

JAPAN INTERNATIONAL COOPERATION AGENCY
THE SOFIA GREATER MUNICIPALITY, THE REPUBLIC OF BULGARIA

THE STUDY ON
THE SOLID WASTE MANAGEMENT FOR
THE TERRITORY OF
THE SOFIA GREATER MUNICIPALITY

MAIN REPORT
VOLUME I-PRESENT CONDITION
AND MASTER PLAN

July 1994

Yachiyo Engineering Co., Ltd.
Tokyo, Japan

SSS
JR
94-076(1/6)

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PREFACE

In response to a request from the Government of the Republic of Bulgaria, the Government of Japan decided to conduct a master plan and feasibility study on solid waste management for the Territory of the Sofia Greater Municipality and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to Bulgaria a study team headed by Mr. Kango Mito, Yachiyo Engineering Co., Ltd., 3 times between March 1993 and January 1994.

The team held discussions with the officials concerned of the Government of Bulgaria, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Bulgaria for their close cooperation extended to the team.

13 July 1994



Kensuke Yanagiya
President,
Japan International Cooperation Agency

July 1994

Mr. Kensuke Yanagiya
President of Japan International Cooperation Agency
Tokyo, Japan

Dear Sir,

Letter of Transmittal

We are pleased to submit to you the reports of the Master Plan, the Feasibility Study, their Executive Summary and the other related documents for "The Study on Solid Waste Management for the Territory of the Sofia Greater Municipality (SGM)". The reports include the advice and suggestions of the authorities concerned, the Government of Japan and your Agency.

The reports deal with future plan of the solid waste management (SWM) in the SGM. There were two main objectives, one was to formulate a Master Plan on SWM in the SGM and the other to carry out a Feasibility Study on selected priority project.

The Master Plan covers until year 2010, and formulated and examined 4 alternatives. As a result, Alternative 2; disposal of all waste by sanitary landfill method up to 2004 and introduction of incineration plant with capacity 600 ton/day by 2005, conditional upon economic recovery, is recommended. The Master Plan also proposes establishing a new Public Limited Company (PLC) to replace the present organization for more efficient SWM.

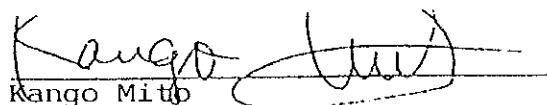
Based on this Master Plan, the following priority project that shall be implemented by year 2000 was selected as follows.

- (1) Improvement of collection system
- (2) Construction of new final disposal site
- (3) Pilot project for recycling
- (4) Establishment of New Public Limited Company for SWM
- (5) Establishment of new waste tax and service fee system

The Feasibility Study confirmed that the above priority project should be implemented to achieve the targets set in the master plan. Although, there are problems to be solved to construct new final disposal site, the team expects the above priority project be implemented as soon as possible.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, and the Ministry of Health and Welfare. We also wish to express our deep gratitude to the Sofia Greater Municipality and the Governmental Agencies concerned in the Republic of Bulgaria for the close cooperation and assistance to us during our study. We hope this report will contribute to the development of the Republic of Bulgaria.

Very truly yours,


Kango Mitu

Team Leader of the Study Team on Solid Waste Management
for the Territory of the Sofia Greater Municipality.

1) PRESENT SOLID WASTE MANAGEMENT CONDITIONS



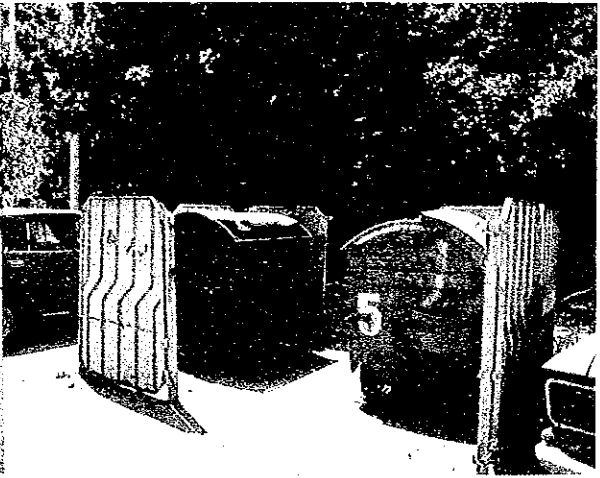
Waste Collection in City Center using compactor vehicle and Meva containers



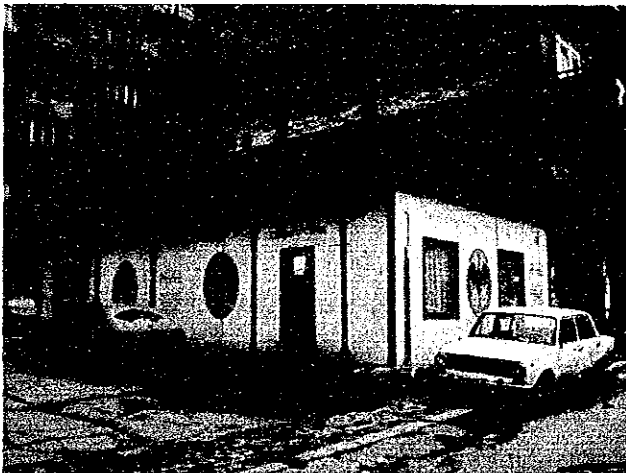
Kison container serving village just outside the Outer Ring Road in Lyulin District



Broken down Ra containers in front of block housing area in one part of the City



Properly maintained and enclosed Ra containers in other parts of Sofia

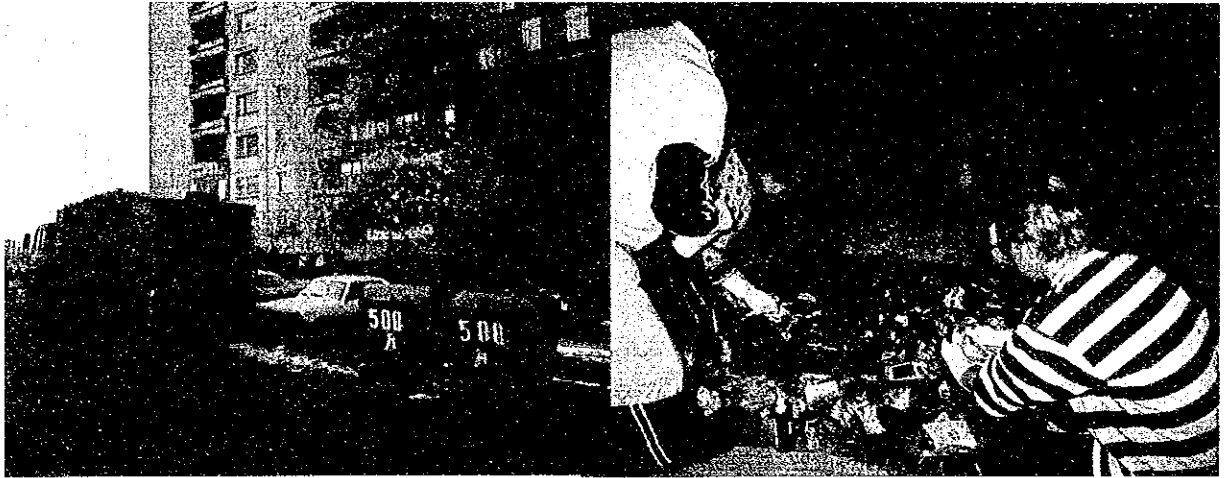


One of 70 shops operated by Mehaplast for recycling. Activity gradually decreasing



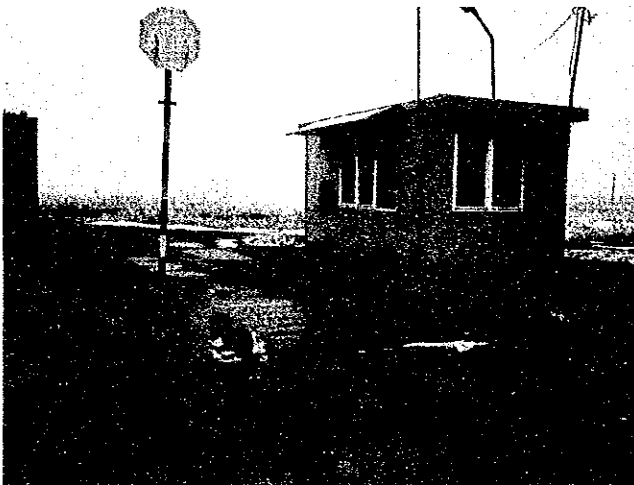
Scavengers separating waste at disposal site for recycling. No SGM control over activity.

2) SURVEYS IMPLEMENTED DURING THE STUDY



Waste collected for 8 days continuously in summer and winter from designated areas.

Waste composition analysis tests



Truck scale at Dolny Bogrov Disposal site



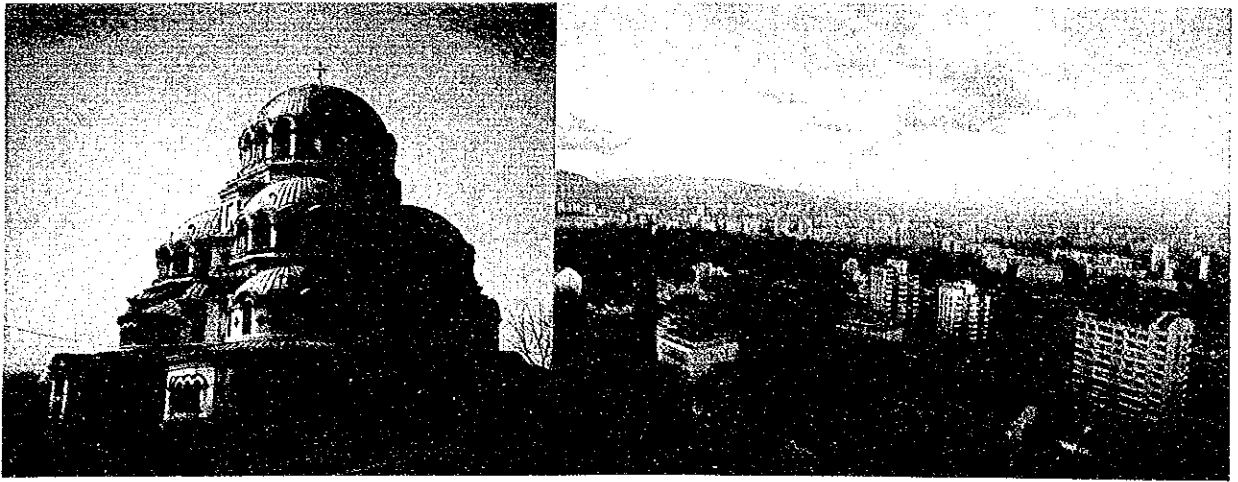
Collection vehicles entering the site weighted for 8 days continuously in summer and winter



Topographic, geological and environmental surveys conducted at Katina candidate disposal site



Geological survey conducted at Dolny Bogrov



SOLID WASTE PROBLEMS IN THE BACKGROUND OF BEAUTIFUL SOFIA CITY

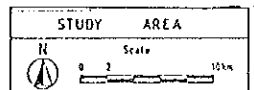
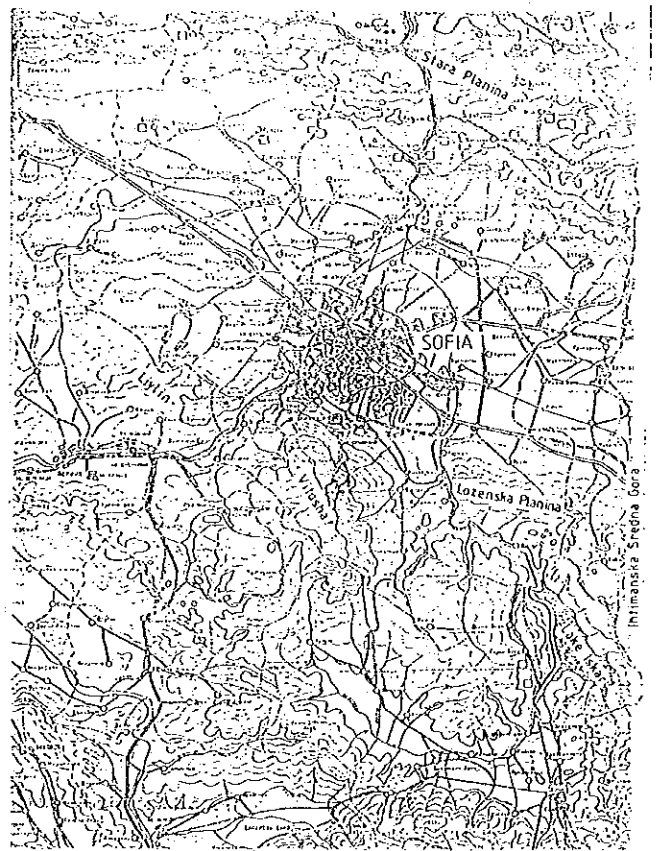


Scattered waste around poorly maintained containers; Meva in the city center and Ra serving block housing areas



Fountain "sprouting" waste in front of market, and uncontrolled scavenger activity at Dolny Bogrov Dump Site





Exchange Rate used in Cost Calculations
was that of January 1st, 1994:

US\$ 1.00 = 36.4 Leva

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ABBREVIATIONS

Alt.	alternative
B/C	Benefit over Cost ratio
BKC	Abbreviation of Bulgarian word meaning "Urbanization and Public Utilities Services"
cap.	capita
CAW	Citizens' Awareness Survey
cu m	cubic meters
EC	European Community
eg	example
EIA	Environment Impact Assessment
EPL	Environmental Protection Law
F/S	Feasibility Study
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
Ha., ha	Hectare
HCS	Hauled Container System
HEI	Hygiene Epidemiologic Inspectorate
ie	that is to say
km	kilometer
l	liter
Lv	Leva (Bulgarian currency)
M/P	Master Plan
MIA	Ministry of Internal Affairs
MOA	Ministry of Agriculture
MOH	Ministry of Health
MOE	Ministry of Environment
MOL	Ministry of Labor and Social Welfare
MRD	Ministry of Regional Development and Construction
MUN	Municipalities
NPV	Net Present Value
O & M	Operation and Maintenance
PCW	Precompressed waste blocks
pcu	passenger car unit
PDS	Pound Sterling
PLC	Public Limited Company: New public company proposed for operation of SWM
RC	Reinforced Concrete
RDF	Refuse Derived Fuel
REI	Regional Environment Inspectorate
SCS	Stationary Container System
SG	State Gazette
SGM	Sofia Greater Municipality
SHW	Solid Household Waste
sq m	square meters
SWM	Solid Waste Management
t/d	ton per day
UPUD	Urbanization and Public Utilities Department, SGM
Veh	vehicle
VOC	Vehicle Operating Cost

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PART I PRESENT CONDITIONS

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

This study has been executed at a time when the government of the Republic of Bulgaria is taking bold social and economic steps in creating a free and democratic society and shifting from a centrally planned economy to a market oriented one.

As may be expected, while political changes have made large strides in the form of presidential and parliamentary elections and drawing up of a new constitution, social and economic reforms are moving at a slower pace. The new constitution decreed the right of the Bulgarian citizens to live in a healthy and sound environment. It is therefore of little surprise that the Bulgarian Government and Sofia Greater Municipality (SGM) decided to initiate this study in solid waste management (SWM) in the nation's capital city, Sofia.

The Study Team spent almost seven months in Sofia conducting surveys, collecting data and having fruitful and detailed discussions with SGM officials and those of other ministries. It is clear that the highly technical and professional expertise of the many officials and individuals the study team came into contact with, is in many cases hampered by the poor equipment and managerial supervision.

The three most important issues tackled by the master plan (M/P) and case study on feasibility of the priority project are introduction of a feasible equipment renewal plan, sanitary landfill site acquisition and operation in accordance with the draft waste act, and institutional development to ensure efficient and sound performance at all levels of solid waste management (SWM).

While there is a problem in lack of sufficient funds to maintain a proper service level, and it is necessary to revise waste tariff system, money may also be saved by streamlining the large manpower and more efficient equipment utilization.

1.2 Objectives of the Study

The objectives of the Study, as agreed upon by both governments were as follows:

- (1) Formulation of a SWM master plan in the territory of SGM
- (2) Implementation of a feasibility study for priority project(s) selected from the master plan
- (3) Transfer of technology through close work with the counterpart team and other related officials of the Bulgarian government.

1.3 Study Area

The Study Area covered the territory of SGM, an area of about 1,310 km².

1.4 Waste Types covered by the Study

The waste types that were covered in the Study are in principle those types disposed of at the municipal disposal sites, which comprise domestic, commercial, street, garden and non-hazardous industrial waste.

For industrial waste, the study was limited to review of existing data with some additional data collection and making general recommendations to improve industrial waste disposal.

1.5 Implementation of the Study

The Study covered two periods of work in Sofia during April to July 1993 (Summer period) and November 1993 to January 1994. A brief chronology of the study featuring the main activities is explained hereafter:

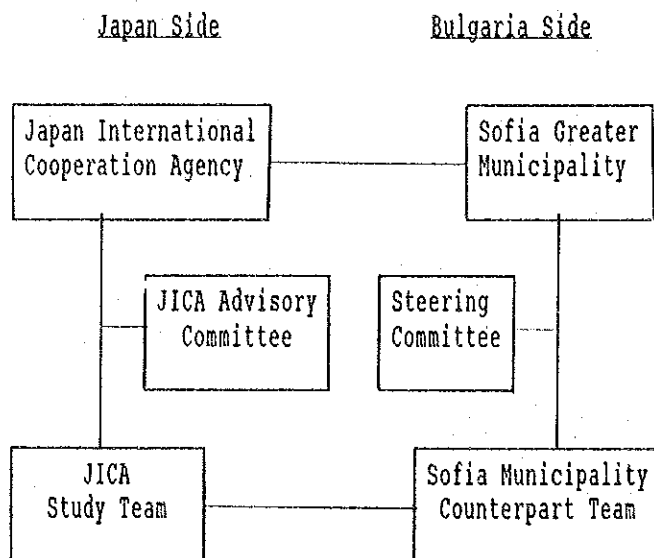
- (1) April to July 1993: Work in Sofia
 - Submission and discussion of Inception Report outlining study objectives, method and process
 - Data collection
 - Solid waste survey and analysis
 - Environmental and geological surveys at existing landfill sites
 - Selection of candidate disposal sites
 - Environmental, topographic and geological surveys of selected site at Katina coal quarry
 - Development of master plan preconditions

- Confirmation of contents for M/P manual and project implementation guidelines
 - Preparation and submission of Progress Report I
- (2) August to September 1993: Work in Japan
- Development of Master Plan Alternatives
 - Evaluation of alternatives and selection of optimum one
 - Preparation of Interim Report
- (3) October 1993: Work in Sofia
- Submission and discussion of Interim Report
 - Submission and discussion of draft M/P manual and project implementation guideline
 - Confirmation of Priority Project content
 - An additional alternative requested by SGM to the master plan for full and early introduction of incineration
- (4) November 1993: Work in Japan
- Participation in training program implemented by JICA for Bulgarian SWM officials including a member of the Counterpart Team
 - Study of additional alternative requested by SGM
- (5) November 1993 to January 1994: Work in Sofia
- Presentation and discussion of non-feasibility of additional new alternative suggested by SGM in October
 - Solid waste survey analysis in winter
 - Environmental surveys at Katina site
 - Confirmation of preconditions for feasibility study
 - Preparation and submission of Progress Report II
 - Confirmation of concept of F/S manual
- (6) February to March 1994: Work in Japan
- Preparation of feasibility study for priority project
 - Compilation of Draft Final Report and F/S manual
- (7) Submission of Draft Final Report
- (8) Final Report

The Study Team realizes that the success of this Study is mainly due to the close cooperation extended to the team by SGM officials in meetings with SGM mayor, his deputy Mr. Kuzmanov and the counterpart team from the Environmental Department headed by Mrs. M. Gugova.

1.6 Participants in the Study

(1) Organization Chart



(2) Structure of the Japanese Side

a. JICA Advisory Committee

Dr. Sachiho Naito	Advisory Committee Chairman Chairman, Board of Trustees Kanto Gakuin (School Corporation)
Dr. Tohru Furuichi	Head of Waste Management Planning Div. Waste Management Engineering Dept., Institute of Public Health
Dr. Kunitoshi Sakurai	Guest Professor of International Environmental Planning University of Tokyo
Dr. Isamu Yokota	Assistant Professor, Graduate School of Nutritional & Environmental Sciences University of Shizuoka
Mr. Tadayoshi Kawano	Chief, Plant Engineering Dept., Public Cleansing Department City of Sapporo

b. Study Team

Mr. Kango Mito	Study Team Leader
Mr. Akira Osawa	Deputy Team Leader - (Phase I) Collection System and Manuals
Mr. Hiroshi Abe	Deputy Team Leader - (Phase II) Collection System and Manuals
Mr. Hirochika Manabe	Collection and Transport I
Mr. Mahmoud-S. Riad	Collection and Transport II
Mr. David S. Wallace	Treatment and Disposal
Dr. Abdelaziz Belherazem	Industrial Waste Study
Mr. Komei Kawauchi	Facilities Plan and Costing
Mr. Naoyuki Minami	Solid Waste Surveys and Analysis
Mr. Peter E. Krista	Organization and Institutional Plan
Mr. Kozo Baba	Economic and Financial Evaluation
Dr. Lothar Schilak	Environmental Study

(3) Structure of the Bulgarian Side

a. Steering Committee:

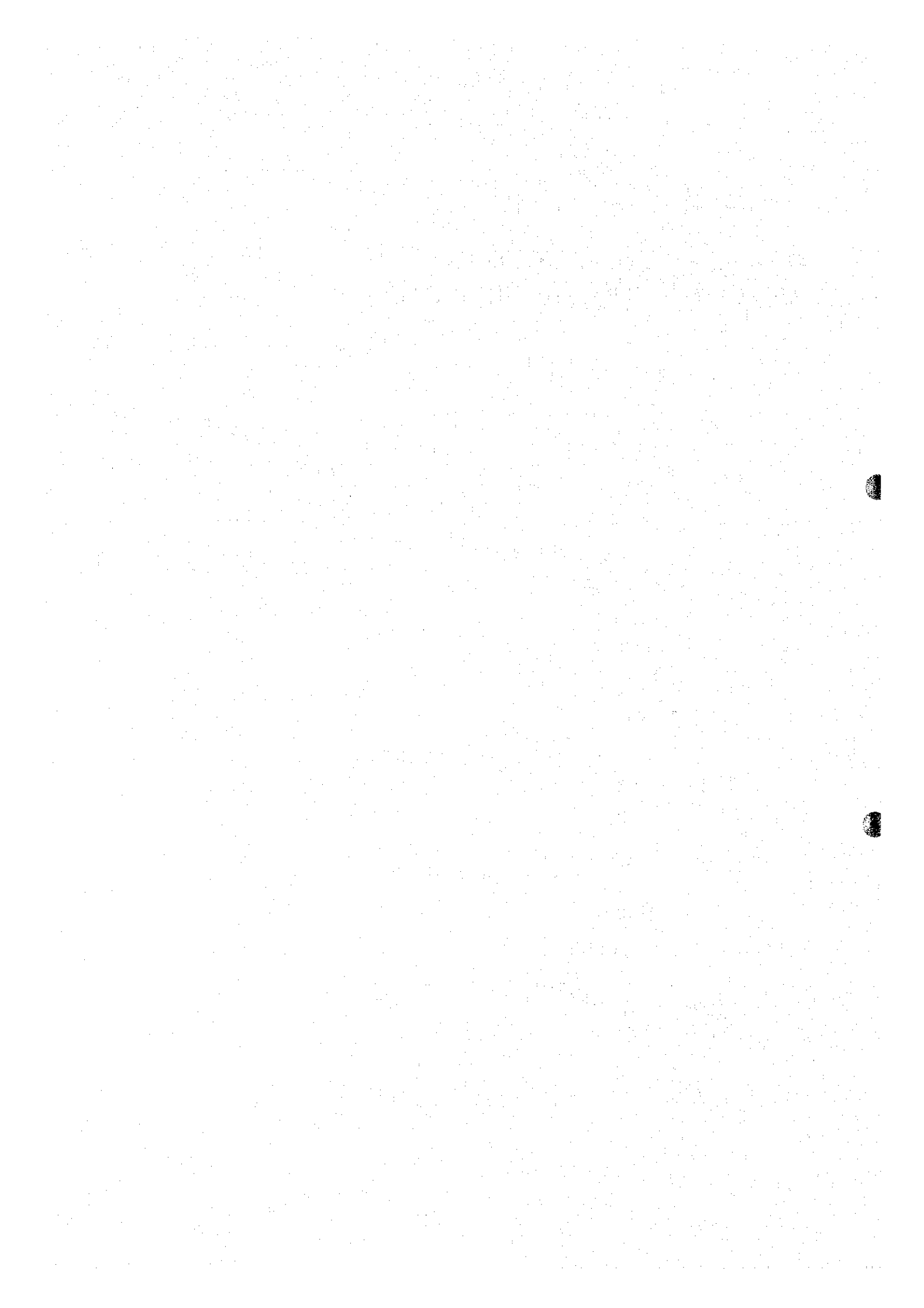
Mr. T. Kuzmanov	Steering Committee Chairman
	Deputy Mayor, SGM
Mr. P. Dobrev	Expert, Public Utilities Dept. Ministry of Reg. Development
Mr. D. Iliev	Expert, Min. of Reg. Development
Ms. Dr. Garsilova	Expert, Ministry of Health
Ms. St. Tzekova	Expert, Ministry of Environment
Ms. S. Lyubenova	Expert, Ministry of Industry
Ms. V. Chakarova	Public Utilities Dept., SGM
Mr. A. Doichev	SGM Mayor's Adviser
Mr. Y. Yanev	SGM Mayor's Adviser

b. Counterpart Team:

Ms. M. Gugova	Head of Environmental Dept., SGM (up to March, 1994)
Mr. O. Bogoev	Chief Expert, Environmental Dept.
Mr. N. Danchev	Consultant to SGM

CHAPTER 2

CURRENT CONDITIONS IN SOFIA GREATER MUNICIPALITY



CHAPTER 2 CURRENT CONDITIONS IN SOFIA GREATER MUNICIPALITY

2.1 Natural Conditions

2.1.1 Brief Physical and Geological Description

The area of SGM is shown (as the Study area) in Figure 2-1-1. It approximates some 1,310 km². In 1991 population density of SGM area was estimated at 931 inhabitants per km² in average.

2.1.2 Geography

The capital of Bulgaria, Sofia, lies in the center of Sofia Basin which, together with some other basins (Samokov Basin, Stanke Dimitrov Basin, Kostenets Basin), represents one of the main intramural plains of the country's western region. With a maximum width of 32km this basin is one of the largest in Bulgaria and stretches out between 42-43°N and 23-24°E with a mean height of 625m (500-750m) above mean sea level.

The entire Basin is encompassed by high, West-East directed mountain ranges: the Balkan Range (Zapadna Stara Planina) in the North, and Vitosha - Rila Range in the south, which is an outlier of the Rhodopen Range (Zapadni Rodopi). Both mountain ranges rise above the 2,000m level with 2,168m (Balkan Range) and 2,290m - 2,925m (Vitosha - Rila Range).

Sofia originates from a tribal center of the Thracian Serdi and was a province during Roman times. Its name is derived from the 6th century church "St. Sofia" in the town center. Its geographical position is 42°41'N and 23°19'E at an approximate height of 550m above the mean sea level.

During the past decade the suburban town area has spread out to the drier western terraces and nowadays reaches the foothills of the Vitosha Range.

2.1.3 Geological and Lithological Structure

The geological structure of the Sofia plain and surrounding mountains is complex and diverse. It is particularly relevant to the Sofia solid waste landfill appraisal work and hence is reviewed in some detail in the Supporting Report I.

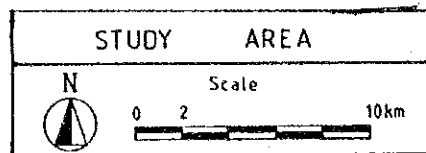
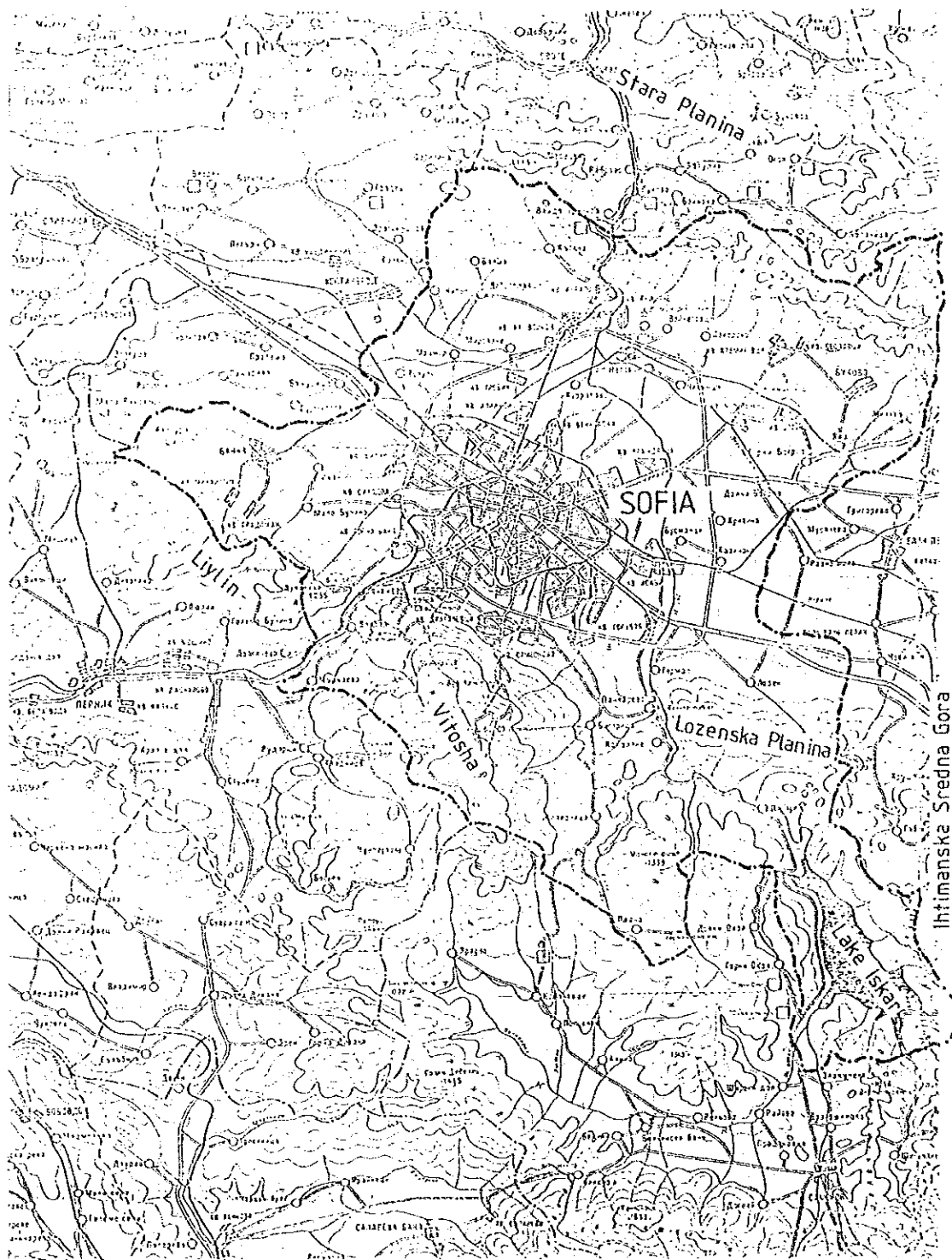


Figure 2-1-1 Sofia Greater Municipality

2.1.4 Seismic Activity

Bulgaria is unfortunately in an area of known seismic activity. The last major earthquake occurred in 1977, and was centered in Vrabcha, Rumania, causing some mild structural damages in Sofia. The zone classification for SGM area is liable to: "Walls and Ceilings caving in on some buildings."

2.1.5 Climate

Atmospheric conditions of the Sofia Basin are mainly determined by the northern (Balkan) and southern (Rhodopen) mountain ranges. It can be summarized as continental humid warm summer climate, which sharpens the cold winters but tempers the Mediterranean heat in summer. Annual mean temperature rises to only 11.7°C with a mean maximum to 21,7°C and a mean minimum to -2.0°C (1931-1986). Average annual atmospheric pressure is 952.6 hPa.

2.1.5 Rainfall

The average annual precipitation is 638.5 mm. It is heaviest in the spring (May, June) and the least in winter (January and February). In winter 60% of the precipitation is in the form of snow which lies in the Sofia plain some 3 months each year and in the surrounding mountains for up to 7 months (eg. on Mt. Vitoshka). The prolonged annual snow melt assists surface water recharge and promotes an even rate of infiltration of the surface waters.

2.1.6 Wind

Equivalent statistical data relating to wind intensity has not been similarly developed for the Sofia Area. Average annual wind speed in the city area is reported to approximate 2.0 m/sec and 2.5 to 3.5 m/sec on the outskirts.

2.1.7 Hydrology

The entire Sofia Basin is mainly drained by Iskar River which originates from Rila Range, an outlier of Rhodopen Range. Many other river systems important for the southern basins rise from this mountain: Maritsa, Mesta and Struma Rivers.

Cutting through Vitosha mountain and creating steep gorges, Iskar River enters the Sofia Basin from the south and crosses the area of SGM. In the northern territories some tributaries join Iskar River which then cuts across the Balkan Range and finally joins the Danube river system north of the Range.

The national Ministry of Environment has ranked Iskar River as category I (source to treatment plant at Kubratovo village) and 2nd (from Kubratovo onwards) water quality category, according to Reg.no.2/1992.

Within SGM areas average amount of run-off has been estimated in the range of 15-32mm per year. Average unit discharge ranges from 5-10 litres per second and km².

The eastern fluvial terraces of the Sofia Basin lying in close vicinity to Iskar River system show a high groundwater level and have long been used for their sediments.

The geological and hydrogeological features of the Sofia plain are reviewed in greater detail in Supporting Report I.

2.1.8 Flora, Fauna and Agriculture

Bulgaria is known for its famous natural sites and localities which are legally protected. In total, 9 National Parks, 85 Reserves, 48 protected localities and 1645 age-old trees have been defined as legally protected sites (data from 1981). These sites cover an area of 118.815,8 ha.

Over 450 animal species (140 invertebrates, 310 vertebrates) are placed under legal protection. The Vitosha mountain area whose northern foot hills are partly within SGM area is habitat of many species found in Bulgaria. One hundred and twenty bird species (340 known in Bulgaria) live in the Vitosha National Park. Eight of 16 species found in Bulgaria live in this area and over 800 butterfly species have been identified so far.

Agricultural activities on the fertile soils within Sofia Basin are restricted by climate conditions. Thus maize and sunflower are less than the prevailing wheat, barley and potatoes. In recent years however vegetable, fruit and grapevine plantations gained importance not only in the Sofia plain but also in adjacent plains like the Samokov Basin.

2.2 Land Use in Sofia Greater Municipality

2.2.1 Present Land Use

The urbanized area is located in the south-west part of SGM surrounded by the outer ring road, forming a circle of about 5km radius with the center point of Sveta Nedelya Church. The commercial area and office area is within an approximately 2km radius from the church.

The residential area is distributed all over the urbanized area with mainly apartment houses. The upper floors of buildings even along the busiest commercial streets are usually used as living quarters. Detached houses with gardens are few and are distributed in the outskirts of the city. There are new towns in the east and west, Mladost and Lyulin, etc.

The commercial streets extend in 4-5 directions from Sveta Nedelya Church. Such are Vitosha Street, Maria Luiza Street, Graf Ignatiev Street, etc. Public offices, museums, etc. are distributed along Tsar Osvoboditel and Rakovski Streets.

There are 3 major large parks; East Park, South Park and West Park.

To the north of the central railway station are the industrial areas with partly residential areas. The southern part of the municipality is Mt. Vitosha which is designated as a national park.

There are many industrial areas in the north to north-east of the municipality, such as Kremikovtzi and Novi Iskar which serious pollution problems. The present land use map is shown in Figure 2-2-1.

2.2.2 Description of SGM Districts

SGM is administratively divided into 24 districts and 152 sub-districts. Districts can be easily categorized into commercial, urban residential, and suburban residential by the dominant land use features there. Districts with mixed land use features are very few. Table 2-2-1 describes the major features by district.



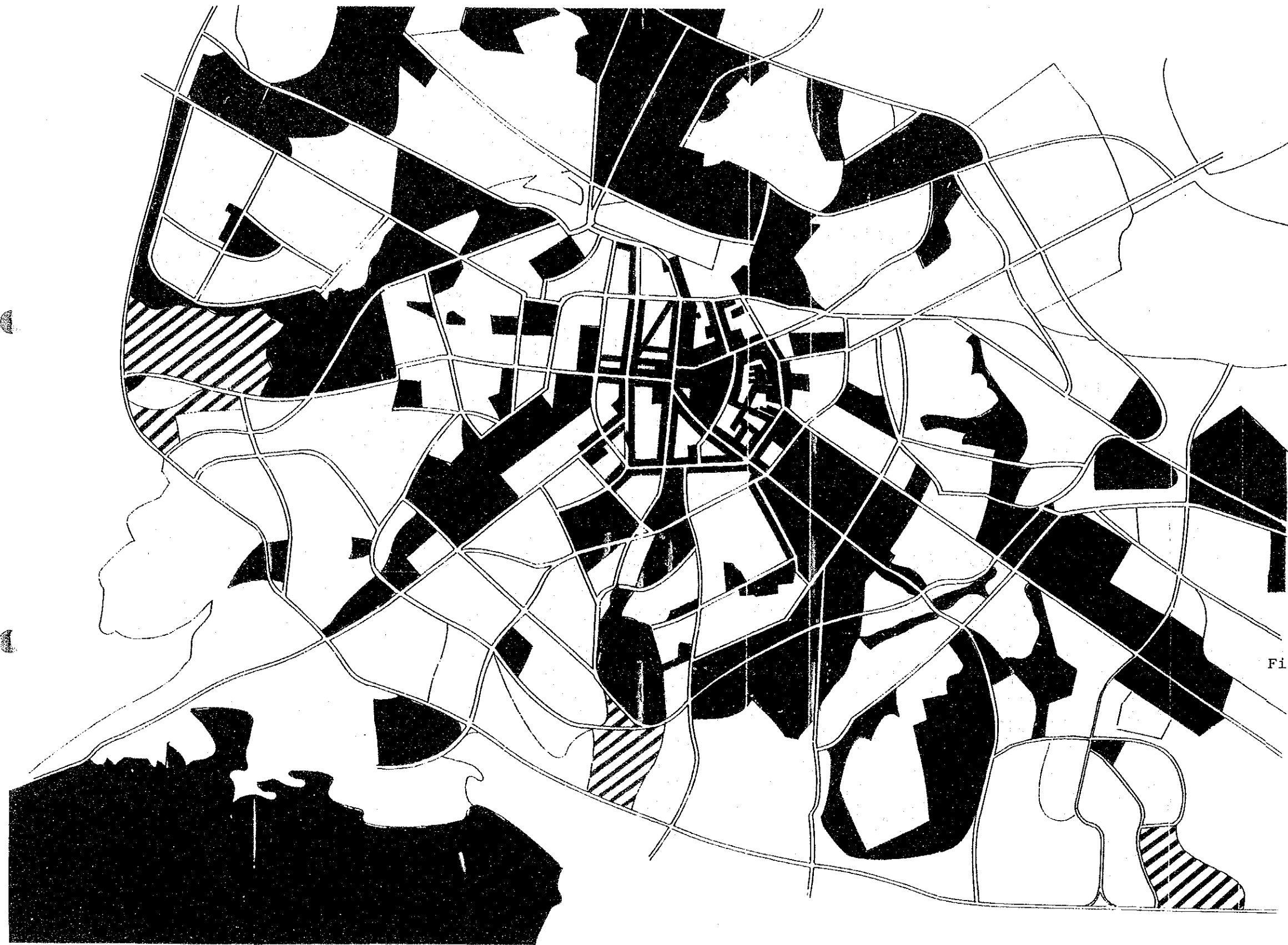


Figure 2-2-1 Present Land Use Map

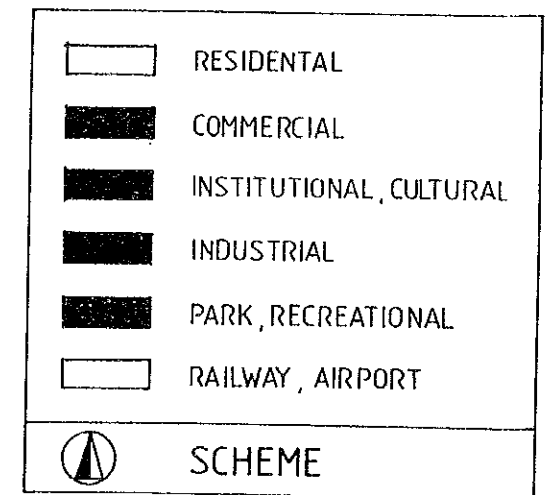


Table 2-2-1 SGM Districts Land Use Features

District	Land Use Features
1) Sredets	Central area where most active commercial streets are located and many ministries and offices concentrated. In the east is the large Borisova Garden.
2) Oborishte	North part of the center, with offices and museums in the south and shopping streets in the west. The east part is mainly residential.
3) Vazrazhdane	Has the largest open market, Zhenski Pazar, and mainly old low to medium rise housing. Public offices and factories are south-east.
4) Krasno Selo	An apartment blocks residential area. The tram factory and maintenance station are located here.
5) Triaditsa	Extends south of the center. In the north are offices and shops; the National Palace of Culture, hospitals and medical institutes and parks are in the central part. The southern part is residential. Also in the south is a large scale residential development project.
6) Lozenets	North part is a residential area with parks and the zoo in the center. The south is part of the above-mentioned development project.
7) Izgrev	Residential area. There are offices located in its center along the main road and there is a large park in the western part.
8) Studentska	Educational institutes complex, with housing areas.
9) Mladost	A new section of medium to high rise apartments.
10) Iskar	Industrial area in the center and residential area is in the south.
11) Slatina:	Western part is residential area of old medium rise apartments. The city airport is in the eastern part.
12) Poduyane	Residential area including railway yards and factories.
13) Serdika	Extends north of the central railway station, and includes both industrial and residential areas.
14) Ilinden	Largely residential area. The south part is an industrial area.
15) Nadezhda	South part is residential and central part is industrial area.
16) Vrabnitsa	East part is residential area with a park. Western part has open spaces and an agricultural area.
17) Lyulin	West part has new medium to high rise apartment buildings. There is a low-income residential area east of the outer ring road.
18) Krasna Pol.	East part represents medium to high rise residential area. In the west there is the large West Park.
19) Ovcha Kupel	East part has a medium to high rise residential area. The western part is a forest and low density residential area.
20) Vitosha	Mt. Vitosha is designated as a national park. North of the foot of the mountain is a residential area of detached houses and villas.
21) Pancharevo	Mountainous area of small towns and villages, with large water reservoir in the south-east.
22) Kremikovtsi	Located north-east of the SGM. Has large industrial areas.
23) Novi Iskar	Located north-west of SGM. Here to is an industrial area.
24) Bankya	Located west of SGM, and is a mountainous area. In the center is the town of Bankya.

2.2.3 Development Projects

There are several medium to high rise apartment houses under construction in Krasno Selo, Lyulin, Ovcha Kupel, etc. No large scale development in the central area is observed.

Sofia municipality has a development project in the south area inside the outer ring road. The project area is 725 ha of which the residential area is 305 ha and a 270 ha park. The master plan has been completed. This project is shown in Figure 2-2-2.

Development plan for extending Novi Iskar residential area north-west to within 200 of Katina coal quarry were prepared in 1988 but have not been implemented so far. SGM intends to modify this plan once a final decision has been made on use of the quarry as a disposal site for solid waste.

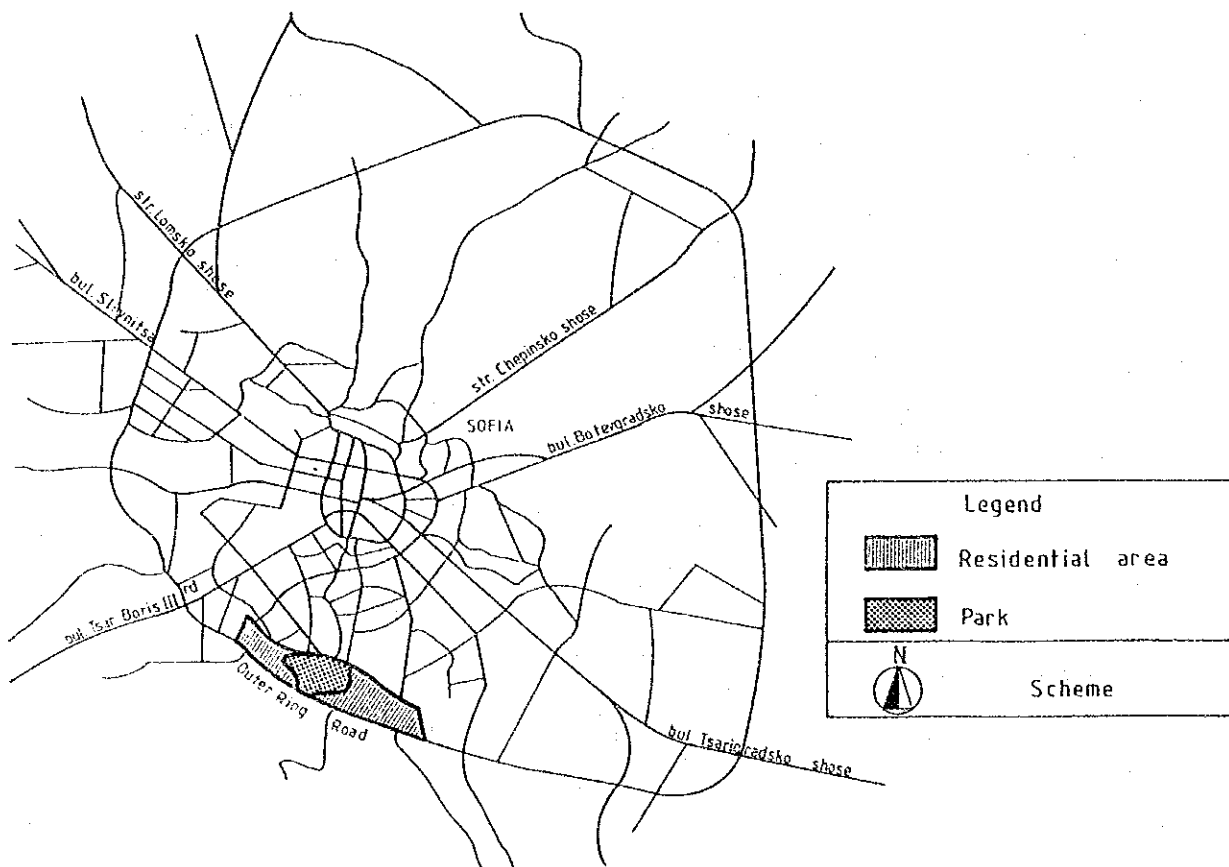


Figure 2-2-2 Development Project in Southern Area

2.3 Infrastructure

2.3.1 General

This section reviews existing conditions and relevant development plans in SGM concerning the infrastructure.

- Road Network
- Public Utilities
 - Electricity
 - Water
 - Gas
 - Steam and hot water supplies
 - Sewerage

2.3.2 Road Network Description

The road network in SGM is used by public transport modes of tram, rail, trolley buses and buses, and private vehicles. In 1990 approximately 40% of the trips were made by trams and public transport mode accounted for roughly 60%.

The roads in Sofia are classified into three classes; IInd class, IIIrd class, and IVth class. Roads are shown by classification in Figure 2-3-1.

The length and area of the roads, carriageway and pedestrian sidewalks for Sofia, as of 1991, are as follows:

- | | | | |
|----------------------|---|-----------|----------------|
| - Street length | : | 4,255 km, | Area: 4,339 Ha |
| - Carriageway length | : | 3,948 km, | Area: 2,741 Ha |
| - Side walk length | : | 5,142 km | |

2.3.3 Public Utilities

1) Electricity

The amount of electricity consumed in Bulgaria in 1992 was 38 million Mwh, of which 36 million Mwh is generated in Bulgaria and the remainder is imported from the Ukraine.

Electric power generation in Bulgaria is as follows:

- | | |
|---------------------------------|-------|
| a. Thermo-Electric Power Plant: | 63% |
| b. Nuclear Power Plant | : 35% |
| c. Water Power Plant | : 2% |

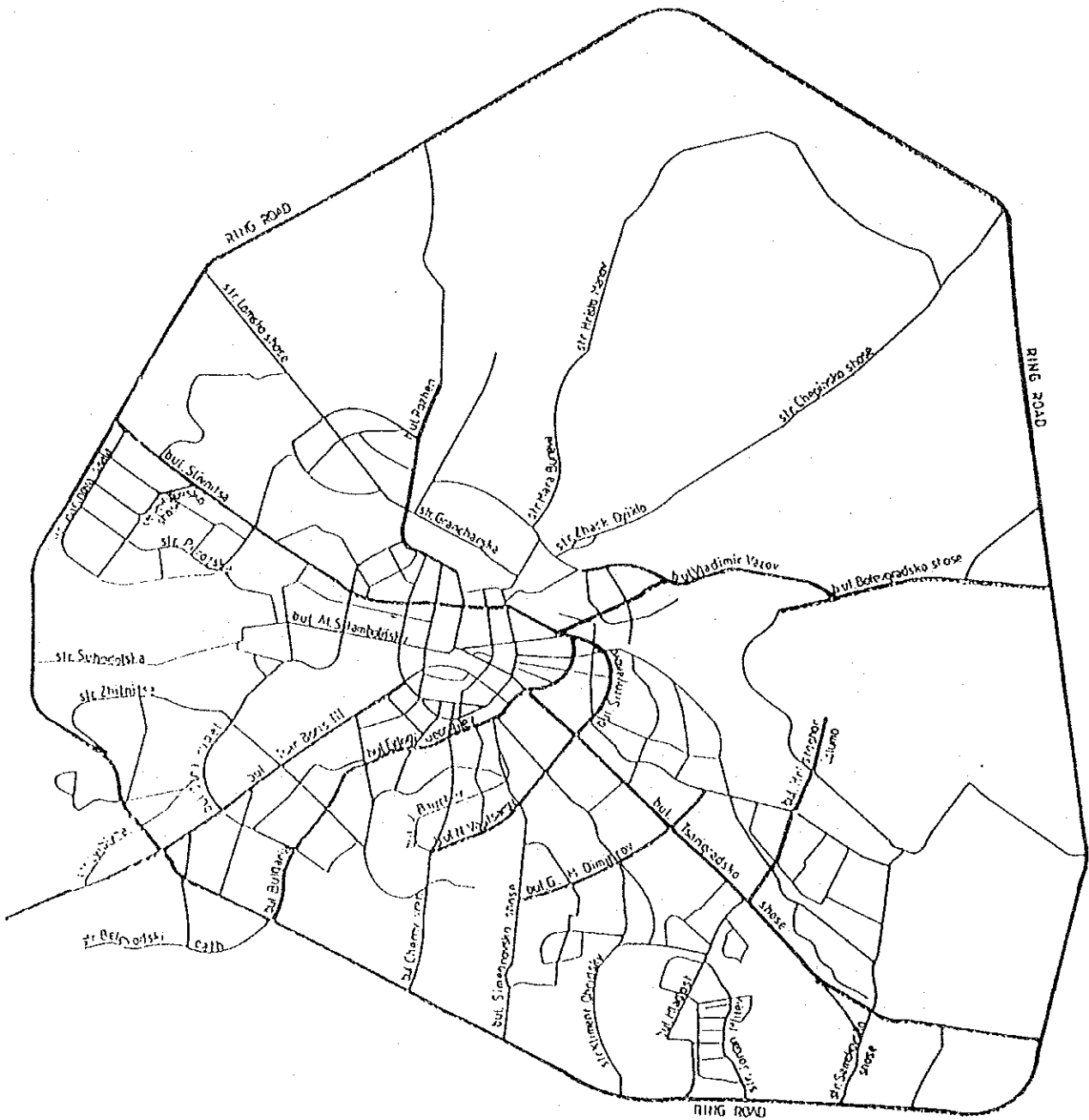
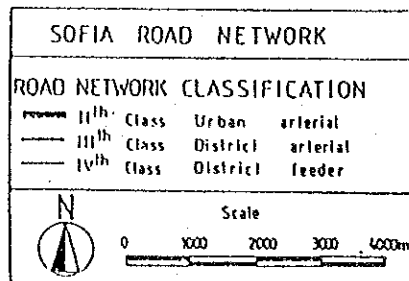


Figure 2-3-1



As of December 1991 the following indices reflect the condition of electric power in Sofia.

- Percentages of households with electricity: 100%
- Total length of electricity network: 7,884 km
- Total number of electricity stations: 4,584 km

In 1992, 20-22% of the power consumed in SGM was generated at stations in the city.

According to regulation 87/29.04.1993, electricity tariffs levied on consumption for household purposes were as follows:

- Day time 0.660 Lv/kWH
- Night time 0.350 Lv/kWH

Tariffs on business and public activities consumption are described in Table 2-3-1.

Table 2-3-1 Tariffs on Commercial Electricity Consumption
(Lv/kWH)

Season	Winter season			Summer season		
	Tension Level			Tension Level		
	High	Middle	Low	High	Middle	Low
Peak Hour	1.472	1.527	1.598	1.289	1.324	1.389
Day Hour	0.799	0.826	0.863	0.691	0.716	0.750
Night Hour	0.395	0.407	0.927	0.340	0.351	0.369
By means of one dial measuring	1.187	1.225	1.285	1.032	1.064	1.116

2) Water

The water supply system of Sofia is fed by the following water sources and main pipelines and the total water quantity is about 9.0 m³/s.

- Iskar Dam: Maximum volume 670 million m³
- Beli Iskar Dam: Maximum volume 15 million m³
- Vladaiska River and Boianska River: average capacity 0.13 m³/s

Water is treated at two treatment plants; Pancharevo and Bistzitza.

In December 1991 water consumption in SGM was as follows:

- Households : 50.2%
- Industrial factories : 23.2%
- Agricultural organizations : 0.70%
- Other public consumers : 25.85%

Water Supply Tariffs (from 1st February, 1993)

- Drinking water for residents: 1.20 Lv/m³
- Drinking water for companies: 3.80 Lv/m³
- Industrial water (for all purpose except drinking): 1.90 Lv/m³

3) Gas

Bulgaria is supplied by Russian natural gas (appr. 1,000 million m³ in 1990 year) with pressure of 5,500 KPa (55 kg/cm²).

Gas is supplied to the following facilities in Sofia:

- Thermal Electricity Power Plants
- Thermal Plants
- Green houses
- Industrial Factories

No gas is supplied to households. Households usually use bottled gas for thermal energy.

4) Steam/Hot Water Supply

The territory of SGM is served by 2 thermo-electrical power stations using natural gas, 2 thermal stations using natural gas (mazut used in emergency) and 12 local thermal sources, of which 11 sources use mazut, gas and oil.

Central heating in Sofia as of December, 1992 was as follows:

- Length of Central Heating Network: 792 km
- Number of Flats with Central Heating: 315,829
(The number of houses with small-boilers is not included.)
- Ratio of flats with Central Heating (% of total flats): 69.3%
- Number of blocks of flats with Central Heating: 7,523
- Number of administrative buildings with Central Heating: 2,814

In 1993 tariffs ranged from 350-600 Lv/Gcal, and 240 Lv/Gcal for citizens.

5) Sewerage

Data on the system serving SGM, as of December, 1992 are as follows;

- | | |
|---|-----------------------|
| - Towns with sewerage system: | Sofia city and Bankia |
| - Towns and villages without sewerage system: | 36 |
| - Total length of sewerage network: | 1,401 km |
| - Total numbers of sewerage laterals: | 32,945 |
| - Total length of collectors | 201 km |
| - Sewerage system (% of total street network) | 40.9% |

The city is served by Kubratovo Waste Water Treatment Plant. This plant was built for mechanical and biological treatment of 500,000 m³/day and treatment of the generated sludge.

Treated water is discharged to Iskar River. The capacity of the Waste Water Treatment Plant covers approximately 70% of the waste water in Sofia.

Tariffs levied on residents and commercial activity are as follows:

- | | | |
|-------------|------------------------|--------------------------------------|
| - Resident: | 0.50 Lv/m ³ | (drinking water) |
| - Company: | 1.00 Lv/m ³ | (drinking water or industrial water) |

2.4 Socioeconomic Conditions

2.4.1 General

The economy of Bulgaria is presently undergoing a major transition from a command and controlled economy to a market economy. This has led to undreamt of opportunities for some, but plummeting living standards for the majority.

The new government initiated a crash program of economic reform, removing barriers to foreign investments, speeding up privatization of state-run firms and establishing rules for restitution - the process by which property and land nationalized by the Communists could be reclaimed by its former owners.

The new political and social realities ushered in many problems and issues which required resolution, among which are:

- Structural changes in the industry of Bulgaria - machine building, hardware equipment, chemical, mining and other branches as well as the military industrial complex work with 50%, even 30% of their capacity;
- 50 - 60% of the trade activities only is carried by private companies;
- Inflation and as a result very high loan interests that makes trade the only profitable activity;
- No ownership on arable land with an exception of 10 - 15% given back to the former owners;
- Less than 5% of the industrial output comes from private "factories";
- Burden of the foreign debt - over \$ 12 000 000 000;
- Unemployment - the official figure is 17%;
- High criminal rate and lack of security.

A macroeconomic adjustment process has been underway since 1990. GDP declined an estimated 11.8% in 1990, lead by industry which declined about 16.3%. Despite the government's efforts to establish a stabilization program the economy in 1990 has contracted at a faster pace than initially envisaged due to the collapse in exports to the former Council for Mutual Economic Assistance countries, sharp reduction of domestic demand and lower-than-anticipated access to foreign financing. Composition of final demand in 1995 is expected to differ significantly from that in 1989 with a relative shift from investment and government consumption towards exports and private consumption.

2.4.2 Population

The population of Bulgaria and SGM is shown in Table 2-4-1 and Figures 2-4-1 and 2-4-2 below. In 1989, the year of de-socialization, there began a decrease in population. In the central area, it has decreased remarkably while the population of the outer areas has increased.

Table 2-4-1 Population Trend

	1985	1986	1987	1988
Bulgaria	8,960,500	8,958,200	8,971,400	8,981,500
Sofia	1,201,719	1,206,908	1,209,562	1,217,024
	1989	1990	1991	1992
Bulgaria	8,989,500	8,990,800	8,982,000	
Sofia	1,221,436	1,220,914	1,220,196	1,182,540

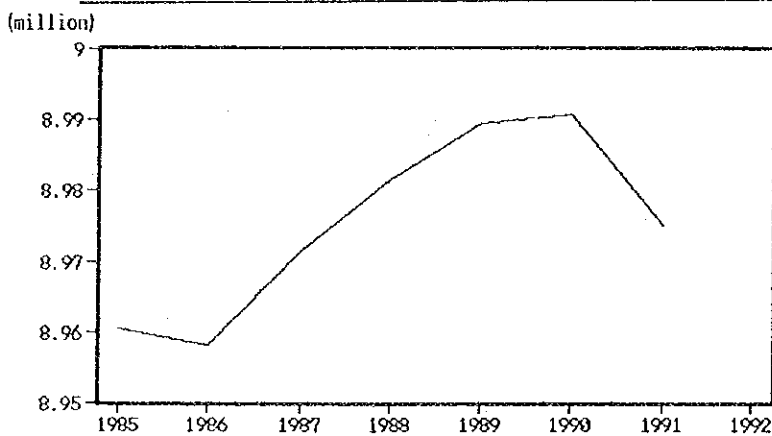


Figure 2-4-1 Population of Bulgaria

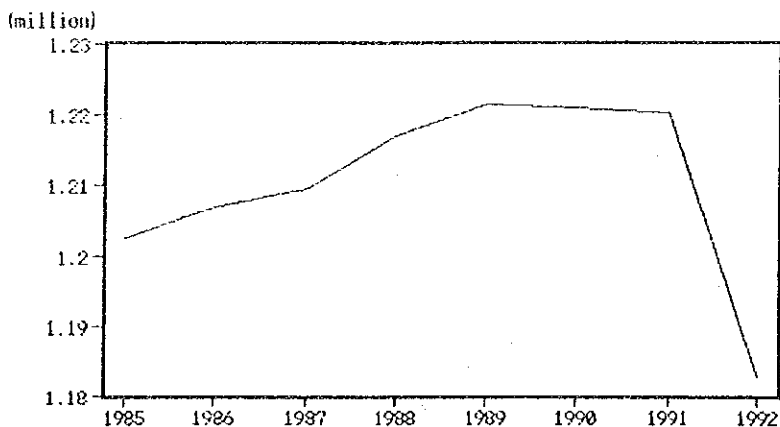


Figure 2-4-2 Population of Sofia

2.4.3 Economic Conditions

1) Present Condition of Bulgarian Economy

The Bulgarian economy is undergoing a major transition from a command and control economy to a market economy. The economic reforms were endorsed in January 1991 by the IMF. The main targets were as follows:

- financial stabilization of the economy: inflation curbing, money aggregates regulation, budget deficit reduction;
- forcing change of established behavior patterns of economic agents to reach market-economy rules;
- exerting sufficient pressure on enterprises so that they either adjust to external conditions or go bankrupt;
- setting-up of fundamental market economy institutions;
- outlining a coherent macro-policy as this was the first attempt at formulating an integrated fiscal, monetary, exchange rate and trade policy in this country.

Based on the experiences of the last three years and after the onset of the stabilization program, the Bulgarian economy has entered a critical stage, though hyper inflation was overcome. Major indices are shown in Table 2-4-2.

Table 2-4-2 Major Indices of the Bulgarian Economy

	1992	1993	1994
GDP (billion Lv)	210.0	344.8	501.0
GDP deflator (%)	70.0	68.5	44.0
index of real GDP (%)	-5.7	-2.5	0.9
Inflation rate (%)	82.6	70.2	45.0
Lv/US\$ exchange rate	23.34	27.50	35.00
Debt (billion US\$)	12.9	14.0	

Source: 168 Hours BBN

The biggest problem is continuity in production decline. GDP (gross domestic product) of 1993 is below 2.5% that of 1992 and is estimated as one third of 1988 GDP. The second problem is increment of number of unemployed and unemployment ratio. It is said that the unemployed numbered 748,100 or unemployment ratio 21.4%, the actual figures seemed more than the statistical data. The third is increment of foreign debts.

Although production continues to decline, the dawn of hope is appearing. Industrial output in November 1993 was 3,400

million Lv, or 18.7% up from October, at October's prices. Production of most industrial sub-sectors increased. The private sector retained its growing role in trade. The turnover of private companies amounted to 8,500 million Lv, or 13.6% more than October. In November total turnover was 14,000 million Lv, or 11.2% up from its 1992 level. The structure of the Bulgarian economy shows a tendency to change to a service-oriented economy in which the tertiary industry gains an advantage over the secondary industry as shown in Table 2-4-3.

Table 2-4-3 Changes of GDP Constitution
(Mill. Lv at current prices)

	1989	1990	1991	1992
GDP	39,579	45,390	138,400	220,000
Agriculture and Forestry	10.9	17.7	12.9	n.a.
Industry	59.4	51.3	50.0	n.a.
Services	29.7	31.0	37.1	n.a.

Source: NSI "Statistical Reference Book of Rep. of Bulgaria, '92"

Concerning debt, Bulgaria and the IMF have drafted an agreement after the completion of the London Club negotiations, and it is expected to remove these obstacles.

The structural reform will still form the core of government policy. Following are the main aspects of that policy:

- speed up privatization
- implement measures aimed at reducing losses and imposing tighter financial controls at enterprises, and
- introduce more efficient management of state property

If steady privatization and restructuring of industry are promoted, the development process will be accelerated because of the personality of Bulgarian people.

2) Industrial Structure of the Bulgarian Economy

Industry is the biggest sector of the economy in both production and employment. According to government statistics, it shared 50% of national income and 37% of employment in 1991.

Agriculture is the second largest sector of Bulgarian economy. It shared 19% of national income and 17% of employment. Construction share was only 6% of national income and 7% of employment. A sharp drop of 41% took place as compared to

Jan.-Mar. 1992. Transportation share was 9% of national income and 6% of employment. Trade and logistics share was 10% of national income and 7.5% of employment.

3) Finance of the State

(1) General situation

The 1994 draft budget approved by the government in late November 1993, projected a GDP deficit of 6.7% (Table 2-4-4).

Table 2-4-4 State Budget
(unit: million lv)

	1992	1993	1994	1994/1993
Revenue	44,124	71,350	99,887	1.40
Tax revenue	40,520	54,841	80,153	1.46
Non-tax revenue	3,604	16,509	19,734	1.20
Expenditure	53,293	98,933	133,557	1.35
Current expenditure	22,625	77,838	102,851	1.32
Capital investment	166	3,117	3,896	1.25
Transfers	30,502	17,978	26,810	1.49
Balance	-9,169	-27,583	-33,670	1.22

Budget revenues include current tax and non-tax (charges, fines, forfeits, etc.) receipts and do not include borrowing. Profit tax, turnover tax and excises represent nearly 50% of the total. Income tax and tax on salaries and tax on wage fund increment represent 15%.

Compared to the 1993 budget non-tax income is not expected to relatively increase though transfer expenditure will increase more than average.

(2) Tax system

In 1991 the profit tax rate was equalized for all enterprises at 40% (before that year it was differentiated from 15% to 95% of profits). But there are tax payments of similar kind - a municipal profit tax (10% of profits) and contribution to the "Melioration Fund" (2%).

Concerning municipality enterprises such as "Chistota", after reducing the above profit taxes (52% of profits) half of profit is transferred to municipalities, then only 24% of profits remains in the company.

Turnover tax is charged according to revenue from sales. In 1988 tax rates and incidence of the tax were changed. The Value Added Tax (VAT) will replace the turnover tax because VAT is a broader and more stable tax. The rate will be moderate at 18%. From April 1991 a new Income Tax Law was introduced. The tax is progressive including tax relief for invalids, handicapped and others.

(3) Trade Balance/Foreign Trade

Although present trade balance changed to black figures in 1992, that of the first quarter of 1993 showed red figures again. Balance of payments on current account was estimated at a deficit of US\$ 980 million in 1993. Trade figures are shown in Table 2-4-5.

It is said that the embargo restrictions to the former Yugoslavia affected the balance.

Table 2-4-5 Turnover, Exports and Imports

	Jan.-Mar. 1993	
	million lv	million US\$
Turnover	34,874	1,337.7
Exports	14,848	569.5
Imports	20,026	768.2
Balance	- 5,178	- 198.7

Exchange rates 1 US\$ = 26.0706 lv

source: Consultex-99 "Quarterly Report, Jan.-Mar. '93"

Commodity structure and structure by country group of foreign trade in the first half of 1992 are shown in Table 2-4-6 on the following page.

On 8 March 1993 Bulgarian representatives signed the Association Agreement with the European Community in Brussels. The agreements for: a gradual transition to free trade between Bulgaria and the EC, an increase in trade turnover, and establishing a balanced economic relation which would help the country in its development towards market economy. The basic outcome of the agreement is expected to be the easier access of Bulgarian goods to EC markets.

Table 2-4-6 Commodity Structure & Structure by Country Group
(million US\$, %)

1st Half of 1992		

Consumer goods		
imports	1,817.8	
exports	1,521.2	
balance	- 296.6	
Goods for processing		
imports	417.4	
exports	386.1	
balance	- 354.8	
Turnover-total	3,756.4	
	Imports	Exports
East and Central		
European countries	37.3	36.4
OECD	41.2	45.8
EC	29.3	31.5
Others	11.9	14.3
Arab countries	11.2	7.4
Other countries	10.3	10.4

Imports and exports of selected commodities are as follows:

Imported Commodities	Exported Commodities
Lathes	Lathes
Milling machines	Electric engines
Electric engines	Forklift trucks
Tractors	Electric telephones
Passenger automobiles	Telephones
Autobuses	Thick iron sheet
Electricity	Soda ash
Iron ore	Carbamide
Construction steel	Nitrogenous fertilizers
Steel sheet	Electricity
Carbon black	Chemical fibers
Cement	Wall tiles
Automobil sets tires	Tobacco leaves
Newsprint	Lavender oil
Cotton	Weaned lambs
Coffee beans	Lambs
Cocoa beans	Poultry meat
Lemons	Fresh vegetable
Oranges	Tomatoes
Olives	Fresh fruit
Refrigerator	Grapes
Vacuum cleaner	Apples

Television
Tape recorders

Fruit juices
Table wines

(4) Interest policy

Interest policy of banks was characterized by a dynamic development in Jan.- Apr. period. In view of the changed economic and financial conditions, the Bulgarian National Bank altered the basic interest rate from 41% to 47% (from 1st January 1993) and from 47% to 51% (from 22 February 1993). Annual interest rates on credits and deposits are shown in Table 2-4-7.

Table 2-4-7 Interest Rates on Credits and Deposits

(unit: %)

Indicators	1992	1993			
	Dec.	29.Jan.	26.Feb.	26.Mar.	30.Apr.

Basic interest rate					
annual compound	49.65	58.57	64.78	64.78	64.78
annual	41	47	51	51	51
monthly	3.42	3.92	4.25	4.25	4.25
Average interest rate on new credits					
annual compound	64.58	75.91	81.72	82.95	83.19
annual	50.87	57.83	61.24	61.95	62.09
monthly	4.24	4.82	5.1	5.16	5.17
Weighted average interest rate on current account deposits					
annual compound	15.47	15.81	16.18	16.21	16.02
annual	14.47	14.77	15.09	15.12	14.95
monthly	1.21	1.23	1.26	1.26	1.25

source: BNB "News Bulletin No 10 Year III" 16-31 May 1993

4) Employment

Since 1993, statistical data is published at the beginning of the following quarter together with a breakdown by months. A precise assessment of the current employment level will be possible only on the basis of data on the real-sector employment supplied by the operative employment and operative statistics. These data do not cover employment in the non-production sector, as well as in agriculture and forestry which are characterized by strong seasonal variations. Figure 2-4-3 shows the employment by sector.

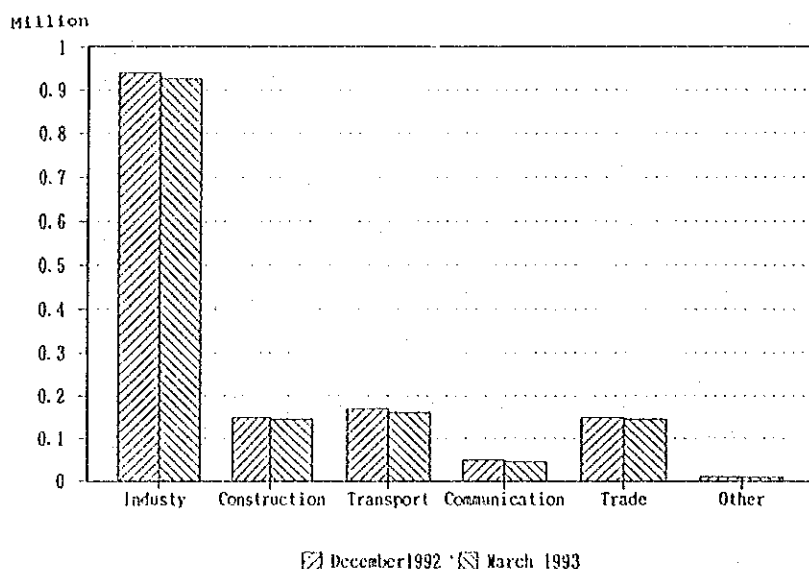


Figure 2-4-3 Number of Employees by Sector

By the end of March 1993, number of employees in the real sector totaled 1,417,000. Operative statistics puts their number at 1,452,100. Difference in estimates is due to incompatibility of enterprises included in "other real-sector branches" category with those included in previous surveys.

In March the number of employed in the real sector (with the exclusion of agriculture and forestry) decreased by nearly 20,000 people in comparison with previous months. Layoffs amounted to 12,500 or 62.5%. A large relative share of layoffs was recorded in industry and trade. As compared to December 1992, there was general decrease of employment in all branches, the largest being in the "other real-sector branches" (28.77%) and transport (9.81%). Provided non-productive sector employment has been following the same dynamics as in 1992, in March it amounted to nearly 658,100. Thus, number of employed in the state and cooperative sector (agriculture and forestry excluded) reached 2,075,100 in March, or a 3.06% drop against the end of 1992.

5) Living Standard

GDP per capita in 1993 was estimated as US\$ 900, though that in 1990 was about US\$ 2,250. The total household income and expenditure are shown in Table 2-4-8.

Table 2-4-8 Total Household Income and Expenditure
(unit: lv per capita)

	1985	1989	1990	1991
Total Income	1,990	2,591	3,102	8,311
of which by sources:				
Wages & salaries	1,203	1,449	1,776	3,775
Pensions	305	429	447	1,386
Family allowance	50	60	69	299
Benefits & scholarships	32	60	68	196
Own farms	284	380	437	1,780
Total Expenditure	1,836	2,332	2,920	7,772
of which by groups				
Food	752	888	1,057	3,681
Clothing & footwear	179	231	348	671
Housing, heating, light	132	173	212	569
Furniture & household equipment	81	107	127	233
Culture & recreation	58	87	135	253
Tax & charges	130	162	199	470

source: NSI "Statistical Reference Book of Rep. of Bulgaria, '92"

It is very difficult to know the living standard from statistical data, though inflation has strongly affected daily life. The current transition period is marked by continuous inflation tension, growing unemployment, and continuously growing differentiation in incomes.

Nominal income per household member grew 7.25 times between 1990 and 1993. At the same time, goods and services retail prices increased 14.8 times. Monthly cost of living per member increased to 2,580 lv in September 1993 from 1,870 lv in December 1992, though it is said that wages rose by an average 52.7% in 1993. Cost for housing, rent, heating, electricity and water doubled to 308.17 lv in one year. Inflation slowed to 3.9% in December 1993 but reached 63.9% compared to December 1992. Under these conditions, the cabinet suggested that national monthly minimum wage be set at 1,588 lv for the first quarter of 1994. The poverty line has been set at 994 lv monthly for the same quarter. But it is said that 70% of Bulgarians live at or near the poverty line.

6) Regional Economy of Sofia

The structure of Sofia regional economy is shown in Table 2-4-9. The figures are analyzed below.

Table 2-4-9 Structure of Sofia Economy

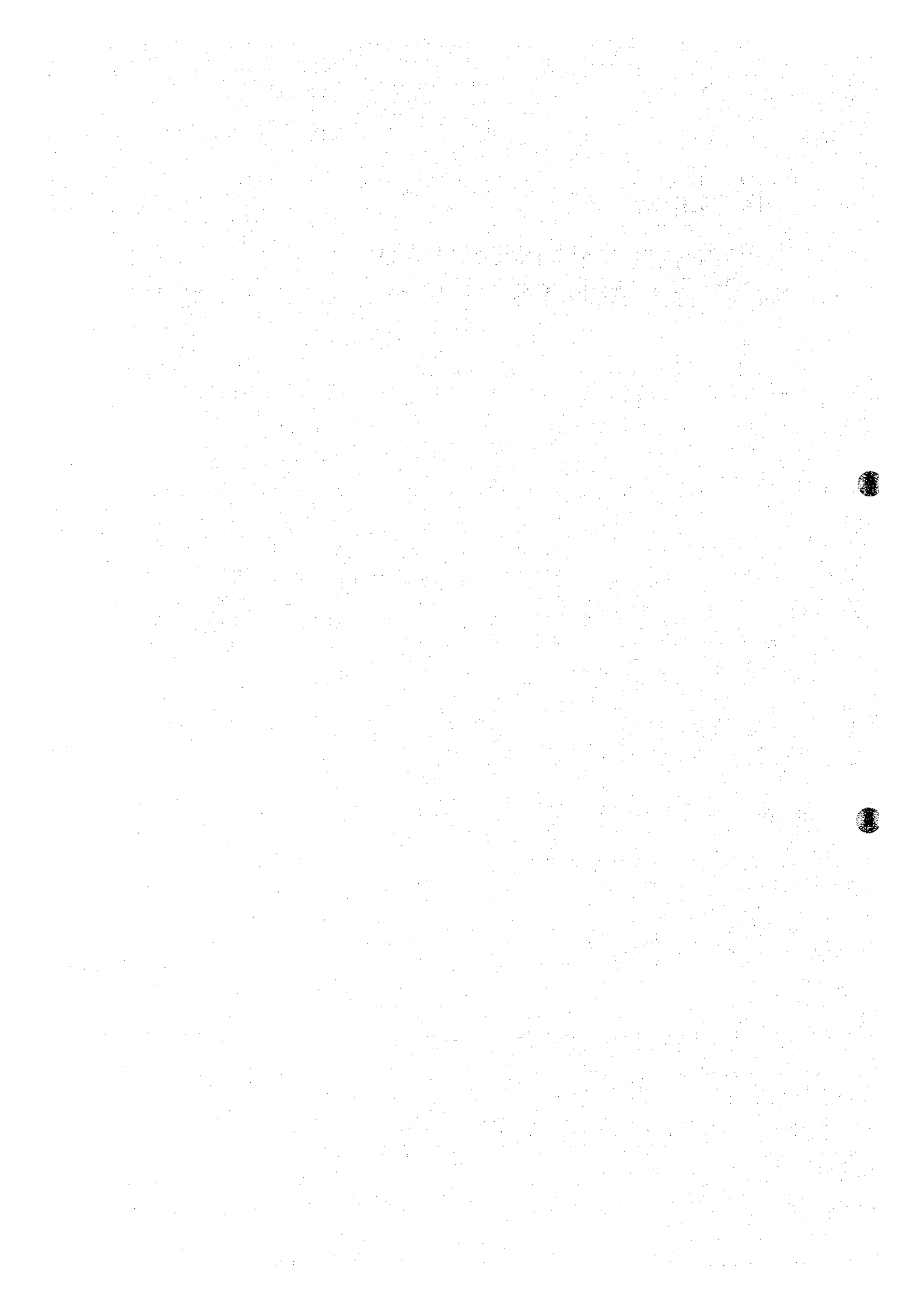
	Sofia Regional (A)	share (%)	National (B)	share (%) (A/Bx100)
Incomes (Million Lv)				
Total	13,653.6	100.0	99,006.5	13.8
Industry	2,955.8	21.6	50,094.4	5.9
Construction	1,911.7	14.0	5,713.2	33.5
Agriculture	357.3	2.6	19,075.4	1.9
Forestry	2.4	0.0	252.9	0.9
Transport	2,811.7	20.6	9,057.3	31.0
Communication	545.8	4.0	1,643.2	33.2
Commerce & Logistic	4,142.4	30.3	9,793.2	42.3
Others	926.5	6.8	3,376.9	27.4
Per capita	11,186		11,023	101.5
Employment (persons)				
Total	461,540	100.0	3,204,605	14.4
Industry	117,305	25.4	1,195,146	9.8
Construction	62,128	13.5	221,729	28.0
Agriculture	6,311	1.4	552,673	1.1
Forestry	228	0.0	17,454	1.3
Transport	41,345	9.0	201,298	20.5
Communication	9,908	2.1	44,977	22.0
Commerce & Logistic	47,479	10.3	239,775	19.8
Others	10,903	2.4	21,134	51.6
Sub Total	295,607	64.0	2,494,186	11.9
Non-productive	165,933	36.0	710,419	23.4
average wage	12,604		11,508	109.5

source: NSI "Region and Municipality of Republic Bulgaria"

- GRDP (Gross Regional Domestic Product) is estimated at about 14% of GDP because the share of national income is 13.8% and the share of employment is 14.4%.
- The biggest sector of regional income in Sofia is Commerce and Logistics. It shared 42% of the national income of the sector. The second sector is industry, but it shared only 6% of the national income of the sector. Construction, Transport and Communication share more than 30% of the national income of each sector. It is clear that Sofia is the national center of commerce, information and services.
- Concerning employment, the biggest sector is non-productive sphere, which includes education, health and administration. In the productive sphere, industry is the biggest sector and construction sector follows it.

CHAPTER 3

CURRENT SITUATION OF SOLID WASTE MANAGEMENT IN SGM



CHAPTER 3 CURRENT SITUATION OF SOLID WASTE MANAGEMENT IN SGM

3.1 Administration

3.1.1 General Administrative Structure of the Country

Bulgaria, being integrated into the zone controlled by the Soviet Union after World War II, received a new Constitution in 1947 which proclaimed Bulgaria a People's Republic. This Constitution was amended in 1971 and after radical political changes during the winter of 1989/1990 the Great National Assembly adopted a new Constitution. At present Bulgaria is a Parliamentary Republic with a President as Head of State.

As a centralized country Bulgaria consists of 9 districts and more than 250 Municipalities. SGM has the status of a region.

Both legislative and executive powers are concentrated at the central government where the Parliament with its 240 members embodies the legislative power with the helping hand of a number of permanent commissions, and the Council of Ministers and different Ministries represent the executive power.

At the local government level a reorganization of the administrative structure is actually under way.

The Municipalities, being empowered to develop their own regulations for the territory they cover, are usually the executive agent for public utilities including SWM.

3.1.2 Ministries and Institutions Related to SWM

Several government institutions are involved in the aspect of solid waste, some of them like;

- Ministry of Environment (MOE)
- Ministry of Regional Development and Construction (MRD)
- Ministry of Health (MOH) and
- Municipalities (MUN)

in a direct way, concerning development and enforcement of environmental laws, regulations and management related to solid waste, while others like;

- Ministry of Agriculture (MOA)
- Ministry of Internal Affairs (MIA)
- Ministry of Labor and Social Welfare (MOL)

only in an indirect way.

Their main functions and tasks are stipulated in Regulations of the Government (RG) published in the State Gazette (SG) specified below.

MOE

RG - SG 10,19/1992

MOE functions related to waste include:

- Drafting of legal documents such as Laws, Regulations, Standards and Guidelines connected with solid household waste (SHW), hazardous substances and hazardous waste
- Supervising Environmental Impact Assessment (EIA) in all activities connected with waste
- Collecting information and recording the state cadastre of waste
- Instructing on how to meet environmental standards and how to rehabilitate injured environment
- Sanctioning offenders according to the charges, fines, etc. stipulated in the legal documents
- Managing the National Environmental Protection fund and controlling the proper utilization of the Municipal Environmental Protection Fund.

The MOE acts on the territory of Bulgaria through sixteen Regional Environmental Inspectorates.

MRD

RG - SG 107/1991, amended 70/1992

MRD develops and carries out the following activities:

- Draft legal documents connected with regional and municipal organization, including specific documents for:
 - * areas for sanitary disposal sites
 - * designing and construction of disposal sites
 - * SHW treatment installations
 - * cleaning of settlements
- Develop and implement strategy and investment policy in urbanization and operation of public utilities in regional and municipal organization

- Adjust technical standards to meet EC standards.

MRD carries out these functions with the help of specialized institutes and Municipal departments.

MOH

RG - SG 4/1992

In the field of SWM this ministry develops and carries out legal documents and activities such as:

- Sanitary and hygiene standards and rules SWM
- Sanitary and hygiene requirements for the protection of public health in settlement areas
- Controls the activities connected with cleaning of settlement areas and removal and deactivation of SHW.

The MOH acts through twenty eight Hygiene-Epidemiologic Inspectorates on the territory of Bulgaria.

MUN

Concerning SWM the local authorities - the municipalities - are generally responsible for the following:

- Developing rules and regulations for the area they cover in accordance with the state legal documents
- Collection, transport and disposal of SHW

MOA

RG - SG 29/1991, amended 42/1992

MOA activities with regard to SWM are limited to participation in commissions concerning approval of selected areas for waste disposal sites and treatment plants or installations.

MIA and MOL are only related to SWM concerning fire protection and labor protection and safety.

3.1.3 Sofia Greater Municipality (SGM)

1) General Structure of SGM

SGM being the ninth region of Bulgaria is subdivided into 24 districts or Regional Administrations (RA) which cover the City of Sofia and the surrounding villages.

The administration of Sofia is organized in different levels as shown in Figure 3-1-1 below.

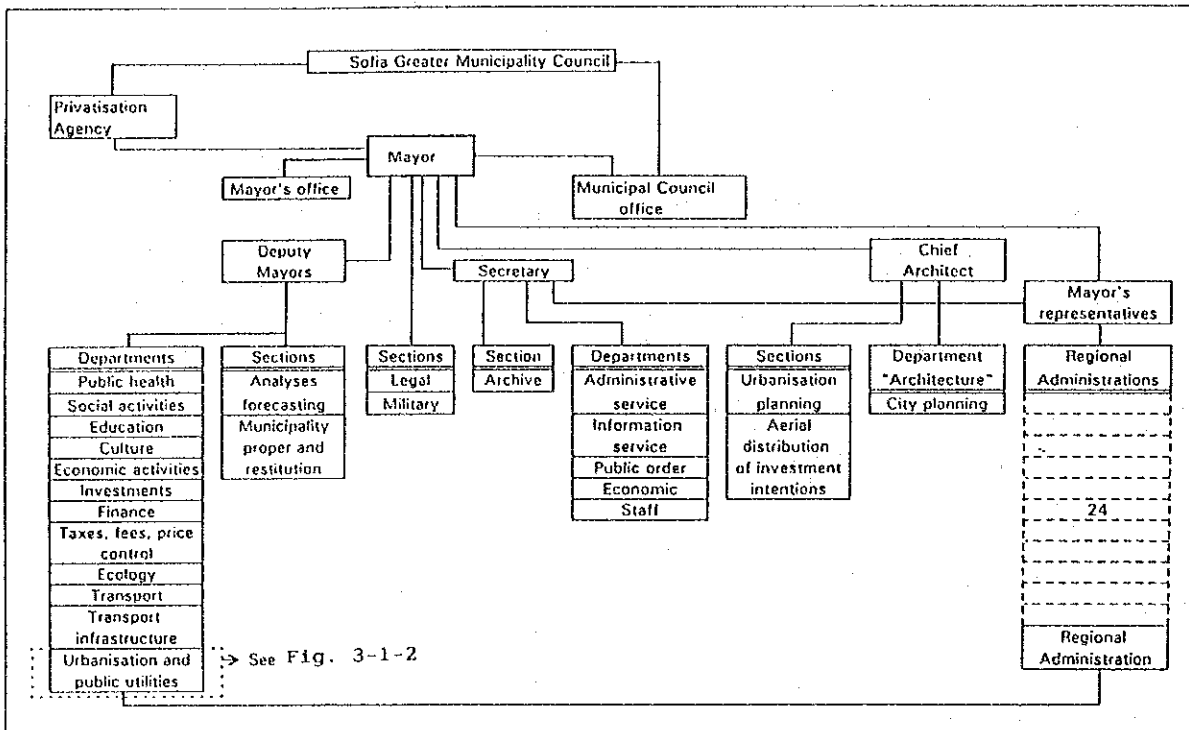


Figure 3-1-1 Organization Chart of SGM

The link between SGM Council and the Mayor is represented by the Municipal Council Office which prepares sessions of SGM Council. The second level - the Mayor - is assisted by 5 Deputy Mayors, the Secretary and the Chief Architect as the third level.

Different departments and sections form the fourth level of SGM Administration. Each one has special functions and responsibilities and the majority of them carry out inter alia methodological guidance to and controlling of the 24 Regional Administrations and the Municipality owned companies.

The central department dealing with different utility activities including SWM and the cleaning of the SGM area is the "Urbanization and Public Utilities" department.

2) "Urbanization and Public Utilities" Department (UPUD)

The department should be regarded as the central advisory and controlling body of the Municipality.

Its main responsibility is the implementation of the SGM Urban Development and Public Utilities Program by allocating corresponding parts of the SGM budget to the Municipality owned companies and the 24 Regional Administrations (RAs).

The activities of the UPUD can be summarized as follows:

- methodological guidance of the municipality owned companies and the 24 RAs
- control of their activity and utilization of funds
- assistance in preparation of the above mentioned companies' and RA budgets

The latter activity is carried out in close collaboration with the "Investments" and "Finance" departments. UPUD employs about 20 professionals dealing with different public utilities like:

- Water supply and sewerage disposal
- Electric Power supply
- Heating system
- Landscaping
- Municipality owned buildings
- Roads and facilities
- Cleanness (street cleaning and waste disposal)

Two economists support their activities.

The only section involved in SWM is the cleanness section consisting of:

- Section chief
- one specialist
- six inspectors

This section works mainly with the

- Chistota company (Municipality owned) and
- 24 BKC companies (owned by the respective RAs) within the limited activities previously mentioned.

Inspectors control quality of service of "Chistota" Company whereas the control of BKC is done directly by the RAs.

UPUD organization and responsibilities are shown in Figure 3-1-2.

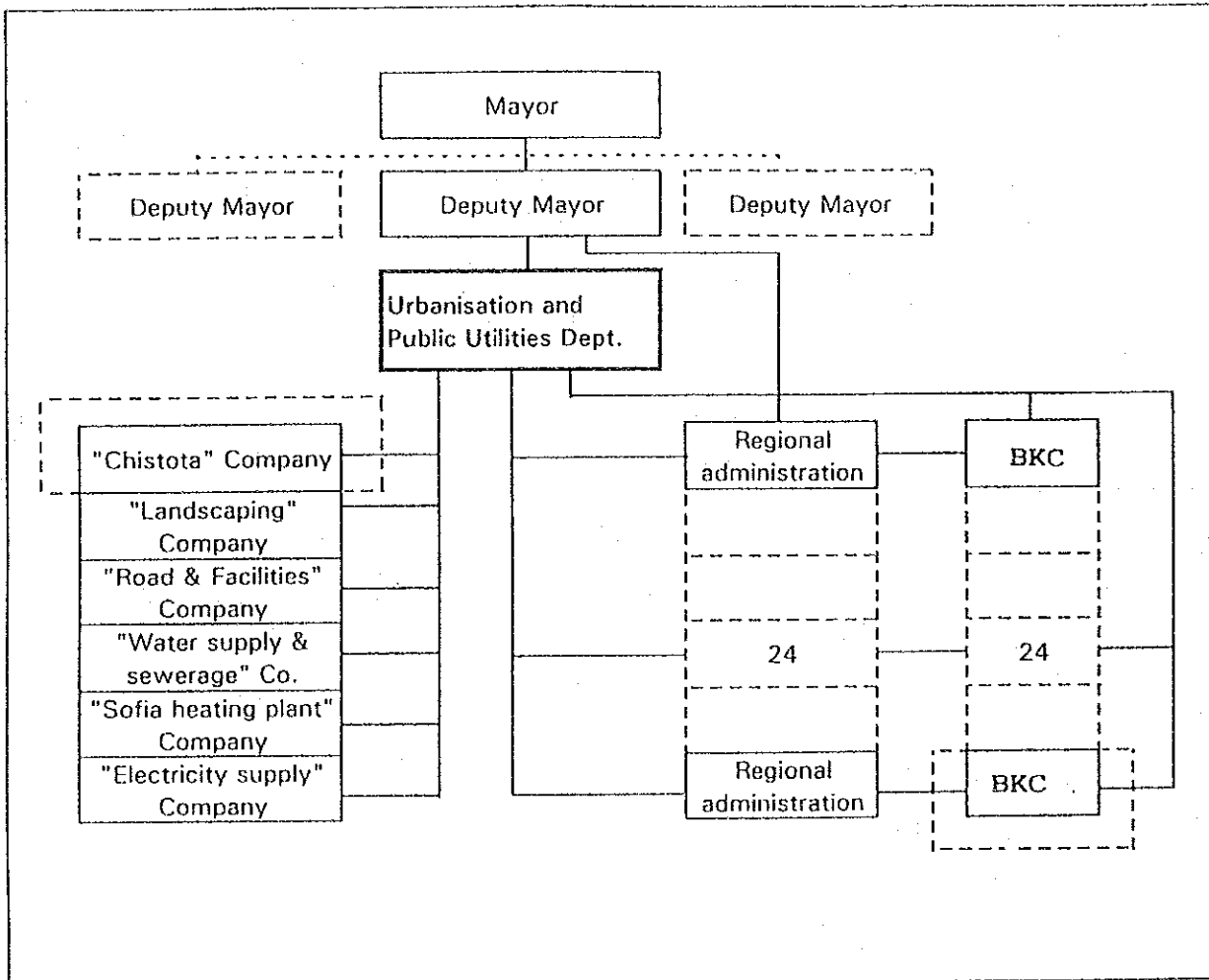


Figure 3-1-2 Responsibilities of UPUD

UPUD is the coordinating link between the responsible Deputy Mayor and the different Municipality owned companies.

3) Chistota Company

This municipality owned company was founded according to Decree 56 in 1988. Its main responsibilities are cleansing of the city center and main streets of Sofia and operation of existing waste disposal sites according to existing rules and regulations.

Activities of Chistota Company can be enumerated as follows:

- collection of street waste from the central part of the city including street cleaning
- washing, sweeping and snow cleaning of the main highways
- general repair and maintenance of their equipment and main repair work for the equipment of the 24 BKC companies
- operation of existing disposal sites at Suhodol and Dolny Bogrov

The organization presented by Chistota Company is shown in Figure 3-1-3.

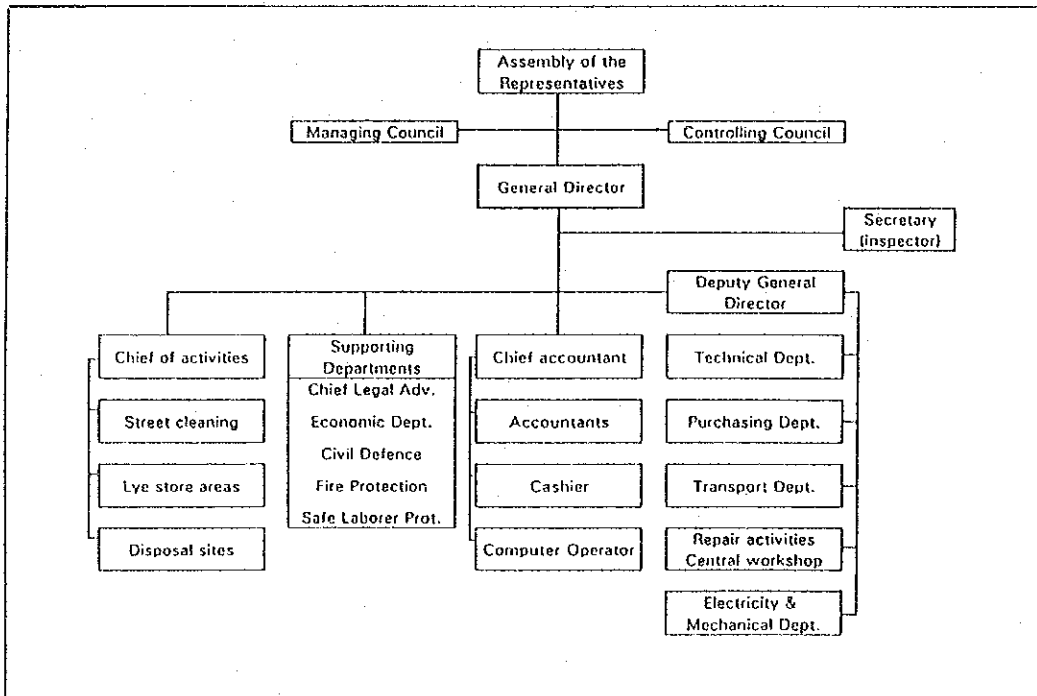


Figure 3-1-3 Organization Chart of Chistota Gen. Co.

The administrative building together with central workshop for equipment repair are located in one complex and stores for inert materials are distributed over the Municipality area. A small site office is located at both waste disposal sites.

Activities and remuneration are based on a contract concluded with SGM assisted by UPUD for one year only, representing over 90% of their yearly turnover.

Furthermore, Chistota Company collects fees for disposal of waste from industrial enterprises which are allowed to deliver their waste to the existing disposal site of Dolny Bogrov.

Even though Chistota company is comparatively well equipped it concludes contracts with other companies for heavy machines like bulldozers for waste leveling and compaction and covering material for the dumping sites like soil, sand, building scrap, etc. No special contracts are concluded with the 24 BKC companies for main repair services of their equipment regardless of the fact that this represents a considerable part of the central workshop activities.

Out of the total 514 staff members, 62 people operate the two disposal sites under the guidance of the Chief of activities. Transport and street cleaning with more than 300 employees represent the main part of the company besides the central workshop with 50 employees.

4) BKC Companies

BKC is an abbreviation of the Bulgarian words meaning "Urbanization and Public Utilities Services".

The majority of BKC are founded according to Decree 56 registered as Municipality owned companies. Only three of them are registered according to the Trade Act. "Kremikovtzi" and "Sredets" are "Sole proprietor limited liability companies" and "Lozenets" is a "Sole proprietor joint stock company". Actually all of them are owned by SGM through the 24 RAs.

Each BKC has its responsibilities within the territory of the respective RA concerning cleansing including waste handling, maintenance of state owned buildings and flats including public buildings, street maintenance and landscaping.

General BKC activities are listed below but it should be kept in mind that deviations exist between different companies:

Cleansing department

- washing, sweeping and snow cleaning of streets
- collection of household and street waste
- transportation of waste to the disposal sites

Building and repair department

- building including repair works of schools, kindergartens, public offices, etc. including water supply, sewerage and electricity installations and necessary repair works on domestic level
- Maintenance of state owned buildings and flats, including current and general repairs and collection of rents

Street maintenance department

- pavement and repairs of asphalt layers and damaged tiles
- construction of sidewalks, playgrounds, etc.

Landscaping department

- landscaping including maintenance
- cultivating and maintenance of local park areas

For the above mentioned activities and their remuneration a contract is concluded on a yearly basis with the RA which receives their allocated yearly budget from SGM assisted by UPUD.

Besides these official activities for the RA, companies have the right to offer and execute other activities with the available equipment and personnel for companies and individuals on a competitive basis like:

- collection and transport of industrial waste from enterprises which have the right to deliver their waste to the official dumping site
- building and repair works
- transport services
- trade

These services can be provided to any company or individuals within and outside of their area of responsibility. Total earnings from these services represent less than 10% of their yearly turnover.

Due to the specific activities of the different BKC only a general organization structure can be represented in Figure 3-1-4 below.

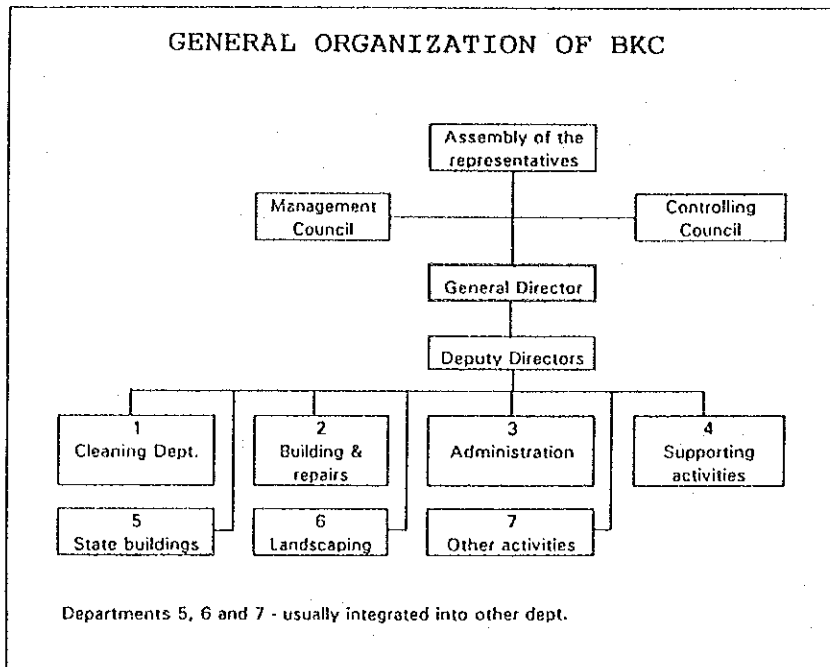


Figure 3-1-4 Typical Organization Chart of BKC

Every RA appoints about 12 inspectors on cleansing who control the respective activities of the BKC and proper utilization of funds. They also have the right to impose fines on and sanction juristic persons and individuals if they violate the regulations on cleansing.

On the basis of the activities mentioned it becomes obvious that neither one of the 24 BKC nor the Chistota Company is involved in any recycling activities at present.

Some attempts on behalf of the Municipality to separate SHW at the source (e.g. paper, glass, plastics, etc.) have failed due to the unwillingness of the citizens to cooperate - lack of responsibility and incentives.

Apart from the small private companies, only "MEHAPLAST" - a state owned limited liability company - deals with recycling of special waste components.

Needless to say that the equipment required for execution of BKC work is owned by SGM and only operated by the BKC. Equipment repair works have to be financed out of their allocated budget from the RA and new investments concerning equipment needs prior approval of SGM and, respectively, integration into the yearly budget.

3.1.4 Conclusions

Bulgaria has a centralized structure and SGM is very similar. A new proposal for merging some departments and respectively separating other activities in line with the concentration of investments activities is under discussion. This proposal, if approved, will not result in substantial changes in the existing situation concerning SWM within SGM. Different departments and sections, companies with their related sections involved in SWM are organized in a decentralized manner in such a way that an effective straightforward approach considering efficient state of the art technologies under the guidance of economic parameters is impossible.

This complicated structure where responsibilities and activities are spread over many departments and companies automatically leads to considerable weaknesses on administrative and executive level with uneconomic utilization of limited funds.

On the administrative level the following points have been identified:

- 25 administrative units exist (Chistota and BKC) in addition to the central SGM department involved in SWM
- for administrative procedures, budget requirements, providing of funds, investments, etc. extensive time input is required for coordination from the Deputy Mayor down to the executive level and vice versa
- the decision process requires often extensive periods
- yearly time consuming contract negotiations on scope of work and services including remuneration which could be simplified into long term routine work and special work
- non-proportional distribution of funds among companies

A walk in Sofia would make it obvious that the level of SWM services leaves a great deal to be desired.

The identified weak points on the executive level are:

- different SWM standards result in different service levels
- too many activities of different nature are concentrated in most BKC often leading to inefficient service execution
- obsolete equipment, part of which is out of order, hampers efficient execution of services
- the majority of BKC seem to be over-staffed in relation to area and population served they run only one shift per day

As a consequence of the weaknesses identified some proposals will be made for a new future efficient organization taking into consideration technical propositions in the Master Plan.

3.2 Laws and Regulations

3.2.1 Legislation Related to SWM

Legislation specifically related to SWM shall be described in this section.

1) Existing Legislation

Four different levels of legal documents exist.

First level -	Laws issued by the Parliament only.
Second level-	Ordinances and Regulations issued by the Council of Ministers.
Third level -	Ordinances, Regulations and Instructions issued by an individual Minister.
Fourth level-	Instructions, Guidelines, Recommendations issued by specialized institutions.

The legal documents in force relating to household and/or industrial waste are the following:

- Regulation on the designing of sanitary disposal sites for solid household waste (SHW)
- Instruction for designing and running of sites for controlled deactivation of SHW
- Instruction for separate collection of SHW
- Instruction for disinfection and elimination of pests in the waste transporting vehicles
- Methodical guidelines for collecting and transportation of SHW from populated areas
- Methodical guidelines for designing of organization for SHW collecting and transport
- Methodical guidelines for elimination and recultivation of unofficial dumping sites
- Methodical guidelines for making a regulation for maintaining and keeping cleanness on municipal territory
- Quality and quantity characteristics of solid waste in Bulgaria. Short term forecast.
- Temporary sanitary and technical norms and rules for SHW arising from populated areas

2) Legislation under preparation

The list of legal documents under preparation is as follows:

- Waste Act
- Regulation on Cleanness of Settlements
- Regulation on Hazardous Waste
- Appendices and Annexes to Regulation on Hazardous Waste:
 - * Catalogue of Hazardous Waste (HW)
 - * Criteria for Classifying Substances or Waste as Hazardous
 - * List of Incompatible Materials
 - * Information Chart for Transportation of HW
 - * Information Chart for HW Acceptance, Delivering and Transport
 - * Signal Chart - for accidents with HW
 - * Blank form for recording an accident with HW during storing, transportation and treating
 - * Information Chart for HW
 - * Instruction for Filling in "Information Chart for Registration of HW"
 - * Instruction for Filling "HW Information Chart Report"

3.2.2 Interaction between Legislation, Execution and Control

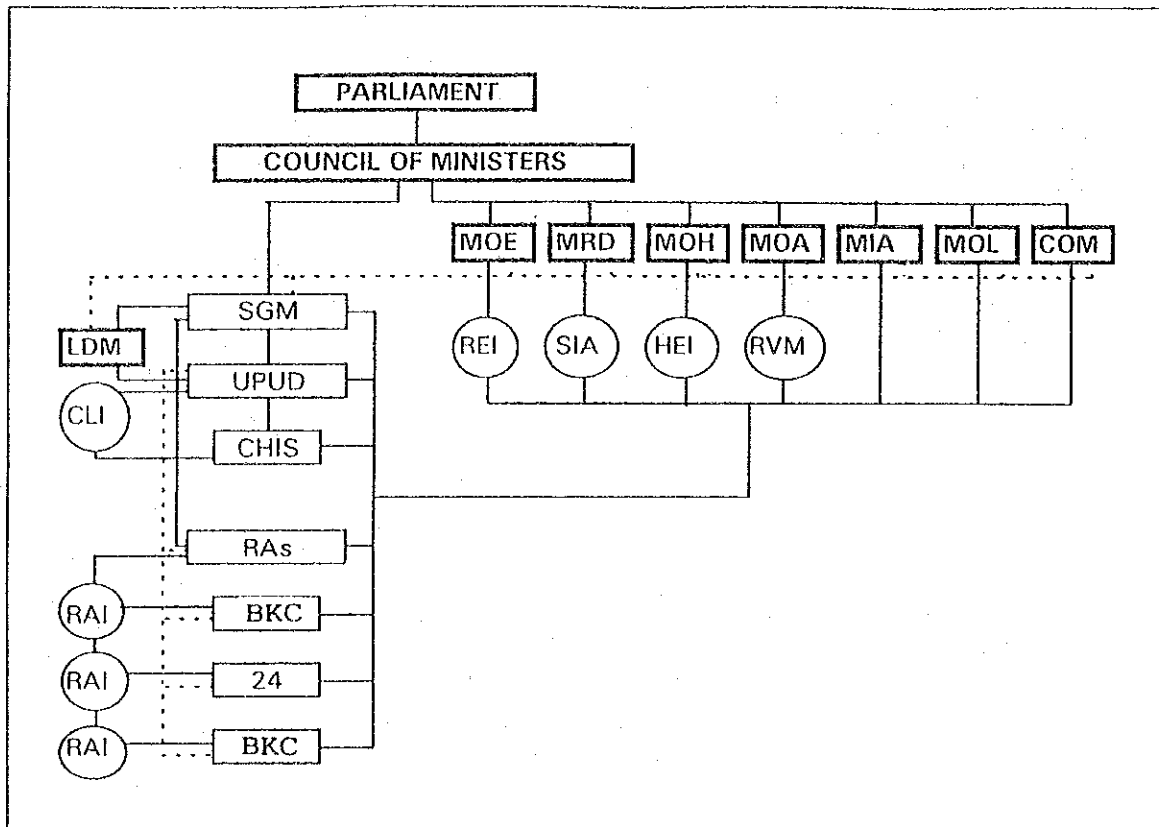
Interaction between legislative bodies involved in environmental aspects, more specifically in SWM, execution of the related activities and external and internal control are shown in Figure 3-2-1.

This figure shows the complexity of interaction where methodological guidance to SGM is shown as well by dotted lines and assistance to the SGM Legal Department. Extensive control activities from different bodies including the internal controlling functions seems to be rather theoretical compared with the actual situation in SGM concerning its cleanness.

3.2.3 Conclusions

The existing legislation in force related to household and industrial waste management does not cover important issues according to the Constitution concerning protection of human health and environment from serious impact caused by unprofessional treatment of waste.

Nevertheless, draft documents under preparation will close an important gap in this respect. These documents should be closely studied and compared with current EC legislation since it is the declared policy of the Bulgarian Government to join the European Union.



Legend:

Legislation bodies preparing laws, ordinances, regulations, instructions, standards, etc.

- MOE - Ministry of Environment
- MRD - Ministry of Regional Development and Construction
- MOH - Ministry of Health
- MIA - Ministry of Internal Affairs
- MOL - Ministry of Labour and Social Welfare
- COM - Committee of Forest
- LDM - Legal Department of the Municipality

Controlling bodies

EXTERNAL:

- REI - Regional Environment Inspectorate
- SIA - State Inspectorate for Area Organisation and Construction Control
- HEI - Hygiene-Epidemiological Inspectorate
- RVM - Regional Veterinary Medical Inspectorate

INTERNAL:

- CLI - Cleanness Inspectors
- RAI - Regional Administrations Inspectors

Administrative level

- SGM - Sofia Greater Municipality
- UPUD- Urbanisation and Public Utilities Department
- RA - Regional Administrations within SGM

Executive level concerning cleaning and solid waste

CHIS- Chistota Company

Figure 3-2-1 Interaction between Legislative and Executive Bodies

3.3 Finance

In this section general information on the overall budget of SGM and data collected on SWM budget are summarized and briefly analyzed.

3.3.1 Sofia Greater Municipality Budget

1) The proposed 1994 budget of SGM is 10,535 million lv. The final budget of 1993 was 7,861 million lv.

The final 1993 budget is 42.4% more than the originally proposed one.

2) Major revenue items in the original 1993 budget are as follows:

a -	Income Tax	1,420 million lv
b -	Turnover Tax	1,263 million lv
c -	Profit of Municipal companies	987 million lv

Total amount of the above three items is more than 70% of the revenue, although total amount of fees represents only 5%.

Waste tax is included in other incomes. Roughly one third is collected from residents and two thirds are from enterprises. The tax is calculated based on property value of residential buildings and annual balance value of enterprises buildings.

Waste tax from residents is collected together with the property tax and the insurance at the offices set up according to the locations of property.

The rate is determined by SGM Municipal Council but the rate of property tax is determined by Law. The tax rate for residents was reduced from 15 per million to 4 per million on the basis of reevaluation which was done in 1992.

The collection rate of the waste tax (actual collected/targets to be collected) was 98.5% in 1992.

3) Major expenditure items in 1993 original budget are as follows:

a -	Communal activities	2,009 million lv
-----	---------------------	------------------

b -	Public health	1,354 million lv
c -	Education	1,316 million lv

The total amount of the above three items represents about 85% of expenditure. Expenditure on SWM is included in the Communal activities.

4) The budget changes are shown in Table 3-3-1.

Table 3-3-1 Changes of SGM budget
(Unit: million lv)

	1990	1991	1992	1993 (a)	1993 (b)	1994 (c)
Revenue						
Tax	905	2,376	3,894	4,495	5,169	6,294
Income Tax	327	1,194	1,638	1,420		
Turnover Tax	29	194	690	1,263		
Profit of Municipal Enterprises	273	690	1,098	987		
Real Estate Tax	9	9	27	40		
Other Taxes	268	289	440	785		
Fees	21	27	116	261	295	375
Other Incomes including:	28	39	440	319	1,001	1,043
Waste tax	20	26	67	80	169	226
Subsidies from State	0	0	725	445	1,396	2,823
Total of Revenue (A)	954	2,442	5,175	5,520	7,861	10,535
Expenditure						
Communal Activities including:	374	852	2,367	2,009	2,630	4,200
Cleaning Activity(D)	45	141	204	248	248	476
Acquisition of long-term assets(E)	218	404	1,662	1,171	2,110	3,400
Public Health	175	581	945	1,354	1,529	2,074
Other Activities	247	857	2,314	2,157	3,702	4,261
Total of Expend. (B)	796	2,290	5,626	5,520	7,861	10,535
Balance(C=A-B)	158	152	-451	-0	0	0
(reference)D/Bx100	5.7	6.1	3.6	4.5	3.2	4.5
E/Bx100	27.4	17.7	29.5	21.2	26.8	32.3

notes: (a) original budget (June), (b) final budget (December)
(c) proposed budget

The figures show the following tendency:

- SGM total 1994 Revenue is expected to exceed eleven times that of 1990 due to inflation in the Bulgarian economy.

- Net revenue without subsidy from state is expected to be only eight times that of 1990.
- SGM Total 1994 Expenditure is also forecast as 11 times that in 1990. The balance will be zero in 1994.
- Share of cleaning activity declined gradually, though the proposed budget expected to be 4.5%.

The budget will be reviewed again half a year later and will be adjusted in accordance with the progress of inflation.

3.3.2 Solid Waste Management Budget

1) Solid Waste Management Budget of SGM

SWM in SGM is carried out by "Chistota" company and 24 BKC. SGM supervises these activities through budget allocation and instruction on guidelines.

SGM Solid Waste Management budget was 248 million lv in 1993. The nominal amount has increased by 1.8 times that of 1992. Considering the inflation rate in Bulgarian economy, amount in real terms has not increased, although its share in the total expenditure of SGM has shown a relative increase (4.2% in 1992 compared to 4.5% in 1993); (see Table 3-3-1).

2) Budget of BKC

The answers to the Questionnaires distributed to the BKC during this Study are summarized in Table 3-3-2.

The following conclusions can be made regarding their financial characteristics:

- Almost all BKC profit from their activities, although four BKC show red figures.
- Concerning Cleansing activities, about half of 20 BKC show a profit but the other half show red figures.
- Lozenets BKC in particular shows a big loss (about 50% of their revenue from cleaning activities).

Privatization is part of Bulgaria's national policy, therefore it is expected that BKC will be transformed into private companies. At present three BKC have been transferred into Joint Stock Companies or Limited Liability Companies. Other BKC are also expected to be transferred into Limited Liability Companies by the end of 1994.

Table 3-3-2 Finances of BKC Companies

unit: 1,000 leva

	Total in 1992										1993/1992					
	Revenue					Expenditure					Balance	Cost/cum1993 (leva)	Budget	Expend.		
	Revenue	Expnd.	Balance	Total	District	Private	Total	Salary	Maintenanc	Fuel						
Sradets	26,691	20,476	6,215	11,839	9,864	1,975	10,497	5,901	1,953	1,834	1,342	56.1	11,485	14,458	1.38	
Krasno Sete																
Vurazhadane	24,700	23,506	1,194	10,398	9,397	1,001	10,260	7,146	864	1,400	138	39.5	10,701	11,363	1.11	
Obresha	9,210	9,207	3	8,919	8,889	30	8,995	4,590	1,358	2,574	-76	87.5	9,109	11,276	1.25	
Serdika	20,980	20,776	204	10,732	9,840	892	11,355	4,442	0	6,913	-623	123.4	11,800	19,989	1.76	
Pouyane	17,789	17,278	511	6,317	6,046	271	6,717	2,390	141	1,363	-400	82.3	7,400	8,719	1.30	
Slatina	15,085	15,079	6	8,200	7,300	900	7,345	2,039	2,273	1,779	855	91.8	11,000	12,227	1.66	
Izref	10,019	9,831	188	5,109	4,624	485	5,140	2,694	0	1,020	-31	54.7	6,033	7,240	1.41	
Lozenets	13,138	12,927	211	7,978	7,021	957	11,969	7,058	461	1,476	-3,991	160.0	8,793	10,428	0.87	
Triaditza	16,022	15,779	243	8,957	8,500	457	8,894	4,925	735	2,346	63	69.3	11,402	14,473	1.63	
Krasna Polyana	19,734	15,529	4,205	10,087	9,899	188	8,566	4,294	250	700	1,521	78.2	12,000	15,428	1.80	
Ijinder	11,965	11,355	610	6,804	6,162	642	6,309	2,728	701	1,914	495	55.9	7,000	10,966	1.74	
Kabezhdza	21,141	21,795	-654	7,064	6,767	817	8,184	4,350	95	1,561	-1,100	78.2	8,093	8,031	0.98	
Iskar				7,209	6,697	512	7,642	4,182	506	1,800	-433	50.0	8,236	8,262	1.08	
Mladost	26,636	26,359	277	14,500	12,500	2,000	14,625	5,694	2,693	3,430	-125	52.8	14,900	21,739	1.49	
Studentske	6,174	6,148	26	3,744									4,082	5,302		
Vitosha	11,387	11,956	-569	8,302	5,708	2,594	7,774	4,815	255	2,410	528	99.7	7,349	14,015	1.80	
Ovcha Kupel	17,271	17,287	-16	10,958	9,968	990	10,699	6,446	150	2,367	259	101.1	13,700	13,311	1.24	
Lyulin	26,098	25,872	226	12,911	10,029	2,882	11,237	3,453	1,528	330	1,574	70.0	10,050	22,198	1.98	
Vrubnitze													5,425	6,390		
Novi Iskar	6,037	6,015	22	5,860	5,517	343	5,310	2,634	110	1,603	550	91.1	6,177	8,194	1.54	
Kramitovtsi	15,639	15,628	11	6,998									9,117	8,336		
Pancharevo	4,256	4,250	6	4,256	3,662	594	4,250	1,766	46	1,029	6	105.7	5,288	5,955	1.40	
Bankia	5,825	6,023	-198	2,102	2,102	0	2,525	1,289	570	660	-423	63.1	3,941	2,651	1.05	
Total	325,797	313,076	12,721	179,264	149,992	18,530	168,293	82,836	14,689	38,509	229	61.6	210,325	273,559	1.63	

There is also one instance of a BKC serving an area outside its own territory to collect household waste with a view of creating competition and reducing the cost of SWM.

3) Budget of Chistota Company

The changes in the Chistota Co. budget are shown in Table 3-3-3.

Table 3-3-3 Finance of Chistota Company
(unit: 1,000 Lv)

	1989	1990	1991	1992	1993
Revenue(A)	10,527	11,488	25,528	42,417	55,183
from SGM	6,000	6,300	20,000	31,600	
from BKC					
from Companies	4,527	5,188	5,528	11,417	
Expenditure(B)	9,388	10,531	24,784	41,709	52,999
Personnel expenditure	3,736	4,009	8,701	11,708	19,224
Maintenance & overhaul	1,021	1,005	986	2,913	
Fuel	709	1,545	3,231	9,819	
Others	2,605	2,653	10,833	10,630	
Depreciation	1,317	1,319	1,033	639	500
Balance(C=A-B)	1,139	957	744	708	2,184
ratio(C/Ax100)	10.8	8.3	2.9	1.7	4.0
Investment	682	380	5	66	
for Cleaning activity(D)	676	363	5	27	
ratio(D/Bx100)	7.2	3.4	0.0	0.1	0.0

note: There is no revenue from BKC except repair services

The figures show the following :

- Total amount of revenue has increased because of inflation. Considering the inflation ratio however, the ratio of the revenue increase seems insufficient.
- Although the balance is in the black, amount of profit and profit ratio have decreased.
- Increase ratio of expenditure is higher than that of the revenue. Especially increase ratio of personnel costs is large, although that of maintenance costs and of investment costs is small or zero.

No tariff has been set. The price was changed every three or six months according to the actual cost. Whenever the price is changed, a letter is distributed to the corresponding companies informing them of the change.

The current disposal fee is 4 lv per m³. The fee is collected at the disposal sites.

Concerning SGM, the bill is prepared every month according to the actual cost, though the total receivable amount is limited by the SGM budget.

The revenue and expenditure according to activities is shown in Table 3-3-4.

Table 3-3-4 Revenue and Expenditure by Activity

(unit: 1,000 Lv)

Items	Activities	Street Cleaning			Disposal			Warehouse, etc			Total		
		1991	1992	1993	1991	1992	1993	1991	1992	1993	1991	1992	1993
Expenditure		17180	30140	33641	4616	7735	11909	1139	769	7629	22935	38644	52999
Materials		944	1009	618	4	148	207	3	19	2500	951	1176	3325
Fuel & oil		6637	9413	9202	194	379	434	3	1	53	6834	9793	9685
Electric energy		11	159	132	11	31	20	1	26	173	23	216	325
Water		237	489	344			1	1	1	69	238	490	414
Depreciation		630	408	340	63	60	57	8	5	103	701	473	500
Salary		3897	8421	11210	187	523	869	71	141	1897	4155	9085	13976
Income tax		1567	3512	4280	73	233	304	24	49	664	1664	3794	5248
Transport rental		258	493	472	3520	5300	8410	230	252	180	4008	6045	9062
Maintenance & overhaul		1476	2719	2400	38	131	140	684	3	309	2198	2853	2849
Light, central heating			14	11	4	71	60	5	20	712	9	105	783
Additional activities		75	91		165	98		29	159		269	348	0
Organiz. & Managm.		1296	2890	3883	347	731	1230	72	74	810	1715	3695	5923
Others		152	522	569	10	30	177	8	19	159	170	571	905
Revenue		18573	31092	36240	4846	8121	12507	1196	808	6436	24615	40021	55183
Balance		1393	952	2779	230	386	598	57	39	-1193	1680	1377	2184

The figures show the following characteristic features:

- major activity is street cleaning which represents 63% of all cleansing activities.
- other activity including warehouse have increased relatively, though balance is bad.
- major items of street cleaning expenditure are as follows:

	1991	1992	1993
Salaries	22.7%	27.9%	33.5%
Fuel & oil	38.6%	31.2%	27.5%
Income tax	9.1%	11.7%	12.8%
Organization & management	7.5%	9.6%	11.6%
Maintenance & overhaul	8.6%	9.0%	7.2%

- major items of expenditure on disposal activities are as follows:

	1991	1992	1993
Transport rental	76.3%	68.5%	70.6%
Organization & management	9.5%	7.5%	10.3%
Salaries	4.1%	6.8%	7.3%
Fuel & oil	4.2%	4.9%	3.6%
Income tax	1.6%	3.0%	2.6%

(rental cost of transport includes the salaries of operators, fuel cost, etc..)

Salaries of Chistota Company employees are shown in Table 3-3-5.

Table 3-3-5 Salaries of Chistota Employees
(Lv/month)

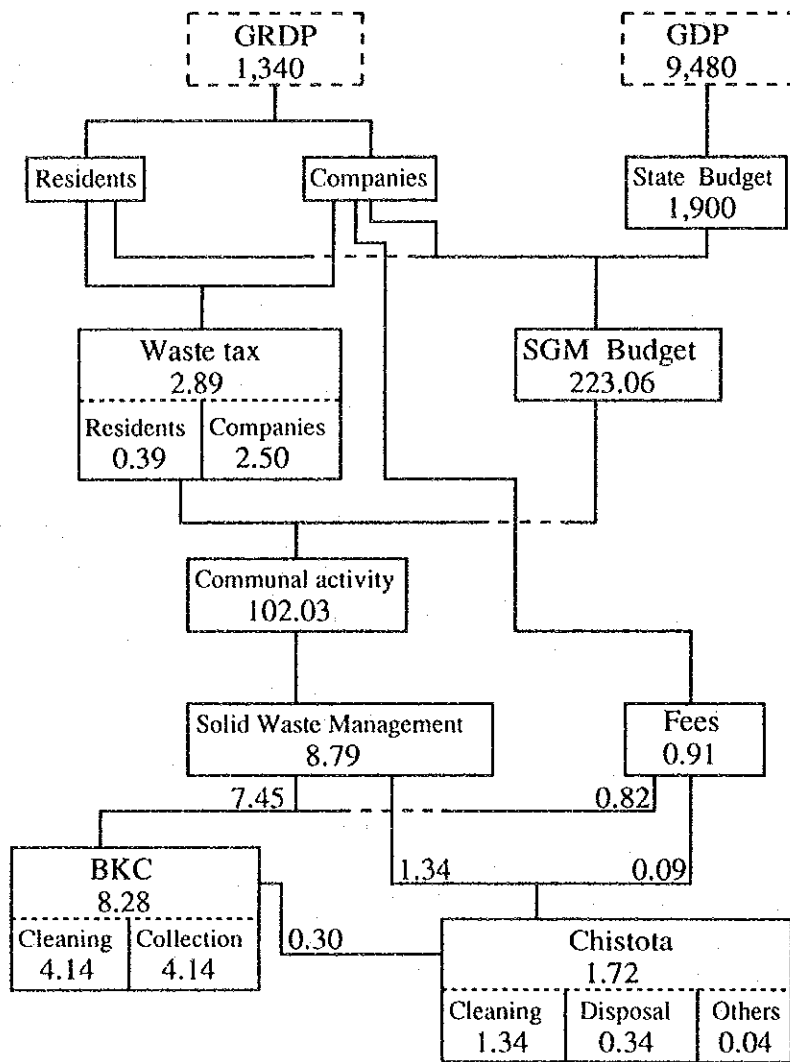
Job	Basic salary	Salary including additions
Manager	3,200 - 5,950	3,620 - 6,735+a
Specialist	3,000 - 4,950	3,360 - 5,544+a
Driver	2,150 - 2,160	2,870 - 3,680+a
Mechanic	1,760 -	3,067 -
Worker	1,900 - 1,950	2,490 - 2,650+a

notes: Bonus is paid according to work result, but it is not included in above figures.

Experiences are considered to calculate additions.

3.3.3 Money Flow on Solid Waste Management

The money flow on solid waste management is summarized in Figure 3-3-1.



Unit: US\$ million
 Exchange rate 1US\$=23.2Lv
 (Jun 1993)

Figure 3-3-1 Solid Waste Management Money Flow (1992)

3.4 Solid Waste Amount and Composition

3.4.1 Solid Waste Surveys Conducted

In order to estimate the solid waste amount and composition in SGM field surveys were conducted both in Summer 1993, and Winter '93-'94 as follows:

- a. Solid waste amount transported to Suhudol and Dolny Bogrov disposal sites
- b. Solid waste amount discharged in specified areas
 1. Boyana in Vitosha District: Detached housing area outside the ring road
 2. Hemus in Slatina District: Low-medium rise apartment block in the central area
 3. Pirotska Street in Vazrazhdane District: Low-medium rise apartment block in the central area with shops and restaurants
 4. Belite Brezi in Krasno Selo District: High-rise apartment block
 5. Ovcha Kupel: Medium-rise apartment block
 6. Lyulin: Medium-high rise apartment block
 7. Mladost: Medium-high rise apartment block
 8. Dolni Bogrov: Detached houses in a village area
 9. Fuklteta in Krasna Polyana district: Gypsy area, old detached houses
 10. Vitosha and Denkoglo street in Sredets district: Busy commercial area with housing
 11. Sopping center "RUM" of Ovcha Kupel: Shopping center with supermarket and restaurant
 12. Genski Pazar in Vazrazhdane district: Busy open market area
 13. Ministry of Construction building in Oborishte district: Typical public office building
 14. Slavianska and Aksakov street in Sredets district: Medium-rise buildings with residential apartments houses, offices, shops and restaurants
 15. Novotel Hotel Europa, Serdika district: First class 4 star hotel
- c. Solid waste analysis on physical composition and chemical composition

Both Summer and Winter surveys were conducted by the National Center of Hygiene, under the supervision of the Study Team.