^{-3}. The Azerbaijan standard is 50 μg m^{-3} . There is no air quality monitoring data available for lead.

Economic and social impacts

Paragraph 20 Economic and social costs will be felt particularly in Baku, the area of highest population and economic activity.

Paragraph 22 Much of the land in or near Baku could become valuable residential land. However, oil pollution has degraded the quality and value of the land. Using a value of say, US$ 10 000[6] per hectare for land in and around Baku, the value of the now useless polluted land would be US$ 100 million. There is also additional pollution damage to buildings and equipment, caused for example by increased corrosion rates.

Pollution damage from industry, oil production, energy and transport

Paragraph 28 The main reason for severe air, water and soil pollution is the presence of outdated technology, malfunctioning equipment or absent pollution prevention or abatement equipment. In the event of economic recovery, pollution levels are likely to increase in the absence of new environmental measures.

Air Pollution

Paragraph 30 Data from 1991 to 1995 show that one or more of the major air pollutants were present in Baku at levels up to five times higher than those allowed by Azerbaijan's air quality standards. Volatile organic hydrocarbons are the most obvious pollutants in Baku, although these are not monitored on a regular basis.

Paragraph 36 The primary source of atmospheric pollution is the release of associated gasses by the oil industry. The problem is exacerbated by worn out or outdated collection equipment for the oil and gas, resulting in large losses. In the Baku area, volatile organic hydrocarbon releases in the Baku area were 500 000 tons in 1995, reduced to 200 000 tons in 1996. Emissions were around 45 000 tons when the NEAP was written. The severity of the radiation contamination associated with oil production industries is unclear.

Paragraph 37 In Baku, emissions of industrial pollutants unrelated to the oil industry are relatively small, except for the emissions of CFCs from Bakonditioner (air conditioner plant) and 8 000 tons of dust from the Karadag cement plant.

Paragraph 39 Traffic is a growing problem in air pollution, and within Baku is more important than industry and power production. When written, the NEAP reported a car-pool for the country as a whole of 115 000[7], but anecdotal reports suggest this figure is now over 200 000. There are reports of well over 250 000 vehicles[8] in Baku. The NEAP reports 90 percent as over five years old, and more than 40 percent as over ten years old.

Paragraph 40 Gasoline is a source of ambient lead, as about 10 percent of high octane gas is leaded.

[6] figure used by World Bank in its calculations and analyses
[7] passenger cars only
[8] including busses and trucks

Paragraph 44 To reduce traffic pollution, the national strategy must address the issues affecting Baku in particular. Regulations should restrict the import of highly polluting vehicles and requirements for catalytic converters on newer vehicles. Reports indicate that these regulations are widely flouted[9].

Water pollution and consumption

Paragraph 49 Water resources in Azerbaijan are limited and there are shortages of drinking water supplies in some areas, although the average consumption of drinking water at 130 litres per day is relatively low by international standards. Of the drinking water distributed to the Absheron peninsula, around half is lost in the pipe distribution system.

Paragraph 50 These inefficiencies are compounded by the rising ground water levels. In some zones of Baku, the top of the water table could reach within 0.5 to 1.0 metres of the surface if regular daily pumping stops. Baku's sewerage system has been in operation for 50 to 100 years and does not have the capacity to handle today's domestic sewage load. As a result, municipal wastewater is leaching into near-surface ground water and posing a public health threat.

Paragraph 52 Much of the Caspian Sea coast of Azerbaijan is polluted, in particular the Baku Bay area. Oxygen levels in Baku Bay are generally very low, typically 18 to 20 percent of the levels to be expected in a healthy biological system.

Paragraph 54 In Baku, more than 40 percent of the housing districts are not connected to the central sewage network and only 50 percent of the volume which is connected undergoes treatment. The total discharge of waste water from Baku to the Caspian Sea is 1.3 to 1.4 million cubic metres per day.

Paragraph 55 In Baku, one refinery is the single most significant contributor to industrial water discharge.

Paragraph 56 However, one refinery in Baku recirculates all of its process water, although most industries do not.

Paragraph 60 In order to implement pollution reduction efforts, a proper monitoring system is required. Whilst this should rely in part on self monitoring, a managed system is required.

Soil pollution from industry, energy and transport

Paragraph 62 On shore ponds of oil in and around Baku cause severe pollution. It will take a very long period for the elements (in particular the heavy metals) to degrade to half their current concentrations.

Paragraph 63 Much of the 10 000 hectares of heavily oil polluted lands within the Absheron peninsula are within the BCE area. In a press release through Azer-press dated 28 March 2000, the official figure for polluted land in the Absheron peninsula is 7 380 hectares, but acknowledges an unofficial figure of 10 000 ha.

Paragraph 64 Dealing with this contamination will be both expensive and technically difficult. To date there is no agreed policy for dealing with the land.

[9] Interviews by team members with Eco police in 1999 confirm this

The environmental impact of oil exploration

Paragraph 65 Development of the oil and gas sector is key to Azerbaijan's economic recovery and to the direct economy of the Baku area. It is important to note that Azerbaijan does recognise the adverse effects of the oil industry on the environment and is committed to taking steps to prevent or mitigate the adverse environmental impact.

Paragraph 66 Environmental Impact Assessments have been carried out on the newer oil field developments and this process will continue.

Paragraph 67 Oil companies have made commitments with regard to environmental management systems for the Shakh-Deniz project and for other operations in the Caspian Sea.

Paragraph 68 At the time of writing the NEAP, discharges by the oil industry of pollutants to sea was still being carried out, in direct contravention of regulations then in force.

Paragraph 71 Oil pipelines are being constructed and the relevant international agreements are being or have been negotiated. As these pipelines originate in the BCE area, there will be implications for the BCE in the event of accidental spillage.

The Caspian Sea

Paragraph 79 The rising levels of the Caspian give rise, inter alia to secondary pollution of the sea from oil fields, in particular the Biby-Eybat oil field on the outskirts of Baku. The soil in these fields is heavily polluted with oil which may seep into the Caspian through the groundwater. A barrier has been erected, but the Caspian has already flooded many oil pump installations and oil polluted lands at lower levels.

Paragraph 80 The potential to damage the infrastructure of the rail and road network would indicate the necessity to relocate the main road from Baku south towards Astara and Iran and require a full investigation by the BCE into what immediate actions should be taken.

Cultural Heritage

Paragraph 119 The Icheri-sheher is an urban architectural monument of the middle ages and is seriously threatened by its state of disrepair. It is imperative that as much of the cultural history surviving is preserved.

Paragraph 120 The problems in that area are exacerbated by acid rain and other forms of environmental degradation, in particular air pollution.

Paragraph 123 The new buildings within the Icheri-sheher have been designed and constructed without architectural impact studies and the NEAP recommends that this is redressed.

Summary

It is clear that many of the environmental issues identified in the NEAP apply to the country as a whole and to Baku by implication. For example, issues of biodiversity,

forestry, flora and fauna and ecology generally will apply to areas within the BCE area.

However, there are many issues relating principally to the oil and gas industry and to traffic generated air pollution which are particularly pertinent for the BCE.

4.3 Institution

4.3.1 Organisation

a. State Committee on Ecology

The structure of the SCE is shown in Figure 4-4. It comprises:

- seven divisions, each divided into two or more departments and sectors;
- 29 local ecology committees;
- 14 nature reserves and some 20 preservations.

The chairman of SCE is Deputy Prime Minister Hassanov, who retains responsibility for the Committee in addition to a broader portfolio. There are also two deputy chairman posts, currently vacant. The total staff of the SCE is 1,278[10].

As has been recognised by the World Bank and other bodies, the current SCE requires major restructuring in order to enable the significant environmental management task facing Azerbaijan today to be met. Policies need to be determined in a coherent and integrated manner, ensuring that there is common understanding and a balance between the needs of different sectors, priorities and pressures.

The Cabinet of Ministers is not able to determine the *specifics* of policies proposed and an alternative mechanism needs to be adopted. This will require an informed decision making process to be adopted, transcending existing ministries and state committees. Currently there are many central, state-controlled entities, each responsible for a different aspect of environmental management and policy-setting. This situation makes decision making difficult, and the formal procedures controlling decision making hamper quick, flexible responses to environmental management issues or environmental disasters.

In order to achieve this restructuring and empower the SCE, the World Bank has identified the SCE as one of the pilots for a wider-ranging governmental reform programme. That programme aims to assist the GoA identify a new central structure in order to simplify and make more transparent the legislative and executive processes. This process is also anticipated to make the legislative process more participative and inclusive, ensuring for example that the poor are not unfairly treated[11]. Overall, this programme is likely to take some seven years (ie till 2006) to complete and an interim process will need to be developed as some state bodies (including the SCE) operate in a new framework whilst others remain outside. The WB recognises that this will place great strain and pressure on those within the pilot bodies (SCE, Ministry of Health and Ministry of Education) during the transition period.

[10] 1998 data – stable for 3 years+

[11] Clearly, in a country which has over 1 million IDP and refugees without a clear electoral voice, there are major obstacle to this objective

At this stage, the WB is considering the structure of a technical assistance programme to enable the SCE to make the desired changes and is starting to address this issue with the Office of the President.

The newly reorganised SCE (probably as a ministry) will be responsible not only for policy development, but also for ensuring its adoption into the appropriate legislative framework. Policy setting will be one of the key responsibilities of the Minister, to ensure that the relevant policies are adopted at the highest levels and followed through by others. Under the structure proposed, a deputy minister will have overall day-to-day responsibility for policy setting and development.

Clearly, whatever structural and institutional changes occur, there will be significant implications for the regional offices, including the BCE. These bodies will become responsible for more effective, efficient and equitable implementation of environmental management, including pollution control, local policy development (and informing the SCE/Ministry of policy implications and development issues) and enforcement.

b. Baku Committee for Ecology

The Baku Committee for Ecology and Nature Utilisation Control (BCE) is the committee within the State Committee covering the largest population within Azerbaijan. The major urban conurbation, the coastline, on and off shore oil production and scarcely populated areas to the south of Baku each present different environmental challenges for the committee.

The BCE has historically been organised along conventional lines, inherited from the soviet structures.

Due to illness, there have recently (May 2000) been changes to the structure and these are reflected in the figures below. Figure 4-5 shows the structure at March 2000, whilst Figure 4-6 shows the newly revised structure. Total staffing is currently shown as 89 (including the chairman).

The reporting lines are currently undefined and this must be seen as a serious concern, as departments operate without clear leadership and reporting lines. Previously, as with many Azerbaijani institutions, reporting was direct to the chairman who had a wide span of control. As described above[12], decisions are rarely taken other than at the highest levels and it has not historically been clear what the role or functions of deputy chairmen (including the first deputy chairman where this post existed) were.

In making the recent reorganisation, the chairman has sought to introduce the positive management reforms intimated in the review of environmental management undertaken with the SCE as part of the UEIP project.

However, there needs to be a clear definition of the tasks, roles and responsibilities of the BCE to be implemented as part of the reform process. In particular, there will be a need to separate policy making from enforcement functions and develop the institution's capacity to educate and inform the community to effect compliance with best environmental practice.

[12] Section 2.1.3 of the main report refers

The process of planning and policy-making must cover all parts of the economy operating within the BCE area, and also public health issues and both the short and long term economic drivers. It will be essential to develop mechanisms for effective exchange of ideas and information amongst productive sectors of the economy and other interest groups, (including NGOs) soliciting and encouraging their active involvement in seeking to achieve the environmental objectives.

The BCE will need to work with the SCE and other governmental agencies to ensure that unnecessary replication is kept to a minimum (for example in measurement, standard setting, policy development, environmental economics etc).

As the SCE transforms to a ministry, the BCE will need to have a structure reflecting the priorities mandated for it in the charter which will be constructed. The clear focus for the BCE will be on implementation of environmental policy to ensure:

- effective local implementation, reducing pollution and identifying likely problem areas through a licensing and permitting regime;
- efficient management of its own operations and support for industry and the population through enhanced professional standards;
- equitable approaches to ensure that no organisation in the Baku area is treated more or less severely in assessing environmental impact, in assessing environmental liability or in monitoring, control and enforcement.

The work currently being undertaken in developing a master plan for the BCE clearly seeks to identify those skills and knowledge areas which the current BCE will require in order to carry out its rôle in the future.

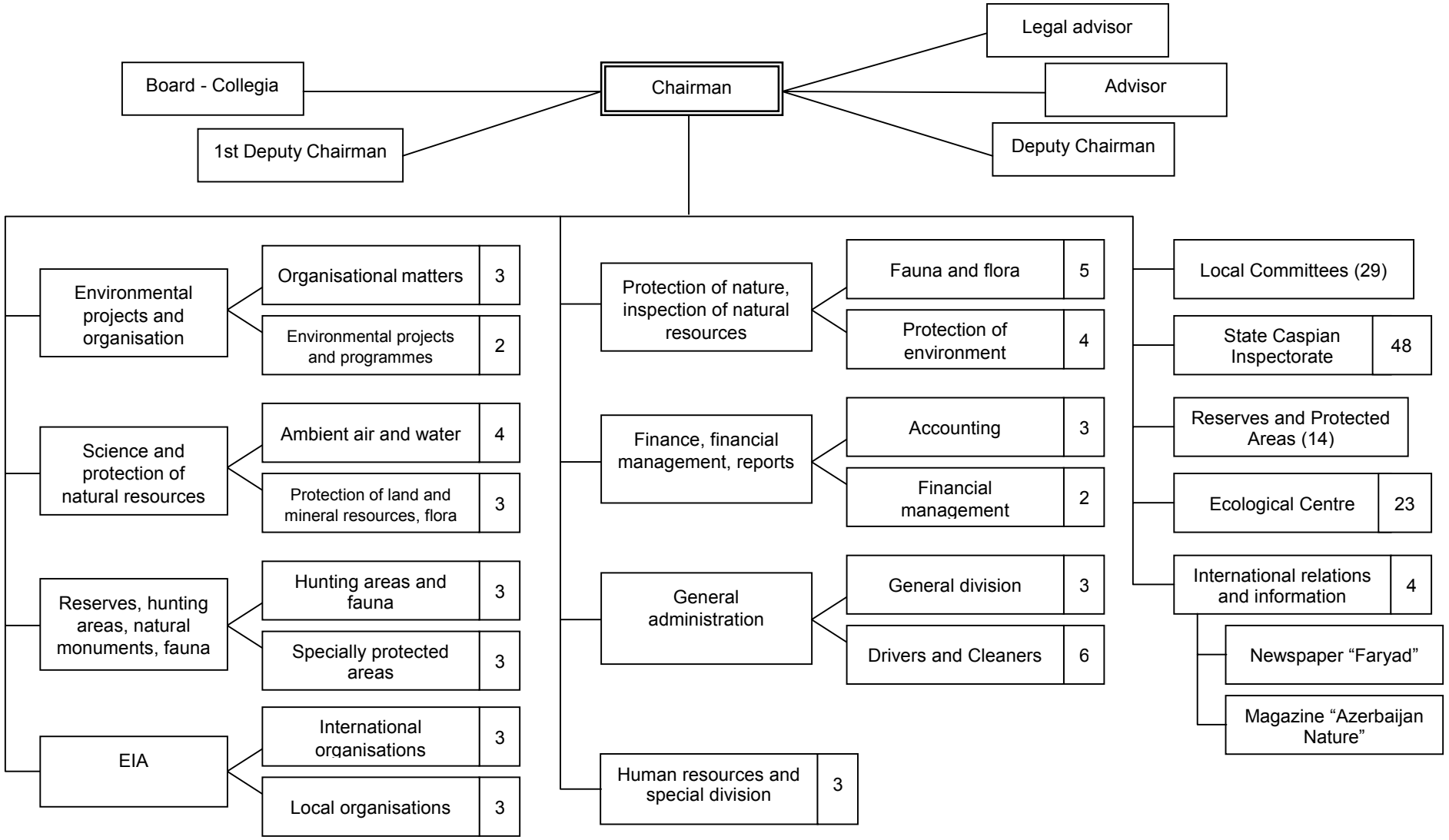


Figure 4-4: State Committee for Ecology; Organisation Structure

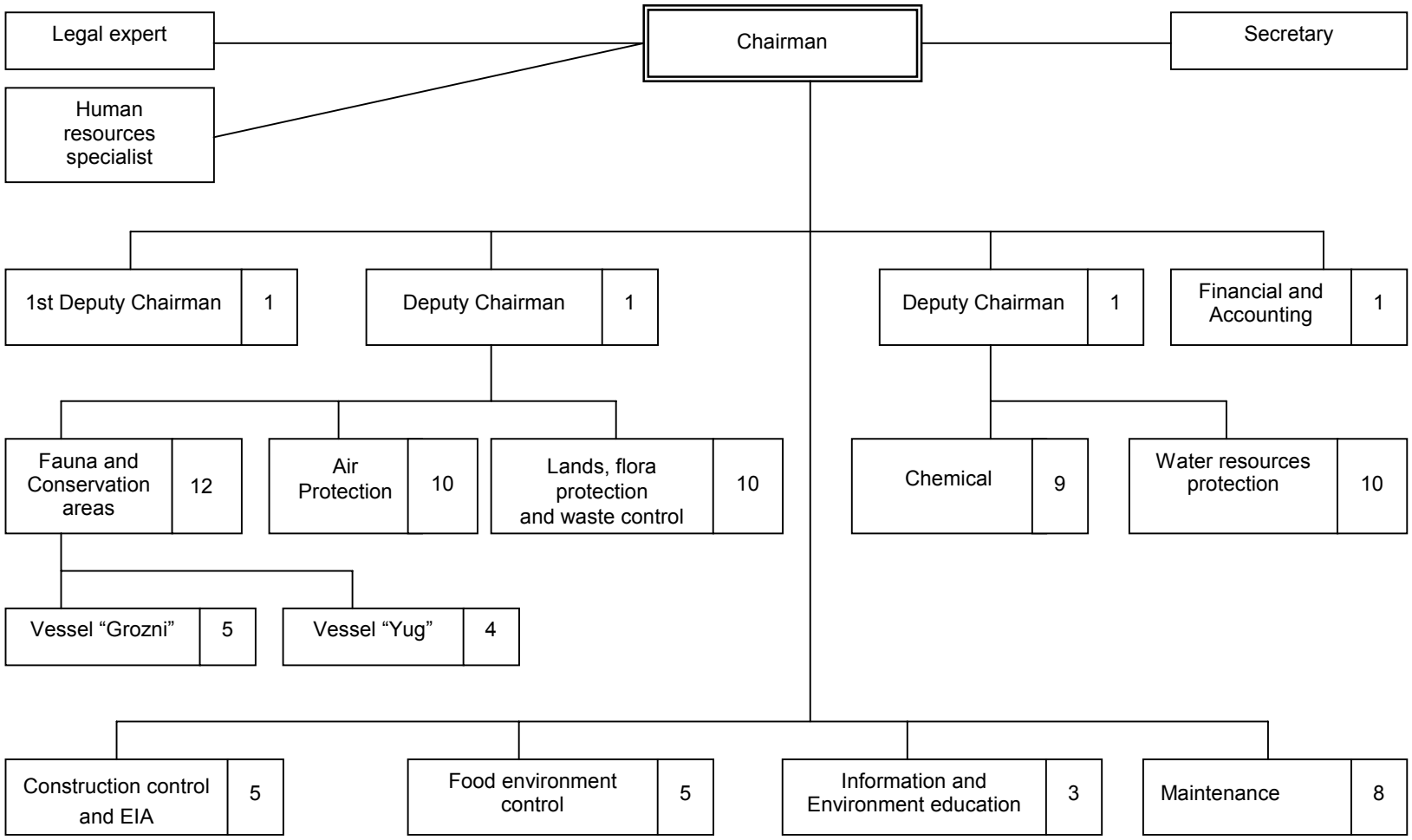


Figure 4-5: BCE: Organisational Structure March 2000

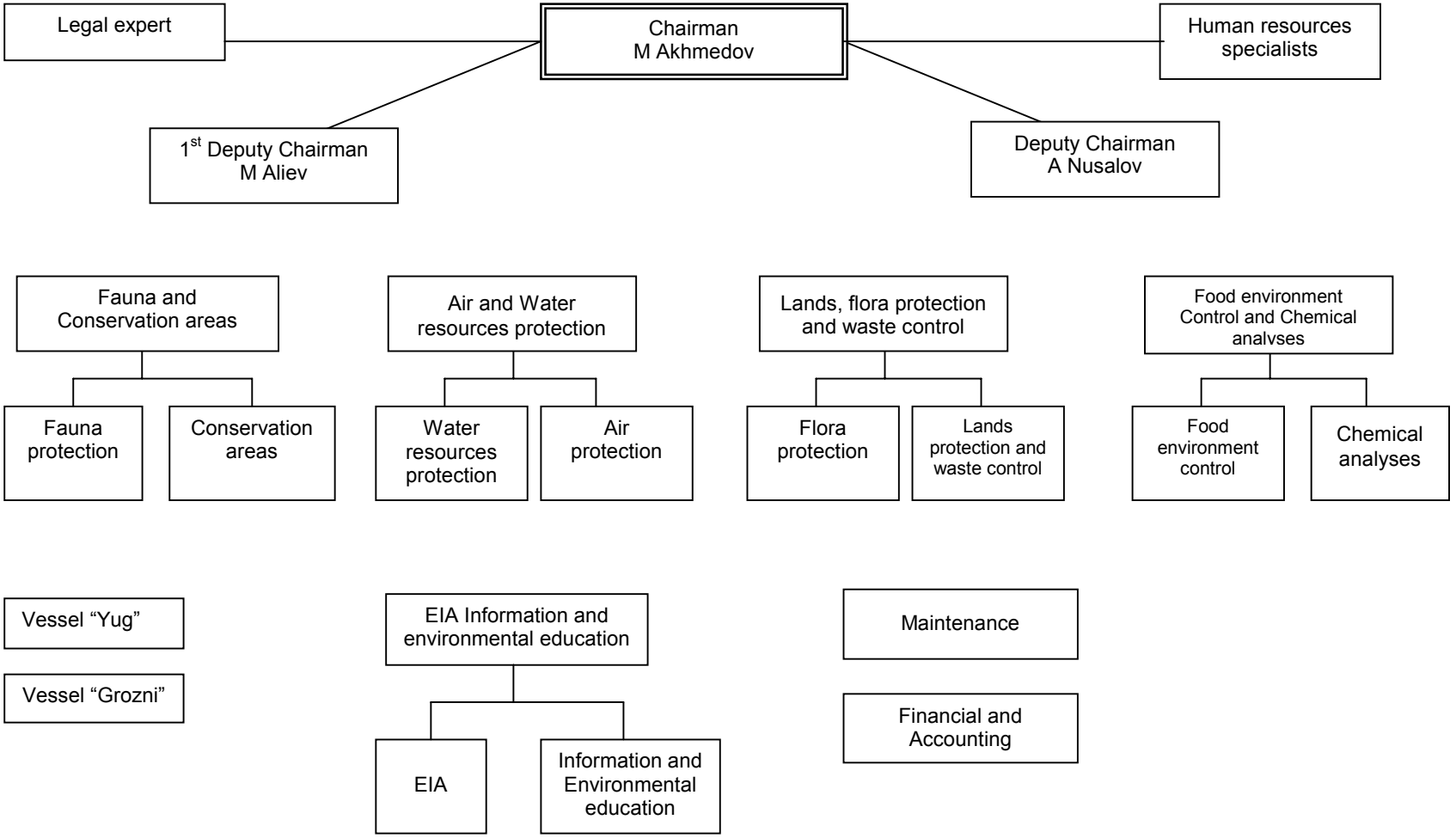


Figure 4-6: BCE: Organisational Structure May 2000

4.3.2 Legislation

a. Introduction

Following independence after the break-up of the Soviet Union, the GoAz recognised that there were significant shortfalls in environmental practices (although there were standards in place), and introduced a law on the environment and determined the charter for the SCE. The Soviet system had dictated a large number of quantified standards, but these were largely ignored. In many cases the numeric standards set bore no relation to what was achievable anywhere in the world and there was no effective means of encouraging organizations or firms to move towards the achievement of these standards. Enterprises reported their environmental performance on an arbitrary basis, generally having taken no measurements and with little regard for best practice. At this stage, it is difficult to secure reliable information about the standards. However, anecdotally it is reported that the standards were often set so as to be better than western countries. For example, if a pollution level of 10 ppm of some pollutant was the maximum acceptable in one country, then the Soviet system imposed a limit of say 5 ppm. This may well have been at time when no one was capable of achieving a result better than 15 ppm.

Initially, as with most aspects of public administration, these were based on soviet custom and practice. The charter of activities clearly laid out the remit of the SCE as a whole and its departments.

The SCE is now the main organisation responsible for developing and implementing the GoAz's environmental policy.

The environmental legislation of Azerbaijan is based on the *1995 Constitution of Azerbaijan* and the *1991 Act of Independence of Azerbaijan* which stress that the environment and all natural resources of the Republic are the property of the Azerbaijan nation. The *Constitution* states that the citizens of the Republic are obliged to protect nature and its resources. For the benefit of the present and future generations, the state has the responsibility to take the required measures for protection and scientifically justified rational use of land and its subsoil, water, vegetation and animals; for keeping water and air clean; for ensuring reproduction of natural reserves; and for improving the human environment.

The primary environmental legislation of the country was, until recently, the *1992 Law on Nature Protection and Nature Use in the Azerbaijan Republic*. The State Committee for Ecology (SCE) has recently been involved in the process of redrafting the country's environmental framework legislation. A revised *Law of the Azerbaijan Republic on Environmental Protection and Natural Resource Use* (the 1999 Law) has been approved by parliament.

A copy of the law is shown in the Data Book at Chapter 4.2. Many of the normative documents required to make this legislation effective have yet to be introduced. In the interim, the position is uncertain and interpretation of what is appropriate is left to individual inspectors and managers within the BCE and other committees. This partially explains the poor environmental standards achieved (if in doubt do nothing) and the reluctance of the BCE to instigate legal proceedings against companies.

b. The SCE's and BCE's responsibilities

The SCE's responsibilities include monitoring environmental conditions in the country, issuing permits for allowable discharge and disposal of contaminants, inspecting enterprises, suspending or shutting down enterprises which violate environmental laws, regulations or permit terms, and developing the state's ecological expertise.

These responsibilities are the basis of those applying to the BCE and other regional committees.

The GoAz has recognised that it is appropriate to review these responsibilities, and is revising the SCE's Charter so that it will provide a more effective and flexible basis to address current and future environmental management priorities.

The current regulatory regime for environmental management spreads responsibility among different government departments. Sector ministries take responsibility for the environmental issues within their sphere of competence, and some responsibilities remain with organisations that existed before the SCE was established. The SCE believes that it would be more efficient and effective to consolidate key environmental management duties under one agency. The 1999 law *might* have effected the changes needed to bring this about. However, at this stage this has not occurred.

A copy of the BCE charter is shown in Section 4.3 of the Data Book.

The table below illustrates the issues relating to the implementation of each article within the 1999 law on environment as they impact upon the BCE

Table 4-17: The 1999 Law on Environment

Article Number	Baku Issue		Implications
	Yes	No	
1		no	
2		no	
3		no	
4	§2.2 §2.3		EIA organisation Protection, restoration and utilisation of Flora and fauna
5	yes		Enabling legislation
6	§1.1 §1.2 §1.7		Citizens' rights to information Citizens' rights to compensation Citizens' rights to comment on EIAs
7	§1.3		Organisations' rights to information
8		no	
9		no	
10		no	
11	yes		Special licenses
12	yes		Cadastre and records
13	§1.3		Collection of fees etc
14	yes		Licensing
15		no	
16	yes		Contribution to cadastre
17	yes		Monitoring

18		no	
19		no	
20		no	
21	yes		Certification
22	§3		Collection of fines and fees
23		no	
24	yes		Fines and fees
25		no	
26		no	
27	yes		Fund mechanism
28		no	
29		no	
30		no	
31		no	
32		no	
33	yes		How are these limits checked?
34		no	
35		no	
36	yes		Design planning
37	yes		Design planning
38	yes		Supervision of construction
39	yes		Evaluation post bankruptcy - unusual
40	yes		Evaluation post liquidation - unusual
41	yes		Evaluation at commissioning stage
42	yes		Factory inspection
43	yes		Policy for city planning
44		no	
45		no	
46		no	
47	yes		Solid waste disposal management
48		no	
49		no	
50		no	
51	yes		EIA and food production issues
52	yes		EIA
53		no	
54	yes		EIA
55	yes		EIA
56	yes		Accounting for EIA
57	yes		Quality control
58		no	
59	yes		Specialist’s training
60		no	
61		no	
62	yes		Protected areas
63	yes		Statistics
64	yes		Quality control
65	yes		Emergencies
66	yes		Emergencies

67	yes		Local procedures?
68	yes		Compensation
69		no	
70		no	
71	yes		Understanding the powers
72		no	
73		no	
74	yes		How are staff insured?
75		no	
76	yes		Appointment of auditors
77	yes		Certification of auditors
78		no	
79	yes		Compensation
80		no	
81		no	
82		no	

It is clearly a source of concern that neither the SCE nor the BCE are sufficiently well equipped or resourced to provide the range of services and facilities required to meet their obligations under the law.

It is essential that an adequate budget funding allocation is made in order to secure the long term provision of environmental services to the population of Baku.

4.3.3 Financial System

a. Azerbaijan Financial System

The financial system of Azerbaijan is centralised. Although a law pertaining to the "Financial Foundation of Municipalities" was promulgated in December of 1999, it is considered to take several years to realize.

The allocation of the national budget is done in two ways: a) through the Baku Executive Power (EP) to the District EPs in Baku, or b) through the 21 state committees to every district committee (e.g. SCE to regional organisations including BCE).

Aside from the general budget which is allocated from the central government, each district organisation has an *off-budget* that is a measure of their degree of self-sufficiency (the off-budget is mainly derived from enterprises). The district organisations are obliged to report regularly to the Ministry of Finance on off-budget resources.

b. Environmental Committee Budget

b.1 SCE Budget

b.1.1 Budget Scale

The 1999 overall budget of SCE was 3,159 million manat (US$767,000), only 0.1% of the central government budget. The "budget" resources, which were 74% of requested budget, accounted for 86% of the overall budget. The "off budget"

resources, 14% of the overall budget, was only 30% of the initial target to be collected.

The "budget" has increased by more than 20%, but "off budget" got only 46% of actual figure in 1998. Of the 8,734 million initially requested for the 2000 "budget", only 3,000 million manat was acknowledged. There are no replies to the following expenses: survey expenses, repair expenses, fee for participation in international organisation activities/programs, and capital.

Table 4-18: SCE Budget

(unit: million manat)

		1998	1999		2000
		Actual expenditure	Initial budget	Actual expenditure	Initial budget
SCE	Budget*	2,221.0	3,666.3	2,711.8	2,999.7
	off-budget*	975.0	1,514.0	446.8	991.8
	Total	3,196.0	5,180.3	3,158.6	3,991.5
Reference	Environmental protection fund collected by SCE	711.4	203.0	174.5	205.0
	State Budget**	2,641,709	?	3,208,000	3,930,935***

Notes: * including Regional Committee on Environment
Source: Financial department of SCE
** Statistical Yearbook of Azerbaijan 2000, SCS
*** Main Macroeconomic Indexes of Azerbaijan 1999, TURAN news agency

b.1.2 Revenue of the First Three Quarters in 2000

The revenues of the first three quarters in 2000 (from January to September) are 2,074.5 million manat (US$456,000), 1,938.7 million manat by "budget" resources and 135.8 million manat by "off budget" resources. The "budget" resources include the allocation for Regional Environmental Committee (CEs), but "off budget" resources did not include the "off budget" collected by Regional CEs in the figure. There is other budget amounted 634.7 million manat for the eco-center and 14 sanctuaries, which are operated based on fee revenues. But this budget does not include that for the Absheron sanctuary in Baku.

The revenue of "off budget" was 45% of the initial plan (300 million manat for 9 months of 400 million manat for year), while the "budget" was 86% of the initial budget bill (2,250 million manat for 9 months of 3,000 million manat for year).

b.1.3 Expenditure of the first three quarters in 2000

The SCE budget allocated from Ministry of Finance means the revenue in one side and the expenditure in other side. The expenditure of "off budget" should be reduced if the revenue of "off budget" was less than the plan.

The expenditure of "off budget" in the first three quarters was 105.3 million manat, and 37% of the initial plan (282 million manat for 9 months of 376 million manat for year).

Table 4-19: Breakdown of Expenditure in SCE

Unit: 1,000 manat

	Initial plan for three quarters (A)	Jan – Sep			B/A (%)
		Budget	Off-budget	Total (B)	
Salary & Wage	1,372,214	1,110,714	43,038	1,153,752	84.1
Social Fund	452,831	366,650	14,013	380,663	84.1
Goods & Services for Office	570,614	456,315	10,269	466,584	81.7
Repair Services	45,000	5,000	17,310	22,310	49.6
Tax etc.	16,128	0	16,045	16,045	99.5
Capital Expenditure	75,000	0	4,665	4,665	6.2
Total	2,531,787	1,938,679	105,340	2,044,019	80.7

Source: Financial Department of SCE

Approximately 56% makes up the direct personnel expenses; personnel expenses, including social insurance, amount to 75% of the overall budget. Other 25% expenses were mostly paid to maintain the office including utilities and maintenance. Only 0.2% of overall budget, 6% of the initial plan, was expended for capital outflow.

b.1.4 Environmental Protection Fund

The Environmental Protection Fund (EPF) is considered a separate account for environmental management and/or environmental improvement, but it has been hardly used for such purposes at present. Almost all are transferred to the Ministry of Finance. The fund has not contributed to SCE budget, though SCE has the responsibility to collect the fund. The fund collected by SCE was 609.0 million manat in the first three quarters of 2000, which includes that collected by regional CEs. SCE was allocated partly to purchase personal computers in few years ago.

But it is necessary to use the fund for environmental management and environmental protection effectively because the fund is a key instrument for the "polluters pay principle" in Azerbaijan. And it is more important to assist the finance of investment executed by SCE/BCE in future.

The collected amount of the environmental protection fund records 81.2% of the initial plan (750 million manat for 9 months of 1,000 million manat for year), while the "off budget" were collected only 45% of the initial target.

b.2 BCE Budget

b.2.1 Budget Scale

The 1999 overall budget of BCE was 426 million manat (US$103,400), only 13% of the SCE budget. The "budget" resource, 70% of the overall budget, as 75% of the initial budget has been gained. The "off budget" resources, 30% of the overall budget, as only 17% of the initial target have been collected.

Table 4-20: BCE Budget

Unit: million manat

		1998	1999		2000
		Actual expenditure	Initial budget	Actual expenditure	Initial budget
BCE	Budget	151.6	392.8	296.3	427.0
	Off-budget	166.0	756.5	129.4	385.0
	Total	317.6	1,149.3	425.7	812.0
reference	Environmental protection fund collected by BCE	213.7	203.0	174.5	205.0
	SCE budget	3,196.0	5,180.3	3,158.6	3,991.5

Source: Financial department of SCE and BCE
* Main Macroeconomic Indexes of Azerbaijan 1999, TURAN news agency

The overall budget has increased in 1999 by 34%, though "off budget" resources have decreased, as 78% of actual figure in 1998. The "budget" resource has been increased by about 100%.

b.2.2 The Characteristics of BCE Budget

The BCE budget allocated from Ministry of Finance through SCE means the revenue in one side and the expenditure in other side. The expenditure of "off budget" should be reduced if the revenue of "off budget" was less than the initial plan.

The actual "off budget" revenue in 1999 was only 17% of the initial plan. That depended on the BCE services for EIA examinations mainly.

Table 4-21: Breakdown of Off-budget Revenue in 1999

Unit: 1,000 manat

	Initial plan for 1999 (A)	Actual (B)	B/A(%)
EIA Examination	n/a	90,524	n/a
EIA document	n/a	30,000	n/a
Land Allocation	n/a	8,950	n/a
Total	7,400,000	129,474	17.5

Source: Financial Department of BCE

It is said that the services for EIA document was transferred to Eco-centre in SCE, and the almost all EIA examination have finished until 2000. That causes the "off budget" revenue more strict.

Approximately 50% makes up the "budget" for direct personnel expenses (salary and wage); personnel expenses, including social fund, amount to 67% of the overall budget in 1999. Other expenses mostly refer to office expenses and repair of furniture and equipment, and does not cover capital outflow.

Approximately 95% of salary and wage was gained from "budget" resources, while only 3% of repair services was got from "budget" resources. Small portion of goods and service for office was allocated from Central government, especially for telephone and electricity, e.g. 2 months expenses for telephone in 12 months. The transportation expenses were not paid to the inspectors when they visited factories in

Baku. That causes environmental management by BCE inactive, unstable and irresponsible.

Table 4-22: Breakdown of BCE Expenses (1999)

(unit: 1000 manat)

	Initial	Actual		
		Budget	off-budget	Total
Salary & Wage	330,368	196,347	11,421	207,768
Social Fund	115,629	69,706	8,653	78,359
Goods & Services for Office	251,272	28,210	44,957	73,167
Repair Services	260,548	2,000	64,395	66,395
Capital Expenditure	150,000	0	0	0
VAT	20,805	0	0	0
Total	1,149,350	296,263	129,426	425,689

Source: Financial Department of BCE

The collected amount of the EPF was 204 million manat as 76% of the billing amount in 1999. It was more than double of "off budget" revenue. There was tendency to be paid at the end of year.

b.2.3 Revenue of the first three quarters of 2000

The overall revenues of the first three quarters in 2000 are 349.7 million manat, total 257.9 million manat by "budget" and 91.8 million manat by "off budget". The share of "off budget" was 26% in the overall BCE budget.

The BCE budget allocated from Ministry of Finance is shown in the following table.

Table 4-23: Breakdown of Budget Revenue (Expenditure)* in BCE

Unit: 1,000 manat

	Initial plan for 2000	Jan – Sep		
		Initial for Three quarters (A)**	Actual (B)	B/A (%)
Salary & Wage	260,518	195,389	165,989	85.0
Social Fund	84,300	63,225	54,482	86.2
Good & Services for Office	82,200	61,650	37,423	60.0
Repair Services	0	0	0	0.0
Capital Expenditure	0	0	0	0.0
Total	427,018	320,264	257,894	80.5

Note: * The "budget" means the revenue in one side and the expenditure in other side.
** Initial budget for 2000 x 3/4

The "budget" for direct personnel expenses makes up 64% and that for personnel expenses including social fund, amount to 85% of the "budget" resources. Basically the salary for the permanent employees was paid, though the salary level was very low (average monthly salary is 152,000 manat). And the rises of salary, planned in the initial budget, have not been carried out.

The "off budget" resources depend on the BCE service for EIA examination mainly. The target of 385 million manat was decided from the expenditure needed for BCE without detail revenue plan and effective measures.

Table 4-24: Breakdown of Off-budget Revenue in BCE

1000 manat

	Initial for 2000	Jan – Sep		
		Initial for Three quarters (A)	Actual (B)	B/A (%)
EIA Examination	n/a	n/a	72,989	n/a
Land Allocation (Land & Flora)	n/a	n/a	12,236	n/a
Laboratory	n/a	n/a	6,619	n/a
Total	385,000	288,750	91,844	31.8

Source: Financial department of BCE

b.2.4 Expenditure of the first three quarters of 2000

The "off budget" expenditure was only 26% of the initial plan, 287.5 million manat for 9 months of 383 million manat for year, though the "budget" expenditure was 80% of the initial budget.

Table 4-25: Breakdown of Off-budget Expenditure in BCE

Unit: 1,000 manat

	Initial for 2000	Jan – Sep		
		Initial for Three quarters (A)	Actual (B)	B/A (%)
Salary & Wage	38,000	28,500	11,684	41.0
Social Fund	12,540	9,405	3,193	34.0
Good & Services for Office	77,000	57,750	33,887	58.7
Repair Services	65,000	48,750	27,098	55.6
Capital Expenditure	180,000	135,000	0	0.0
VAT	10,836	8,127	0	0.0
Total	383,376	287,532	75,862	26.4

Source: Financial Department of BCE

The expenses for goods and services for office, and that for repair services are majority. 20% of "off budget" was spent for the personnel expenses, which includes wages for temporary employees including social fund and the bonus for permanent employees. It is said that these personnel expenses was cut down drastically by Ministry of Finance, when the "off budget" was approved. The capital expenses are zero, because the "off budget" revenue was very small.

b.2.5 Environmental Protection Fund

There are three types in the Environmental Protection Fund.

- The pollution fees
- Fine
- Claim

"The pollution fees" are paid by factories according to the discharge volume to the environment such as air, water and/or land based on the eco-passport. The tariff of fees was set in 1992, and has not been adjusted to the inflation. Then, it is not effective to motivate enterprises to perform environmental operation. "Fine" is

charged when the discharge volume was over the permission of eco-passport, when the inspectors of BCE visit factories and find such situations. "Claim" is charged when the actual environmental damages appeared.

The Environmental Protection Fund collected by BCE was 154.2 million manat (about double of "off budget" revenue), while the billing amount was 443.9 million manat. The pollution fees share majority (66% of billing amount and 76% of collected amount).

Table 4-26: Breakdown of Environmental Protection Fund in BCE

Unit: 1,000 manat

Items	Billing value	Collected value	Collection rate	Average payment
Fines	12,148	6,732	55.4	99.0
Claims	137,037	29,837	21.8	414.4
Fees	294,709	117,653	39.9	372.3
Total	443,894	154,222	34.7	338.2

Source: Financial Department of BCE

The collection rate was about 35% of the billing amount, while it records 100.1% of the initial plan, 154 million manat for 9 months of 205.3 million manat for year. It is better than the attainment of "off budget" revenue. The latter was 32% of the initial plan, 288.8 million manat of 9 months of 385 million manat.

As the EPF, the target to be collected by department is decided in the beginning of the year. The chiefs of departments are obliged to report the results monthly. But it is very difficult to recognize the actual situation of each factory.

Table 4-27: Environmental Protection Fund by Department in BCE

Unit: 1,000 manat

Items	Billing value	Collected value	Collection rate	Average payment per developer
Water & Air	316,363	123,544	39.1	333.0
Land & Waste	124,605	27,917	22.4	536.9
Fauna	2,926	2,761	94.4	83.7

c. Baku City Budget

c.1 Budget Scale

The budget of Baku Executive Power (BEP) in 1999 was 350.8 trillion manat (US$85.2 million), 11% of the central government budget. This amount also covers the budget of the 11 districts within the city. For budget formulation, each department of the District EPs and BEP submits proposals to the BEP Financial Department. The proposals are summarised and presented to the Ministry of Finance. After the parliament gives its approval, the Ministry of Finance notifies the BEP of its budget.

Until last year, 13% of the national tax collected from Baku City (80% of the overall national tax amount) was handed down to BEP. From this year (2000), this will be reduced to 8.86%. In accordance with this change, the 2000 budget is currently under revision.

The management, maintenance and cleansing services for the public housing in Baku City are the responsibilities of the Communal and Housing Service Department. The department's 2000 budget is 398 billion short as in spite of having a revenue of only 280 billion manat, its expenditure totals 678 billion manat. Only 84 billion of this amount can be appropriated from the general budget of BEP.

Table 4-28: Communal and Housing Service Department Budget（2000）

(unit: million manat)

Category		Budget
Revenue	Communal service fee	8,556
	Rental fee for public housing building	5,000
	Rental fee for business building and space	4,445
	Others	10,000
	Total	28,001
Expenditure	Current administrative expenses	3,500
	Current expenses for maintenance staff	5,600
	Expenses for communal service	43,200
	Other current expenses	3,500
	Current expenses for repair	12,000
	Total	67,800
Loss		-39,799

Source: Financial Department of BEP

c.2 Cleansing Services Budget

Waste collection and disposal are handled by every district branch of the BEP Communal and Housing Service Department. However, the services only cover the buildings, shops, etc. owned by the District EP. The collection of waste in other buildings is carried out by the building owner or contracted out to the Communal and Housing Service Department for a certain fee.

Table 4-29: District Population & Population Targeted by the Communal and Housing Services (1998)

		Population (in thousand)		Service Population (B) (in thousand)	(B/A x 100) (%)
		1999 Census*1	1998 (A)		
1	Sabayil	85.8	76.8	28.1	36.6
2	Yasamal	237.5	219.4	72.6	33.1
3	Nasimi	221.6	198.1	101.1	51.0
4	Narimanov	177.0	144.0	65.8	45.7
5	Nizami	179.4	159.0	64.5	40.6
6	Khatayi	240.8	213.9	136.0	63.6
7	Garadag	105.6	92.0	14.2	15.4
8	Binagadi	247.1	187.1	72.0	38.5
9	Sabunchu	213.1	188.2	39.0	20.7
10	Surakhany	186.8	147.4	59.5	40.4
11	Azizbeyov	130.2	114.0	16.7	14.6
Total		2,024.9	1,739.9	669.5	38.5

Note: *1: Information from State Committee for Statistics
Source: Communal and Housing Service Department of BEP

Waste collection services have been privatised and two foreign-affiliated companies, KASCO and UP Azerbaijan (UPA), are currently engaged. The decrease in the collection fee, however, led to waste collection by UPA only in one out of the nine districts the service was initially contracted for with UPA The present division of services is as shown in the following table.

Table 4-30: Division of General Waste Collection, Street Sweeping and Waste Disposal Services by District

		Collection	Sweeping	Final Disposal
1	Sabayil	KASCO	Communal service	KASCO
2	Yasamal	KASCO	KASCO	KASCO
3	Nasimi	Communal service	Communal service	UPA
4	Narimanov	UPA	Communal service	UPA
5	Nizami	Communal service	Communal service	UPA
6	Khatayi	Communal service	Communal service	UPA
7	Garadag	Communal service	Communal service	KASCO
8	Binagadi	Communal service	Communal service	UPA
9	Sabunchu	Communal service	Communal service	UPA
10	Surakhany	Communal service	Communal service	Communal service
11	Azizbeyov	Communal service	Communal service	Communal service

Source: Communal and Housing Service Department of BEP.

The number of workers and vehicles used in 1998 is shown in the Table 4-31.

From 1,200 manat/person/month, the waste collection fee was reduced to 700 manat/person/month in March 2000 by the Cabinet of Ministers with the aim of improving the collection rate. Nonetheless, in Sabayil district, where the team could visit and have an interview with the district EP, the team detected no improvements.

Table 4-31: Data on District Street Sweeping and Waste Collection by the Housing and Communal Services (1998)

District	Number of waste collection workers	Number of waste collection staff	Number of street sweeping workers	Annual salary/wage (million manat)	Number of vehicles		
					Trucks	Compactors	Dump trucks for collection of swept waste
Sabayil	26	10	794	498.0	13	13	16
Yasamal	49	7	521	346.0	22	26	8
Nasimi	35	18	1,241	776.0	21	13	19
Narimanov	54	17	561	379.2	6	16	6
Nizami	51	24	656	438.6	8	27	6
Khatayi	185	16	861	637.2	14	24	5
Garadag	12	10	110	79.2	6	2	4
Binagadi	116	11	623	449.4	17	7	17
Sabunchu	41	13	318	223.2	7	7	3
Surakhany	115	3	231	209.4	4	2	2
Azizbeyov	15	12	120	88.2	3	2	5
other*							2
Total	699	141	6,036	4,125.0	121	139	93

Notes:
- 2 tractors at Balakhany waste disposal site
- There are 2 disposal sites in Baku (Balakhany and Surakhany waste disposal sites)
- Balakhany waste disposal site has 16 workers each receiving 30,000.00 thousand manats per annum.

Source: Financial Section of the Communal and Housing Service Department of Baku EP.

The table below shows the revenue from and estimated expenditures of fee collection.

Table 4-32: 1988 Revenue & Expenditure and 1999 Revenue from Fee Collection

(unit: million manat)

		Waste fee collected in 1998	Costs (1998)			Balance (1998)	Waste fee collected in 1999
			Personnel	Vehicle*1	Total		
1	Sabail	337.3	498.0	756.0	1,254.0	-916.7	247.8
2	Yasamal	1,726.6	346.2	1,008.0	1,354.2	372.4	n/a
3	Nasimi	1,866.7	776.4	954.0	1,730.4	136.3	1,365.3
4	Narimanov	1,761.0	379.2	540.0	919.2	841.8	n/a
5	Nizami	1,300.1	438.6	738.0	1,176.6	123.5	859.8
6	Khatayi	2,432.0	637.2	774.0	1,411.2	1,020.8	1,787.0
7	Garadag	236.4	79.2	216.0	295.2	-58.8	n/a
8	Binagadi	1,128.0	449.4	738.0	1,187.4	-59.4	731.6
9	Sabunchu	351.0	223.2	306.0	529.2	-178.2	215.6
10	Surakhany	636.7	209.4	144.0	353.4	283.3	502.9
11	Azizbeyov	220.0	88.2	180.0	268.2	-48.2	32.2
	Other organisations						340.6
Total		11,995.8	4,125.0	6,354.0	10,479.0	1,516.8	6,082.8

Note: *1: Fuel cost and maintenance & repair cost of vehicles
Source: Financial section of Communal and Housing Service Department of BEP.

The revenue from fee collection in 1999 was 6,083 million, only half of 1998.

c.3 Water Supply

Based on the study of the World Bank, the water supply section was taken out of BEP and reorganised into a totally new joint-stock company (Absheron Regional Water Company: ARWC). Further, financing from the World Bank led to the commencement of the rehabilitation of the water supply facilities as indicated in the Master Plan for the waterworks and sewerage systems of the Greater Baku area. Overall the investment totalled US$2,839 million, and US$1,936 million was used to develop a new catchment basin.

Organisational modification, water charge revision, and improvement of the collection rate are also covered in the master plan. The table below shows the present water charging system.

Table 4-33: Water Supply Tariff

Classification		Unit	Tariff
Population	- housing and communal services:	manat/m^3	150
	- organisations engaged in commercial activities		4,000
	- organisations engaged in gardening activities		3,700
	- public organisations, others		800
Manufacturing	- treated water	manat/m^3	3,700
	- technical water		510

Source: Financial Department of BEP

c.4 Sewerage

The sewerage section was also taken out of BEP and reorganised into the Baku Sewerage Company in 1999. Rehabilitation works are also being carried out for the sewerage system although in a manner different from the one specified in the water supply and sewerage master plan for Greater Baku. The revenue in 1999 was 279 billion manat. With an expenditure of 270 billion manat, the company has a profit of 9 billion manat. At present, however, treatment facilities are obsolete and some of the employees have not been paid for a period of 6 months.

The table below shows the present tariff system.

Table 4-34: Sewerage Tariff

Classification	Unit	Tariff
• Industrial and self-sustained organisations	manat/m^3	750
• Public organisations	manat/m^3	250
• Commercial and private organisations	manat/m^3	2,000
• Households	manat/ m^3	40

Source: Financial department of Baku-Sewerage Company

The sewerage company has offices in every district for the collection of fees which is separately carried out from the water supply fee.

The numbers of residents and organisations/enterprises receiving sewerage services total 1.2 million and 5,500 respectively. The tariff collection rate is low at 30%. In particular, organisations/enterprises have huge outstanding bills.

Payment is done at the branch office and entered into the computer. Nonetheless, it is difficult to prosecute those who refuse to pay.

c.5 Other Environmental Management Issues

The District EP has an environmental management section. The section reports environmental problems within the district to the head of the District EP.

The EP of Khatayi District, which faces the Caspian Sea, was visited by the study team and only had one person in charge of the environmental management section. According to her, environmental problems at the district include: water supply, drainage/sewage, and soil contamination by oil. Of these, wastewater is the most pressing. There are no biological treatment facilities, and machines are used to treat wastewater of factories. This leaves a huge volume of untreated wastewater which is considered to be directly linked to the contamination of Baku Bay. Because of privatisation under transition economy, wastewater discharge regulation is not strictly adhered to.

d. Municipalities and the Environment

Municipalities have recently been formed and their precise roles and responsibilities have yet to be agreed. However, the law on Financial Basis for Municipalities (1999) defines those sources of funds which are or will be available to municipalities. These include:

- property tax (individuals);
- royalty tax (materials of local significance);

- hotel tax;
- parking tax;
- ecological tax.

The municipalities will not be state budget bodies, and it is intended that such borrowing powers as municipalities may have will be curtailed and oversight of fiscal policy undertaken by the Ministry of Finance.

Initially, there may be some central budget support, but the amounts across the country will be small. The role of municipalities could be beneficial to the environmental improvement at local level, but at this moment too many things are uncertain for the team and anybody else to assess their practicability.

4.3.4 Land Use

a. City Plans

The master plan of Baku city, as well as the land use plan, is said to be under ongoing preparation by the Department for Architecture and City Planning of Baku City with the collaboration of Bak Gipro Gor (design) Institute of Baku. However, it is not currently in progress due to a budgetary restriction.

b. Present Situation of BCE on Land Use Control

In soviet times, BCE's permission was required for a development permit by regulation, but since the break-up of Soviet Union, followed by the independence of Azerbaijan, this practice has been ignored. As a result most of developments have taken place through the Department of Building and Construction. However, this does not mean that the BCE has nothing to say about developments in Baku. Through the environmental protection law the BCE has voiced its opinion on developments in a limited manner.

4.4 Technical Management

4.4.1 Monitoring System and Laboratories

a. Air Quality Monitoring

There are nine air monitoring stations in Baku and air quality is monitored three times a day at 07:00, 13:00 and 19:00. Temperature, humidity, wind speed and wind direction are measured by self-registering thermometers, hydrometers, and anemometers with wind vanes. They are at present measured manually, because the devices are out of order. Items monitored are dust, SO_2, NO_2, Cl_2, HCHO, CO, $C_5H_3O \cdot CHO$, Hg, NH_3 and black carbon, but all stations do not necessarily monitor all these items.

b. Water Quality Monitoring

There is no river flowing in the study area, but lakes and canals need water quality monitoring.

Many lakes in the area receive wastewater from factories, oil field and households, meaning their water quality is a great concern. Hydromet carries out periodic water quality analysis of the following lakes:

- Yasamal 1;
- Yasamal 2;
- Ganli-Gol;
- Beyuk-shor;
- Bul-bul.

ANASA also conducted water quality analysis of several lakes including Beyuk Shor, Bul bul and Gadjigasan for three years from 1997 to 1999, although the motivation behind its analysis is not known.

The Absheron Main Canal is a principal irrigation canal supplying water to agricultural areas in the peninsula. Its water must be clean enough to ensure safe cultivation and not cause soil contamination. The responsibility for controlling this canal lies with State Committee for Improvement of Land and Water Economy.

The monitoring of seawater around Baku is carried out by two bodies. The SCE monitors pollutants discharged at outlets along the bay, whilst Hydromet measures ambient seawater quality.

The most important water body for Baku city is Jeiranbatan reservoir, which is one of the major sources of potable water supplied to the city. It is in the Absheron district next to Baku city, and is within the jurisdiction of the Absheron Committee for the Environment. Setting and maintaining water quality standards is shared among various bodies including the Ministry of Health, Absheron Regional Water Company (ARWC), the Ministry of Water Economy and others. In practice, the control of its water quality is the responsibility of ARWC. In recent years, water quality deterioration of the reservoir had been anticipated because of wastewater from settlements and poultry firms nearby.

c. Soil Quality Monitoring

The causes of soil pollution in the BCE territory include oil extraction, toxic substances left within the premises of industry, domestic and industrial solid waste improperly disposed of, and expired or banned pesticide use and disposal.

Oil contamination: State Land Committee has a map of contaminated soil with 257 sampling points

The methods that are technically and financially appropriate for Azerbaijan to clean-up oil contaminated soil are being identified by projects funded by the WB and TACIS. There is even a private company which operates a decontamination pilot plant in which they mix oil contaminated soil and water, then separate soil, water and oil, and recover oil.

Soil contamination in industrial places: 13 chemicals at 134 points, 6 chemicals at 114 points at 2 soil layers, and 20 metals at 200 points were studied by the Instituite of Geography, Institute of Soil and Agrochemistry and the State Committee for Land, respectively (see Section 4.1.3). However, sampling points were simply placed on a map, not necessarily taking probable pollution conditions into account.

Solid waste: There are a huge number of illegal waste dumping sites across the city. A problem posed by those dumped waste sites in terms of soil pollution is that they may contain toxic materials which are causing soil pollution

Expired or banned pesticides: A disposal site for expired or banned pesticides was specially constructed in 1986. Pesticides were originally contained and sealed in about 180 concrete cells of 30cm thickness. Later, however, almost all cells were opened by someone and the contents were stolen and some scattered around. Soil could be seriously contaminated, but the site is far enough from houses not to affect people. What is of greater concern is that banned pesticides could be brought out and taken somewhere.

d. Activity of Laboratories

d.1 BCE Laboratory

BCE does not have its own laboratories except a small one (20 m^2) inside the BCE building. An independent laboratory building was planned and its construction commenced some years ago. But it was stopped in half way due to the shortage of budget from SCE and the structure was left as it is now. Without enough space, BCE has borrowed some area inside a room of Academy of Sciences and stored its equipment. Therefore, BCE analysts can not carry out their routine analysis and equipment remains without used.

BCE's primary duties are to monitor air emission, wastewater and solid waste discharged from point sources such as factories and other facilities , to monitor the exhaust gasses from mobile sources such as vehicles and to control food contaminated environmentally.

Due to the shortage of budgets allocated to operate, maintain and control the laboratory, however, inspections could not be carried out frequently except the cases where analysis was requested and paid by clients that are mostly factories. Further, due to economical crisis after independence from FSU, the operation ratio of factories has been dropped significantly and the number of requests itself from factories has been also reduced.

The Netherlands Government has donated atomic absorptive spectrometers in January 2000 and the consultants have trained the BCE analysts. But they are not fully operated yet.

The major laboratory equipment of the BCE is listed below.

- Atomic absorptive spectrometer 2 units
- Gas chromatograph 1 unit
- Liquid chromatograph 2 units
- Spectrophotometer 1 unit
- Photocalorimeter 2 units

d.2 SCE Laboratory

SCE is the organization to manage the national environment problems and to have jurisdiction over the relevant district offices. In spite of these duties, SCE does not have a national laboratory (in other words a central laboratory). What SCE has is an analytical centre named Caspian Inspectorate that is in charge of the monitoring of discharge points substances from which may pollute the Caspian Sea. In the Caspian Inspectorate Laboratory, there are two equipment rooms, microbiology room, chemical analysis room, weighing room and reagents room. SCE has 60 laboratory staff but there is no budget allocated for analysis except for the wages. Therefore, no

routine analysis is conducted unless requests are raised by clients such as factories in Sumgait. The Netherlands Government has donated an atomic absorptive spectrometer to SCE as well as BCE, but it is not used for routine analysis. SCE owns the following major analytical equipment at this moment.

- Atomic absorptive spectrometer 1 unit
- Liquid chromatograph 1 unit
- Gas chromatograph 2 units

d.3 Hydromet Laboratory

State Committee for Hydrometeorology owns a laboratory which conducts analysis of air pollution, water pollution and soil pollution. This laboratory has analytical rooms for air, water, soil, seawater and physics.

Hydromet has nine monitoring stations for air and samples taken at these stations are sent to this laboratory to be analysed. This laboratory also analyses the water quality of rivers and lakes nation wide. As for the Caspian Sea water, periodical sampling and analysis has been conducted.

Hydromet owns the following major analytical equipment at this moment.

- Spectrophotometer 2 units
- Photoelectric calorimeter 1 unit
- CO analyser 1 unit
- Electron capture detector 1 unit
- Frame ionisation detector 1 unit
- Thermal Conductivity Detector 1 unit

4.4.2 Pollution Source Control

This section presents pollution source control done by the BCE/SCE. Here the pollution sources refer to factories (point pollution sources), mobile pollution sources (vehicles), sewage treatment plants and solid waste generators.

a. Factory

The BCE has an annual plan for the inspection of factory and is monitoring 250 factories at present. The inspections conducted in 1998 and 1999 were 310 and 244 times in total respectively. Basically BCE shall inspect an oil related factory 4 times per year, other large-scale factory 2 times and other small scale once a year.

The documents listed below are used as tools for controlling environmental pollution from factories and enterprises. The outline of the documents is presented in Table 4-35.

- Environmental Passport
- Normative Document
- Inventory
- 2TP
- Charge Calculation Sheet

Among those the environmental passport has been regarded as one of the most comprehensive documents to ensure the environmentally safe operation of factories

and enterprises. Although the BCE and SCE are obliged to enforce pollution control at those units, neither committee has copies of the environmental passports. They do not have even a list of factories and enterprises to be controlled or do not know the number of factories/enterprises in the BCE's territory that have the environmental passports. According to the Factories Survey conducted by the team the number of factories in the study area that have the environmental passports revealed to be 288 in total out of 775 factories/enterprises, i.e. 37.2 % of passport possession rate.

Neither BCE nor SCE has a copy of normative document, but BCE has copy of 2TP and inspectors of BCE sometimes use it for inspection. BCE does not have inventory of factories but have a list of factories prepared by inspectors. There are charge calculation sheets but it not well managed.

The monitoring activities including laboratory analysis to inspect and check the actual environmental status of the factories are very limited due to insufficiency in budget, equipment and facilities.

Table 4-35: Outline of Documents required for Controlling Factories (Point Pollution Sources)

Documents / Items	Environmental Passport	Normative Document		Inventory	2TP			Charge Calculation Sheet
		Maximum Permitted Emissions	Maximum Permitted discharge		Air emissions	Water and wastewater	Hazardous wastes	
Establishment Year	GOST-17.00.04.90 1990	Decree of Cabinet of Ministers of Az. Soviet Republic dated 05 Jan 1982	Decree of Cabinet of Ministers of Az. Soviet Republic dated 01 Dec 1978	Decree of Cabinet of Ministers of Az. Soviet Republic dated 05 January 1982	07 May 1986 Revised on27 May 1992	22 June 1995		Decree # 122 issued by the Cabinet of Ministers on 03 March 1992
Enforcement Year	01 July 1990	05 January 1982	01 Jan 1977	05 January 1982	07 May 1986 27 May 1992	22 June 1995		03 March 1992
Prepare by Who	Factories (according to GOST - 17.00.04.90)	Factories	Factories	Factories	Factories	Factories	Factories	
Submitted to Who	Local Committee for Ecology	Local Committee for Ecology	Local Committee for Ecology	Local Committee for Ecology	SCE and State Committee for Statistics	1.Ministry of land improvement 2. State Committee for Geology 3. SCE	State Committee for Statistics	
Interval of Submission	Within one month after changes in production process	Every 5 years	Every 3 years	Every 5 years	By the end of every year	By the end of every year	By the end of every year	Quarterly
Other Information		Recommendations of SCE on preparation of Maximum permitted emissions 29 Dec 1993						

b. Mobile Pollution Sources

By law the BCE has responsibility of monitoring exhaust gas from vehicles. It is, however, not the BCE but the traffic police under the Ministry of Interior that actually conducts inspection. The BCE has requested the traffic police to conduct the vehicle inspection in cooperation with the BCE, but so far they have not given the BCE a preferable reply.

c. Sewage Treatment Plants

The Baku Sewage Department (BSD) of BEP is responsible for the wastewater quality discharged from sewage treatment plants. The BCE does not monitor the treated wastewater quality.

The BCE does not monitor the wastewater quality discharged to the Caspian Sea from sewage outlets either treated or non-treated. The Caspian Inspectorate under the SCE monitors it but to a very limited extend due to insufficient budget. The Inspectorate conducts monitoring only when they receive an order for inspection from the other organisation.

d. Solid Waste Sources

d.1 Municipal Solid Waste

MSWM (municipal solid waste management) is the responsibility of BEP and district EPs. The BCE inspects landfills and illegal dumps in view of environmental conservation but it does not monitor (including chemical analysis of air or leachate) the damaged environment caused by them. The BCE has a power to approve a landfill site, and instruct operators of landfills to improve their operation. The BCE inspects illegal dumps and gives the district EPs instructions to take an action to stop illegal operation.

Monitoring work done by the BCE at present is in general very limited due to the insufficiency of human power, budget, enforcement tools, etc.

d.2 Hazardous Waste

At present neither the BCE nor the SCE conducts monitoring work on HW (hazardous waste). The tools and legislation for controlling and monitoring HW, such as a manifest system, have not been established. Considering such situation the SCE is conducting a HWM study with the financial assistance of the WB.

d.3 Medical Waste

Medical waste management is the responsibility of medical institutions and Ministry of Public Health has responsible of monitoring medical waste management according to the "Sanitary Regulations for Maintenance of Residential Areas, SanPiN 42-128-4690-88, 1988". Consequently neither the BCE nor the SCE conducts monitoring work on medical waste management done by medical institutions though some of medical waste is disposed of at municipal landfills without treatment at present.

4.4.3 Nature Conservation

In Azerbaijan the areas or places with interests of the environment, nature, history or amenity are designated as the following in an order of significance as defined in Law on Particularly Protected Areas and Objects, March 2000.

- state nature reserves including biosphere reserve;
- national parks;
- nature parks;
- ecological parks;
- state nature sanctuaries;
- natural monuments;
- Zoological parks;
- botanic gardens and dendrological parks;
- health resorts.

The country has one Ramsar Convention Area in Kirov Bay, which is out of Greater Baku located about 220 km to the south from Baku. Baku has one or more areas designated as state nature reserve, national park, state nature sanctuary, and natural monuments as described below.

a. Nature Reserves

A Nature Reserve is an area where is designated to maintain original conditions in peculiar and rare natural systems and to carry out scientific studies of natural processes and events. Its ecological complex as a whole is of vital importance due to its topography, landscape and rare and valuable species. Some reserves are designated so due to its historical importance. There are 14 reserves in the country with a total area of 191.2 ha.

In the nature reserves, human activities such as construction, use of surface and underground water, logging, hunting and fishing are forbidden.

In the study area, Gobustan Nature Reserve was established as a historic reserve in September 1966. It is located about 60 km to the southeast from the Baku city centre and only one reserve in the Greater Baku. Caves and rocks spread over 100 km^2, and ancient paintings of people, animals and life scenes, which date back to the 12th century BC, are found on them.

Only part of the area is open to tourists and an adjacent museum displays flints, shells, ceramics, kitchen tools and others found in caves. This reserve is under the control of Ministry of Culture.

b. Sanctuaries

Sanctuaries are areas which are designated in order to protect specific species. There are 20 sanctuaries with a total area of more than 260,000 ha in the republic. Greater Baku has two sanctuaries, both of which are under the control of the Fauna protection department of the BCE. According to the said law, the sanctuaries can be used for scientific, cultural, educational and limited economic purposes.

b.1 Absheron Sanctuary

The Absheron sanctuary, located at the east end of the Absheron peninsula, was established in July 1969. It covers the area of 815 ha, including 364 ha of littoral area

(500 m wide from the sea shore), 152 ha of salty area, 95ha of reed-beds and 190 ha of lands with rich soil and groundwater supply[13]. Species of fauna protected in this area are a number of migratory and wintering waterfowl and other mammals including jackals, foxes, Caspian seals, seagulls, mute swans, coots, flamingos, and peacocks.

In 1971, 40 gazelles were brought to the sanctuary in order to enrich the fauna composition. Its population increased to 75 in 1984, but then eventually vanished from the area because of a large number of predators. The forage resource of the area could maintain over 200 gazelles.

The Absheron Sanctuary is protected by the BCE. The BCE's three guards watch at the gate by three shifts for 24 hours.

b.2 Gil Island Sanctuary

Gil Island sanctuary was also established for fauna conservation in February 1964. It is located 6 km off shore from Gobustan settlement. It serves as migratory birds wintering place, habitat for 10,000 seagulls' colonies, and Caspian seal rookery. There also inhabit 200 rabbits, which were intentionally introduced.

Formerly the area was about 2,000 ha, but decreased to 400 ha as a result of the rised water level of the Caspian Sea.

The BCE has the responsibility to protect this area. Without practically working ships, however, their control can not be efficient. It is reported by the local scientists that the island has been badly disturbed by humans (e.g. residents in near settlements on the mainland often go to the island to collect bird eggs), and the nature value of the island is no longer high as before.

c. National Parks

In the Greater Baku there is only one National Park along the boulevard at the sea front. The President of Azerbaijan Republic declared this park as a national park. The master plan approved in 1999 will upgrade the park as a recreational area and enhance its effectiveness as a coastal defence in the coming 20 years.

A Dutch consultant, IWACO, points out that there are mainly three obstacles for this National Park to become a true recreational area as follows.

- Around five wastewater outfalls that discharge wastewater into the Baku Bay along the boulevard pollute the area with odours.
- The oil that accumulates along the boulevard with southern winds causes odours as well as visual pollution.
- The near shore area along the boulevard is littered with debris.

The execution of the said master plan will overcome such problems. The Baku Executive Power is in charge of the control of the Baku Boulevard National Park. Being in a good position in the city, recreational use of this park should bring great benefit to the society.

[13] stated by the BCE personnel. The information source is not known.

d. Natural Monuments

Natural monuments are small areas with characteristic and remarkable landscapes, particular beauties, historical or cultural assets, or other types of nature values. Following relevant decrees, every site is registered by filling an environmental passport, which must be approved by Academy of Science and the SCE, and listed in an official paper.

In the Greater Baku, there are 10 natural monuments, as summarised in Table 4-36.

Table 4-36: Natural Monuments in Greater Baku

Name	Characteristics	Controlling Authority
Binagadi Deposits	It was a habitat of quaternary flora and fauna including 40 mammal species, 120 bird species, 2 reptile species, 1 amphibian species, 107 insect species and 22 plant species.	Binagadi Executive Power
Baku Layer	It is located in the southwest part of the peninsula near Khanlar settlement, showing a classic section of low quaternary deposits with a thickness of about 70 m.	Sabayil and Bibi-Eibat Executive Power
Bayil Rocks	It displays a perfect pattern of secular fluctuating motion of the earth's crust.	Sabayil shipyard
Lokbatan Mud Volcano	Its mud volcano is 130 m high above ocean level, located in Karadag district near Lokbatan settlement.	Karadag Executive Power
Greater Kanizdag	This is a volcano with a height of 400 m above ocean level, a diameter of 2 km and a crater whose diameter is nearly 300 m.	Karadag Executive Power
Ayrantekan Mud Volcano	This volcano is located 10km to the northwest from Atbulag railway station, erupting gas, mud and oily water. The last big eruption was in 1990.	Karadag Executive Power
Korgoz Mountain	Also called Baku ears, it displays a pattern of the destroyed anticlinal fold composed of compact limestone. Its height is 388.8 m above ocean level, being the highest point in the peninsula.	Karadag Executive Power
Beyuk Dash	This is a cluster of clay karsts with varied size of craters.	Gobustan Executive Power
Yasamal Valley	This gives a panoramic view of erosion of valley.	Karadag Executive Power
Dashkil Mud Volcano	This presents a flat elevation and is studded with mud salses.	Karadag Executive Power

Source: BCE

As the table shows, almost all of the natural monuments are controlled by local authorities. The Land protection and waste control department of the BCE holds power to supervise how they are controlled, and restricts development projects near the monuments in an approval procedure when a new project or design change of existing facility is proposed.

e. Conservation of Other Areas

e.1 Conservation of Flora

The Absheron peninsula is principally arid and semi-desert, and most part is covered by low grass-type greens. Higher vegetations are mostly those which were planted some decades ago.

Tree plantation in the city is mainly done by three organizations:

- production association for greenary plantation subordinated to the Baku Executive Power which works for tree planting in parks and other common spaces;
- production association of forestry (former Ministry of Forest Economy, now also called Azerbmeshe) which is engaged in forest belts development and erosion control in such areas as Yasamal, Batamdar, Jeiranbatan water reservoir, and costal area;
- Ministry of Transport which enhances vegetation along the roads.

The BCE's responsibility is not green promotion but green protection. It does not plant trees by themselves but protect planted trees by controlling on-going or planned activities that might affect the plantations. The Department of Flora of the BCE is in charge of this duty with 4 personnel.

The Forest Code gives a base of the country's forest policy. This sets out a policy framework for forest promotion, but almost excludes the forest protection matters. There is also the Forest Law, which only covers areas of natural vegetation protection and is not relevant to the Baku area since there is no natural vegetation to be protected from the viewpoint of this law. The BCE's work, i.e. protection of planted trees, is based on a decree of Cabinet of Ministers of 1983. The decree, however, requires revision in order to reflect the full-range of social changes in Azerbaijan after its independence, and the draft of new decree is under consideration.

e.2 Conservation of Fauna

The Fauna Protection and Conservation Areas Department of the BCE carries responsibility to protect fauna in its territory. Four inspectors of this department are engaged in this task under the supervision of the department head and the deputy head. Fundamentally what they do is to give licenses to people to hunt animals and patrol the area. The department issues about 500-700 hunting licenses in a year. Due to a lack of transportation means, its activity to control human disturbance to animals, which should be in the center of its duty, is largely hampered.

The department has two vessels with crew of 12 persons in total. The vessels are used to control illegal capture of animals along the coast of 375 km and islands and to monitor bird habitation. The two are nearly 30 years old and require frequent repair. Costs for repair, fuel and five-year sailing license are heavy burden on the BCE.

4.4.4 Geographical Information System

a. GIS status

In general, when establishing a new GIS database, the present condition of existing GIS in various organizations must be understood to adjust the new system to those others. This is to avoid duplication of database and to share the database among systems as efficiently as possible.

For this reason, the team studied current GIS status utilised in other organisations before creating an environmental database for the BCE. As far as the team is aware, environmental GIS has been established within the framework of four externally assisted projects as described below.

a.1 Environmental Rehabilitation Project of Sumgait

The environmental rehabilitation project has been carried out in Sumgait with the assistance of UNDP, and an environmental GIS database of the Sumgait area is developed. Although this project was to be finished in May 2000, it was extended to May 2001. At the end of the project an Environmental Rehabilitation Centre is to be established with the assistance of UNDP, WHO, SCE and private enterprises and the GIS will be further developed.

a.1.1 Hardware and Software

The hardware and software used for the environmental GIS construction in this project are as shown in Table 4-37.

Their hardware consists of two sets of PC with such peripheral tools as a scanner, printer, and digitiser. MapInfo was initially used as a GIS software, but ArcView is currently utilised. Microsoft Access, Microsoft Excel and Microsoft Word are also used for database creation. Furthermore, their WebPages are developed using various images and charts in HTML format, which are prepared using their database.

Table 4-37: List of Hardware and Software Employed in Environmental Rehabilitation Project of Sumgait

Hardware	Software
PCs Scanner (A3 size) Colour printer Digitiser (A0 size)	Arc View GIS 3.0 MapInfo Microsoft Word Microsoft Excel Microsoft Access Windows 95 (or98)

a.1.2 Database

The environmental database currently established in this project is as shown in Table 4-38. The database such as contour lines, roads, rivers and lakes were created using a topographical map of Sumgait area at the scale of 1:25,000.

The database consists of five main layers for environmental preservation and each layer contains several datasets of specific information. A wide range of Information is still being added.

Table 4-38: Database Structure in GIS Established in Environmental Rehabilitation Project of Sumgait

General	Exact boundary of city District and settlement boundaries Roads Streets Currents, rivers
Environment	Geo-dynamic processes (map) Relief Land use Sea coast and sea level Soil Vegetation Basic biocenosis Climate
Industry	Main enterprises (location, characteristics, description) Metallurgical enterprises Chemical enterprises Fuel-energy enterprises Light industry enterprises
Condition of environment	Main pollution sources Air pollution Water pollution Soil pollution Points of discharge Sampling stations
Social and medico-ecological	Municipal boundaries of the city (settlements, districts and quarters) Social sector (education, medical establishments, cultural establishments) Human health (mortality rate, morbidity, diseases, industrial diseases)

a.2 Baku Bay Gulf Oil Pollution Project

This project is carried out by a Dutch consulting company, IWACO, with a finance of SENTER (Minister of Economic Affairs in the Netherlands). In this project environmental GIS database is not created but instead the database of Caspian Environmental Program (CEP) is applied. This contains such data as a base map of the Caspian Sea and sea sediment.

The GIS component of this project is focusing on the GIS training for the SCE personnel. The GIS equipment used for the training was installed a couple of years ago by the World Bank prior to the preparation of the National Environment Action Plan.

a.2.1 Hardware and Software

The hardware and software used for the GIS training by IWACO are as shown in Table 4-39.

Table 4-39: List of Hardware and Software Employed for the Baku Bay Gulf Oil Pollution Project

Hardware	Software
PCs Black & white plotter Colour plotter Black & white printer Digitiser	Arc View GIS 3.1 Microsoft Word Microsoft Excel Windows 95 (or 98)

a.2.2 Database

As mentioned above, the system uses CEP's database not having its original one.

a.3 Project for Strengthening the Capacity in Inventory of Land Cover/Land Use by Remote Sensing

This project is currently conducted by ANASA using satellite image data to create a land cover / land use database of whole country with the assistance of FAO in cooperation with State Committee for Land Use.

a.3.1 Hardware and Software

The hardware and software used in this project are as shown in Table 4-4.

Two sets of PC are equipped with a scanner, plotter, printer, digitiser and CD-RW as peripheral tools. ArcView GIS 3.1 is used for GIS analysis, while ENVI 3.2 is utilised for remote sensing analysis (satellite data analysis).

Table 4-40: List of Hardware and Software Employed in GIS of ANASA

Hardware	Software
PCs	Arc View GIS ver.3.1
Scanner	ENVI ver.3.2
Colour plotter	Microsoft Word
Colour printer	Microsoft Excel
Digitiser	Microsoft Access
CD-RW	Windows 95 (or98)

a.3.2 Database

The present land cover / land use data of the whole country have been created by LANDSAT TM data taken in 1999 and field survey. The scanned topographical map has been geometrically corrected to be adjusted to the satellite data. The software named ENVI is used for satellite image analysis and geometric correction of the topographical map. Furthermore, geology, climate, vegetation, canal, river, lake and administrative boundary data are created using ArcView.

a.4 Caspian Environmental Programme (CEP)

In the CEP, the database concerning the water pollution of the Caspian Sea and a base map of the Caspian Sea coast are established. In the first phase of this project, the base map of the Caspian Sea and five riparian countries of the Caspian Sea were created under the assistance of TACIS. Presently the programme is in the second phase, and the databases on water quality and sediment information have been prepared by the assistance of UNDP. In future, using this established database, Caspian water pollution will be examined and evaluated.

a.4.1 Hardware and Software

The hardware and software used in this project are as shown in Table 4-5.

The programme has two sets of PC with a A3 colour printer as peripheral equipment. If needed, SCE's equipment such as a scanner, plotter, and digitiser is used. As for the software, ArcView GIS 3.1 is installed for GIS database development while Microsoft Access is utilised for the construction of attribute data.

It is planned to obtain a scanner, a plotter and Image Analyst, which is the optional module of ArcView, by the assistance of UNDP around June or July 2000. The Image Analyst will be employed for satellite image analysis.

Table 4-41: Hardware and Software Employed in the CEP

Hardware	Software
PCs Colour printer CD-ROM 21 inches monitor	Arc View GIS ver.3.1 Microsoft Word Microsoft Excel Microsoft Access Windows 95 (or 98)

a.4.2 Database

In the first phase, a base map of the Caspian Sea and the five riparian countries of the Caspian Sea was already built. The information of established database is as follows:

1) Pipelines (oil and gas)
2) Depth of the Caspian Sea
3) Altitude
4) Roads
5) Data of main cities
6) Rivers
7) Lakes
8) National boundaries
9) Caspian Sea coastline
10) Mosaic image data of the Caspian Sea prepared by Landsat TM data
11) Water pollution data (contamination distribution near river mouths)

These databases are developed by Thematic Centre for Water Pollution within CEP. Part of data was prepared in Almaty in Kazakhstan. The Data Gathering Unit has managed these databases using network system. Further, Caspian Sea coastline data was prepared using Landsat TM data taken from 1997 to 1998.

b. Important Considerations for a New GIS Establishment

Based on understanding about the present condition of the above-mentioned four GIS, the team has been attempting to establish an environmental GIS database for the BCE with careful attention to the following points.

- creation of database consistent with other GIS without duplication
- GIS training for the C/P
- establishment of BCE homepage

b.1 Creation of Database Consistent with Other GIS without Duplication

The environmental databases are currently established in various organizations as above but the character of database in terms of accuracy, coverage, and data categories varies. Some organization creates an inland database, whilst some organization constructs the database of the Caspian Sea. In the project in Sumgait, the base map is created using a topographical map of a large scale with high accuracy since their target area is narrow while the covered area of the CEP is vast thus its base map is created using a topographical map of a small scale with lower accuracy than that used in Sumgait.

To make the newly developed GIS consistent with those existing ones and to avoid any unnecessary duplication, the team has to take account of the variety of database systems among them.

b.2 GIS training for the C/P within BCE

In the Baku Bay Gulf Oil Pollution Project, extensive GIS training was carried out to the SCE staff and the trainees made their good effort to get well accustomed to the system. The more one uses the GIS, the more effectively he could use it. Considering that the GIS has to serve the BCE as an environmental management tool, training for the BCE is vital. The team will continue to provide GIS training to the BCE so that the BCE personnel will be able to acquire the knowledge of GIS maintenance, application, and management. In addition, the team will prepare a GIS manual in order for the GIS to be further used and developed by the BCE themselves after the termination of the present study.

b.3 Establishment of BCE Homepage

Generally information on the environment should be shared among citizens, private enterprises, educational facilities, and social organizations so that environmental consciousness is raised and environmental education is provided The team will create a homepage for BCE that shows an environmental outline of Baku and that could be opened on the internet to the public once the BCE secures its internet server.

4.4.5 Food Control

The new law on foodstuff was drafted and is waiting for the approval of the President. The presidential decree No. 267, dated 27 January 2000, requested relevant organisations to submit comments and opinions on who should do what for the enforcement of this law, and the enforcement system is under preparation. Moreover, a new foodstuff certificate system is going to be approved by the President. In this system, the following organisations have power to issue each certificate within its own authority.

- State Committee for Standardization and Metrology: conformity certificate;
- Ministry of Public Health: sanitary certificate;
- Ministry of Agriculture: veterinary and phytosanitary certificate.

The SCE is vested power to issue opinion on ecological safety of foodstuff. However, the practical meanings of “opinion” or “ecological safety” are not clear and not well understood.

The BCE created Department of Food Quality Control and Chemical Laboratory in 1999, within which a unit for food quality control was set up with six personnel, aiming to control all stages of food business activities including production, transportation, storage, import, and sale. The department is, however, not yet aware of the scope of its precise responsibilities, which is expected to be specified in a new Presidential decree.

The BCE personnel consider that the new Presidential decree will specify the responsibility of the SCE/BCE, which includes the control of concentrations of heavy metals and phenols in foodstuff, radioactivity and toxicological aspects of chemical substances. The control of pesticides concentration in foodstuff by the SCE was

already stipulated in the Presidential decree No.618. Ecological opinions that are to be required by the said certificate system will be made based on these observations.

4.4.6 EIA

The requirements for environmental project evaluation are stated in the Law on Environmental Protection of 1999. Article 54 defines the requirement for the SCE to include EIA review in its activities. However, the law does not define who should conduct EIA.

In a general international practice, a developer prepares an EIA report, but in Azerbaijan, there are cases where developers request the Ecological Centre under the SCE to do. The BCE also prepared an EIA report only once before.

The SCE and BCE are responsible for reviewing project plans from an environmental point of view. The former reviews oil-related projects and other large-scale projects whilst the latter reviews the remaining small projects.

In principle, all development activities are subject to the EIA process. Because of this, although the BCE has only 6 people in the EIA unit, as many as 112 projects were reviewed in 1999. The BCE charges 5% of the total project cost for the EIA review to the developers. The collected charge in 1999 amounted to about 100 million manat (about US$ 25,000). The average charge is, therefore, one million manat (US$ 250) and the average project cost is calculated to be only 20 million manat (US$ 5,000).

It is very rare for the BCE to receive an EIA report. The BCE does not require the developers to submit EIA reports but receives project plans and designs, because most projects are small and simple. Time spent by the BCE for evaluation, which is limited to 3 months by a regulation, is also very short: four or five days in many cases. The conclusion of review is documented in a few pages and sent back to the developer.

In 1999, the BCE turned down about 20 % of reviewed projects due to inappropriate project design, and requested the developers to modify the design. The system, therefore, seems to be working for the prevention or minimisation of environmental impacts to a certain extent.

The EIA review requires expertise of specific subjects such as air, water, waste, soil and natural environment, and the personnel of other BCE departments are often involved.

In 2000, the number of cases reviewed by the BCE until September was 98.

4.4.7 Protection of Mineral Resources

a. Relevant Organisations and their Responsibilities for Mineral Resources Protection

The following organizations are responsible for use and protection of mineral resources:

1. State Committee for Geology and Mineral Resources (SCGMR);
2. State Committee for Mining Supervision (SCMS);

3. State Committee for Ecology (the higher authority).

State Committee for Geology and Mineral Resources (SCGMR) is responsible for prospecting, estimation and categorisation of mineral deposits and reporting to State Fund of Mineral Resources.

State Committee for Mining Supervision (SCMS) is responsible for mining lease, identifying contours (boundaries) of deposits and leasing to organisations and companies. The SCMS is also responsible for engineering supervision during mining operations.

BEP is responsible for allocation of lands approved by the SCMS for mining operations.

State Committee for Ecology (SCE) is responsible for ensuring rational use of mineral deposits, control for proper waste disposal to approved sites, and control for mine reclamation.

Allocation of a site for mining operations should be approved by the SCE. Being the higher authority for this matter the SCE may forbid mining operations on the site or allow with certain conditions.

The SCE is also responsible for prevention of irrational and illegal use of widespread minerals (sand, clay, gravel, etc.). In case of illegal mining operations the SCE imposes a fine on an offender. If the offender refuses to pay the fine, then the case is brought to the court.

b. Works being conducted by the BCE

The Environmental Protection Law and the BCE's Charter set responsibilities of the BCE. The Land Protection and Waste Control unit is responsible unit within the BCE and its duties include:

- control for authorised mining of sand, clay and limestone within the area of BCE's responsibility;
- control for illegal mining operations;
- spot-check inspections;
- prosecution of offenders.

Illegal mining operators (organisations, companies or individuals) are fined based on Decree #239 dated 28.12.98. In the year 2000, by October twenty enterprises have been fined at the total amount of 94.8 million manat. 14 fines at the amount of 26.8 million manat have been paid, while the others have been prosecuted in court. The illegal mining operators are forced to stop their unauthorised activity. If they refuse then documents are sent to police to remove machinery from the site. This year, police have removed machinery from five illegal mining operators from the site in Shihlar area.

Only one inspector in BCE is responsible for control of mineral resources.

Chapter 5

Identification of Key Environmental Issues

5 Identification of Key Environmental Issues

Key environmental issues to be focused in the study were identified and are presented in this chapter. Those issues were ones that are either currently significant or anticipated to emerge in future.

5.1 Environmental Status

The total volume of harmful airborne pollutants from stationary sources has significantly decreased since the independence of the republic, corresponding to the drop in operation rates of industries since the independence of the republic. Without due attention to the environment or necessary anti-pollution facilities, but with inefficient and obsolete production machinery, however, the pollution load per unit of production is high. Many old and ill-maintained vehicles are deteriorating air quality, although at present only in limited places such as bus stations and major road intersections.

The Absheron peninsula does not have its original water source. Almost all water necessary in the peninsula, either for domestic use or productive use, has been drawn from outside for a substantial time, resulting in a huge amount of wastewater to be discharged in Baku. Many lakes in Baku were thus created and are still receiving wastewater from households, industries and oil extraction. Not only the bad quality of lake water but also the risk of flooding due to increasing wastewater inflow are the key concerns. The shore along the Caspian Sea is also seriously polluted. Baku Bay is highly contaminated with oil compounds in particular.

Oil extraction with negligence in the environment for over a century has left more than 10,000 hectares of land contaminated with oil. Hazardous material left in abandoned factory premises is another threat to soil contamination.

5.2 Environmental Policy

The State Committee for Ecology is the body formally responsible within the Azerbaijan Republic for the formulation of environmental policy. However, this responsibility has, in practice, been neglected as, since independence, short-term economic pressures have taken greater importance within the country.

The policy-making activities at State and Baku Committee levels are inefficient and ineffective, but it is important to recognise that there are several causes for this:

- there is a lack of reliable, relevant and consistent data concerning the environment. The information which is received is typically late[1], restricted[2] or suffers from inadequate measuring equipment;
- the State Committee (and by inference the Baku Committee) is not strong enough compared with the sectoral ministries (although this may be improving whilst the SCE Chairman is a deputy prime minister);

[1] The State Statistical Committee provides data only annually
[2] Hydromet (for example) does not share all the relevant data it collects

- there is an unclear regulatory framework and a lack of effective enforcement at local levels;
- policy, production and enforcement are frequently vested in one organisation[3], posing conflicts of interest;
- there is a real imbalance between short term economic pressures within those organisations in the Baku area which are still working and longer term environmental considerations;
- there are many instances of shared, duplicated, absent or unclear responsibilities, for example with Hydromet, State Geology Committee, Ministry of Health, Ecological Company of Republican Road Police and others;
- there is an insufficient budget to permit the formulation *and implementation* of any new environmental policies;
- the potential for NGOs[4] and other organisations to assist in environmental management has not been fully used within the Baku committee area.

It is also important to note that the Baku committee has no experience of policy formulation and implementation. The administrative and governmental systems have not encouraged this approach but only a tactical, responsive style of environmental management, dealing with problems after they occur.

5.3 Environmental Institution

5.3.1 Organisation

The Baku Committee is organised in the traditional soviet style. All authority rests with the Chairman, who reports to the State Committee[5].

The organisation structure has recently been reviewed following institutional development proposals presented to the State Committee, but reporting relationships within this new structure have yet to be defined.

The proposed structure defines the management as:

- Chairman;
- First deputy chairman;
- Deputy chairman.

The structure defined within the charter specified the departments and divisions, which should exist within the BCE and confirms the senior management team as shown above. However, the recent restructuring at subordinate levels has created different departments and it would normally be necessary to revise the charter to reflect these changes.

[3] for example, Azerbmeshe (the State forestry concern) has responsibility for timber production, forestry management, tree planting and enforcement of regulations. Similar conflicts arise within Azerbaliq (State fisheries concern) and SOCAR (State Oil company)

[4] for example, the Society for the Protection of Nature is moribund and there is little or no contact with others

[5] precise reporting level not defined

Further revisions to the structure will be required if the committee is to fulfil policy development roles and determine environmental priorities within the area, in addition to its pollution control activities. It may be appropriate to postpone this until the future role of the BCE and its internal reporting relationships are more clearly defined.

The indicated structure for the proposed Ministry of Environmental Protection should, in due course, be mirrored within the BCE and will require the development of a range of management and technical skills not currently available within the committee, in order that the BCE can deliver the ministerial mandate.

That structure, as currently proposed, has two major elements:

- a policy planning and coordination unit;
- an environmental compliance unit.

The BCE would be part of the latter division, but would be required to assist in policy formulation.

There would be closer formal links with the district and city authorities within the area covered (and municipalities in due course when these become operational).

At present, there is no agreed timescale for these changes, but in any event, the new (May 2000) structure should be regarded as an interim arrangement.

5.3.2 Legislation

a. Legislation

The BCE is established as a State body subordinate to the SCE[6].

Within the current model of governmental administration, departments of state require a charter to permit an organisation's activities. The charters seek to define the fullest scope of activities, which are permitted, other actions being *ultra vires.*[7]

The activities of the BCE are governed by its recently revised Charter, dated November 1999 and revised following the introduction of the *1999 Law on the Environment.*

The chairman is appointed by and reports to the SCE[8]. It does not specify the individual within the SCE to whom the chairman reports, but this is understood *(de facto)* to be the chairman of the SCE.

In summary, the BCE is responsible for application of all environmental legislation within the Baku area.

As with many governmental charters, the description of responsibilities does not translate into activities "in the field". The charter gives the BCE authority over productive, governmental and ministerial bodies in environmental matters[9].

Superficially, the charter is a comprehensive document, having the force of law. It does however confine the BCE's area of activities to monitoring and control of

[6] Charter paragraph I-2
[7] undertaken without legal authority
[8] Charter paragraph IV-16
[9] Paragraph I-5 (summarised), I-12.11

environmental matters and development of the standards and norms to support this. As with the SCE charter, it does not appear to require the BCE to develop policies in any area of activity.

The BCE will require assistance to develop a new charter in the event the transition to ministerial status is accepted.

b. Enforcement

The charter of the BCE reflects that of the SCE in style and structure and states clearly that there are a number of enforcement tools available. In the first instance, the BCE should concentrate on information and education as the means to ensure compliance with regard to good environmental practice. Only when that approach has failed to deliver the environmental standards required, should the BCE resort to fines and other penalties.

Amongst other duties, the BCE is responsible for collection of charges and fines[10] for the discharge of polluting substances, for the disposal, storage and burying of waste (polluter pays principle). Historically, these fines and charges have been used by the SCE and formed an environmental fund. However, since 1998 money collected has been transferred to the State budget.

Compliance with regulations and norms is mandated in detail[11]. However, in Baku as nationally, the imposition of fines is at a very low level. There may be many reasons for this and we will work with the BCE to examine ways of ensuring increased environmental compliance, including the imposition of penalties and enforcement of law where appropriate.

Major incidences of pollution have been reported and fines levied, otherwise the pollution cases are sent to the prosecutors' office where the offending party is within state control or ownership.

5.3.3 Financial System

a. Budget of BCE

The BCE has several problems: small absolute budget amount, difficulty in securing most of the investment fund, incapability of managing natural reserves. The average wage (1999) in the public sector is less than half of the private sector (412,000 manat/month) at 166,000 manat/month, and this low wage level results in the low motivation of the BCE staff.

The "off-budget" revenues from services rendered to enterprises should provide the funds necessary for other expenses excluded from the "budget" allocated from Ministry of Finance. Nonetheless, a lack of transportation limits the range of services that the committee can offer. As a result, a vicious circle exists in financial system of BCE.

Even with the EPF for 2000, the BCE understands that only a total of 154.2 million manat can be accumulated in the first three quarter of the year (from 456 payers in total). The absence of a ledger system results in time spent tracing the source of money received.

[10] BCE Charter 1999 : Clause 12, section 6
[11] para I-12.20

b. Cleansing Services

The number of areas not receiving collection services is also a consequence of the transitional period brought about by privatisation. This results in a vicious circle of insufficient accumulation of collection fees (low collection rate) and debased services.

Further, the responsibilities of the Communal and Housing Department of Baku EP are not clearly defined, particularly as the collection of waste and waste collection fees involves a number of organisations.

The waste collection fee was set by the government at a low level, consequently becoming a problem to private collection companies, in view of the impact on their finances.

The disposal fee for the use of the Balakhani disposal site, one of the four authorised landfills in the study area, is comparatively higher than the collection fee at 500 manat/m^3. This may encourage illegal dumping.

c. Water-Supply & Sewerage System

For the water-supply system, advocating administrative reform, facility rehabilitation, and the adoption of measures to prevent water loss is considered to help cope with future increase in demand.

With the sewerage system, the procurement of funds to implement rehabilitation measures is a huge problem. Under the present fee collection method, drastic measures including compulsory payment (e.g. joint billing with the water bill, etc.) should be adopted considering that the opportunity to improve the collection rate by the current fee collection system is very limited.

d. Other Environmental Management Systems

The actual management of the environment at the district level is difficult considering the indecision regarding the importance of appointing a person in charge. Consequently, activities do not go beyond the problem finding level and the atmosphere is one that awaits any improvement in the administrations of enterprises in the area. Together with the cleansing services, environmental management is closely related to the revival of the area economy and would therefore necessitate the direct participation of the District EP.

5.3.4 Land Use

a. Stance of the Team

The land use plan of Baku City is said to be under on going preparation by the Department of Architecture and City planning of Baku City with the collaboration of Bak Gipro Gor (design) Institute of Baku. However, it is also said that it is not currently in progress due to a budgetary restriction. After the land use plan is prepared, it should be authorized by an appropriate authority for instance the city council. After authorization it has a legal power to be enforced. A land use plan without authorization is nothing but a pie in the sky.

The role of the study team in terms of land use plan is to express its recommendations from environmental consideration for more environmentally sound land use (Figure 5-1).

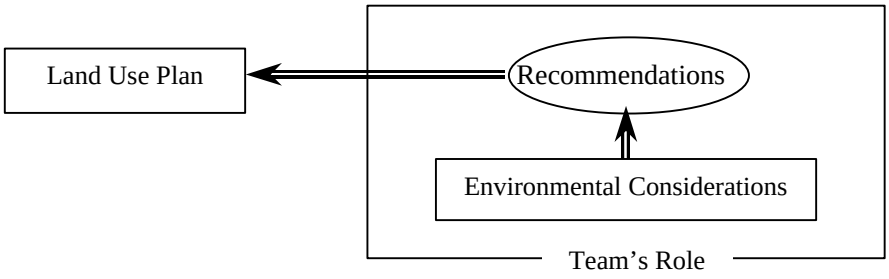


Figure 5-1: Stance of the Team for Land Use Issue

However, generally speaking, a land use plan is one of the basic documents which delineate a future image of the city. Therefore, it requires specialist skill to prepare it. A land use plan has a considerable impact on the policy of the city development. Therefore, it may be necessary to adjust basic policy or concept within the government. The government organization should be solid and well organized to prepare an appropriate land use plan. A land use plan shows the future vision of the city, which should digest the development plan of the city. To do so, there must be overall development framework and indicators for the future city.

Without the existing land use plan, the team is aware of risks of deviating from or contradicting the plan or general development framework intended by the city. However, now that the competent land use plan is not available to the team, the team has to construct recommendations to land use solely from the environmental viewpoint, which will be useful for BCE to practice its authority in terms of the land use.

b. Problems of Current Land Use

The team recognised three main points to be addressed:

- a major problem of land use planning in Baku is that there is no competent land use plan available as yet. The land use plan is the *basic* tool to control the development of the city. It should be prepared as soon as possible. It should be open to the public, so that the people of Baku know the policy and the development direction of Baku. Not only residents, but also investors and developers should be able to know the future perspective of the city. Developers and investors want to know the possibilities and risks of their work. It can be said that the development of a city much depends on the speculation of real-estate developers;
- it is also vitally important to make the procedures for development permits, as well as building permits, very clear and open. Unclear procedures will inhibit or destroy the aims of urban planning. The team is not even sure if the overall development framework for Baku has been set or not, which is the foundation for preparing a land use plan;
- the immediate issues of the current land use in Baku are the abandoned oil fields and the abandoned industrial zone. Sewage treatment, polluted sea shore

and accumulated industrial waste are also big environmental problems, but these are more specific environmental issues which require further investigations, rather than mere land use problems. The revival of these abandoned oil fields and industrial zones are much dependant on the overall development framework for Baku, in line with the development direction of the country itself. Without this basic overall framework, revival works of land use will be just a patchwork solution, rather than a remedy.

c. Enforcement of Land Use

It is essential to prepare a competent land use plan which is authorized by the city for the enforcement of land use plan. The land use plan should be open to the public. It should be available and accessible to the general public without difficulty. A development permit or a building permit should be given according to the land use plan. The procedure of development permit should be clear and open, as well as the land use plan. There should not be many exceptions. The both sides city officials and developers should well understand and observe the aims of the land use regulation. For instance, before planning a construction of factory, a developer should pay attention to the neighbouring residential area in case the industrial building site is close to a residential area. The site should be selected for an industry which has less mal effect on the residents. The industry which has less industrial fumes, noise, obnoxious odour, etc. has to be selected. A geographically dangerous location, like on top or at foot of cliffs, should not be allowed to construct buildings, but plant trees. Considering the rise and fall of the Caspian Sea level, coastal areas should be used for temporary facilities, whose use can be stopped anytime without much difficulty, e.g. parks.

5.4 Technical Management

5.4.1 Monitoring System

a. Institutional Issues

The second paragraph of Article 17 in the Law of Environmental Protection defines “monitoring” as “to control the environment by integrating environmental information”. Monitoring can never be achieved only by collecting environmental information, which is nothing but measuring. Monitoring must include environmental quality management based on collected information, and the obligation and power to execute monitoring reside in the SCE.

At present, however, the task of the SCE is largely confined to the control of pollutants discharged to the environment and they do not pay adequate attention to the status of the environment, which is the consequence of pollutants discharge. As far as the SCE bears responsibility to conduct monitoring, it should be obliged to guarantee clean environmental media, such as air and water, for the general public.

There are three major issues to be addressed that hinder the SCE from complying with its responsibility of monitoring.

a.1 Issues to Hinder the SCE's Monitoring

(1) Duplication and Complexity of Laboratories

The collapse of Former Soviet Union (FSU) has left behind many laboratories, which carry out environmental quality analysis, and a number of experienced scientists. The Academy of Sciences has institutes such as Institute of Soil, Institute of Geology, and Institute of Chemistry, each of which has its own laboratory and highly skilled staff. There are also laboratories within the Caspian Inspectorate under the SCE, Hydromet, and the BCE. The laboratories of the Hydromet have been particularly engaged in background measurement of air, water and soil for years.

Hydromet is the only organisation that measures air quality. The laboratories of the Caspian Inspectorate and the Hydromet, however, both conduct the water quality analysis of the Caspian Sea, thus there is obvious duplication. The laboratories of the Hydromet and ANASA analyse water in lakes. Lake sediment is analysed not by Hydromet but only ANASA, which in fact entrusts the works to the Institute of Geology within Academy of Sciences.

As a result of the duplication and complexity of laboratories, huge collection of data, which have been collected by well-educated personnel, are held by different organisations.

(2) Data Collection without Objectives

Data used to be collected according to the directions and principles formulated in Moscow. Now that the decision flow from Moscow is cut off, the laboratories are simply following their old practice, still continuing analytical works without particular objectives.

Furthermore, the laboratories of Hydromet do not have objectives to analyse environmental quality, but for a different reason. Hydromet was initially vested with responsibility for air and water monitoring (i.e. measurement *and* management of environmental quality) and it even had a power to issue administrative orders to polluters. When the SCE was established in 1987, the authorities of environmental quality management and pollution source control were transferred to the SCE but the responsibility for air and water quality measurement remained in Hydromet. Therefore, Hydromet, which is no longer in charge of environmental quality management, is collecting data without original objectives being relevant.

Data collected without any purpose have been unfortunately simply accumulated and not been utilised.

(3) Charges for Data

The loss of links with Moscow also implied to the laboratories that they had to be economically independent. Azerbaijan, however, encountered severe economic difficulties after its independence and financial conditions of the Azerbaijan Government was too tight to support the activities of laboratories financially.

The data previously collected by the laboratories turned to be a means of self-support. In general, no data is accessible without payment. The governmental organisations, however, can not afford to obtain data, resulting in a total lack of data-sharing. In any event, as a state organisation, the BCE should not be required to pay for data from other departments.

a.2 Factors for Change

Since data are dispersed, closed and costly, the SCE is not able to understand the environmental status, which should be a prerequisite for environmental monitoring. There are, however, two factors that could bring about a positive change to the SCE.

(1) Existing Resources

Azerbaijan inherited the laboratories and highly capable experts but the laboratory equipment is obsolete and the laboratory staffs are facing financial constraints. They are limited but should still be vital resources which exist in the country. Maximising the potential of the existing resources is one of the optimal approaches to be taken.

Considering the weak financial basis of each laboratory at present, the integration of the existing resources will be the most realistic and prudent decision.

(2) Establishment of Ministry of Environmental Protection

There is a plan to transform the SCE to a new Ministry of Environmental Protection (MOEP) by combining the environmental measurement functions of Hydromet. When it is put into practice, the laboratories of the Caspian Inspectorate and Hydromet will be put together under the MOEP.

a.3 Team's View

In the view of the JICA team under the circumstances as above, the unification of the laboratories of the Caspian Inspectorate and Hydromet and upgrading the integrated laboratory to create a new comprehensive laboratory within the MOEP will be the best practical option.

The creation of the MOEP laboratory, which would be called "Central Laboratory", will give such benefits to the MOEP, and to the environment, as below:

- all components necessary for the execution of monitoring including environmental quality measurement, data integration, data utilisation and reflection of data to environmental quality control come together under the jurisdiction of the MOEP;
- expertise raised in the current laboratories can be utilized for a specific objective of environmental management and will be further developed;
- the concentration of laboratory works will enable the efficient allocation of budget.

a.4 Function of the Central Laboratory

The Central Laboratory of the MOEP should play a leading role in developing an environmental quality monitoring system throughout the country and should be equipped with a range of analytical equipment. ****** (part between *** is moved below)

The Central Laboratory should functions as follows:

- monitoring planning;
- research and development;
- quality control of laboratories in the country;

- education and training;
- analysis of samples;
- data evaluation.

(part of *** here) The next question will be what the relationship between the Central Laboratory and the BCE will be. The BCE should take responsibility to monitor environmental quality in its territory and therefore needs analytical equipment. Although the BCE may have a new laboratory, the Central Laboratory should also work as a regional laboratory for the BCE. The functional structure of the Central Laboratory is schematically shown in Figure 5-2

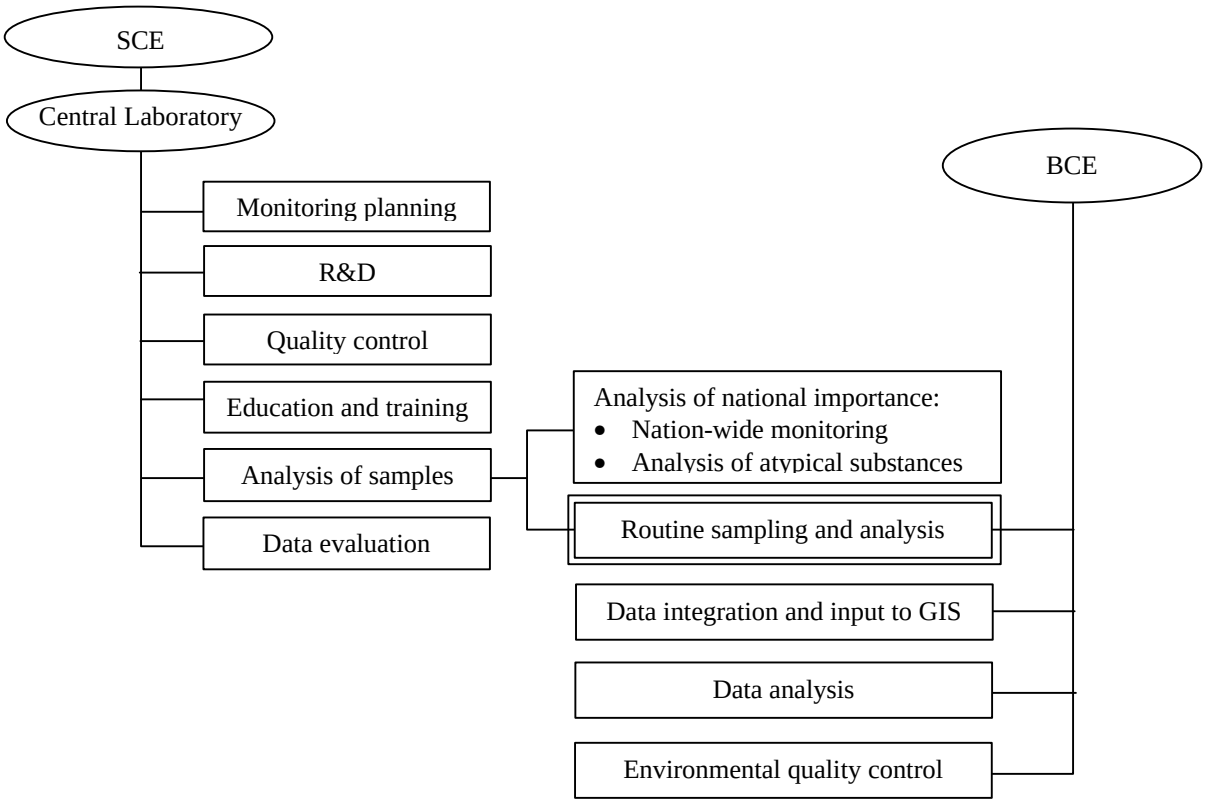


Figure 5-2: Function of the Central Laboratory and Relationship with the BCE

a.5 Data Management

On the establishment of the MOEP, data acquisition will be considerably improved since necessary data will be taken by its own staff. In order to assess environmental quality in the past and understand the trend of environmental quality, however, the MOEP still needs to get data from other institutions. Furthermore, other laboratories, such as those in Academy of Sciences, will continue to be in important positions in environmental quality analysis. They and the MOEP should complement each other. The system for data exchange among the relevant organisations is an urgent necessity.

All citizens should have a right to claim a healthy and clean environment: the currently active and prospective business entities should know what the

environmental status is near their operation areas. Therefore, the data of the MOEP should be accessible to the public, and the GIS that is being developed in this project will be a useful tool by which the data can be presented through the internet.

b. Technical Issues

b.1 Air Quality Monitoring

Vehicle transport will become a main culprit of air pollution, as the economy develops. The current air monitoring system, however, does not have enough monitoring stations to monitor air pollution caused by mobile sources, and pollutants specific to vehicle emission are not well monitored.

Among the nine stations, a monitoring station near the Ishaalchar subway station in Yasamal district is the only station where direct impacts of vehicle exhaust gas can be monitored. The team recommends adding one monitoring station along a road with heavy traffic in order to raise the confidence of monitoring data. Furthermore, some other parameters specific to vehicle pollution, namely hydrocarbon, and suspended particulate matter, should be measured additionally.

The remaining eight stations, located some distance away from roads, monitor general air quality background and are generally adequate. A minor problem is wind speed and direction, measured at the monitoring stations near the Baki Soveti subway Station, Moscow Avenue and Babek Avenue, since these sites are surrounded by tall buildings and wind measurement is erroneous. Wind speed and wind direction should be measured at open places near those sites.

The photochemical oxidant is a secondary pollutant which is formed by photochemical reactions between hydrocarbons and nitrogen oxides. Generally hydrocarbons arise from traffic, but in some places in Baku, the principal source of hydrocarbons may be oil extraction.

b.2 Water Quality Monitoring

In monitoring lakes and canals, it is necessary to examine the possible impacts of water pollution on people, groundwater, crops, fauna and flora; to clarify the objective to monitor those water bodies; to locate monitoring points that well represent the appropriate bodies of water; and select appropriate monitoring items. In this process, particular attention should be paid to the purpose for which the water is used.

A possible constraint on water quality monitoring in the study area is that different authorities are involved in the control of bodies of water such as lakes, canals, sea, and a potable water source. As departments collect water quality data and keep the data to themselves, it is costly and time consuming to access, exchange, interpret, and analyse data. Under such circumstances, it is difficult to develop practical policies that accurately reflect the status of the actual water environment in the area. Therefore, the promotion of data sharing is vital and the GIS will be a valuable tool.

Although the Jeiranbatan reservoir is out of the study area, it is necessary to develop a water quality management plan for the reservoir using the following components:

- geological investigation in its watershed;
- study on land use in its watershed;
- identification of sources and causes of pollution;

- development of land use control measures to protect water quality.

b.3 Soil Quality Monitoring

The action against oil contamination should start with the examination of existing data. The release of data is a prerequisite.

There is an urgent need to understand what sorts of toxic substances are left, to which extent and where they are. The possibility of soil contamination should be assessed by reviewing the operational history of each factory. An inventory of factories with a risk of soil contamination has to be developed by starting with those with higher risks. Policy decisions must be then made on control measures, reflecting the significance of contamination for human health and natural assets.

Although the pesticide disposal site is out of the study area, the team considers that there should be signboards to notify people of danger and the site should be enclosed by fences.

5.4.2 Pollution Source Control

a. Factory

a.1 General

Baku was one of the principal cities that had supported the industrial development of FSU until 1991. With the energy industry as a backbone and its associated chemical and mechanical industries, industrial production in Baku flourished, but causing significant pollution problems.

Due to the collapse of FSU, Azerbaijan's industry lost economic ties with its clients, resulting a significant drop in operational rate of factories. The physical volume index (PVI)[12] in 1998 is 31.8% of that in 1990. The oil industry and power sectors show relatively good PVI figures, 65.9% and 61.0% respectively, while the PVI of the other industries is below 25%. Industrial restoration is one of the foremost matters of importance for the country, but it will be only possible - not by the rehabilitation of existing obsolete and inefficient facilities - but by its regeneration.

The fall in operational rate, which signifies economic depression, has brought favourable conditions in terms of the environment. Assuming that the amount of emitted pollutants is in proportion to the operational rate, the current pollution level will be one third of its peak. This further implies that the pollution abatement cost currently needed would not be very high.

It is not an easy task to introduce an alteration to the environmental management structure which might negatively influence productive activities during economic growth. However, in Azerbaijan's current economic conditions, it should be possible to prepare for future expansion in a way which would be practical and beneficial in the long term at a relatively lower cost.

a.2 Environmental Conservation Measures

Environmental conservation measures are categorised into (i) **upstream measures** to reduce or prevent the generation of polluting materials and (ii) **downstream**

[12] Statistical Yearbook of Azerbaijan 1999, State Committee for Statistics.

measures to convert those polluting materials, which are inevitably produced, to harmless ones. One of the upstream measures is the use of energy and raw materials with little pollution. In case of energy resources, the use of clean energy is the most fundamental upstream measure against air pollution. The replacement of coal with oil with much lower ash or the replacement of oil with gas not containing heavy metal can significantly improve the quality of emission gas.

The other upstream measure is efficient use of all the resources. Improving the efficiency of raw material use can not only reduce the generation of the waste but also improve the productivity of the factory in many cases. Efficient water use reduces the volume of wastewater, and consequently lightens the burden of wastewater treatment. Since improved energy efficiency results in the reduced generation of waste gas, it plays a big role. In Japan in the 1970's, the improvement of combustion control of boilers and furnaces was a major contributor of the improved air quality.

The downstream measures have three categories. The first is treatment in the factory itself. For example, the installation of dust collectors or gas scrubbers belongs to this category. In case of wastewater, the removal of solid materials and pretreatment prior to be discharged to the city sewerage are in this category. If the wastewater is discharged to public water bodies, the factories have to treat it to meet the emission standard.

The second category of the downstream measures is treatment in collective facilities such as city sewage plants. In case of solid waste, intermediate treatment to reduce the waste volume (for example at collective incineration plants) and final disposal belong to this category. The third category is the most downstream treatment that takes place after a problem appears, such as the re-mediation of the polluted sites.

Various countermeasures from upstream to downstream play respective and important roles complementarily. In general, however, the upstream measures are more cost effective than the downstream measures. The former also contributes to the improvement of the productivity of the factories in many cases, whilst the latter is often merely economic expenditure. For example the re-mediation of polluted sites is extremely expensive than prevention. Accordingly giving high priority to upstream measures (See Table 5-1) should be a basic policy. The term "priority" used here does not necessarily show the order of necessity of the countermeasures.

Table 5-1: Priority of Environmental Conservation Countermeasures

Classification	Order of Priority	Countermeasures (Examples)
Upstream Measures (Prevention)	I	Change to clean energy Change to clean raw materials
	I	Effective use of raw materials Effective use of water Effective use of energy
Downstream Measures (Treatment and re-mediation)	II	Waste gas scrubbing SO_X removal NO_X control Wastewater treatment

	II	Collective sewage treatment Collective waste treatment Collective waste disposal
	III	Re-mediation of polluted sites

a.3 Current Pollutant Emission

a.3.1 Air Pollutant

(1) Sulphur oxides

Sulphur content in heavy oil used in Azerbaijan is substantially low and gas fuel is also widely usedin the factories. This is actually an absolute advantage over most other industrial cities. Therefore, boilers at factories and power stations are not equipped with sulphur removal units and they do not, generally, need them.

According to the Factories Survey, the maximum concentration of sulphur oxides (SO_x) emission is 309mg/Nm^3 and the average concentration is 67 mg/Nm^3. This low level concentration without any countermeasures is largely due to low sulphur content in fuel. The maximum concentration of emission, 309mg/Nm^3, needs to be reduced by installing an exhaust gas treatment facility if an emission standard in the most strictly controlled areas in Japan is applied. However it is slightly higher than the maximum allowable emission level of EU, 300mg/Nm^3.

(2) Nitrogen oxides (NO_x)

There are almost no devices to control nitrogen oxides at the 19 factories visited by the team. According to the Factories Survey, the maximum emission concentration of nitrogen oxides (NO_x) is 160mg/Nm^3 (110 ppm) and the average one is 17mg/Nm^3 (12 ppm). In Japan an allowable emission level is stipulated in volume and ranges between 60 – 800 ppm depending on the area. The maximum concentration of Baku (in weight) is equivalent to 110 ppm, which needs to equip with an exhaust gas treatment facility in some area (160mg/Nm^3 x 22.4 ltr/32.6 = 110 ppm). However, the average NO_x concentration in Baku (17mg/Nm^3 is equivalent to 12 ppm) is much lower than the allowable emission level stipulated in Japan.

(3) Particulate Matters (Dust and Soot)

According to the Factories Survey, the maximum emission concentration of dust is 207mg/Nm^3 and the average one is 14mg/Nm^3 . In Japan the maximum allowable concentration is regulated in weight and it ranges between 30 - 500mg/Nm^3 according to the facility type and emission gas volume. For instance, the maximum allowable concentration for a cement production furnace is 100mg/Nm^3 (and 50mg/Nm^3 for the most strictly controlled area) and that for a waste incinerator, emission gas volume of which is more than 40,000mg/Nm^3/hour, is 150mg/Nm^3 (and 80mg/Nm^3 for the most strict area) Taking the current dust and soot emission in Baku into consideration dust and soot collectors with high performance such as electrostatic precipitators or bag filters are recommended to introduce in the factories which deal with powdery materials.

a.3.2 Industrial Wastewater

According to the Factories Survey, there are 199 wastewater discharge sources (factories) and total volume is 17,800 ton/hour except cooling water with no

pollutants. Among this volume, 33% (107 wastewater, 5,800 ton/hour) is sent to the city sewage plants. Maximum concentration of pollutants of the water is 381 mg/l for BOD, 513 mg/l for COD and 535 mg/l for suspended solids. A conventional sewage plants with biological treatment process can treat this concentration level if the wastewater does not contain harmful materials.

On the other hand, 60% of wastewater amount (46 sources, 10,700 ton/hour) are discharged to public water bodies. It is necessary to monitor their quality. Azerbaijan already employs a system in which industrial wastewater is pre-treated at factories and collected to sewage treatment plants for final treatment, although the system requires further improvement. Problems may arise, however, if the enforcement of pre-treatment at factories is weak, or if cost sharing lacks fairness.

a.3.3 Hazardous Waste (HW)

According to the Factories Survey, the most of the factories (77.9%), which produce HW, treat/dispose HW within their compound. When asked about future HW management, most of the factories (72.6%) that produce HW answered that they will continue to treat/dispose HW within their compound. Very limited number of factories (14.4%) stated that they may entrust treatment/disposal works to a waste disposal agent.

From the economic and technical point of view, however, it is preferable to pre-treat and dispose of the HW by a centralised system except for some types of specific waste. The promotion of enterprises, which are specialised in HW treatment and disposal, will be necessary.

a.3.4 Pollutant from Oil Mining

Pollutants generated by oil extraction are mainly volatile organic compounds (VOCs) together with carbon monoxide, wastewater and oil sludge.

VOCs are released to the air directly from oil wells, but also during the oil-water separation process. Oil-water separation is at present operated in the open air, but it will be worth examining the recovery of hydrocarbons by enclosing the process. Oil content in wastewater should be reduced by upgrading the efficiency of oil-water separation. Oil sludge must be collected periodically, and it is recommended that the oil content in the sludge is recovered and the remainder purified.

a.4 Environmental Management System at Factories

According to the 250 Factories Survey, most of factories surveyed (85.6%) replied that they have made effort to reduce adverse impact to the environment. However, more than half of factories (56.9%) do not know the CPT (cleaner production technology). The factories that introduced the CPT are limited (16.6%).

The anticipated growth of exports to the European market will require enterprises to develop an environmental management system that complies with worldwide standards. The standard, ISO14001, includes not only traditional pollution control but also energy saving and efficient use of resources measures. Environmental management stipulated in ISO14001 must include the rigid execution of four steps (environmental management planning, implementation of the plan, check on activities, and modification of the plan) and continuous improvement of the system.

Most of the 19 factories that the team visited have staff specifically in charge of the environment, even the factories which had stopped their operations. This suggests that there is a foundation within the factories to foster their environmental management systems.

a.5 Environmental Impact Management by Factories

a.5.1 Current Methodology

The control of air pollution caused by air emission from a factory is based on a diffused concentration control method, by which the factory applies a diffusion model in omni-direction to major pollutants and forecasts environmental impacts in its surrounding area. They have to consider the consequence of their air emission, taking account of not only the ground level concentration of pollutants from them but also the background pollution level.

An advantage of this method is that the governmental responsibility becomes lighter as factories play a role in regional environmental control. It is not, however, favourable to require diffusion calculations for each factory for the following reasons:

- diffusion calculation needs specific skills and can be a heavy burden on the factories;
- calculated figures are subject to significant errors unless parameters in diffusion models and calculation methods are consistent;
- it is not appropriate to require a factory to consider background levels resulting from air emissions from other factories;
- the team presumes that a factory, which starts its operation later, will be allocated a lower limit of permissible emission, since the background pollution level will have increased. By doing this, the desirable ambient air quality will be assured, but there is little fairness in not evenly obligating polluters to prevent pollution.

On the other hand, industrial wastewater is, in general, controlled by pollutant concentration. This ensures fairness among pollution dischargers, but requires additional attention to total pollution load to the environment.

a.5.2 Future Environmental Impact Management

Environmental impact management in the coming decade in Baku must reflect the current trend towards privatisation. Companies, once privatised, do not act complementarily as under the planned economy but turn to become competitors providing similar services. Therefore, environmental control over the factories has to be fair and transparent, and pollution control requirements must be clear enough to make all factories consent.

Considering such a change of business, air pollution control should more depend on discharge concentration control than diffused concentration control. As for wastewater discharge control, the current control method will not need any major modification since it mainly take discharge concentration into account.

Control of concentration of air emission and wastewater discharge, however, limits the environmental obligation of factories only up to their outlets of pollutants and

their attention to the regional environment cannot be expected. Instead, an environmental authority has to take the responsibility to monitor regional environmental quality and enforce concentration control at pollution sources from the wide viewpoint of the regional environment.

a.6 Environmental Control of Factories by BCE and SCE

The JICA preparatory team, dispatched in August 1999 prior to the current study, reported that factories in Baku need to submit documents called "environmental passports" containing information on their environmental control, and that the BCE keeps more than 1,000 environmental passports.

The JICA study team, however, found that the responsibility for keeping the environmental passports had been shifted from BCE to SCE, and neither BCE nor SCE actually keep environmental passports, their summaries, or even a list of factories under their control. In other words, there is no authority that grasps the overall status of pollutant generation in region. The reason for this situation is that the responsibility to control influences by productive activities on the environment was by and large entrusted to factories.

As privatisation is promoted, however, pollution control at source is not enough and it is necessary to develop an environmental management structure that covers an entire region. For this purpose, the BCE or SCE should develop a list of factories operating in their jurisdictions, categorise them by type of operation, and periodically obtain data of pollutant discharge from them. The team recommend the BCE to develop a database for proper control of point pollution sources (factories) based on data obtained by the Factories Survey conducted by the team.

b. Mobile Pollution Sources

Control of mobile pollution sources is the responsibility of the Ministry of Internal Affairs and the Police, and monitoring of air pollution by the mobile sources is the responsibility of the BCE. The BCE should request the Ministry of Internal Affairs to fully accomplish its work of exhaust tests and send the results to the BCE.

Traffic jams seem to be one of the contributors to air pollution. Illegal parking is hindering traffic, causing vehicle congestion. Vehicles' frequent stopping and starting results in a large amount of emissions gas. It is essential to develop a plan to ease traffic jams in the city in order to smooth traffic flow so that gas emission is reduced and ambient air in the roads is well mixed and diffused.

c. Wastewater

A master plan of wastewater, "Water and Wastewater Master Plan for Greater Baku, March 1999," was formulated by the World Bank (WB), followed by Wastewater F/S conducted by the Baku-Berlin Infrastructure Development JV. The priority projects will be implemented based on the F/S report, which the team has not received despite requests.

c.1 Sewage

The Wastewater M/P aims to raise sewage (domestic wastewater and industrial wastewater treated to an acceptable level) treatment rate from 44 % at present to 100 % by the target year 2015. Once the M/P is implemented thoroughly, water

pollution problems caused by sewage, which is currently discharged into bodies of water inland and in the Caspian Sea, will be resolved.

The M/P report estimates the total capital investment required is US$ 1,131 million. However, the report points out the following:

- the total capital expenditure required is much greater than is affordable given the current levels of wastewater tariffs and revenue collection;
- it will therefore be necessary to curtail significantly the programme shown in the M/P and to prioritise investment over the next 15 years;
- capital expenditure should therefore be concentrated on measures that will eliminate flooding in Baku city and the current gross pollution of the harbour.

c.2 Industrial Wastewater

The current policy is that industry is responsible for treating its own wastewater, and this should be forwarded. According to the Wastewater M/P, by 2015 all industrial wastewater should be discharged to the city sewerage and treated at the wastewater treatment plant, together with domestic wastewater. Therefore the industry is obliged to treat its wastewater to an extent that is acceptable to the city sewerage. The M/P, however, does not mention wastewater treatment at individual industrial units.

The Wastewater M/P concludes that it is the responsibility of industry to treat its wastewater to an acceptable level. The M/P does not include an industrial wastewater treatment plan but addresses the following topics:

- existing industrial wastewater discharges;
- extent of pre-treatment of industrial wastewater;
- policy for the pre-treatment of industrial wastewater.

Finally the M/P study presents the following policy for industrial wastewater pollution control:

- the review of the current industrial wastewater situation and the relevant legislation revealed an urgent need for action. However, given the current economic situation, there is likely to be resistance to some of the more costly improvements that might be proposed under such a plan. These may be hard to justify in economically difficult times when there are apparently more important issues to be confronted;
- the effective implementation of the above policy requires the setting of strategic goals. For simplicity these have been identified for a number of key areas, although there are close links between them:
  - monitoring inspection and regulations;
  - integrated pollution prevention control;
  - institutional strengthening and environmental awareness;
  - finance.

d. Municipal Solid Waste

d.1 Current Situation

Municipal solid waste (MSW) in this report is defined as non-hazardous solid waste that can be disposed of at a municipal landfill.

UP Azerbaijan (UPA) and KASCO Waste Service (KASCO-RCP) developed municipal solid waste management (MSWM) M/Ps for the districts under their service, but their reports have not been disclosed to the team. There are no MSWM M/Ps for the whole study area or for the other districts. In addition, no authorities identify factors crucial for proper MSWM, such as generation and disposal amounts of MSW.

The team received information on monthly disposal amounts from Sabayil and Yasamal districts from KASCO-RCP. Using this information, the team estimated the refuse generation rates per capita of these two districts with the following assumptions:

- a unit weight of refuse is 0.5 ton/m^3;
- refuse collection service coverage rate is 100 % in the two districts;
- refuse disposal amount is equal to refuse generation amount.

The daily refuse generation rates per capita were calculated at 3,019g and 1,684g for Sabayil and Yasamal districts respectively. These are enormously higher than those of Adana and Mersin in Turkey.

Table 5-2: Comparison of MSW Generation

Items / District or City	Disposal Amount in Volume (m3/day)	Disposal Amount in Weight (ton/day)	Population Living	Generation (Disposal) Rate per Capita (g/person/day)	Refuse Collection Coverage Rate (%)
Sabayil District in 1999*1	517	259	85,800	3,019	?
Yasamal District in 1999*1	800	400	237,500	1,684	?
Adana in Turkey in 1999*2	-	803	1,196,620	671	97
Mersin in Turkey in 1998*2	-	425	634,850	669	91

Source *1: KASCO-RCP
*2: The Study on Regional Solid Waste Management for Adana-Mersin in the Republic of Turkey, January 2000

There are four authorised but non-sanitary disposal sites in the study area. Balahani and Lokbatan disposal sites operated by UPA and KASCO-RCP respectively charge for tipping and others are free. There are, however, 800 to 850 illegal dumpsites (the area of which is 200 to 250 ha in total) according to a report made by an inspector of the BCE. It is clear that this large number of illegal dumping sites results not only from a reluctance to pay for tipping and transportation to the disposal site, but also insufficient refuse collection services.

Except in the city centre, illegal dumping is found everywhere including in a natural monument area such as Yasamal valley. It denigrates the landscapes of the city and even threatens the health of citizens, because some illegally dumped waste may

contain hazardous substances. The inspectors of BCE know the sites, but in practice, all they can do is to ask the district offices to clean them up.

Baku EP intended to strengthen MSWM capacity through the privatisation of collection and disposal operations. UPA obtained concession for nine districts in 1998 but they are operating only in Narimanov district as at May 2000, due to financial problems mainly caused by an insufficient refuse collection fee. KASCO-RCP, the contractor of Yasamal and Sabayil districts, cannot provide sanitary landfill operations due to financial constraints as well.

There were well-established recycling systems and markets for recyclable wastes before 1991 in the Former Soviet Union (FSU). However, the collapse of the FSU resulted in the absence or insufficiency of final users of recycled materials in Azerbaijan. Without sufficient final users, the recycling system and market for recycled materials such as paper, plastics, textiles and metals were seriously damaged, although recycling of waste is the most desirable way of MSW disposal.

d.2 Team's View

In order to establish a sound MSWM system in the study area, the team recommends formulating a MSWM M/P. The M/P should be formulated paying attention to the following aspects:

- identification of current waste flow that shows how much waste is generated, discharged, illegally dumped, and disposed of at landfills;
- establishment of sustainable financial system;
- elimination of illegal dumping;
- reestablishment of the recycling system.

e. Hazardous Waste

In general, hazardous waste management (HWM) is not established in the study area and is not even planned. Since improper HWM is a direct threat to human life, the Urgent Environmental Investment Project (UEIP) financed by the World Bank (WB) includes a HWM project as a sub-component of the Environment Management Component. The HWM study has commenced in July 2000 and will end in June 2002.

This HWM study will develop a "cradle-to-grave" management system for hazardous waste (HW). The study includes the development of a classification system and inventory for HW, a register for producers of HW, the development and implementation of regulations for storage, handling and transportation of HW and site design.

The WB UEIP has another component important to HWM - Mercury Cleanup Component, which is due to commence shortly and will end in 2003. The component includes the construction of a safe, new landfill. The Project Implementation Unit (PIU) of UEIP intends to construct a HW landfill not only for mercury-contaminated waste but also for other HW.

f. Medical Waste

This study defines medical wastes as infectious/hazardous wastes generated from medical care. There is neither a medical waste management plan in the study area nor a plan to formulate one. Therefore the team conducted an opinion survey of 40

medical institutions in the study area in order to understand the generation amounts of medical waste and their waste management practices in terms of segregation, storage, discharge, collection, treatment and final disposal.

The "Sanitary Regulations for Maintenance of Residential Areas, SanPiN 42-128-4690-88" prohibit medical waste disposal (infectious/hazardous from medical institutions) at a landfill without treatment. According to the opinion survey for medical institutions conducted by the team, some of medical institutions discharge their medical wastes without treatment and those wastes are disposed of at landfills with municipal waste. A M/P for medical waste management is therefore urgently needed.

5.4.3 Nature Environment Conservation

a. Conservation Areas Management

Nature conservation works in Baku have been attempted by preventing or minimising impacts of human activities that may affect the nature resources. Practically the role of the BCE is to keep nature intact, and peoples' access to the two sanctuaries to enjoy the nature is not encouraged.

In fact, the BCE does not possess fundamental instruments to accomplish such duties. They have no transport means but only two obsolete vessels to cover the land of over 2,000 km^2 with 375 km coastline. In the Absheron sanctuary there is only an old gate and a small lodge for the guards, which is an extremely poor condition for the guards to stay for 24 hours in three shifts. There is no signboard at the entrance, no fence, nor any monitoring posts to survey the ecological status of the area. Such deficiencies totally hamper the nature conservation efforts of the BCE.

Although nature conservation under these conditions is therefore a hard task for the BCE, protection by exclusion of the public may still not be sufficient. The team recognises that the sanctuaries are of paramount importance considering the following facts:

- the environment and landscape in most parts of Baku city are severely degraded;
- the opportunity for the general public living in the city to enjoy nature is inadequate;
- the Absheron peninsula is semi-desert and is not rich in natural resources by nature except for the sanctuaries.

Therefore the sanctuaries are environmentally vital in the peninsula. It is unfortunate that a relevant law does not allow people to visit these and enjoy nature. It is impossible for people even to notice the nature value that they actually have. Without the appropriate appreciation by people of nature, however, there would be little rationale to protect it. Thus what needs to be done is not only the maintenance but also the enhancement and best use of the real nature value.

For the general public to enjoy the nature in the sanctuaries fully, legislative review and formulation of a new legal framework that are currently under way in Parliament are needed. Further, some other facilities will be required for safe and pleasant visiting. If people's appreciation of nature value is promoted, society as a whole

will start to keep watch over the natural values of the sanctuaries, and nature conservation will be advanced.

For the targets mentioned above, i.e. nature conservation and recreational use, the following facilities will be needed:

- fence and attractive entrance space.;
- comfortable lodge with appropriate facilities for the guards;
- monitoring posts;
- transportation;
- visitor centre with pictures and descriptions of main species found in the area;
- wooden footpaths in part of the sanctuaries;
- signboards to present information on nature and to warn the visitors of dangerous spots.

b. Fauna Protection Works

The tasks of the Fauna and conservation areas department of the BCE and their problems that hamper the proper execution of those tasks were discussed with the BCE personnel and the team. They can be illustrated as in Figure 5-3.

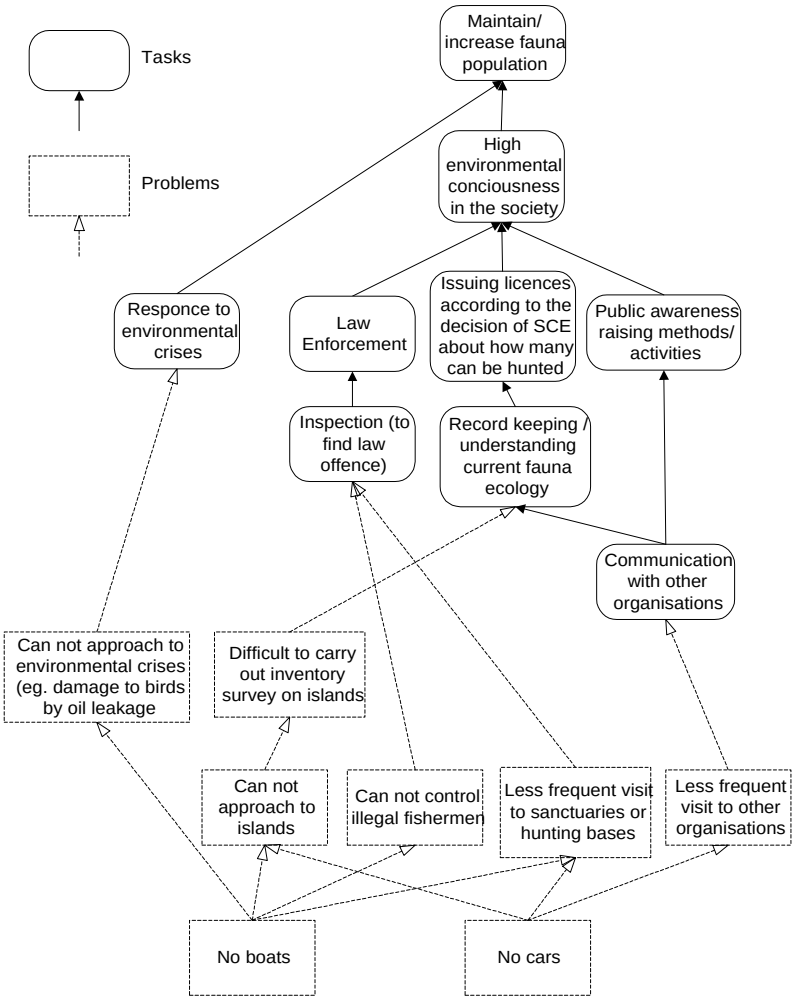


Figure 5-3: Tasks and Problems of the BCE Fauna Protection Works

c. Flora

c.1 City Greenery

From the land use data (existing 1:10,000 land use map), it can be presumed that four land use categories, namely park and green area, forest plantation, recreational area and wild nature reserves, correspond to the area where people can enjoy greenery. Those are shown in Table 5-3.

It is an internationally accepted way to assess greenery area by examining area per capita, as Table 5-4 shows (column 2).

Table 5-3: Greenery Space by District (1)

Unit: m^2

District	Parks	Forest plantation	Recreational	Res - Wild nature	Total greenery area
Sabayil	953,517	1,813,536	466,127		3,233,180
Yasamal	83,188	589,318			672,506
Nasimi	288,209	17,987			306,196
Narimanov	639,343				639,343
Nizami	1,991,005	221,596			2,212,601
Khatai	404,813	933,574			1,338,387
Sub-total	*4,360,075*				*8,402,213*
Garadag		1,666,632	23,595,282	1,280,853	26,542,767
Binagadi	377,253	5,754,368	24,176,071		30,307,692
Sabunchu	367,164	2,218,944	63,411,718		65,997,826
Surakhani	544,276	2,327,279	2,562,342		5,433,897
Azizbeyov	219,791	1,962,783	44,268,534	3,877,914	50,329,022
Total	5,868,558	17,506,017	158,480,074	5,158,766	187,013,416

Source: Land use in GIS established by the JICA team.

Table 5-4: Greenery Space by District (2)

	(1)	(2)	(3)	(4)	(5)	(6)
	Population	Greenery area/ Population	Park and green/ Population	Open space	Open space/ Population	Population density
District	Thousand	m^2/capita	m^2/capita	1,000 m^2	m^2/capita	Person/km^2
Sabayil	74.3	43.52	12.83	6,077	81.78	2,654
Yasamal	221.5	3.04	0.38	1,578	7.13	13,844
Nasimi	195.8	1.56	1.47	60	0.30	19,580
Narimanov	147.9	4.32	4.32		0.00	5,916
Nizami	159.1	13.91	12.51	154	0.97	7,955
Khatai	215.5	6.21	1.88	3,107	14.42	6,734
Sub-total	*1014.1*	*8.29*	*4.30*	*3,261*	*3.22*	*7,741*
Garadag	94.3	281.47	0.00	940,607	9,974.62	83
Binagadi	209.3	144.81	1.80	16,043	76.65	1,292
Sabunchu	188.6	349.94	1.95	56,527	299.72	773
Surakhani	165.8	32.77	3.28	24,899	150.18	1,359
Azizbeyov	116.4	432.38	1.89	221,371	1,901.81	294
Total	1,788.5	104.56	3.28	1,270,421	710.33	816

Source: Land use in GIS established by the JICA team.

This table suggests:

- Yasamal, Nasimi, Narimanov and Khatai districts, which are in the central Baku and in which one third of city population live, have extremely small greenery area per person. In those districts, open space per capita is also scanty (columns 4 and 5), thus greenery area can be increased only by the conversion of land use (eg conversion of abandoned old factories to parks).
- The other districts have relatively large green area per capita. This is, however, largely due to the presence of large recreational areas and forest plantation. If we take only parks into account, the figures drop significantly for all districts (column 3).
- Considering the result of Question 39 of the public opinion survey that not many people enjoy excursion, large recreational area may not serve the population as would be expected. From the observation by the team, the forest plantation areas are the places where single species is systematically and monotonously planted on grids. Although such forest is one of the important elements of city landscape, it does not serve as a place where people commune with nature. Therefore it can be presumed that the opportunities for people to enjoy greenery are limited throughout the city in spite of large recreational area and forest plantation.

From the argument above, the nearby greenery (parks) should be developed in the urbanised city centre. Because of the limited resources in Azerbaijan in terms of finance and manpower, it will be reasonable to concentrate the resources into the limited area, which will be the six districts in the city centre (Sabayil, Yasamal,

Nasimi, Narimanov, Nizami, and Khatai). In these districts, greenery area/capita is 8.29 m^2/capita and park is 4.30 m^2/capita, while open space is 3.22 m^2/capita.

Because of the limited open space, development of parks requires the conversion of land use, which will not be easy. Therefore, it will become vital (i) to urge industries, schools, public offices, housing complexes, and other organisations to plant trees within their properties, (ii) to obligate or strongly recommend the contractorsd to plant trees when land use is to be converted for new development purpose, and (iii) obviously to prevent existing trees from felling as much as possible.

c.2 Flora Protection

Through the repeated meetings, the team and the Flora protection department of the BCE developed a "problem tree" as shown in Figure 5-4

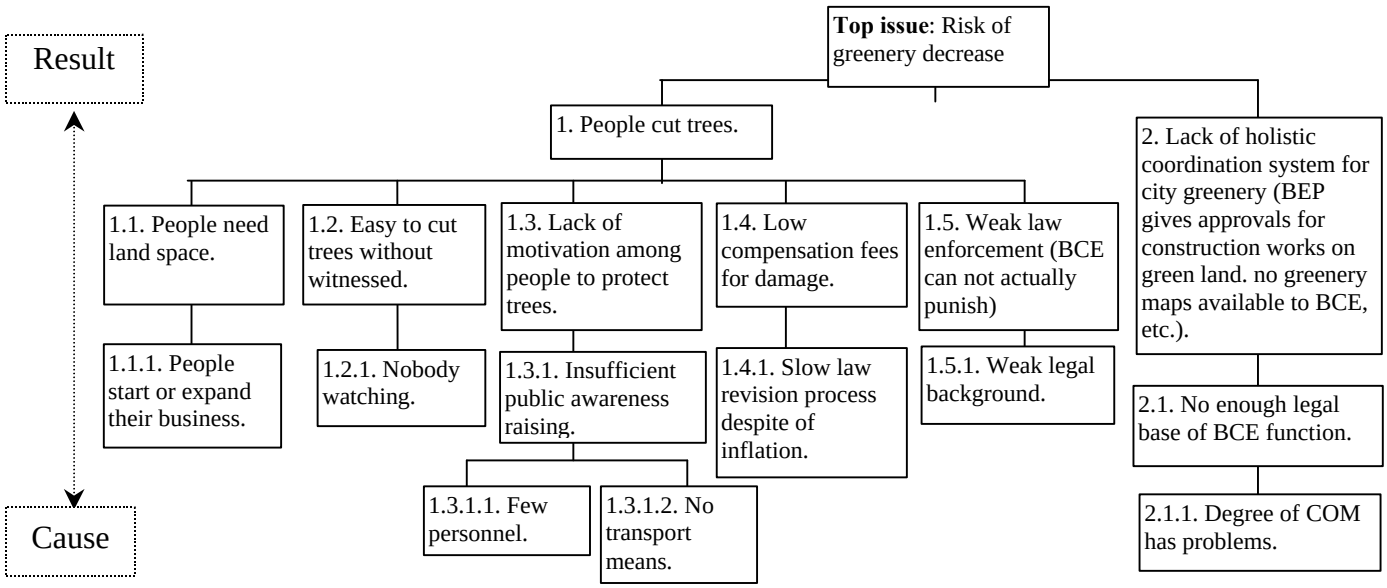


Figure 5-4: Problem Tree of Flora Protection

From this analysis, the team concluded as follows.

- In reality it is impossible to protect all greenery in the city by any means. Citizens should fully understand how important the greens are and how much efforts have been made to increase greens in the city to the current level in its history, and should appreciate the benefit of greens. Raising public awareness is the ultimate solution, although it takes time.
- Because the ownership of trees belongs to those who planted, it is reasonable to entrust the protection works to the tree owners who should have good ground to protect their trees. In this case, the BCE's task will be to supervise their protection works.
- If the BCE can expand its task, that is now limited to greenery protection according to its words, BCE should have more wider view to enhance city greenery. Its tasks will include:

- to monitor planting and cutting works by BEP, Ministry of Road Construction, and industries and control the overall increase of greenery.
- to set priority areas to plant and urge relevant organisations to plant there.
- to promote tree planting (for example, to obligate or strongly recommend new industries, commerce and housing development to plant trees in the EIA process or other occasions, to obligate legal or physical persons who want to cut trees to plant trees in other places (no net loss of greenery), organise events at schools to plant trees/flowers, support tree nurseries.)
- to encourage voluntary work among people and involve NGOs.
- to develop close cooperation with Universities, Academy of Sciences and Botanical Garden and discuss which species should be planted, which tree diseases should be paid attention, how to raise public awareness (c.f. Botanical garden and a NGO has an education program for school children), and others.
- to keep record of greenery (how many trees were planted, how many m^2 of greenery increased, where will be planted in the next year, etc.) and open the record to the public.

- It is obvious that expanding the BCE's tasks as above requires new legislations which clearly stipulate the rights and responsibilities of the BCE, and partnership among relevant organisations particularly the BEP.

5.4.4 GIS

GIS database establishment is one of key components of the current project. Although the term "establishment" may imply "completion of the system", it must be noted that a GIS requires constant database update that should never be terminated. A GIS is not a solution but a merely tool whose value can only be realised when it is actually utilised. Furthermore, institutional arrangements are necessary to operate the system. Therefore, the issue is threefold: (i) how to keep the GIS alive (GIS maintenance), (ii) how to apply the GIS to environmental management (GIS application) and (iii) how to manage the GIS (GIS management).

a. GIS Maintenance

GIS maintenance requires a regularly updated database, which in turn requires constant access to data sources. In this regard, the team has noticed that there are external data sources and internal data sources both of which are important for the BCE's GIS.

a.1 External Data Sources

The majority of data related to environmental issues are collected by organizations other than the BCE, including Hydromet and ANASA. This will be largely because the work scope of the BCE (and the SCE) emphasises the control of human activities which might cause negative environmental impacts, paying little attention to environmental status itself. Inspection at enterprises and development design review (EIA) are their main tasks, and status of the environment is observed by the others. Such task demarcation is not necessarily to be criticised, but the problem is that environmental data are kept undisclosed. In other words, external data sources exist, but data flow towards the BCE is severely limited.

The JICA team has attempted to collect and integrate such information into the newly developed GIS database. The team, however, also recognises that clear rules must be worked out among those organisations concerned, in order to ensure a steady data stream is obtained.

Meanwhile, the GoAz plans to reform the SCE to a Ministry status incorporating the environment-related responsibilities of Hydromet, the forestry and fisheries state concerns. Data accessibility is therefore expected to improve to a certain extent.

a.2 Internal Data Sources

The JICA team received vital information from the BCE personnel. The information, however, was possessed by individuals and had not been documented until the team requested. This signifies that there *are* internal data sources but these are not ready to be used or shared by the organisation as a whole.

The internal data sources should be fully utilized and reflected in the GIS.

b. GIS Application

The actual application of the GIS depends on the purpose the BCE wants to achieve. The team suggests the main application forms should be:

- overall environmental management in Baku city;
- inspection and law enforcement;
- evaluation of EIA reports;
- instruction and recommendation for the rational land use in view of environmental protection of the city.

GIS applications, however, should not be restricted to be purpose-driven. For example, GIS is a sophisticated visual tool and self-explanatory. Therefore, it could be easily and effectively applied for educational purposes, even though environmental education would not be initially intended by the BCE.

c. Institutional Arrangement for GIS

Introduction of GIS is nowadays a worldwide trend; a number of cases of GIS introduction can be found. There are, however, also a few cases where the GIS is no longer taken care of and ends up as ornament. Most of such problems stem from the following:

- only one or two personnel know how to operate the GIS. The GIS is thus used for limited purposes interesting to that minority. When the staff are moved to different departments or organisations, nobody remains who knows the GIS;
- the cost in terms of manpower, finance, and time was not fully understood prior to GIS introduction. GIS introduction is not a final stage, but simply a starting point, from which operation and maintenance develop;
- the GIS is regarded as a burden which does not improve the works but only complicates them. There is no motivation to use it among the personnel.

A GIS entails various actions, including data acquisition, data input, computer operation, data application, data presentation, and data distribution (Figure 5-5). Since all these are virtually new and additional tasks for the BCE, these could be heavy loads if there is no practicable institutional arrangement to systematise all these actions.

In order to arrange effective use for the GIS, the BCE and the team must consider a number of points.

1. All actions mentioned above must be simple at the initial stage. In particular, data acquisition and input has to be as simple as possible since this is the backbone of the whole system and should not be impeded. It is preferred that data are digitised at source and sent to the BCE as computer files. The BCE should have rules to standardise the data format and data supply procedure.

2. The GIS should not remain supplementary but be incorporated into the BCE's daily works. Therefore, not only the personnel of the Department of Information but also personnel of other departments should have access to and use the system.

3. The GIS should be regarded as an asset not of individuals but of the BCE, and preferably of the general public. The team has proposed to open the database to the public using the internet, so that the population can enjoy benefits that can be drawn from the GIS. Awareness that the GIS is serving society will be a foremost impetus for the personnel which operates and maintains the system.

4. The BCE must have a taskforce that has full responsibility for GIS management. As of April 2000, the BCE reorganised, combining its Department of Information with the Department of Environmental Impact Assessment. The taskforce will be organised by this department together with other relevant personnel and mainly should:

    - explore the use of the GIS;
    - decide which kinds of data are needed.;
    - identify data sources;
    - orchestrate data handling procedures;
    - encourage the personnel to use the GIS;
    - find out the best way of data release and presentation management.

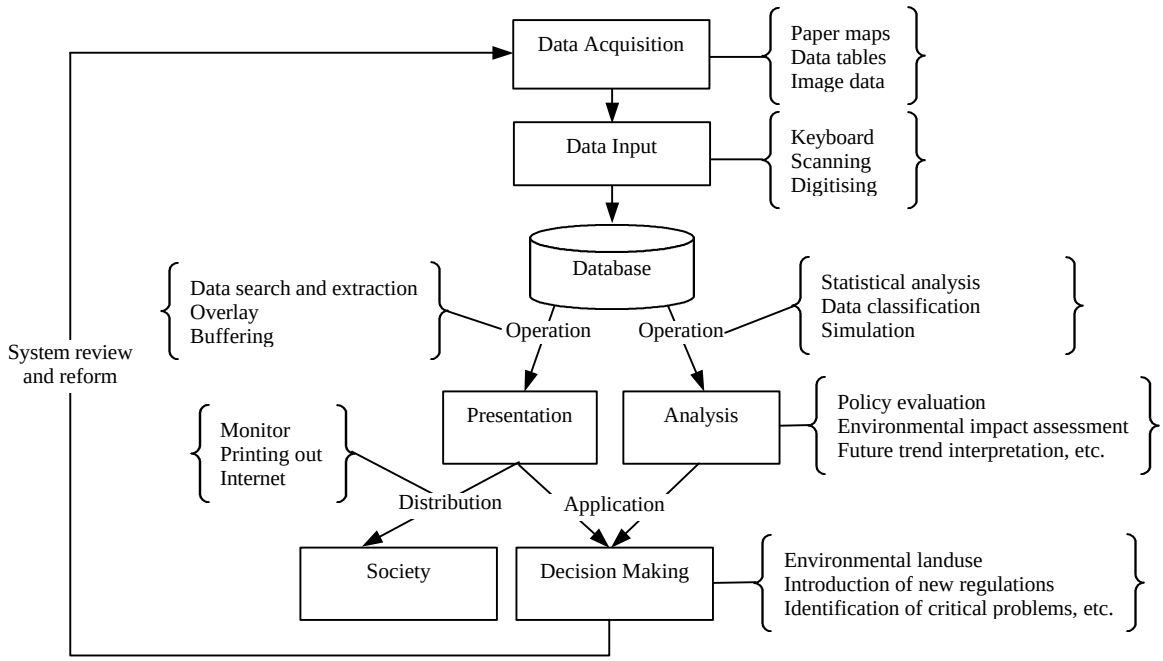


Figure 5-5: Series of Actions Involved in the GIS

5.4.5 Food Control

The food control of the Republic is under restructuring, as described in Section 4.4.5.

The team considers that a public health matter in regard to food poisoning should remain with Centre for Sanitation and Epidemiology, which has long experience in food analysis and possesses a large number of staff with medical-related background. The food safety is one of the fundamental jobs of a country, and should not have any confusion or misunderstandings among governmental bodies. The development of a clear legislative structure is the foremost importance.

When considering the BCE's role, one should always remind that the BCE, under the SCE, is the superior body in the area of nature protection and rational utilisation of nature resources as stated in the BCE charter. The understanding of the team about the relationship between food control, environment and the BCE/SCE is as in Figure 5-6.

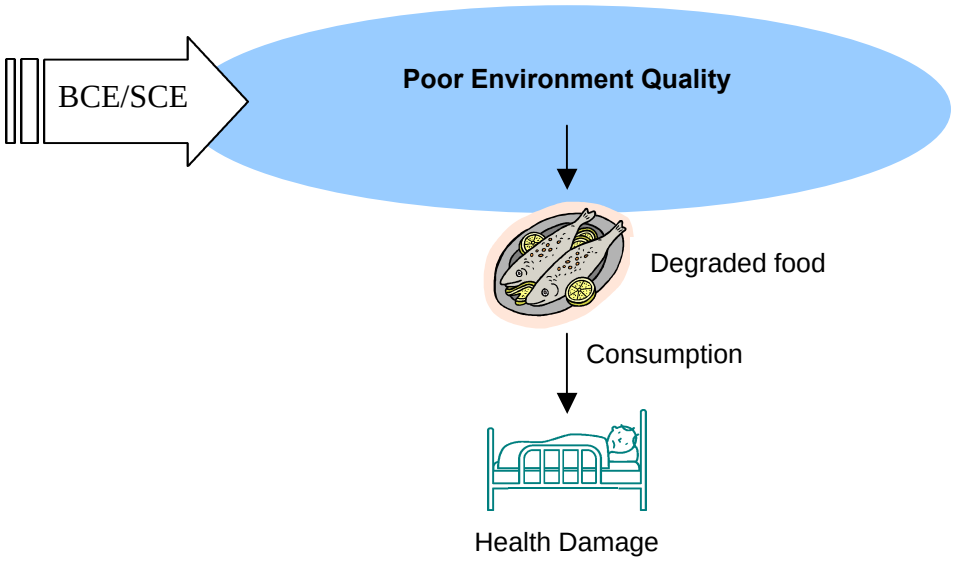


Figure 5-6: Food, Environment and BCE/SCE

The figure expresses that the role of BCE/SCE is, at least primarily, to control the environment quality which, if it is poor, could damage food quality. The damaged food could in turn affect human health through the food chain. The causal substances could be heavy metals from factories, misuse of pesticides, dioxins from incinerators and others. Under such circumstances, the control of food only can not be effective at all because food still continues to be polluted as far as the environmental quality is deteriorated. In fact, the detection of such damaged food is the evidence of unsatisfactory environment control by the BCE/SCE, thus the BCE/SCE should pay the prime attention to environmental management. In consequence, food quality will be ensured.

5.4.6 EIA

The EIA system currently run by the BCE has the following issues to be addressed.

- It is necessary to clearly stipulate what environmental items should be assessed for each project.
- The methods to be used for impact prediction and assessment must be made clear.
- In the current system, part of projects in Baku city are subject to the EIA process by the SCE. However, once new development takes place, it is the BCE that is responsible for environmental control of all those activities in its territory. It is therefore recommended that the BCE should take all responsibility in regard to the EIA process of projects in the city. Consequently the environmental control over the newly completed projects becomes easier for the BCE.
- When the BCE handles the EIA of technically complicated projects, it should organise an Environmental Review Expert Group involving external experts of relevant specialities.
- The EIA charges, which developers have to pay to the BCE, should be set according to the size of workload necessary for the BCE in the EIA process.
- The conclusion given by the BCE is too simple. Its bases should be clearly expressed so that the following developers can take appropriate actions prior to project application.
- The EIA process should involve the residents.

5.4.7 Protection of Mineral Resources

The problem of authorised limestone mines is improper development of deposits. Due to out-of-date equipment the efficiency of existing limestone mines is very limited (according to the BCE inspector only 30-50% of potential resources are mined) and no restoration measures are taken upon completion of mining activity. Additionally, the wastes generated are not disposed of at the landfills approved by the authorities. As a result, about 1,000 hectares around Baku have been damaged with 1.2 million m^3 of wastes generated from limestone mines for the past decade.

Illegal mining activity has caused a large number of pits of a different scale scattered all over the area, including the protected recreation sites and health resorts located in the northern seashore of Absheron peninsula. In many cases such pits are turned into illegal dumpsites.

A major problem of the responsible department in the BCE is insufficient number of inspectors and a lack of transportation for the inspection/control of the large area.

Chapter 6

Master Plan Framework

6 Master Plan Framework

6.1 Socio-economic Framework

6.1.1 National Development Plan

A National Development Plan of Azerbaijan has not yet been prepared. Before the independence of Azerbaijan, the FSU had prepared a general plan - however, it was not for Azerbaijan, but only for Baku City. Azerbaijan has not made its own development plan, partly because the country does not have a tradition of governance to make a national development plan and partly because the country does not recognise the significance of a national development plan.

Instead, the National Environmental Action Plan (NEAP), which was published in 1998 and approved by the Cabinet of Ministers and individual ministries, set the overall frame of the present study.

The preparation of the NEAP was funded in part by a grant from the World Bank, initiated in 1996. A high level steering group was established to guide its development and an expert team, comprising representatives from different government agencies and NGOs, was actively engaged in its development.

The NEAP identifies:

- the main environmental problems;
- their causes;
- their impacts;
- possible solutions.

Problems and mitigation measures were reviewed and prioritised in accordance with three criteria:

- impact on public health and productivity;
- economic impacts;
- risk of irreversible damage to natural resources.

Actions were recommended on the basis of their urgency, importance for current and future economic development and availability of affordable solutions.

The key environmental problems and action priorities identified were:

- severe pollution damage caused by industries, oil exploration and production, and energy;
- the threat of irreversible collapse of the sturgeon stock triggered by the loss of reproductive capacity, pollution and over fishing;
- deterioration of water quality, especially of drinking water in both rural and urban areas, causing an increase in water borne diseases;

- loss of fertile agricultural land from erosion, salination, pollution with heavy metals and chemicals and deterioration of irrigation systems;
- loss of forestry cover (mainly in war affected areas);
- threats to protected areas leading to a loss of biodiversity;
- damage to the Caspian coastal zone caused by flooding from sea level rise and pollution;
- deterioration of the cultural heritage due to natural causes, aggravated by modern environmental problems such as acid rain and uncontrolled development.

It also indicates significant constraints on environmental management:

- lack of integrated environmental and economic policies;
- a need for environmental policy reform;
- a need for strong education and enforcement mechanisms.

It is clear that the environmental issues identified in the NEAP apply to the country as a whole and to Baku by implication. For example, issues of biodiversity, forestry, flora and fauna and ecology generally will apply to areas within the BCE area. However, there are many issues relating principally to the oil and gas industry and to traffic generated air pollution, which are particularly pertinent for the BCE.

6.1.2 Baku City Development Master Plan

A Baku Development Plan ("The General Plan of Baku City"), with a target year of 2005, was made and approved by decree No.182 issued by the Cabinet of Ministers on 18th May 1987. It took 15 years (1973 – 1987) for State Department of Architecture and City Planning in association with Baku Gipro Gor (design Institute of Baku) to prepare this plan.

Since the independence of Azerbaijan, however, the General Plan has been practically ignored. Development of Baku has taken place, ignoring the General Plan for the decade.

The Department of Architecture and City Planning of Baku is supposed to prepare the new general plan (to be called "The Baku City Development Mater Plan") and control land use in Baku. The department does not deny its responsibility to do so. However, the fact is that there is no budget allocated for this purpose. Consequently, the new Baku City Development Master Plan has not been written yet. Meanwhile, unfortunately, most good architects and engineers left Baku Gipro Gor.

The team is sure that having no city general plan is a serious threat to the city environment: a number of development activities have been in progress without holistic coordination. The formulation of a city M/P is an essential requirement for sustainable city growth.

The team initially intended to formulate an environmental management M/P in order to make Baku City development environmentally sustainable. This should have been based on the city M/P. However, without a city M/P, the team developed a "stand

alone" environmental management M/P, which should be properly reflected in the city M/P and other relevant development plan in the city.

6.1.3 Completed/On-Going/Planned Environmental Projects

The team identified the recently completed, on-going, or planned development plans related to environmental management and these are summarized in the table below. The team recognises that the environmental management M/P should be self-consistent, be mutually beneficial and have no undue overlaps.

Table 6-1: Status of Other Environmental Projects

Project	Component	Donor	Study Area	Sector	Content	Duration		Cost
						Plan	Actual	
Urgent **E**nvironment **I**nvestment **P**rogramme	Sturgeon Hatchery	World Bank	Kura River	Fishery	Construction of Sturgeon Hatchery for 15million-fingerlings per year	1998-2003	No progress	$7 million
	Mercury Cleanup		Sumgait	Soil Contam-ination	To cleanup mercury accumulated in an chlorine plant in Sumgait	1999-2001	Mar.2000-2003	$6.7 million
	Onshore Oil Field Cleanup		Mashtaga	Soil Contam-ination	To implement a pilot project in order to clean up oil contaminated land	1999-2001	Commencement will be Mid/2001	$4 million
	Restructuring of SCE	UK know-how Fund	SCE	Institution	Restructuring of environmental management system in Azerbaijan	1999-2000	Completed in Oct.2000	$0.6 million
	Hazardous Waste Management	Japanese Trust Fund	Azerbaijan	Hazardous Waste	Inventory of hazardous waste, development of a new classification and regulation	1999-2001	May.2000-Oct.2002	$0.8 million
Water and **W**astewater **M**aster **P**lan	Water and Wastewater	World Bank	Greater Baku	Water and Wastewater	Master plan study for water and wastewater in Baku targeting the year 2005 and 2015	1997-1998	Final Report submitted in Mar.1999	$1.45 million
Policy and **H**uman **R**esources **D**evelopment	Environmentally Sound Privatisation, Environmental Education		Azerbaijan	Institution	To achieve environmental improvements and support the privatisation of highly polluting enterprises and to develop an environmental education system.	-	Put out for tender	$0.25 million
Wastewater **F**easibility **S**tudy	Wastewater	Berliner Wasser Betriebe	Greater Baku (Exc. Sumgait)	Wastewater	Feasibility study for wastewater in Greater Baku exclude Sumgait targeting the year 2005	-	Completed in Nov.1999	$1.0 million
Strengthening the **C**apacity in **I**nventory of **L**andcover/ **L**anduse by **R**emote **S**ensing	ANASA GIS Data Base	FAO	Azerbaijan	GIS	Construction of GIS data base for land use	1999-2001	Under progress	$0.2 million
Oil **C**ontamination **C**leanup		TACIS	Baku	Soil Contam-ination	To find out feasible local methodology to rehabilitate oil contaminated soil	Nov.1999-Mar.2001	Under progress	€1.6 million

Project	Component	Donor	Study Area	Sector	Content	Duration		Cost
						Plan	Actual	
Caspian **E**nvironment **P**rogramme	Project Coordination Unit（PCU)	TACIS, UNDP	Caspian Sea	Institution	To support implementation of the technical assistance and project preparation of the CEP`	1998-2002	Under operation	€3 million
	Data Gathering Unit	UNDP	PCU	GIS	Database construction of Water pollution in the Caspian Sea	Jan.1998-Dec.1999	Base Map for Caspian Sea was completed and GIS database will commence in the middle of 2000	
	Thematic Centre for Water Pollution	TACIS	Caspian Inspectorate	Marine pollution	To promote agreement on common environmental standards, control and enforcement procedures.	Jan.1998-Dec.1999	Ph1 completed, Ph2 has just started.	€0.75 million
	Environmental Toxicology Research of Sturgeon fish and seals in the Caspian Sea	Japanese Government	Caspian Sea	Marine pollution	To examine and pinpoint accumulations of heavy metals and toxic compounds	2000-2001	The study is starting.	$1.0 million
Sumgait **E**nvironment **R**ehabilitation **P**roject	Environmental Centre for Sumgait	UNDP	Sumgait	Institution	To raise environmental awareness among stakeholders in Sumgait	Oct.1997-Sep.2000	Under progress	$0.6 million
	Information Management Centre		Sumgait	GIS	To establish environmental GIS data base in Sumgait	Oct.1997-Sep.2000	Under progress	
	Environmental Monitoring programme		Sumgait	Monitoring	To develop monitoring strategy and determine the parameters, frequency and locations of monitoring	Oct.1997-Sep.2000	Under progress	
Baku Bay Gulf **O**il **P**ollution **P**roject	Basic Pollution Survey	SENTER (Minister of Economic Affairs of the Netherlands)	Baku Bay	Marine pollution	Examination of the existing pollution problems of Baku Bay	-	Completed in June 2000.	$0.7 million
	F/S for Oil Sludge Processing at Azerneftyag Refinery		Baku Bay	Hazardous Waste	F/S for recycling petroleum waste from Azerneftyag refinery	-	Completed in June 2000.	
	Pilot Project of Debris Removal along the Baku Boulevard		Baku Bay	Marine pollution	Pilot project to clean up part of Baku Bay which is polluted by the oil, ships and debris	-	Completed in June 2000.	
	GIS Training		SCE	GIS	To provide PC training to the personnel from SCE and CI	-	Completed in June 2000.	

6.1.4 Population Forecast

A population forecast is generally made considering several factors of a city including magnitude, the characteristics, history and development, as well as past trends. However, the forecast is mainly based on the current population and the population increase rate. The population of Baku, obtained from the State Committee of Statistics, is adopted as the current population.

The rate of increase of the Baku population was estimated, with the cooperation of the counterpart, assuming the following:

(1) Baku population growth rate in the past 5 years.

A decrease in the population was surveyed in 1999 as a result of the war in 1990 and 1992. However, many have returned to Baku ever since the war ended. Table 6-2 shows the changes in the population of Baku from 1995 to 1999.

Table 6-2: Baku Population (1995 – 1999)

Year	1995	1996	1997	1998	1999
Population (1,000)	1,771	1,779	1,786	1,788	1,789

Source: State Committee for Statistics
Note: Figures exclude refugees and IDPs (internally displaced persons).

As shown in the table above, the population of Baku has been increasing gradually: the increase rate from 1995 to 1998 is about 1%.

(2) Azerbaijan population growth rate

The population growth rate of Azerbaijan indicates that although the rate of growth is decreasing, the population keeps increasing as a whole.

(3) Situation of refugees and internally displaced persons (IDPs).

The 1999 population of Baku totals 1,789 thousand, and refugees and IDPs make up 236.4 thousand (11.7%) of this figure. The increase in the refugee and IDP population is considered to be higher than that of the original Baku population in terms of birth rate and the constant influx of relatives once they have settled in the city. This situation compensates for the low increase rate in the indigenous population.

(4) Political and economic situation of Baku

Following independence, Azerbaijan is now in a state of transition and therefore quite politically and economically unstable. However, conditions are forecast to stabilize after a while as the oil industry - the mainstream industry - is seen to generate job opportunities. Baku, the centre of Azerbaijan's oil industry, attracts population from other parts of the country. Accordingly the population growth in Baku will be generally greater than in Azerbaijan.

Based on the above considerations, the population increase rates of 1.3% until 2005 and 1.5% from 2006 to 2010, which was adopted by the WB project for the Greater Baku Water and Wastewater project, are considered appropriate. As a result the population forecast for the study is as follows.

Table 6-3: Baku Population Projection

	District	1999 (1,000)	2005 (1,000) (Increase rate: 1.3%/y)	2010 (1,000) (Increase rate: 1.5%/y)
1	Sabayil	85.8	92.7	99.9
2	Yasamal	237.5	256.6	276.5
3	Nasimi	221.7	239.6	258.1
4	Narimanov	177.1	191.4	206.2
5	Nizami	179.4	193.9	208.8
6	Khatai	240.9	260.3	280.4
7	Garadag	105.6	114.1	122.9
8	Binagadi	247.1	267.0	287.6
9	Sabunchu	213.1	230.3	248.1
10	Surakhani	186.8	201.9	217.5
11	Azizbeyov	130.3	140.8	151.7
	Baku	2,025.3	2,188.5	2,357.6

Source: 1999 figures are based on data from State Committee for Statistics; 2005 and 2010 figures were projected by the Study Team

6.1.5 Economic and Industrial Development

a. GDP Estimate

The study team obtained the following information from its interview with the Ministry of Economics in the 1st Study Work in Azerbaijan:

- studies carried out by the World Bank for water and wastewater master plan formulation estimate a 5 to 7% annual GDP growth rate;
- based on the opinion of the interviewee, a yearly petroleum production of 50 million tons and developments in economic reform are considered to bring a continuous economic growth of 8 to 10% per annum.

However, “Greater Baku Water and Wastewater Master Plan” applied only 4% growth of GRDP/capita, while “the first report of the Azerbaijan Republic to the UN Convention on Climate Change” showed such as optimistic forecast as 21% growth until 2005 in GNP and 17% onwards as quoted in the inception report of “Technical Assistance for the Development of a Hazardous Waste Management System, UEIP of WB”.

Considering that the 1999 GDP was only 53% of the 1990 GDP, and that direct petroleum related investments from overseas in 1998 made up 21% of the GDP, the study team thinks that developments in economic reform would engender the rehabilitation of production facilities to comparatively high standards. Consequently, the team concurs with the Ministry of Economics as to the possibility of attaining an annual growth rate 8 to 10%.

The team, however, infers that the take-off period will be influenced by the time set to construct transportation means for petroleum and gas exportation.

In the preparation of this study's framework, the following assumptions are applied:

- 8.5% per annum, the growth rate in the first half of 2000, is assumed until 2004, the initial target year for the Baku-Tbilisi-Ceyhan rout construction project;
- 10% per annum growth rate from 2005 to 2010.

Based on the above growth rate, the GDP in 2006 will reach the 1990 level. The GRDP of Baku City is assumed to increase in proportion with the GDP.

Table 6-4: Economic Development Forecast

(unit: billion manat)

	1999	2000	2005	2010
GDP	16,489	17.891	27,273	43,924
GRDP	7,305	7,926	12,083	19,459

b. Industrial Structure

The recovery of the manufacturing industry and the development of the service industry are considered to make the industrial structure of Azerbaijan in 2010 relatively less dependent on petroleum. The service industry will reflect lively economic activities, and developments are considered to lean toward the business sector.

In reference to the changes in the 1991-1999 period, the following assumptions are made and also shown in the table below:

- continuous decrease in primary industries.
- secondary industries are going to maintain their 1999 level.
- increase in tertiary industries will be in proportion to the decrease in primary industries.

Table 6-5: Industrial Structure in 2010

(unit: % of GDP)

	1991	1999	2010
Primary Industry	30.4	21.7	15.5
Secondary Industry	23.6	23.5	23.5
Tertiary Industry	46.0	54.8	61.0

Source: JICA Study Team

6.1.6 Implication of Population Forecast and Economic Development to the Environment

As shown above, the population in 2010 is expected to be 306,000 (15%) more than the present level. The negative consequences that could result from this include:

- increase in sewage, solid waste, air pollutants from housework and traffic;
- loss of natural environment by urbanisation;

- necessity to treat and dispose of contaminated soil, illegally dumped waste and industrial waste buried in abandoned factories.

Economic development in Baku is forecast to increase the GRDP in 2010 2.5 times more than that in 2000. The share of the industrial sector in the GDP is foreseen to stabilise in the next decade, and this would consequently raise the present volume of industrial operations 2.5 times. On the other hand, this could also result in the increased generation of wastewater, air pollutants, solid waste, and exhaust gas due to the activated traffic of people and cargo. As technical and financial difficulties will obstruct the rehabilitation of factories that have stopped operating years ago, industrial growth here is seen to imply an increase in industrial land use, and in turn the decrease in natural environmental resources.

The team attempted to predict the increase of each pollution load according to the population growth and industrial development of Baku. It was assumed that the amount of water consumption, domestic wastewater and medical waste is proportional to population, and the amount of industrial wastewater increases in proportion to GRDP growth. As for the air pollutant, it is presumed that its amount from point sources is proportional to GRDP growth, and that from mobile sources increases in proportion to the number of vehicles, which is estimated to be 1.51 times more in 2010 than the 1999 level in the whole country according to Statistical Yearbook of Azerbaijan 2000. The yearbook also states that the total amount of air pollutant in 1999 was 917,100 tons, 62.7% of which is from point sources and the rest is from mobile sources.

Table 6-6: Predicted Pollution Loads

	Unit	Year			
		2000	2003	2006	2010
A. Population	Person	2,051,200	2,132,300	2,220,900	2,357,200
B. GRDP	bill. manat	7,926	10,123	13,290	19,459
C. Air Pollutant	ton/year	983[1]	1,204	1,497	2,048
from point sources	ton/year	(624)	(797)	(1,045)	(1,531)
from mobile sources	ton/year	(359)	(407)	(452)	(517)
D. Water Consumption	1,000 m^3/day	1,381[2]	1,436	1,495	1,587
E. Industrial WW	1,000 m^3/day	288 [2]	368	483	707
F. Domestic WW	1,000 m^3/day	1,008 [2]	1,048	1,091	1,158
G. Municipal SW	ton/day	603.8[3]	704.0	835.7	1,070.0
H. Medical Waste	ton/day	13.1 [4]	13.6	14.1	15.0

[1] Pollution of harmful particle matters into atmosphere quoted in the Statistical Yearbook of Azerbaijan 2000.
[2] quoted in the wastewater M/P.
[3] from the waste amount and composition survey by the team.
[4] from the medical institutions survey by the team.

6.2 Master Plan Framework

6.2.1 Definition of Environmental Management Master Plan

Environmental management which is sought by the study is defined as a set of actions to be taken to enhance the environmental values and prevent negative impacts on the environment in the course of economic, social and welfare development for current and future generations.

Humans enjoy diverse environmental values, whether consciously or not. These values include natural resources such as flora, fauna, bio-diversity as a whole, and minerals; social values such as land space, clean air and water, and peaceful landscape; and other benefits such as pollution assimilation capacity (e.g. dilution and decomposition of pollutants) and balancing effects to control the earth's environment (e.g. maintaining temperature and cutting off ultra-violet rays).

The crucial thing for the environment is that environmental values are in general not infinite and do not regenerate. Once part of the environmental values have deteriorated, severe impacts on humans and any other living creatures could be brought about. Since development at the cost of the environment will pose unaffordable costs on society in the future, environmental considerations must be incorporated into the entire socio-economic system. This proves the necessity to aim for sustainable development.

A master plan for integrated environmental management, which this study is to formulate, aims to show the direction towards the sustainable development of Baku city to the SCE, BCE and the general public.

Environmental management embraces broad fields ranging from nature conservation to pollutant discharge control. The integrated environmental management M/P is, however, not a series of master plans for each field of the environment, which requires considerable input of time and finance. Instead, the M/P as an output of this study will be the plan that directs the BCE/SCE to improved environmental management by executing their responsibility and promoting environmental projects and actions of other organisations. The individual M/Ps and concrete action plans should be developed, following the directions shown in the M/P by this study, by relevant authorities.

6.2.2 Goals

Taking the above-mentioned principle of the study into consideration, the ultimate goal of the integrated environmental management master plan is:

"To contribute to the sustainable growth of Baku City with due attention to the environment, by the target year 2010."

The master plan will aim for the following objectives to attain this goal:

1. Development of an environmental management policy framework in Baku City.
2. Enhancement of capability to enforce the environmental management policy framework in Baku City.

6.2.3 Targets

a. Target Year

The target year for the master plan is set at 2010. The M/P will be implemented by phase, as shown below, to achieve the above-mentioned objectives.

Phase I: 2001 - 2003

Phase II: 2004 - 2006

Phase III: 2007 - 2010

b. Targets by Sector

Environmental management covers multiple areas of interest, involving various organisations and individuals. Setting targets, particularly those expressed in figures, is thus beyond the discretion of the C/P and the study team. Therefore, the team took the following procedure to set them up:

1. The team proposed a table to show targets in the IT/R , which served as a base for further discussion during the second study work in Azerbaijan.
2. The team discussed the targets with the C/P and member of the steering committee, and received the comments from them.
3. Taking those discussions and comments into consideration, the team set up the targets presented in the table below to formulate the environmental management M/P.

Table 6-7: Targets for Each Environmental Sector

Phase / Sector	Present (2000)	Phase I (2001 – 2003)	Phase II (2004 – 2006)	Phase III (2007 – 2010)
Air Quality	1. Emission gas is not measured practically. 2. 25% compliance with exhaust gas standard of vehicles.	1. 50% compliance with maximum permissible emission of factories. 2. 30% compliance with exhaust gas standard of vehicles.	1. 60% compliance with air emission standard of factories. 2. 50% compliance with exhaust gas standard by vehicles.	1. 80% compliance with air emission standard of factories. 2. 90% compliance with exhaust gas standard by vehicles.
Water Quality	1. **Industrial WW:** Industrial WW from 33% of factories is discharged to the sewerage.[5] 2. **Domestic WW:** 44% of domestic WW is treated at the WW treatment plant.[6] 3. **Water Resource Protection:** Total water losses to the actual water consumption is 160%.[7]	1. **Industrial WW:** 60% of industrial WW is discharged to the sewerage for treatment. 2. **Domestic WW:** 60% of domestic WW is treated at the WW treatment plant.[6] 3. **Water Resource Protection:** Total water losses to the actual water consumption is 125%.[7]	1. **Industrial WW:** 78% of industrial WW is discharged to the sewerage for treatment. 2. **Domestic WW:** 78 % of domestic WW is treated at the WW treatment plant.[6] 3. **Water Resource Protection:** Total water losses to the actual water consumption is 90%.[7]	1. **Industrial WW:** 90% of industrial WW is discharged to the sewerage for treatment. 2. **Domestic WW:** 90 % of domestic WW is treated at the WW treatment plant.[6] 3. Water Resource Protection Total water losses to the actual water consumption is 50%.[7]

[5] from the factory survey by the team.
[6] quoted in the Wastewater M/P (Sewage collection coverage **0.78** x Sewage treatment rate **0.57** = **0.44**).
[7] quoted in the Water M/P.

Phase Sector	Present (2000)	Phase I (2001 – 2003)	Phase II (2004 – 2006)	Phase III (2007 – 2010)
Land Protection and Waste Control	1. **MSWM:** Refuse collection is insufficient and waste is open dumped at the disposal site. 2. **HWM:** There are no appropriate disposal facilities. 3. **Medical WM:** More than 20 % of medical waste is disposed of at landfills with municipal waste without treatment.[8] 4. **Illegal Dump:** 800 to 850 illegal dumpsites are identified. 5. **Land Contamination:** More than 10,000 ha of land is contaminated with oil.	1. **MSWM:** Sufficient refuse collection service covers whole population. 2. **HWM:** A HW final disposal site is constructed. 3. **Medical WM:** Primary treatment (at generation) of 100 % of medical waste. 4. **Illegal Dump:** The increase of illegal dumpsites is stopped. 5. **Land Contamination:** The research for oil contaminated land restoration is completed.	1. **MSWM:** 70% of MSW is sanitarily disposed. Recycle rates of metal scrap and waste paper reach 35 % and 25 % respectively. 2. **HWM:** 50% of HW is appropriately treated and disposed of. 3. **Medical WM:** 50% of medical waste is appropriately treated and disposed of. 4. **Illegal Dump:** 20% of illegal dumps are cleaned up. 5. **Land Contamination:** 10% of oil contaminated land is cleaned up.	1. **MSWM:** 100% of MSW is sanitarily disposed. Recycle rates of metal scrap and waste paper reach 70 % and 50 % respectively. 2. **HWM:** 100% of HW is appropriately treated and disposed of. 3. **Medical WM:** 100% of medical waste is appropriately treated and disposed of. 4. **Illegal Dump:** 50% of illegal dumps are cleaned up. 5. **Land Contamination:** 20% of oil contaminated land is cleaned up.
Fauna and Flora Protection and Conservation Areas Management	1. **Fauna**: Fauna population and diversity are at the risk of decline. 2. **Flora:** Greenery space in the central 6 districts is 8.3m^2/capita, of which park area is 4.3 m^2/capita. 3. **Conservation Areas:** Conservation areas are at the risk of deterioration without practical control plans.	1. **Fauna:** Fauna population and diversity are preserved. 2. **Flora:** Greenery space in the central 6 districts is 8.5m^2/capita, of which park area is 4.5 m^2/capita. 3. **Conservation Areas:** Control plans for priority conservation areas are developed.	1. **Fauna:** Fauna population and diversity are preserved. 2. **Flora:** Greenery space in the central 6 districts is 9m^2/capita, of which park area is 4.7 m^2/capita. 3. **Conservation Areas:** Control plans for priority conservation areas are put into effect.	1. **Fauna:** Fauna population and diversity are preserved. 2. **Flora:** Greenery space in the central 6 districts is 10.0m^2/capita, of which park area is 5 m^2/capita. 3. **Conservation Areas:** Conservation areas are appropriately protected by development activities.

[8] from the medical institutions survey by the team.

c. M/P Components

The achievement of the targets shown above largely depends on the execution of various environmental improvement plans which are to be implemented under the jurisdiction of different organisations, other than the BCE or the SCE. In the course of the achievement of the targets, the BCE and the SCE should improve their work quality and efficiency in order to act as a facilitator for successful project execution of such organisations, and the M/P was formulated for this purpose.

To consider strategies to be taken by the SCE and the BCE, the team categorised their work field into nine areas. Not all these nine areas correspond to the organisational structure of the SCE/BCE, and the team recommend them to reorganise their structure based on this categorisation.

1. Air Protection
2. Water Resources Protection
3. Land Protection and Waste Control
4. Fauna & Flora Protection and Conservation Areas Management
5. Laboratory (Chemical Analysis)
6. Food Environment Control
7. EIA
8. Public Relations and Environmental Education
9. Administration

The M/P was then developed for each of these areas as presented in Chapter 7, together with strategies in order to achieve the targets.

6.2.4 Environmental Zoning

Environmental values vary and include natural resources such as fauna, flora and soil resources necessary for human living such as water, cultural values such as a historical heritage, and also a peaceful landscape. These environmentally valuable elements in Baku must be carefully protected or conserved. Environmental zoning is a process to designate such area of environmental importance as an environmental zone against the foreseeable environmental damages in the processes of urbanisation or other human activities by designating the area as environmental zone.

At present there is neither a city master plan nor a city land use plan. The team strongly urges the relevant authority to develop a city land use plan incorporating the environmental zoning proposed in this M/P and officially approve the plan for practical enforcement. Environmental zoning is a powerful means of guiding sound development and protecting the natural environment provided only if it is properly enforced.

The team's proposed environmental zoning is shown in Plate 10.

a. Principle for Environmental Zoning

The area for environmental zone can be classified as conservation zone, proposed zone for an appropriate land use and security buffer zone.

a.1 Conservation Zone

This refers to the area of features which deserve special preservation because they contain or support unique, threatened or endangered natural or cultural features. The

area must be protected and conserved with special care. However controlled access to a limited area should be allowed in order to give people opportunities to understand, appreciate and enjoy the environmental assets.

The conservation zones in Baku are further categorized as follows.

a.1.1 Nature Conservation Zone

This zone includes the following five zones, which are defined by a Law of Azerbaijan Republic on Particularly Protected Areas and Objects.

- nature reserve;
- sanctuary;
- national park;
- natural monument;
- health resort area.

a.1.2 Resource Conservation Zone

This zone includes the following 3 zones.

- water reservoir for drinking water;
- Lake Bulbul for fishing, which is currently polluted (Cd and Pb of sediment are 0.21mg/kg and 67.4mg/kg respectively at the centre of the lake) by illegally discarded solid waste and waste water from surroundings. The city forbids fishing in the lake at present. However, this used to be a good lake to enjoy fishing and boat paddling;
- Lake Masazir for salt production, where currently salt is systematically produced. This salt production is not legally permitted due to contaminated lake water. However, this lake has a good potential of producing salt, if water of the lake is kept clean.

a.1.3 Cultural Conservation Zone

This zone includes the following two zones.

- old town of Baku;
- conservation village;

a.2 Proposed Zone for an Appropriate Land Use

In order to improve and conserve the environment in Baku for a healthy living a 'proposed zone for an appropriate land use' is designated. It is the area which has been environmentally degraded and needs to be rehabilitated or the area which present land use is preferably changed to other uses. These zones are:

- oil excavation field;
- industrial area within the amphitheatre of Baku;
- seashore for recreational use.
- proposed Baku green belt.

a.3 Restricted Zone

Restricted zone is an area reserved for the security of people in consideration of fire or disaster or an area where people are advised not to access for the safety of their health.. This zone includes surrounding area of:

- oil refinery;
- Lake Beyuk Shor;
- waste disposal site.

b. Proposed Environmental Zoning

The following table is a list of proposed environmental zones. Their location is indicated on a GIS map. Actual boundaries of zoning areas should be examined more closely by using maps of larger scale like 1/500 or 1/1000.

Table 6-8: Environmental Zoning Proposal

		Zone	Code	Location *	Description	Conservation Measure
Conservation zone	a) Nature conservation zone***	Nature reserve	ncz-1	Gobustan nature reserve	prehistoric living quarters with numerous pictures on rocks and living devices, an excellent tourism resource	to be protected and reserved without any change, a buffer zone to be designated
		Sanctuary	ncz-2	Absheron sanctuary, Gil island sanctuary	not properly managed at present, detail description in 4.4.3 of the Main Report	wise use with appropriate facility details are described in 7.4.3 of the Main Report
		National park	ncz-3	Sea side boulevard in front of old town	major recreational park in the city, shore is oil contaminated, no water contact	recreational facility to be controlled, water contact is desirable by cleaning oil contaminated sea shore
		Natural monument	ncz-4	10 sites	detail description in 4.4.3 of the Main Report	no development to be allowed to endanger the value of the monuments, refer to 7.4.3 of the Main Report
		Health resort area	ncz-5	northern part of the peninsula	many long beaches with resort facilities, sea water of some bathing beaches are contaminated either by oil or coliform bacilli **	area reserved for health resort use only, no other development allowed, water quality to be complied with Azeri sanitary limit and the Caspian sea EQS, inflow waste water to be controlled
	b) Resource conservation zone	Water reservoir for potable water	rcz-1	Jeiranbatan water reservoir	water basin is developed without proper control, in danger of water pollution by sewage from surrounding housings and factories	restriction of development in water basin area, measures against possible land slide/erosion
		Fishing lake	rcz-2	Lake Bulbul	illegal fishing, illegal waste dumping, can be a good lake to enjoy fishing, major housing developments are going on in surroundings	the lake water to be protected by stopping illegal dumping and proper treatment of inflow waste water from the surroundings
		Salt lake	rcz-3	Lake Masazir	salt production at lake shore, nearby oil pipe line accident once happened	protection of water by restricting surrounding development, precautionary measure against possible contamination
	c) Cultural conservat-ion zone	Old town of Baku	ccz-1	within the wall of old town	town of Baku originated here in middle age, surrounded by heavy stone wall, many old architectures inside the town	to preserve historical architectures and town structure itself, development is not allowed, but to renovate old buildings
		Conservation village and temple	ccz-2	Gala village and Ateshgah temple	old and unique form of village, Ateshuga temple is the centre of Zoroastrianism	protection of village houses and unique temple, restriction of new development within the conservation area

	Zone	Code	Location *	Description	Conservation Measure
Proposed zone for appropriate land use	Seashore for recreational use	pal-1	Shikh beach, Sahil beach, Lokbatan beach	beach water is not fit for swimming at present due to sewage inflow and oil contamination**	to be conserved for swimming beaches from possible contamination by waste water and oil
	Oil field	pal-2	surrounding area of Baku amphitheater	approx. 80% of oil rigs are abandoned, scattered pipes and electric poles are ugly, production of oil is quite limited	deserted appearance, and deserted oil field to be improved, e.g. soil covering, planting trees, land use alteration to be encouraged
	Industrial area	pal-3	within Baku central part	majority of factories have been practically closed, creating vast vacant space in the middle of the city	gradual conversion of derelict industrial area to green residential area or city use e.g. distribution centre to be encouraged, no new industry, no polluting industry, no further expansion of major polluting industry, obligatory greenery
	Baku buffer zone	pal-4	along Baku amphitheater, in and around oil field	most of the area is barren land or deserted oil field at present	creating large green buffer belt by planting trees 500m to 1000m wide along oil field for wind and dust protection of the city, species of planting trees to be carefully selected
Restricted zone	Oil refinery	sbz-1	in the central part of Baku	right in the middle of the city, no security buffer zone	security buffer zone to be provided, no further expansion, encouraged to remove from the central part of Baku
	Lake Beyuk Shor	sbz-2	refer to the map	highly polluted lake due mainly to oil excavation activities	limited access to the site to prevent people from accessing close to the lake
	Waste disposal site	sbz-3	fefer to the map	4 urban solid waste disposal sites, 1 hazardous waste disposal site, 1 radio active waste disposal site	limited access to those sites especially hazardous and radio active waste disposal sites to protect people from any harmful effect

* Location of environmental zones are indicated on GIS maps. ** Based on the study of WB on Water and Wastewater Master Plan for Greater Baku.
*** defined by the Law of Azerbaijan Republic on Particularly Protected Areas and Objects.

6.2.5 Institutional Framework

a. Directions

The BCE is a regional office of the SCE and is therefore subject to the impact of whatever changes may affect the SCE structure or mandate. It is envisaged that during the period of the plan, the SCE will undergo a transition to a Ministry for Environmental Protection (MOEP). As the regional branch office covering almost 25 percent of the population of Azerbaijan, the BCE will remain the principal office of the new MOEP. At this stage the timescale for this transition is not known, but is likely to be before the end of 2002.

Management is weak by western European, American and Japanese standards. In order for the new MOEP to be successful, the BCE will need to address six key institutional issues:

- the legislation under which the BCE operates is frequently unclear and contradictory. In many cases the powers of the BCE are not adequate to prevent or control environmental degradation;
- the current internal structure is a legacy of a centralised management structure, based on the Soviet management model in which only very senior managers have independent authority;
- there is excessive reliance on instructions and directions from the SCE, despite technical expertise being available in the BCE;
- the relationship with the BEP and most other government bodies is an arms length one, where the BCE is treated as an external body, not part of an integrated government. This restricts access to information and excludes the BCE from decision making processes in the Baku region;
- there is a lack of up-to-date environmental data to enable the BCE to make appropriate environmental judgements;
- there is a severe shortage of finance for effective operation.

b. The SCE

b.1 Organisation

The objective of organisational changes to consolidate responsibility for environmental management is to create one body - a new government ministry , the Ministry for Environmental Protection (MOEP) with an over-arching and cross-cutting responsibility to safeguard and improve environmental quality. The MOEP will take on a range of additional responsibilities, some immediately and others over a phased period of organisational transition and development. The result will be an organisation with responsibility for:

- environmental policy setting, taking over the functions of environmental policy setting and enforcement from production and abstraction entities[9];
- implementation of policies through appropriate agencies;
- monitoring the environmental performance of the country as a whole, specific regions, industrial sectors and individual units through designated agencies[10] ;

[9] for example, oil sector, minerals extraction etc

- determination of standards for environmental quality;
- control of emissions, abstractions, discharges and pollution through integrated systems of licensing;
- enforcement of the law by working with other agencies to prosecute and penalise offenders;
- educating the public and informing them of environmental matters, being accountable to Parliament and thereby to the population of Azerbaijan in a democratic framework;
- the coordination of international agreements in the environmental field, with particular reference to the Caspian Sea issues, giving rise to a more co-ordinated and integrated approach;
- the development of a single centre of expertise, adequately resourced, seeking to bring Azerbaijan up to world class standards and enabling the country to take its rightful place in world environmental affairs;
- the coordination of environmental research, in particular with regard to critical sustainable development issues in Azerbaijan (for example sturgeon breeding, heavy metal and chronic industrial pollution, desertification etc), with reference to research conducted elsewhere, enabling the investments in research within Azerbaijan to be capitalised and maximised;
- the establishment of an environmental disaster management centre of expertise[11] able to advise on protection from disaster, prevent or mitigate emerging crises pending intervention and assistance from other bodies (other state committees with relevant responsibilities), and able to coordinate such assistance, ensuring that in the event of disasters occurring, damage to the environment can be minimised.[12] This would cover, for example, nuclear, flood or earthquake incidents;
- the development of a transparent system of economic instruments, both incentives and constraints to encourage environmental performance improvements, together with clear accountability for disbursement of grants and funding in the environmental arena;
- possible development of the Environment Fund to lessen the burden of the environmental management programme on the state budget, ensuring that environmental improvements are not seen as a "drain" on the state's limited resources;
- evaluation and publication of the environmental status in the country.

The recommendations for change to MOEP have been accepted by Deputy Prime Minister Hassanov as Chairman of the SCE, although it is not clear what progress is currently being made.

[10] Which might be from other government bodies or the private sector where appropriate
[11] working where appropriate with the UNDP DMTP unit established in Azerbaijan
[12] There will clearly be a need to recruit and develop suitable experts in this area to ensure that there is a competent response to any incidents.

b.2 Legislation

Developing new environmental legislation is an inherently slow process, balancing best international knowledge with the specific circumstances applicable in Azerbaijan. Compromises are frequently required to ensure that social and industrial development is not restricted by excessive or inappropriate legislation.

The current regulatory regime for environmental management spreads responsibility among different government departments. Sector ministries take responsibility for the environmental issues within their sphere of competence, and some responsibilities remain with organisations that existed before the SCE was established.

As with many other countries, environmental laws have developed in an *ad hoc* fashion. In many countries in recent years, there has been a drive towards harmonisation and the development of framework environmental acts supported by secondary legislation, technical standards, guidelines and codes of conduct.

National environmental laws are, to a large extent, driven by international and supra-national developments. International environmental agreements to which an increasing number of countries are parties, have influenced the contents of national legislation. At the European level, the rapid development of European Union (EU) environmental legislation has resulted in almost uniform provisions in the laws of Member States. EU environmental legislation is also influencing legislation in countries in central and eastern Europe which intend to join the Union or have close links with it. The result of these developments is a degree of similarity among the environmental laws of countries, across different legal systems.

The MOEP should aim to set up a framework in order to fight the increasing scale and frequent adverse effects of environmental crime, likely as the economy develops. It should propose concerted actions by all government departments to protect the environment under criminal law, including effective investigation and prosecution, as well as effective police, criminal justice and administrative cooperation.

The initiatives proposed should contain:

- provisions on the consolidation of criminal law, including the definition of "serious environmental crime";
- provisions on cooperation and on the free exchange of information between public sector bodies;
- provisions on setting up a register of special skills or know-how with regard to combating serious environmental crime.

These proposals would provide for minimum sanctions for serious environmental crimes. These would also oblige the MOEP (and therefore the BCE) to punish environmental crimes in a way that was "effective and commensurate with the offence". They would aim to introduce police, criminal justice and administrative cooperation to allow prosecutions of all acts or omissions under aggravating circumstances in breach of national environmental legislation causing (or likely to cause) substantial damage to the environment through either pollution of air, water, soil or subsoil, or the storage or disposal of waste or similar substances.

Whilst Azerbaijan in general, and Baku in particular should be encouraged to adopt international legal minimum standards and requirements in order to prevent further environmental damage, given that there are only limited resources, Baku should be

permitted to develop systems that take into account its development needs. Higher standards could gradually be phased in, as and when sufficient resources to implement and enforce them become available.

Recent environmental laws have placed more of an emphasis on prevention rather than cure. The laws include measures for preventative and structured planning - for example, licensing regimes which require prior environmental impact assessment of proposed activities and requirements to develop environmental management plans to prevent or mitigate environmental damage. They also contain provisions giving the public rights in the decision-making and enforcement processes relating to environmental management - for example, rights to environmental information held by public authorities, and to institute judicial action for environmental damage.

A table of the laws applicable at present in the environmental sector is in the Data Book Section 4.1.

b.3 Licensing

The SCE is responsible for the issue of licences for certain activities defined in legislation. These include:

- permits for economic activities hazardous from an environmental point of view;
- permits for natural resource utilisation;
- certification of products involved in environmental protection where standardisation is an issue;
- permits for waste, hazardous discharges to the environment etc.

The SCE is also responsible for devising processes to ensure these permits and licenses are issued as appropriate.

It is envisaged that the MOEP will retain responsibility for these aspects of licensing. Additionally, the MOEP will oversee the licensing process for fishing forestry, and other resources where a quota restriction may be appropriate.

b.4 Enforcement

Several options for change to the national structure of environmental management have been considered in recent years, including the enhancement of self-regulation and strengthening powers of inspection and enforcement. It is essential both to have a competent and informed policy making body, but also to ensure its effective implementation, having adequate powers to ensure conformance.

At present, the ambiguities in the law, the shortage of measuring equipment and the relative imbalance of authority between line ministries and the SCE make effective enforcement action against major polluters both time consuming and difficult. The SCE requires a mechanism for accurate measurement of environmental damage and the ability to instigate routine prosecutions in a speedy and efficient manner.

Compliance with regulations and norms is mandated in detail[13]. However, nationally, the imposition of fines is at a very low level. Many inspections result in no prosecution or fine. A similar position applies in Baku.

[13] Charter para I-12.20

In the case of major pollution incidents which have been reported, fines have been levied, although approval from the prosecutor's office is required where the offending party is within state control or ownership.

b.5 Human Resources Development

Strengthening the institutional capacity to develop, maintain and where possible enhance technical and managerial expertise within the SCE (and other branches of government) will be a critical activity during implementation of the proposed structural reforms.

One key element of the capacity building will relate to training. A training needs assessment of some of the senior SCE managers has been conducted under the DFID-Know How Fund project, and this identified both strengths and areas where further skills development would be valuable. These have started to be addressed through a recent study tour to the United Kingdom, and there has been a programme of technical training in Azerbaijan during much of 2000. This will provide a good platform for further capacity building throughout the restructuring process.

The other major human resources development element relates to the need to attract the best qualified staff, and then motivate and reward them so that they will remain with the SCE or successor bodies. This is an issue which will have to be addressed throughout the whole Public Sector Reform Programme to ensure that bright, able young people:

- are attracted into government service;
- are able to work in an environment that makes them feel that they are both contributing to the development of the nation and advancing their own careers;
- have salary and service conditions administered in the same way as in more economically developed countries which offer adequate reward for their efforts (and are enough to prevent the best staff taking jobs with international companies).

Development of the proper civil service structure which is consistent with Azerbaijan's aspirations to develop as an open democratic society will be a long and complex process. The support of the Public Sector Reform Programme will be vital to its success.

c. The BCE

c.1 Organisation

In making the recent reorganisation, the BCE chairman has sought to introduce the positive management reforms intimated in the review of environmental management undertaken with the SCE as part of the UEIP project.

However, there needs to be a clear definition of the tasks, roles and responsibilities of the BCE to be implemented as part of the reform process. In particular, there will be a need to separate policy making from enforcement functions and develop the institution's capacity to educate and inform the community to effect compliance with best environmental practice.

The BCE will need to work with the SCE and other governmental agencies to ensure that unnecessary replication is kept to a minimum (for example in measurement, standard setting, policy development, environmental economics etc).

As the SCE transforms to the MOEP, the BCE will need to have a structure reflecting the priorities mandated for it in the charter which will be constructed. The clear focus for the BCE will be on implementation of environmental policy to ensure:

- effective local implementation, reducing pollution and identifying likely problem areas through a licensing and permitting regime;
- efficient management of its own operations and support for industry and the population through enhanced professional standards;
- equitable approaches to ensure that no organisation in the Baku area is treated more or less severely in assessing environmental impact, in assessing environmental liability or in monitoring, control and enforcement.

It is clear that there will be a need for a major reorganisation whether or not the SCE develops into a Ministry for Environmental Protection. Within this report, there has been an identification of the minimum staffing levels for monitoring and control of a number of environmental management areas. The suggested transitional mechanism is shown in Figure 6-1 below.

The structure mirrors that proposed for the MOEP and pre-supposes that the primary function of the BCE will be to ensure environmental compliance. In general, policy making will be a key function of the MOEP, informed by the BCE (and others, including for example the Academy of Sciences).

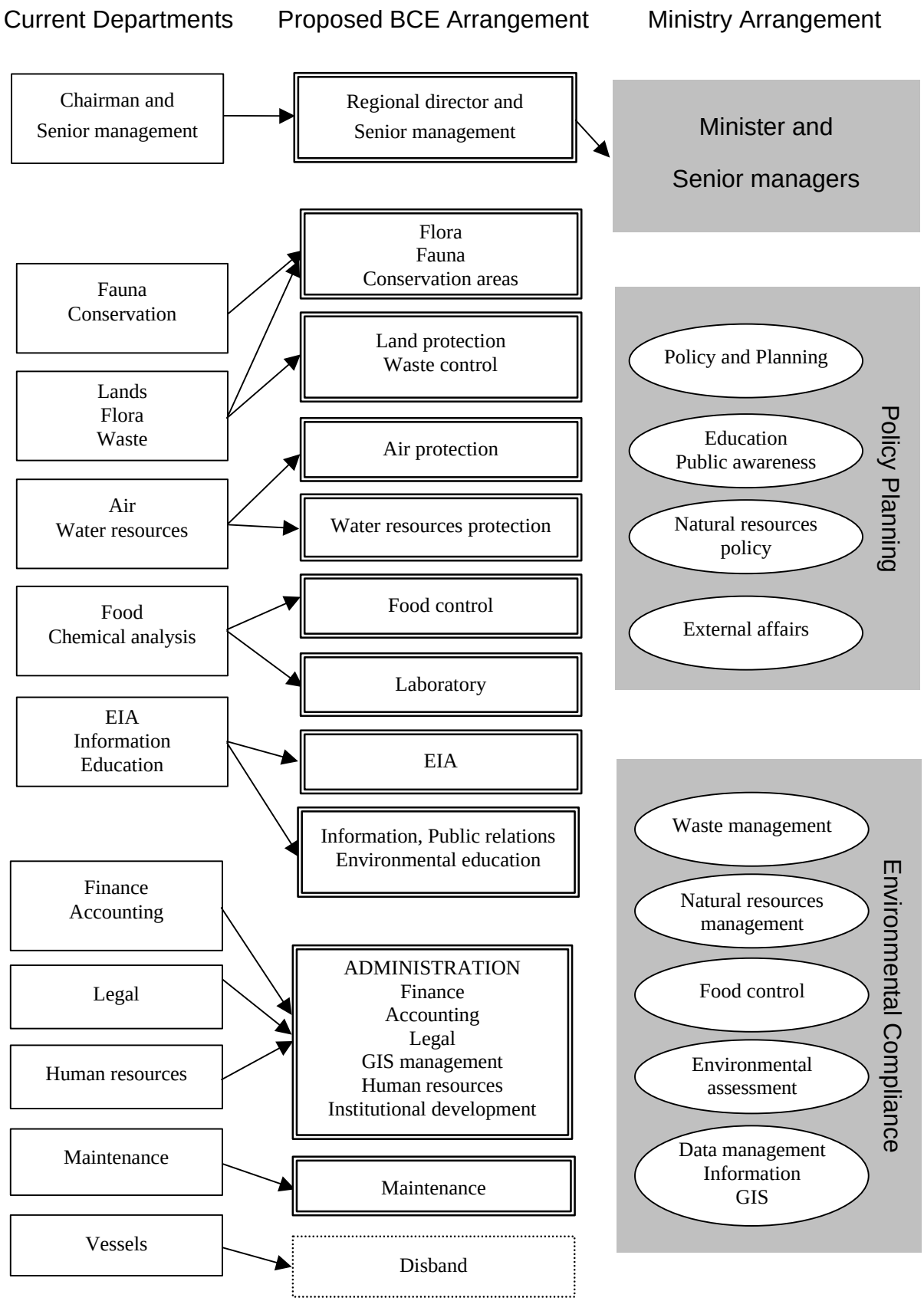


Figure 6-1: BCE Transition to Ministry Branch Office

c.2 Legislation

Following transition to ministry status, the SCE and regional offices will require new charters in accordance with the legal process. The charters should be much broader in scope than the present editions.

In the event that the proposals referred to above in respect of the SCE/MOEP, it will be essential for the BCE to upgrade the level of knowledge and skills to ensure that it is able to operate as the "front line" in environmental management and control on behalf of the Azerbaijan government and people.

c.3 Licensing

The licenses for activities within the BCE area which are the responsibility of the SCE are issued by the BCE. However, in some cases the SCE issues licenses directly and clarification is essential. The recommended approach is that activities exclusively conducted within the BCE area, for example discharges from point sources or natural resource abstraction, should be subject to permits and licenses issued by the BCE. Where there is a wider impact or potential impact, for example with hazardous wastes or nuclear materials, it may be appropriate for the licenses to continue to be issued by the SCE.

c.4 Enforcement

Within a newly formed Ministry of Environmental Protection, one of the key functions of the branch offices - in this case the BCE - will be to ensure compliance with legislation, using enforcement and sanctions as a last resort. Staff at the BCE will need to balance the "public interest" with rights of individual polluters to carry out their business.

This will require much closer working between the BCE, polluters, the Ministry of Justice and other governmental bodies, all working to a common "agenda". Staff at the BCE will need to be trained in the judicial processes, the economic issues and measurement techniques and limitations in order for the enforcement of legislation to be effective.

A basic problem facing all bodies instigating enforcement action is how to determine which offences should be prosecuted, and which ignored or dealt with in some other way.

Clearly, it will not be possible within the timescale of the plan to eliminate all polluting vehicles, nor to prevent all productive units discharging waste water or other products inappropriately.

This is the type of problem facing every police force and choices - not always easy - have to be made, given the resource limitations for the BCE.

A method to determine what is fair and in the best interests of the environment will need to be established by the BCE, taking into account the health needs of the population of Baku, the economic imperatives and national and international pressures. If the guidelines for enforcement are widely circulated and understood, there will be much more ready acceptance by producers of the standards required and the consequences of their breach.

c.5 Human Resources Development

The average age of staff at the BCE is 41+ years in a range from 22 - 70, suggesting that there is no immediate pressure from pending retirements - nor is there likely to be within the duration of the master plan proposed. The organisation of the BCE is discussed in above.

A training needs analysis was conducted by questionnaire and interview within the BCE. The results are shown inSupporting Report 6.2. All staff were invited to complete the questionnaire and the level of response was high. Fifty nine responses were received from the BCE, a response rate of around two-thirds of the staff, giving validity to the scope and extent of the survey work.

The training needs analysis also identified the following issues:

- staff have received very little formal training since joining the BCE. This is confirmed by the deputy chairman and heads of department who acknowledge that there has been little formal external input. The main method for training staff has been either to rely on their own self-learning or by peer group dissemination of information, custom and practice;
- some staff have relevant previous environmental experience before joining the BCE. However, in many cases this is now out of date;
- the deployment of staff on non-core activities is high and efforts must be made to reallocate administration in order to ensure that highly qualified inspectors and other staff are able to devote more time to key issues;
- computer skills are at a low level and this is an urgent training need, given the importance of the GIS to the development of the BCE.

A number of workshops and seminars have been organised within the master plan development period and it will be essential that further training is undertaken to ensure all staff have the necessary knowledge and skills to conduct the required work.

In addition to technical training, there is a need for extensive managerial and functional training within the BCE. This is evident from the time analysis gained from the training needs analysis, discussion with managers and department heads at the SCE and BCE and experience with developing institutions in Azerbaijan, other republics of the FSU and more widely.

The following programmes are required and should, if possible, be delivered during phase I of the M/P (except as noted). Ongoing training and programmes for new managers will also be required during the M/P period. Topics for training include:

- managing and supervising staff : day-to-day control, job definitions, performance management, reporting, allocation of staff, health and safety (staff and external);
- effective team leadership : motivation, management, delegation, support;
- workflow management : managing peaks, planning scope of work, project management;
- communication and presentation skills (includes web principles) : report writing, presenting to developers and the public, drafting legislation;
- public relations and media handling skills;
- financial management : budgeting, financial control, cost management, obtaining best value for money;

- interviewing and questioning skills : information gathering, challenging data, recruiting staff, surveys and questionnaires, social impact studies (phases I, II);
- environmental economics;
- negotiation skills : dealing with the private sector and the international developer, getting the best for all parties;
- computing skills : Windows, Word, Excel, Access, Powerpoint, GIS;
- data access and management : Internet, database principles, data presentation, researching environmental information, dissemination of information;
- English language skills (all phases);
- prosecution and enforcement (all phases);
- environmental issues for EU accession (Phase III).

These courses should be delivered using either participative learning workshops (not lectures!) or using computer based learning materials.

All programmes should be based on realistic case study material for Azerbaijan and Baku. The basis of many of these programmes exists, but would require updating and customisation before use in the BCE.

There is an extensive library of English language materials which has been developed by the British Council in Baku for local use.

Training programmes should be led by an international trainer supported by local, experienced trainers. Workshops should be limited to 16 participants and three day programme elements. In a number of cases, there will not be a requirement for this number of participants. For example, public relations and media handling will involve only a small number of BCE staff. In this case, invitations to participate may be extended to neighbouring regional ecology committees and also to appropriate SCE staff. (The BCE and associated sponsors should not be responsible for meeting the costs of visiting participants. This will mean that no attendance fees will be required.)

Managers and staff *satisfactorily* completing a programme should receive certification. Ideally there should be financial incentives for satisfactory completion of programmes.