CHAPTER 3

POPULATION AND WATER DEMAND

CHAPTER 3 POPULATION AND WATER DEMAND PROJECTION

3.1 Population

3.1.1 Present Population

The latest census in Albania was conducted in 1990, which indicated the population of Tirana as 253,138. As mentioned earlier in this report, urban and suburban areas have had an influx of immigrants from the rural areas since 1990 and population of Tirana City has rapidly increased.

Present population of the city and its surrounding areas as of 1996 was provided by the MOPWT and contained in Appendix 3.1.1. The city area is divided into 11 zones by boundary of major roads. The population in each zone is estimated and its salient feature is categorized by housing typology defined by the as shown in Table 3.1.1 and Figure 3.1.1, respectively.

Table 3.1.1 Housing Typology Defined by MOPWT

Category	Description
Type-1	Constructed in post-1990 as illegal
Type-2	Constructed in post-1990 as legal
Type-4	Under construction
Type-5	Constructed before 1990 as legal

Note: Type-3 is not applied under current urban development.

Illegal buildings are defined as such building built without official permission with regardless to land ownership. These buildings have started to appear after 1990 because all the land in the country has been owned by the Government before 1990. These private ownership of land was created by the Restitution Commission to Restitute after 1991. Although this Commission is continuously working for land restitution, it is said by the government officials that it is impossible to draw exact location and boundary of land ownership on the map.

The present population in Tirana and its surrounding areas is summarized in Table 3.1.2.

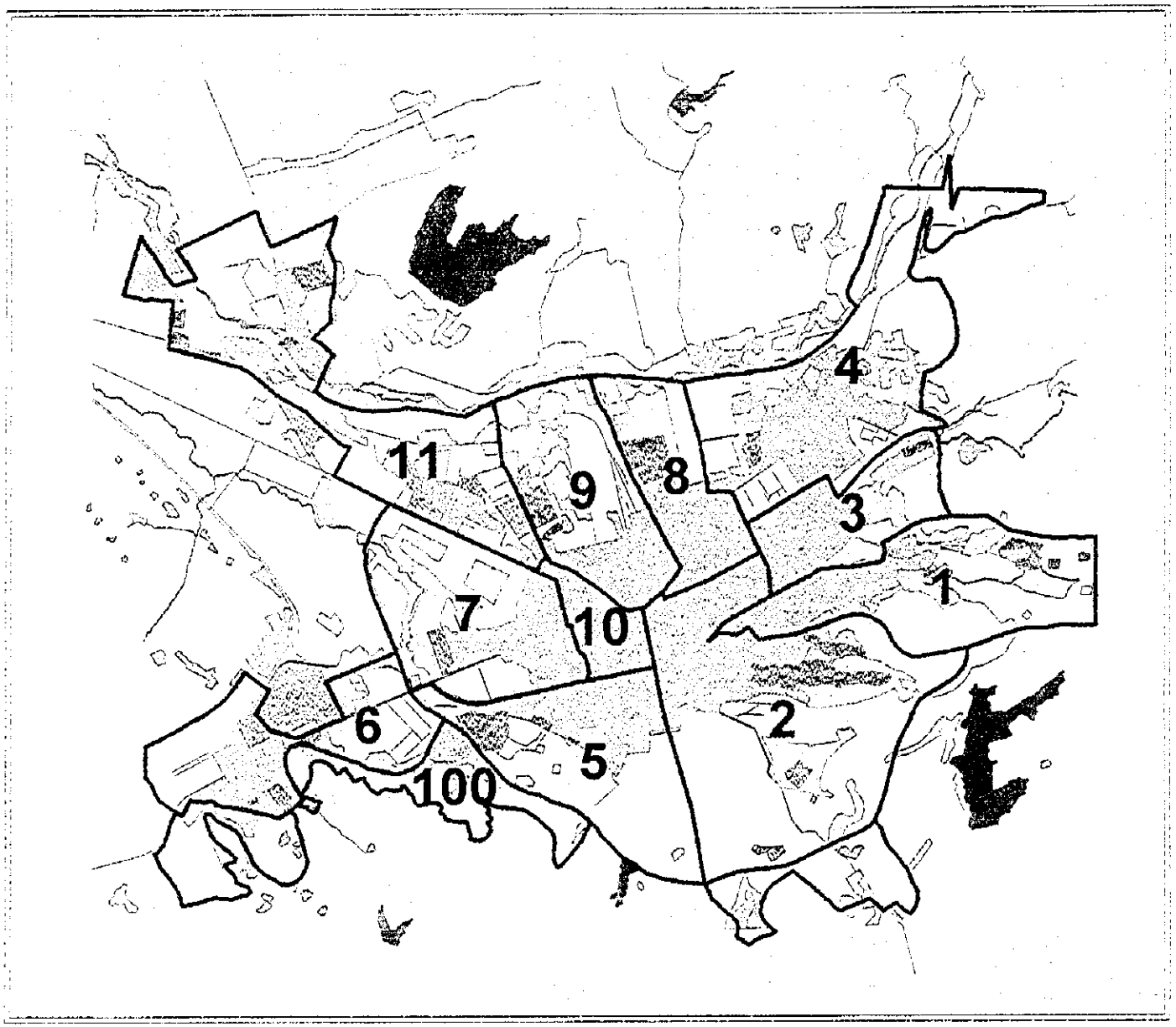


Figure 3.1.1 Housing Typology

Table 3.1.2 Present Population in Metropolitan Tirana

Area and Housing Typology	Area (ha)	No. of Building	Population (person)	Population Density (person/ha)	Occupation Density per Building (person/bldg.)
Inside of City					
Type-1	534.57	2,463	14,781	28	6.0
Type-2	143.40	-	27,787	194	-
Type-5	1,070.23	-	417,388	390	-
Sub-Total	1,748.20	-	459,956	263	-
Expansion Area Type-4	88.80	Under Construction			
Total	1837.00	2,463	459,956	250	6.0
Outside of City					
Type-1	386.96	2,342	14,050	36	6.0
Type-5	138.98	-	32,395	233	-
Total	525.94	-	46,445	88	-
Grand Total	2,362.94	4,805	506,401	214	

Source : Population list prepared by the MOPWT

3.1.2 Population Projection in the Study Area

(1) Estimation method of present population employed by MOPWT

Actual population of Tirana has not been clearly monitored by the authorities concerned due to drastic change of socio-economic conditions and rapid increase of illegal housing since 1990. Therefore, the present population shown in Table 3.1.2 was estimated by MOPWT in accordance with the following manner:

Type-1 area: The population is estimated based on the number of buildings and assumed family size of 6 persons per building.

Type-2 area: The population is estimated based on the assumed population density at 200 persons per hectare.

Type-5 area: The population is estimated based on the assumed population density of 390 persons per hectare within the city area and 233 persons per hectare for the outside of city area.

(2) Present and future population in the Study Area

Population projection and its distribution were carried out in principle based on the past population trend and the future land use plan. These figures have, however, limitation of reliability on actual conditions of the Study Area owing to following reasons:

- socio-economic conditions of Metropolitan Tirana have been drastically changed since 1990.
- Population of Metropolitan Tirana has remarkably increased.
- Demographic data of the latest population census conducted in 1989/90 are, therefore, unreliable to apply for the estimation of present population.

Accordingly, the future population was estimated in accordance with the method of MOPWT applied to estimate the present population. Assumptions adopted by MOPWT, such as population density, size of residential area and housing typology with assumed percentage of housing development/occupation by the target year, were also employed.

Present and future population of Tirana City and outside of Tirana City together with their estimation methods are shown in Tables 3.1.3 and 3.1.4, respectively.

Table 3.1.3 Present and Future Population of Tirana City

Housing Typology	Present (1996)	Future (2010)
Type-1	- The population is estimated based on the number of buildings and assumed family size of 6 persons per building which is equivalent to 28 ps/ha 2,463 Bldg. x 6 ps/Bldg. ≒ 14,781	- Assuming that 50 % of new development area will be built by Type-1 and population density is 30 ps/ha, the population will be: (1,902 - 1,748) ha x 0.5 x 30 ps/ha + 14,781 = 17,091
Type-2	- The population is estimated on based on the assumed population density at 200 ps/ha 143 ha x 200 ps/ha ≒ 27,787	- Assuming that another 50 % of the new development area will be built as Type-2, the population is: (1,902 - 1,748) ha x 0.5 x 200 ps/ha + 27,787 = 43,187
Type-5	- The population is estimated based on the assumed population density at 390 ps/ha 1,070 ha x 390 ps/ha = 417,388	- The population density is assumed to increase 15 % from the present due to the re-construction of some areas 1,070 ha x 390 ps/ha x 1.15 = 479,895
Total Population	459,956	540,173 Say 540,000

Note: ps - person

Table 3.1.4 Present and Future Population at Outside of Tirana City

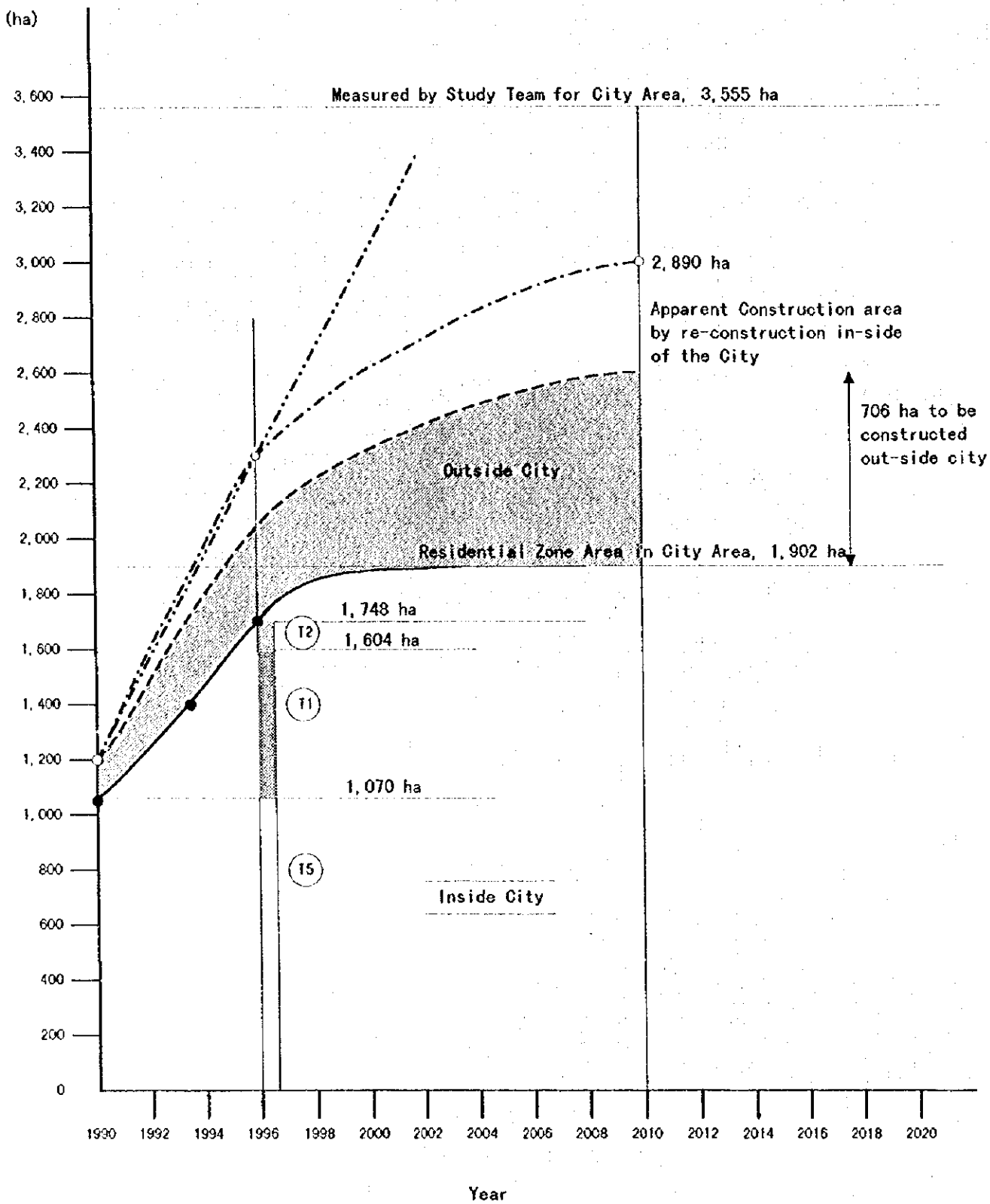
Housing Typology	Present (1996)	Future (2010)
Type-1	- The population is estimated on the basis of the number of building in which 6 persons live in one building, which is corresponds to 36 ps/ha 2,342 Bldg. x 6 ps/B ≒ 14,050	- Assuming that 30 % of the intensive new residential zone area (570 ha) is developed by the target year of 2010, and the population density increases from 36 to 200 ps/ha under the authorized suburban plan, the population is: 1,890 ha x 0.3 x 200 ps/ha + 14,050 = 127,450
Type-5	- The population is estimated on the basis of constructed area with population density of 233 ps/ha 139 ha x 233 ps/ha = 32,395	- Construction of this type is assumed to decrease in the future. Assuming that the same size of area as the present with the same density will be constructed by the target year, the inhabitant population is: 139 ha x 233 ps/ha + 32,395 = 64,782
Total	46,445	192,232 Say 192,000

Note: ps - person

3.1.3 Trend of Construction for Development of Metropolitan Tirana

As per the said population projection in the Study Area, the future urban and suburban development in Tirana is expected to be as shown in Figure 3.1.2.

Figure 3.1.2 Trend of Urban Development in Metropolitan Tirana



3.2 Water Supply System

3.2.1 Existing Water Supply System

The Tirana area is supplied with water by the Water Supply Company of Tirana. The present water supply is, however, intermittent from three surface and 7 groundwater sources.

Locations of water supply facilities are shown in Figure 3.2.1. Table 3.2.1 shows the production capacity of each source.

Table 3.2.1 Water Sources and Production Capacity

Source	Min. (Dry season) l/sec	Max. (Wet season) l/sec
1. Bovilla spring	140	400
2. Shenmeria spring	440	660
3. Selita spring	250	770
4. Laknas wells	160	160
5. Berxull wells	240	240
6. Pishina wells	140	140
7. Kroi I shengjinit	40	40
8. Buka shengjinit	30	30
9. Cokollata shengjinit	20	20
10. Pema shengjinit	30	30
Total	1,490 = 128,736 m^3/day	2,490 = 215,136 m^3/day

Currently, the surface sources are supplying about 50 % (during dry season) to 80 % (during wet season) of the production capacity due to decrease of the surface water flow and stealing of water from transmission pipes for irrigation purposes. All sources are operated on a 24 hour basis to transmit water to the reservoirs.

Since no flow meter is equipped at the inlet and outlet of the reservoirs, the present supply volume is not measured, but is estimated at approximately 120,000 to 150,000 m^3/day. A loss in distribution network is assumed to be 50 % based on the fact that they are beyond their design service life associated with the lack of budgetary resources for operation and maintenance.

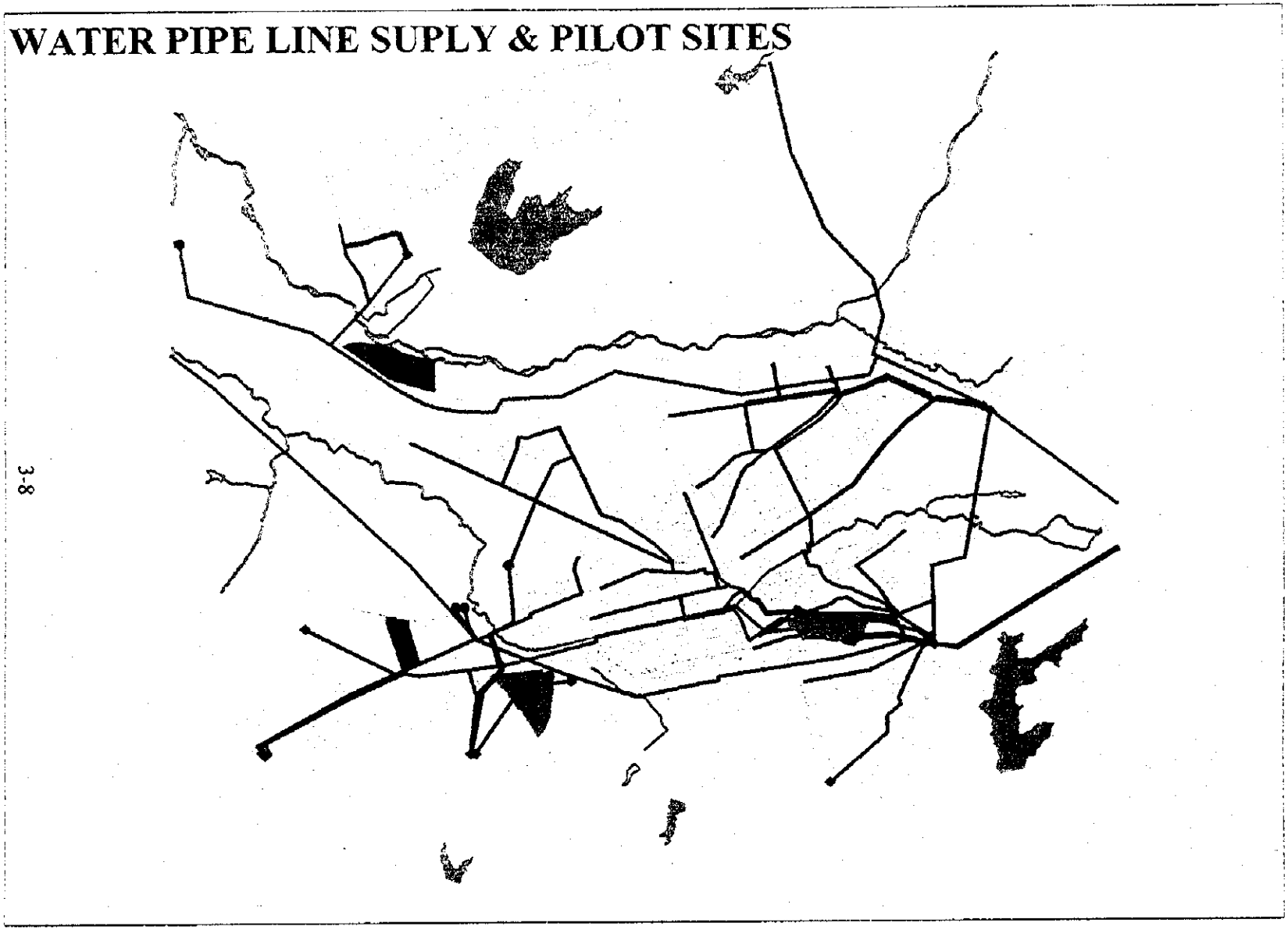


Figure 3.2.1

Locations of Water Supply Facilities

Present population served by the city waterworks is estimated at 450,000 persons assuming non-domestic use is 30 % of the total consumption. The domestic per capita unit water consumption is estimated at 93 to 117 lpcd, while that of typical European cities is 150 to 200 lpcd. This low consumption rate owes to the limited supply capacity of the existing waterworks that consumers are supplied only five to six hours a day. Water meters are installed to only 8 % of the total number of consumers at present.

3.2.2 On Going Projects

The Bovilla dam construction project was initiated by the Albanian Government with the estimated cost of approximately US$10 million. This project is expected to be completed by the middle of 1997.

The Italian Government has funded for improvement of the existing water supply system, such as rehabilitation of existing distribution mains and reservoirs, as well as construction of water treatment plant with a design capacity of 155,000 m^3/day to utilize the water stored at the Bovilla dam. This rehabilitation work and construction of water treatment plant with a total cost of approximately US$ 25 million will be completed by the beginning of 1998.

The Bovilla water treatment plant has common treatment processes, such as chemical coagulation, flocculation, sedimentation, filtration and disinfection.

Layout of the Bovilla Water Treatment Plant is shown in Figures 3.2.2. Water supply service zones covered by each reservoir are also indicated in Figure 3.2.1.

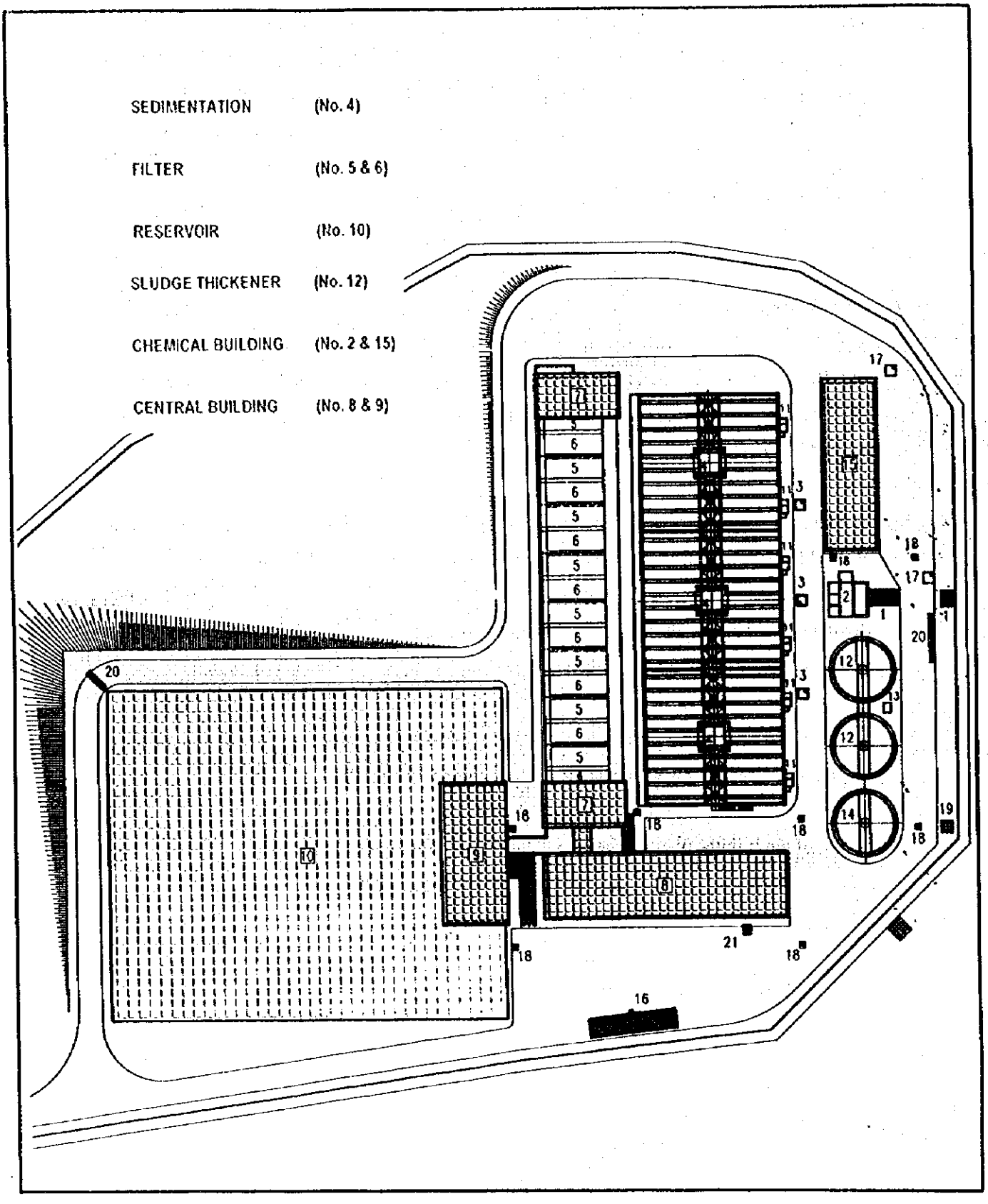


Figure 3.2.2 Layout of the Bovilla Water Treatment Plant

3.2.3 Expected Near Future Water Supply Situation (2000)

Upon completion of the Bovilla Project, the water supply situation will be remarkably improved. Table 3.2.2 shows a comparison of water supply situation between the present and the near future (2000).

Table 3.2.2 Comparison of Water Supply Situation between Present and Near Future (2000)

Items	Present (1996)	Future (2000)
1. Reserved Water Quantity in Reservoirs	120,000 to 150,000 m^3/day	270,000 to 300,000 m^3/day
2. Distribution Loss (50 %)	60,000 to 75,000 m^3/day	135,000 to 150,000 m^3/day
3. Non-Domestic Use (30 %)	18,000 to 22,500 m^3/day	40,000 to 45,000 m^3/day
4. Domestic Use	42,000 to 52,500 m^3/day	95,000 to 105,000 m^3/day
5. Per Capita Unit Water Consumption for Domestic Use (Assuming served population is 450,000)	93 to 117 lpcd	172 to 191 lpcd
6. Apparent Per Capita Unit Water Consumption (3+4)/450,000 ps.	130 to 167 lpcd	245 to 273 lpcd

Note: ps. - person

3.2.4 Water Demand Projection for Target Year 2010

(1) City area

The improved water supply service in Tirana upon completion of the Bovilla Project is deemed to be maintained through the future, when the desirable service level for domestic consumption seen in typical European cities (150 to 200 lpcd) is taken into consideration.

Future population within the city in the target year was estimated at 540,000 as described in the preceding subsection. Water supply service was assumed to be provided to this population.

Assuming that non-domestic use will remain at about 30 % of the total consumption and the distribution loss will be improved to 45 %, the water demand in Tirana City in the target year 2010 is estimated as described below.

1) Domestic use (70 % of total consumption):

540,000 persons x 170 lpcd = 91,800 m^3/day

2) Non-domestic use (30 % of total consumption):

91,800 m^3/day x 0.3/0.7 = 39,200 m^3/day

3) Distribution loss (45 % which is to be improved in the future):

(91,800 + 39,200) x 0.45/0.55 = 107,000 m^3/day

4) Stored water volume in reservoirs:

1) + 2) + 3) = 238,000 m^3/day

(2) Outside of Tirana City

Water demand in the outside of Tirana City is estimated to be 72,000 m^3/day, under the following assumptions:

1) Water supply service coverage will be 90 % of the estimated population (192,000) in the area
2) Non-domestic consumption will be 25 % of the total consumption in the area
3) Distribution loss will be improved to the same level of Tirana City (45 %)

(3) Water demand in target year 2010

The total water demand of the Study Area in 2010 is estimated to be approximately 310,000 m^3/day as a sum of the above mentioned water demand projection.

To meet with this future water demand, further augmentation (approximately 40,000 m^3/day) of water supply capacity will be required in addition to the Bovilla Project. This augmentation shall be supplemented by rehabilitation of existing distribution network to reduce distribution loss and by introduction of water meters to reduce consumed non-revenue water.

CHAPTER 4

EXISTING SEWERAGE SYSTEM

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4.1 Existing Sewerage System in the Study Area

4.1.1 General

The existing sewerage system in Tirana City is a kind of combined collection system wherein sewage and some part of storm water are flowing into the same sewer lines. Throughout the existing sewer network, gravity flow was adopted in its design and no pumping station was introduced.

The history of existing sewerage system began in 1938 when the some trunk sewer was constructed by the use of bricks plastered with mortar or by concreting on site. The existing sewerage system was then completed in 1962 aiming to drain only some part of storm water into sewer lines during heavy rain, while remaining storm water was expected to be overflown to Lana River or Tirana River. Likewise, the principal idea in designing the existing system was to collect all sewage discharged in the city and to dispose it with some part of storm water into rivers in downstream.

There was an idea to construct a sewage treatment plant somewhere near Lana River. At that time, it was considered to construct rectangular concrete sewer in the trace of existing natural brooks or natural water courses to accommodate the maximum storm water run-off. Thus, Tirana and Lana Rivers, including natural brooks and water courses in the south and southwest part of Tirana City were considered only to receive storm water.

(1) Sewerage service area

The existing sewerage service area covers most of urban area in Tirana City with an area of 1,245 ha and population of 337,383. This service area can be subdivided into five (5) zones based on the configuration of its sewer network. The existing sewerage service area and its sub-zones are shown in Figure 4.1.1. The following table shows sub-zones with their area and served population.

Table 4.1.1 Existing Sewerage Service Area

Zone	Area (ha)	Population (1996)
Tirana River	213.6	47,914
Center	183.2	46,791
Lana - North	396.4	117,262
Lana - South	380.6	108,070
Kombinat	71.0	17,640
Total	1,244.8	337,383

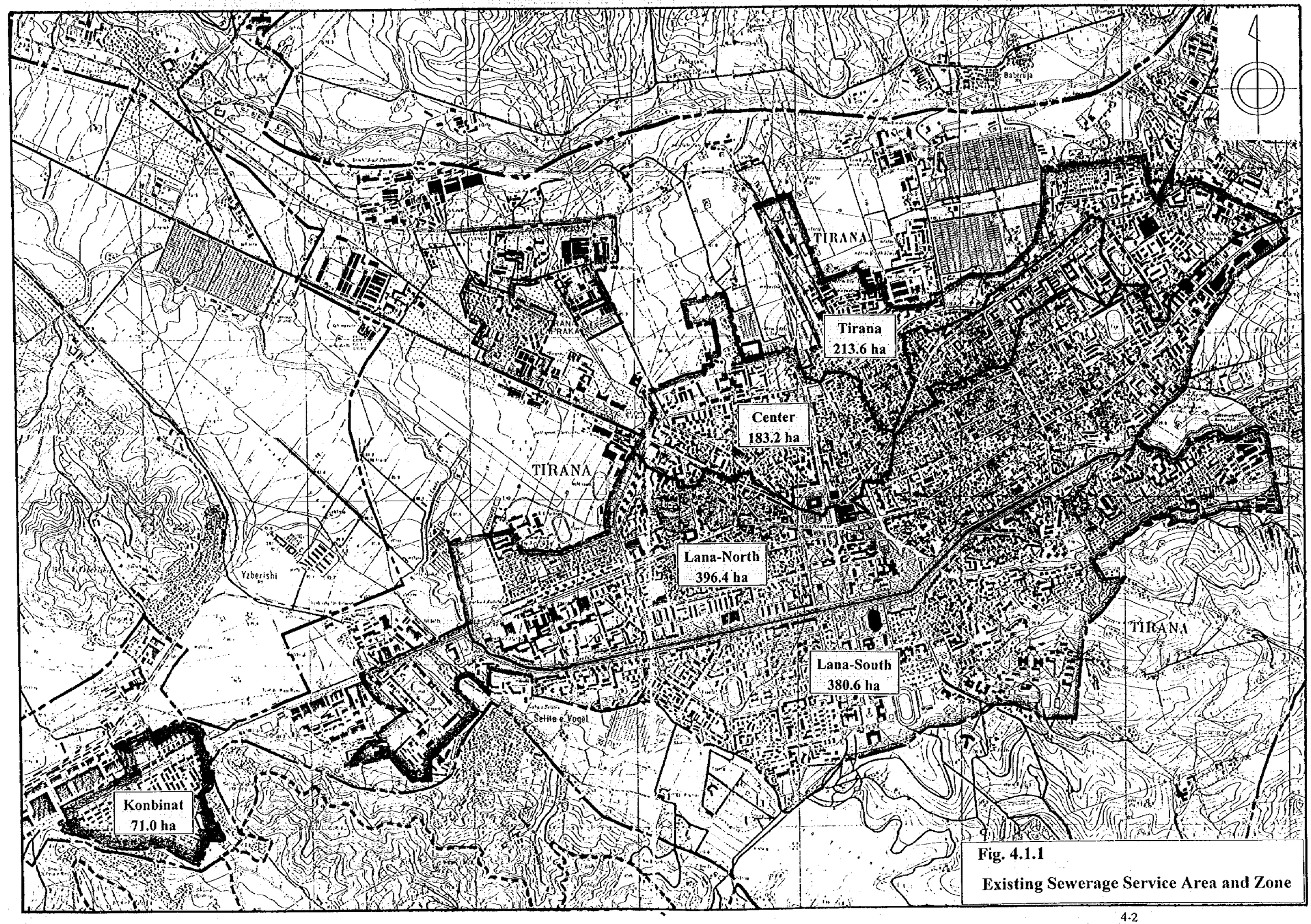


Fig. 4.1.1

Existing Sewerage Service Area and Zone

The service area covers 34% of area and 73% of a population of the City.

Tirana Zone is located south of Tirana River and wastewater generated in this zone is discharged into Tirana River through four sewer pipes. This zone consists of industrial area and small agricultural area near the river, and some residential and commercial areas in south. Some areas between this zone and Tirana River are developed legally and illegally in recent years without any sewerage system.

Center Zone covers an area between Tirana Zone and Lana-North Zone. This zone has been almost fully developed as commercial and residential areas with 4-5 floored offices buildings and apartment buildings. The wastewater generated from this zone is collected from east to west and discharged into Tirana River at its western end.

Lana-North Zone is located at right bank of Lana River and covers city center consisting of governmental offices, conference halls, hotels, offices and residential areas which extends from center to eastward and westward. Wastewater from this zone are collected by the interceptor along Lana River and discharged into Lana River at western end of the interceptor. However, some wastewater is overflowed from the interceptor at many places along the river, due to blockage and sediments in the interceptor. Recently, many restaurants and coffee shops have been constructed and wastewater from these facilities are discharged directly into the river.

Lana-South Zone covers an area between Lana River and hilly area at the southern part of the city. Characteristics of this zone including sewage collection system are similar to the Lana-North Zone.

Kombinat Zone consisting of industrial and residential areas is located at south-east end of the city. Sewerage system in this zone is isolated from other zones and its size is small. Wastewater collected from the factories and houses together with storm water is discharged into small branch of Lana River located at north. In the sewerage service area, there is no complete sewerage system having sewage treatment plant. However, sewer network has covered built-up area of the city, while fringe areas have limited coverage of simple sewers.

(2) Non sewerage service area

In the unserved area of the existing sewerage system, domestic sewage from toilet is discharged into septic tanks or pit latrines, and their effluent are infiltrated to the ground in most of houses. Wastewater from kitchen and bath room is directly discharged to stream/brook/river and some of them causes stagnant water on the roads and low eleva-

tion area.

4.1.2 Present Condition of the Existing Sewerage System

(1) Sewerage system

The present environmental conditions in Tirana City is not at desirable level. Serious environmental deterioration has been caused by the past economic-oriented policies wherein focusing on physical production targets without consideration of environmental impacts. Public awareness is also limited to the current environmental protection policies. Rapid increase of population and economic activities in recent years associated with deterioration of the existing sewerage system and garbage dumping have caused this environmental deterioration.

Negligence on the improvement of the existing sewerage system have led to the following serious problems in the Study Area:

- There are many places in the residential area, where wastewater remains all the year round.
- Sometimes wastewater cannot be drained from buildings and houses, and flows out roads and basements of the buildings.
- Water in Lana River looks and smells like wastewater.
- Water in Tirana River has been worsened recently.
- In rainy season, there are many flood in the city, and this water remains for two to three days at some area. Flooded water mixed with wastewater flows into basement rooms in many places.

A sewerage system for the storm water is usually designed by return period 4 and 2.5 years for the main and secondary pipes, respectively, which is also adopted in Albania at present. However, the original idea of the design of sewerage system of Tirana was to cover up the brooks for storm water. Therefore, the trunk sewer has been planed to carry off wastewater and part of storm water (3-5 times of wastewater quantity), and the remaining storm water overflow to the brooks/rivers through roads. Accordingly, the design policy is apparently different between the original idea and the present design method.

As a result causing the different design policy, the following temporary countermeasures are taken, because the interceptor and trunk sewer pipes do not have sufficient capacity to flow storm water.

- Interceptor manholes are intentionally blocked at many places so as to easily discharge a storm water to the rivers.
- Wastewater is discharged into the natural brooks directly.
- Some sewer pipes which are buried deeper than the main sewer discharge the wastewater into brooks nearby.
- The sanitary sewage is discharged from the many sewer pipes to Tirana and Lana Rivers directly.

(2) Operation and maintenance

The operation and maintenance of the sewerage system is done by the Enterprise of Road and Sewerage Maintenance depending on everyday defect reports and the availability of manpower. There is no operation manual and regular maintenance program. Maintenance service are limited because of lack of manpower, tools and equipment. At same time there is less control from the management to the maintenance teams and also less communication between these teams and the management section. The same tendency also was observed in relation to Municipality and the Enterprise. All maintenance works are done as repair, and new connection are carried out very few and generally maintenance teams do not have good knowledge for the existing and new system.

(3) Field inspection on sewer pipe and storm water inlet conditions

During the Stage 2 field work, the following inspection was carried out:

1) Interceptor main
2) Storm water inlet

Major findings on this inspection work are as follows:

1) Interceptor main

a. Location

Full span of existing interceptors at both sides of Lana River.

b. Number of manholes

29 manholes

c. Purpose

Confirmation of accumulated sand deposits and damages of pipes

d. Results

Approximately 20 % of surveyed manholes showed accumulated sand at about half of diameters of sewer pipes, while the rest of manholes were less than 10 cm

of sand accumulation.

With regard to the damage/breakage and deterioration of sewer pipes, it was quite favorable conditions, though these pipes were more than 35 years in use. Deterioration of concrete materials were limited to the extent that small aggregates were exposed to the inner surface of pipes. In this respect, they are not at the state to require urgent repair/rehabilitation.

At two locations, cracks were observed on the pipes. No other noteworthy damages/breakage was observed in this survey.

2) Storm water inlet

a. Location

Approximately 1 km length along the interceptor main at northwestern part of Lana River and approximately 2 km length along the road at southeastern part of Lana River

b. Number of storm water inlet

15 locations

c. Purpose

Confirmation of accumulated sand deposits and clogging conditions

d. Results

Opening at half of storm water inlets were completely closed by sand/mud and other materials. Remaining inlets showed opening ratios ranging 50 to 100 %.

With regard to sand accumulation, half of inlets were favorable conditions. As a whole, the survey revealed poor status of maintenance work.

(4) Inundation area

Areas affected by inundation were identified as shown in Figure 4.1.2. Even inside of present service area of the existing sewerage system, some areas are encountering inundation upon medium intensity rainfall or small intensity with prolonged rainfall.

Major reasons of this inundation are presumed as follows:

- Insufficient flow capacity of sewer pipes,

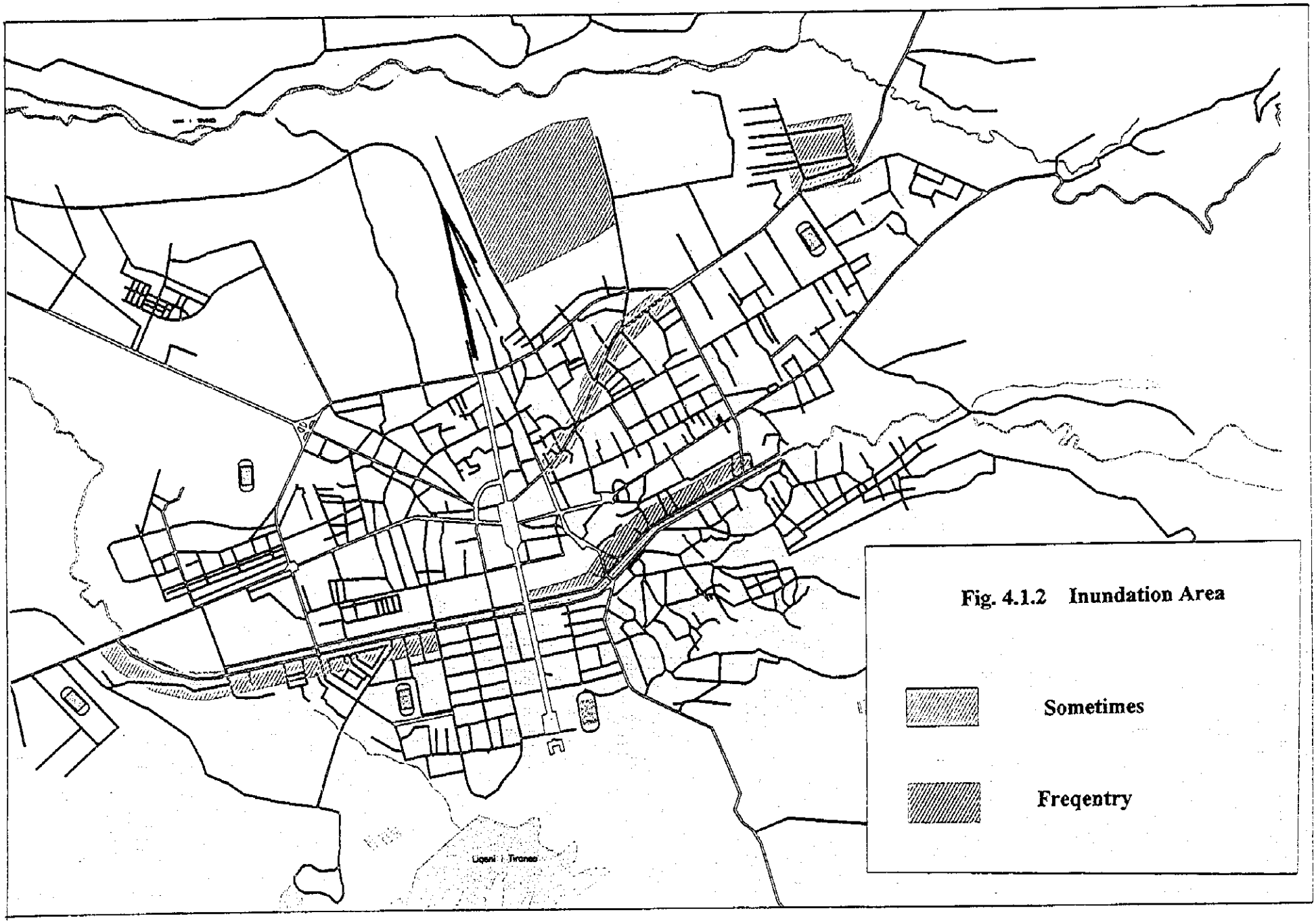


Fig. 4.1.2 Inundation Area

- Clogging of openings at storm water inlet, service connection pit and sewer pipes owing to poor maintenance,
- Poor pavement ratio and structural deficiency for surface run-off of roads.

Owing to poor drainage conditions caused by the above reasons, road surface becomes substitute water course of storm water. It is considered that large gradient of roads also contribute to short time storm water run-off and to result inundation in low elevation area.

4.1.3 Evaluation of Existing Sewage Collection System

(1) Present condition

The existing sewer system in Tirana City is formed by combined sewage collection pipes with diameters ranging from 200 mm to 1,000 mm for a total length of about 510 km. Among the sewer network, main sewer drawing was prepared in this Study at a scale of 1/20,000 referring to the existing drawings with a scale of 1/500 (refer to Figure in Appendix). This drawing exhibits all the existing major sewer lines having diameter of 400 mm or larger and the longest route of lateral sewers also indicated, even smaller pipe having diameter of 300 mm or smaller, for calculation of storm water hydraulic capacity.

As it is visualized in the drawing, the existing sewer network in Tirana City can be subdivided by its zone as shown in Table 4.1.1 and Fig. 4.1.1.

Table 4.1.2 exhibits a summary of main sewer lines by pipe diameter in each zone, based on the Table contained in Appendix.

In Tirana City, it is called that sewer lines with diameter 300 mm or larger are major sewer lines. However, it is defined in this Study that sewer lines with diameters of 400 mm or larger be major lines considering the overall length and sewered area by diameter. The evaluation of existing sewer network is carried out based on this definition of the major sewer lines.

Table 4.1.2 Length of Main Sewer Lines by Pipe Diameter and Zone

Contents	Dia. (mm)	Tirana	Central	Lana North	Lana South	Kombinat	Total
Length (m)	200			134	390	1,204	1,728
	300	94	772	4,488	3,029	1,602	9,935
	400	3,291	3,831	9,864	10,399	2,310	29,695
	500	2,640	1,467	6,270	4,684	308	15,369
	600	9,408	3,683	9,221	2,075	410	24,797
	800	2,390	1,135	5,144	5,627		14,296
	1000	593	3,314	2,618	1,601	893	9,019
	700x500		316				316
	1000x500			199			199
	1000x600	1,130					1,130
	1500x700		1,884				1,884
	Total	19,546	16,352	37,938	27,805	6,727	108,368
Served Area (ha)		213.6 (17%)	183.2 (15%)	396.4 (31%)	380.6 (31%)	71.6 (6%)	1,244.8 (100%)

Table 4.1.3 shows further the ratio of the sewer length having diameter of 400 mm or larger in each zone.

Table 4.1.3 Ratio of Major Sewer Lines Length by Pipe Diameter and Zone

Contents	Dia. (mm)	Tirana	Central	Lana North	Lana South	Kombinat	Total
Percentage (%)	400	17	25	30	43	59	31
	500	14	9	19	19	8	16
	600	48	24	28	9	10	26
	800	12	7	15	23		15
	1000	3	21	8	7	23	9
	700x500		2				
	1000x500			1			
	1000x600	6					1
	1500x700		12				2
	Total	100	100	100	100	100	100

Note : D≧ 400

The vertical profile of the existing major sewer lines by their route are also presented in Appendix. These vertical profiles clearly distinguish inclination of major sewer lines varying from 10 to 20 ‰ from east to westerly direction.

In the north-south direction, major sewer lines are laid toward Tirana River and Lana River with sufficient inclination.

(2) Evaluation of existing sewage collection system

The evaluation results of existing sewage collection system are summarized in Table 4.1.4. The detailed calculation results on flow capacity by route of sewer lines are available in Table of Appendix. The evaluation results of each case are discussed hereafter.

Table 4.1.4 Overall Evaluation Result

Unit : Percentage

Category	Case	F/C ≦ 100%	F/C ≦ 150%	F/C ≦ 200%	F/C > 200%	Total
Combined	C-1	19	12	10	58	100
	C-2	26	14	11	49	100
	C-3	43	12	14	32	100
Separate	S-1	22	12	10	57	100
	S-2	100				100

F/C is defined as Flow Capacity (safe ratio) in the Table 4.1.4 and it is calculated as below:

F/C (%) = (planned sewage flow in this Study)/(full flow capacity of sewer line) x 100

Table 4.1.5 exhibits breakdown of sewer length percentage by its function having F/C of less than 100 %.

Table 4.1.5 Breakdown of F/C≦100% Pipe by its Function

Unit : % against total pipe length

Category	Case	Network Pipe	Interceptor Pipe	Total
Combined	C-1	19	20	19
	C-2	20	66	26
	C-3	42	45	43
Separate	S-1	22	-	22
	S-2	100	-	100

Note: Shaded C-3 is subject to evaluation of current situation.

The planned sewage flow of each sewer line for the evaluation was estimated based on the design criteria (refer to 7.2 of Chapter 7) prepared for planning of the facilities.

Furthermore, design condition of each case is shown as below:

1) Combined system

C-1 : Planned sewerage flow in this Study is adopted.

In this case, interceptor pipe accommodates not only 3 times of sanitary sewage (hereinafter referred to as "3Q"), but also sanitary sewage and storm water.

Sanitary Sewage Flow			
Sanitary Sewage per Capita	=	440 liter/day	(Hourly Maximum)
Storm Water Flow			
Rainfall Intensity Formula for Main Pipe (D≧500)	=	$\frac{2750}{t + 17}$	(Return Period : 4 Year)
Rainfall Intensity Formula for Small Pipe (D≦400)	=	$\frac{2520}{t + 17}$	(Return Period : 2.5 Year)
Runoff Coefficient	=	0.5	
Inlet Time	=	5 min	
Assumed Average Velocity	=	1.5 m/sec	

C-2 : Design condition is the same as C-1.

However, on premise that 3Q of the sanitary wastewater (Q) is accommodated by the interceptor, and the combined collected wastewater over the 3Q is overflowed from the interceptor junction manholes.

(Improvement of the interceptor manholes is required for this purpose)

C-3 : Sum of the existing sanitary sewage and minimum level of storm water flow as defined below is adopted for evaluation of the current situation.

Sanitary Sewage Flow			
Population Density	=	Existing Density	
Sanitary Sewage per Capita	=	150 liter/day	(Hourly Maximum)
Storm Water Flow			
Rainfall Intensity Formula for Main Pipe (D≧500)	=	$\frac{1970}{t + 18}$	(Return Period : 0.5 Year)
Rainfall Intensity Formula for Small Pipe (D≦400)	=	$\frac{1970}{t + 18}$	(Return Period : 0.5 Year)
Runoff Coefficient	=	0.4	
Inlet Time	=	10 min	
Assumed Average Velocity	=	1.5 m/sec	

2) Separate system

S-1 : Planned storm water flow in this Study is adopted.

Storm Water Flow			
Rainfall Intensity Formula	=	$\frac{2750}{t + 17}$	(Return Period : 4 Year)
for Main Pipe (D≧500)			
Rainfall Intensity Formula	=	$\frac{2520}{t + 17}$	(Return Period : 2.5 Year)
for Small Pipe (D≦400)			
Run-off Coefficient	=	0.5	
Inlet Time	=	5 min	
Assumed Average Velocity	=	1.5 m/sec	

S-2 : Planned sanitary sewage flow is adopted.

Sanitary Sewage Flow			
Sanitary Sewage per Capita	=	440 liter/day	(Hourly Maximum)

4.2 Existing Sewerage System in Albania

4.2.1 General

All of major cities in Albania are discharging their wastewater directly into rivers or open channels without any treatment. In Albania, there is no sewage treatment facilities until now. Thus, all the existing sewerage system have only sewer lines.

Circular concrete pipes are mainly used for the sewer network. Prefabricated non-reinforced pipes are applied for diameters up to 500 mm, while reinforced concrete pipes are used for diameters of more than 600 mm. The minimum diameter of sewer pipe is 200 mm, while the maximum 2,000 mm. Rectangular shape reinforced concrete are used in some combined sewer system and brooks inside the city. Socket pipes have not been used until now and pipe joints are made with cement mortar on site.

The main cities that have sewerage system are shown in the following table.

Table 4.2.1 Sewerage Systems in Albania (1)

No.	City	Sewerage	Combined	Storm
1.	Tirana		+	
2.	Vora	+		
3.	Kamza		+	
4.	Durres		+	
5.	Shijak		+	
5.	Shkozet	+		
6.	Kavaje	+		
7.	Rrogozhine		+	

Table 4.2.1 Sewerage Systems in Albania (2)

No.	City	Sewerage	Combined	Storm
8.	Elbasan		+	
9.	Belsh	+		
10.	Peqin	+		
11.	Librazhd	+		
12.	Prrenjas	+		
13.	Pogradec	+		+
14.	Korce		+	
15.	Bilisht	+		
16.	Maliq	+		
17.	Erseke	+		
18.	Leskovik	+		
19.	Lushnje	+	+	+
20.	Fier		+	
21.	Levan	+		
22.	Patos	+		
23.	Ballsh		+	
24.	Tepelene	+		+
25.	Memaliaj	+		
26.	Kelcyre	+		
27.	Permet	+		
28.	Gjirokaster	+		
29.	Sarande	+		+
30.	Delvine	+		
31.	Vlore	+		+
32.	Selenice	+		
33.	Narta	+		
34.	Berat	+		+
35.	Kucove	+		
36.	Ura Vajgurore	+		
37.	Polican	+		
38.	Skrapar	+		
39.	Kruje	+		
40.	Fush Kruje	+		
41.	Mamurras	+		
42.	Lac	+	+	
43.	Milot	+		
44.	Burrel	+		
45.	Klos	+		
46.	Bulqize	+		
47.	Peshkopi	+		
48.	Rubik	+		
49.	Rreshen	+		
50.	Fushe Arrez	+		
51.	Kukes	+		
53.	Krume	+		
54.	Puke	+		
55.	Lezhe	+		+
56.	Shengjin	+		

Table 4.2.1 Sewerage Systems in Albania (3)

No.	City	Sewerage	Combined	Storm
57.	Shkoder	+		
58.	Koplik	+		+
59.	B. Curri	+		
60.	Konispol	+		
61.	Gramsh	+		
62.	Kurbnesh	+		
63.	Cerrik	+		
64.	Fier Shegan	+		
65.	Rroskovec	+		

4.2.2 Sewerage System in the Municipality of Vlore

For the sewerage system in the municipality of Vlore, the Phare Program of European Union has implemented a project, "Preparation, Study and Final Design for Urban and Industrial Waste Water Collection and Treatment and Surface Water Sewerage". The following is a summary of the preparatory study report on October, 1996.

(1) Profile of Vlore municipality

The municipality of Vlore is located along the gulf of Vlore, 19 km long and 16 km wide. The Karaburuni peninsula closes the bay at its south end, while the Treporti cape closes it at the north end. Almost in the middle lies Sazani, the only island in Albania. To the north of the bay, upon cape Treporti, the Narta Lagoon, the second largest in Albania, is located.

At the moment, the population of the town is 105,000 (in 1989 it was 70,000 inhabitants). This population is distributed in the existent areas of the town (305 ha of residential area) and in those illegally built, with an average density of 344 persons/ha. In the next 15-20 years, accepting an annual population growth rate of 10-15 % in the existing surface of the town that can derive by the enlargement of the private houses in the less density areas or by new buildings in the same areas, the population in these areas may reach 120,000.

(2) Existing sewerage system

Sewerage system of Vlore was introduced following the development of the town in 1940 at the residential area near the Town Hall. Vlore is presently served by a separate sewer system. Diameters of sewers are ranging from 200 mm in the smallest to 1,000 mm in the largest.

Vlore town is located mainly in a flat area from the sea level up to 5m height. Some parts

of the town are hilly area with elevation of up to 75m above the sea level. Because of the flat topography, seven pumping stations (four for communal wastewater and three for industrial wastewater) are currently used.

Past economic situation, however, brought a very poor maintenance of the sewerage system, with the occlusion of sewer pipes, the breakage of pumping units, the lack of funds for extending the system to correspond the urban development, illegal connections, etc. Two sewerage systems are connected in many points and in some locations, especially along the south part of Vlore, the most famous beaches, the collected sewage is directly discharged into the sea, wherein bacteriological water quality is not suitable bathing. It shall also be noted that Vlore coast is interested by North to South current, and also the pollution load from the outfall at Hydrovori, where the main pumping station serving the sewerage systems is located, is disposed off toward the same beach. Owing to the diffusion of pollutants, drinking water from springs are intensively disinfected.

Storm water drainage system in Vlore was also introduced when the sanitary sewer was constructed. This drainage system consisting of two main channels protects the eastern part of the town from flooding to be caused by storm water flowing down from the mountains. One of the main channel conveys storm water to Narta Lake, while the other channel is directly discharging into the sea. These main channels are open concrete water courses, but are covered in built-up area. Storm water collected in the western part of town and Narta area is sent to the storm water pumping station (Hydrovori). This storm water pumping station located near the main sewage pumping station was constructed in 1940 equipped with two pumps having capacity of 2.4 m^3/sec each (one for standby). The storm water drainage system serving the western part of the town and Narta area was built in 1983 with two pumps (5.5 m^3/sec each).

(3) Organizational profile

Vlore Sewerage Sector is a part of the Vlore Housing Agency, which is responsible for the management and maintenance of sewerage and storm water systems, roads and sidewalks in the City of Vlore. This agency is dependent from the Public Service Office of Vlore Municipality. Some years ago the same agency was also responsible for the maintenance of houses and for funeral services, which has been privatized.

The main storm water cannel, from Vlore Hospital to Narta and the main drainage pumping station (Hydrovori) are under the responsibility of the Drainage and Irrigation Agency of Vlore, which is under the responsibility of the District and the Ministry of Agriculture.

The Agency, which has 94 personnel in total, is divided into the following branches and sectors:

- Director 1
- Chief of Engineer 1
- Technical Division 3 - 1 engineer (chief) and 2 technicians
- Financial Division 3 - 1 economist (chief of finance), 1 accountant and 1 cashier.
- Sewerage sector 64
- Pumping station 16
- Mechanical sector 6

(4) Financial profile

There is no monthly charge for sewerage. There are no funds raised locally through local property taxed or from charges for local services etc. The Vlore Housing Agency is required to strictly administer its budget in accordance with the provision negotiated with MOPWT. Vlore Housing Agency financial data for the year 1995 are the following (100 Lek = 1 US$):

- Salaries 118,470 US$
- Social Security 32,420 US$
- Expenses for materials 2,975 US$
- Petrol 20,400 US$
- Electrical energy paid 2,760 US$

(5) Operation and maintenance profile

Funds allocated for tools and other equipment needed for the operation and maintenance of the Housing Agency are very limited and the budget carries no allowance for new investment. The operation and maintenance of sewerage system is carried out on a day by day basis, and depending on the resources availability to the agency that are generally at a minimal level. All the works that are done like repairing, new connection are not recorded. The equipment available to the staff of Vlore Housing Agency is limited to :

- lathe 1
- boring machine 1
- truck 1 - 9 ton
- excavation machine 1 - 0.2 m^3
- tank truck 2 - 3 and 4 ton
- lorry 1 - 2 ton
- motorcycles 2

(6) Phare Program

Implementation of the project, i.e. the rehabilitation of the sewerage system and the construction of a waste water treatment plant will fulfill the following:

a. Reduce sea water pollution in Vlore Gulf
b. Contribute to reduce underground water Pollution in Vlore city area
c. Contribute to reduce potable water contamination
d. Promote economic development in the region enhancing tourism development

The present population has been estimated equal to 100,000 inhabitants equivalent have been considered for small industrial and commercial uses, and 15,000 tourists presence considered. The present population, in terms of inhabitants equivalent, is about 115,000 - 120,000 units.

In the year 2016, assuming a growth rate equal to 3 %, the population will be 180,000 inhabitants, to which 30,000 tourists and 30,000 equivalent inhabitants added, bringing to 240,000 equivalent units the population to be served by the sewerage system and by the WWTP. By that time a potable water gift of 200 l/d per capita has been projected.

The preliminary design in the Preparation Study Report shows the technical feasibility of the following two alternatives.

Alternative 1:	total cost	45.9 million US$
		32.7 million US$ for the separate sewer system
		13.2 million US$ for WWTP
Alternative 2:	total cost	42.8 million US$
		27.8 million US$ for the combined sewer system
		15.0 million US$ for WWTP

As the result or the economic and financial analysis, the Consultant recommended Alternative 1.

The implementation schedule of WWTP construction is as follows.

1997 - 1999:	Pre-treatment for 160,000 inhabitants equivalent and submarine outfall
2000 - 2002:	WWTP for 160,000 inhabitants equivalent, including biochemical, but not dephosfatation
2003 - 2006:	WWTP for 240,000 inhabitants equivalent, and dephosfatation starts

(7) Preliminary design of the WWTP.

Design of the WWTP is carried out with a capacity of 240,000 inhabitants, dividing into three modules. Effluent quality will meet Italian standards, which are less restrict than EU standards, however the minimum percentage of reduction, as mentioned in Annex I of the Council Directive 91/271/EEC will be met. Nitrification and denitrification, phosphate removal plant are needed to meet Italian Standards (NH_4-N: 15 mg/l, Total-P: 0.5 mg/l), but may be at a later stage. WWTP is designed the following conditions.

1) Quantity of sewage

Item	Unit	1996	2016
Planned Population Served	persons	120,000	240,000
Unit Water Consumption	lpcd	100	200
Return coefficient	-	1.0	0.8
Daily Average (dry weather)	l/sec	139	444
	m^3/day	12,000	38,400

2) Quality of sewage

Item	Unit	Influent (1996)	Influent (2016)	Effluent
BOD_5	mg/l	600	410	35 - 40
TSS	mg/l	900	56	< 30
N	mg/l	100 (TKN)	66 (TKN)	8 - 10 (NH_4-N) 12 - 20 (NO_3-N)
P	mg/l	20	15	5 - 6 (Total-P)

4.2.3 Sewerage System of the Other Cities

(1) Durres City

The sewerage system of Durres City is combined system and the construction was started on 1940. At that time the main trunk sewers were constructed and they are still serving now. These main trunk sewers collected storm water and wastewater, and discharge to two points. One points is in the sea at the west part of the city and other points is in one water course at the east part of the city. The main sewerage pipes were concrete made on site with oval section.

In 1968, some concrete circular pipes which collect only wastewater pipes overflowed from the old pipes and two wastewater pumping stations were constructed. Wastewater is pumped from the first pumping station. From the second pumping station the water flows to an open channel that discharges wastewater to the sea at the north part of the city.

These sewerage system is made of concrete circular pipes of 400 mm to 1,000 mm diameter. Because bad condition of the pumping stations wastewater often flows directly to the sea nearby. Also there are many discharge points in the sea. The discharge point of wastewater is an open channel and there is a big risk for health and environment at this point.

For the beach area the situation is different. All sewerage system is by pumps. Six wastewater pumping stations were constructed and they discharge wastewater from one to another using concrete pipes 300 to 800 mm in diameter. These wastewater pumping stations and the main trunks are constructed 80 to 100 m far from the sea side. The last pumping station is located in the entry of Durres City, pumping wastewater from the beach and Shkozet City. From this pumping station, wastewater is discharged into open channel where wastewater from Durres City is discharged.

The capacity of the pumping stations are 5, 28.5, 62,5 88,5, 124 and 208 l/sec, respectively, while the motors are 13, 25, 35, 35, 165 and 390 kW respectively. The pumping stations are made of reinforced concrete, circular with a suction dry pit under the pumps basement because submerge pumps are not used.

The pipes are made of concrete to prevent leakage of wastewater and the joints are used prefabricate "U" section collar as basement to create good connection with cement mortar.

(2) Kruja City

The sewerage system in Kruja was constructed in the 1960's, it is apparently in response to an outbreak of cholera in the city. The system is for foul sewage only, however some small amounts of surface water are also connected at the present. The original system is extended over the years and is presented in the map. No pumping station have been constructed mad some part of the city where the sewerage system are not served, have individual cesspools or septic tanks.

Wastewater from system is discharged directly without treatment to the watercourses at numerous locations. There are no sewage treatment plant or industrial pre-treatment fa-

cilities. The original aim of the design was to convey all sewage out of the city and discharge into Zidolli Stream at the edge of urban area. However, diversions of sewer system are made to discharge sewage into tributaries of Zidolli Stream within the urban area. The sewerage system in Kruja is constructed with prefabricated concrete pipes made by local manufacture. Pipes sizes are from 200 to 500 mm in diameter without reinforcement. The total length of the sewer system is about 17 km.

(3) Fier City

Sewerage system of Fier City is combined system and the construction was started in 1940. This sewerage system is gravity one. At that time the wastewater was discharged directly to the Gjanica River that flows through the Fier City. Following to the development of the city and the extension of sewerage system, the discharge point was transferred to the entry of the city.

In 1980 a new project was planned for the sewerage system in city. After this study the most important pipes of the sewerage system were constructed. They were two main pipes of 1000 mm and 2000 mm in diameter constructed in the ring road of the city and discharge wastewater and storm water to the main drainage channel of the area. These pipes are circular concrete pipes of 1 m long with cement mortar joint. The discharge point is about 1 km far from the end of the city.

(4) Shkodra City

In Shkodra City there is a new sewage system constructed in 1978 and an old system for storm water which is out of order. A part of storm water discharge is used for the sewage system. Shkodra sewage system from inside to the end of the city is a gravity system.

The main trunk pipes of sewerage system is 1000 mm in diameter and made a circular concrete pipe. The wastewater is collected to the suction pit of the wastewater pumping station and lifted wastewater is discharged by the gravity to Drini River nearby the bridge of Drini River.

4.3 Existing Design Conditions

4.3.1 General

Although the existing sewer network in Tirana City is so called as "the combined sewer system", its real state of the system was designed in different policy from the commonly known design criteria.

The conventional combined sewer system is so designed to firstly accommodate full volume of discharged sewage and storm water, and then excessive volume of wastewater (sewage and storm water) beyond the design flow capacity of main interceptor, in other word multiplication factor for intercepting volume which is usually defined as several times of sewage volume, is overflowed from the interceptor outfall into rivers.

In contrast to the above, the existing sewer network is designed to accommodate only 2 to 3 times of the planned sewage volume. Therefore, most of storm water is not absorbed into the sewer lines and left on the surface run-off. The current surface run-off is mainly on the roads as storm water drainage and stagnant storm water can be seen on the roads and residential areas.

These existing major sewer lines were constructed within few years in the middle of 1960s. It is assumed that the financial constraints has restricted the engineering design of these sewer lines. Furthermore, interceptor overflow chamber is not provided so as to overflow the excessive volume of sewage at junction manhole of the main sewer and the interceptor, but discharge pipe to the river is provided at the manholes.

On the contrary to the above, neither the present authority of the sewerage system, nor the local consultants are aware of design criteria and design conditions adopted in 1960s when almost all the existing main sewerage systems was built. Currently applied technologies in Albania are brought out by the engineers who leaned at the Faculty of Hydraulics in Tirana University, wherein technologies were transplanted from ex-Soviet thorough scholarship exchange in 1970s.

However, the on-going sewerage projects are all limited to small expansion of existing sewer lines. Planning and design works are likewise concentrated to in-house service connection and lateral sewers. Application of current engineering practices prevailing in Albania to this particular study is considered not appropriate to deal with the major structural plan and design.

The application for connecting new sewers to the existing lines is subject to approval by the council formed by Municipality of Tirana, the Enterprise for Maintenance of Road and Sewerage System, etc. However, their technical evaluation criteria of the existing lines are likely not established yet.

4.3.2 Sewage Flow Calculation

(1) Sanitary sewage flow calculation

1) Design flow per capita

Nowadays, design sewage flow per capita is taken into account of the 24 hours with water consumption of 150 l/c.d. and a peak hour coefficient equal to 2.

2) Groundwater infiltration into sewers

Groundwater infiltration rate is not considered in existing design of sewer.

3) Sewage Leakage into Ground

Sewage leakage rate is not considered in existing design of sewer.

(2) Storm water flow calculation

1) Run-off formula

Present run-off formula for storm water quantity calculation is used Rational method in Albania as follows:

$Q = C\ I\ A$

where, Q - Water quantity; l/sec

C - Run-off coefficient

I - Rain fall intensity; l/sec per ha, depending upon the return period and total time of flow

A - Catchment area; ha

2) Rainfall intensity formula

For rain intensity, the book published by the Hydro-meteorological Institute "Maximal Rains in Albania" is used. According to the book the maximum rainfall intensity is calculated using the Gumbel distribution. For each return period coefficients are given, respectively. The intensity is given in mm as follows:

$$X, mm = \frac{-Ln(-Ln \times Fx)}{a} + U$$

where, Fx = 1-Security, or Fx = (N-1) / N

N; Return period, years

U and a; Coefficients

The standard storm return period used for the design of storm water system in Albania is 4 years for main sewers and 2,5 year for branch sewers.

Rainfall intensity of 10 to 60 minutes with each value of a and U, is shown in Table 4.3.1.

Table 4.3.1 Calculation of Rainfall Intensity Using Gumbel Method

Return Period		Rainfall Intensity (mm)					
		10 min	20 min	30 min	40 min	50 min	60 min
2.5Year		15.4	20.2	23.5	25.7	28.0	30.4
4 Year		17.8	22.8	26.4	28.9	31.5	34.4
5 Year		18.8	23.9	27.7	30.3	33.1	36.2
7 Year		20.3	25.6	29.5	32.4	35.4	38.8
10 Year		21.9	27.3	31.5	34.5	37.8	41.5
Coefficient	a	0.2432	0.2218	0.1977	0.1790	0.1604	0.1417
	U	12.65	17.14	20.08	21.93	23.78	25.63

3) Run-off coefficient

Generally used 0.5 in Tirana sewerage system.

4) Concentration time

Concentration time is calculated as sum of:

- Inlet time; 5 - 10 minutes
- Time of flow in the minor network, using flow velocity, 1.0 m/sec
- Time of flow in the pipe taken into consideration, according to the calculation

(3) Combined sewage flow calculation

1) Design flow

In the original idea of the sewerage system design of Tirana, main trunk sewer have been foreseen to carry only wastewater and a part of storm water (3-5 times of wastewater quantity) and overflow the other part of storm water to the rivers.

However, in the developed countries, combined sewer size is determined for only storm water flow by the existing criteria.

Mean while, sanitary sewage flow is used in order to check minimum velocity of combined sewer.

4.3.3 Sewage Collection System Design Criteria

(1) Hydraulic calculation

The Pavllovski's formula was adopted in the study area..

It is called Y for the Pavllovski's formula and is calculated as follows:

$Y = 2.5n^{1/2} - 0.13 - 0.75R^{1/2}(n^{1/2} - 0.1)$

where, n - Roughness coefficient that is taken 0.014;

R - Hydraulic radius;

There is a table used for hydraulic calculation based in this formula with roughness coefficient n = 0.014.

(2) Flow velocity

1) Minimum velocities

The minimum velocities for full pipe section is usually used 0.75 m/sec for all sewers.

2) Maximum velocity

Maximum velocity is usually decided in the range of 3 to 4m/ssec.

(3) Sewer capacity

In view of uncertainly of the future development of the town, only 75% of the full pipe section flow is adopted as its sewer capacity.

4.4 Residents' Awareness on Environmental Sanitation

4.4.1 Objectives of the Questionnaire Survey

The questionnaire survey on the "Resident' Awareness on Environmental Sanitation" was intended to scrutinize the following aspects covering a total of 120 households in the Study Area:

(1) Awareness on the need and importance of environmental conservation

(2) Need on the improvement of sewerage system and sanitation facilities

(3) Health conditions

(4) Knowledge on hygiene (causality between water borne/related/vector diseases and hygienic conditions)

(5) Hygiene and sanitation practices

(6) Income and expenditure of households

(7) Willingness and affordability to pay for water supply and sewerage services

Prevailing situation on their daily life was visualized through statistical analysis and evaluation of questionnaire survey results. The outcome of this particular survey will be then reflected in developing alternative measures for improvement of urban sanitation as well as institutional and financial aspects.

4.4.2 Questionnaire Survey

(1) Questionnaire form

A set of questionnaire form covering the aforementioned survey contents was initially prepared in English language and translated into Albanian language (refer to Appendix 4.4.1).

The questionnaire form was designed primarily to be answered as "Yes" or "No" for convenience in statistical evaluation, while some questions required narrative answers.

(2) Questionnaire target

Target households were initially separated into two groups:

1) 100 households located within the service area of existing sewer system, and
2) 20 households located outside the service area of existing sewer system.

Households belonging to the first group were further subdivided by type of housing facilities; individual housing, old apartment building and new apartment building.

Household interviews with the use of questionnaire form were carried out as shown in Table 4.4.1.

Table 4.4.1 Number of Interviewed Households

Survey Area		Number of Interviewed Households
Households within the Service Area	Individual Housing	38
	Old Apartment Bldg.	28
	New Apartment Bldg.	34
Households outside the Service Area	Selita e Vogel Village	20

Location of these questionnaire survey areas is shown in Figure 4.4.1. Detailed area map of interviewed households within the service area of existing sewer system are also shown in Figures 4.4.2 to 4.4.4.

(3) Survey procedure

Questionnaire survey was carried out by Albanian interviewers employed by the Study Team. House to house visits and direct interview to residents were carried out by 6 teams of interviewers (two members for one team) from September to October.

4.4.3 Survey Results

The following comments are prepared as rapid assessment of survey results. Further evaluation will be prepared and presented in the Interim Report. Field survey reports submitted by the local consultants is contained in the Supporting Report 4.4.1.

(1) Lack of awareness on hygiene and sanitation

Only 17.5% of interviewed residents (120 households) are aware of relationship between the unhygienic conditions/contaminated drinking water and the water borne/related/vector diseases. It is noteworthy that about 50% of interviewed residents in Dora D'Istria (new apartment building area) are aware about the said matter, while almost all interviewed residents in the remaining survey area (old apartment building area, individual housing area and Selita e Vogel Village - outside the service area) are not aware of it.

(2) Disposal of domestic sewage

Approximately 90 % of households within the service area of existing sewer network are discharging their wastewater from toilet into the sewer lines, and remaining 10 % are discharging into canals or septic holes. In Selita e Vogel Village, unserved area of existing sewer network, all households are discharging their wastewater from toilet on to the roads.

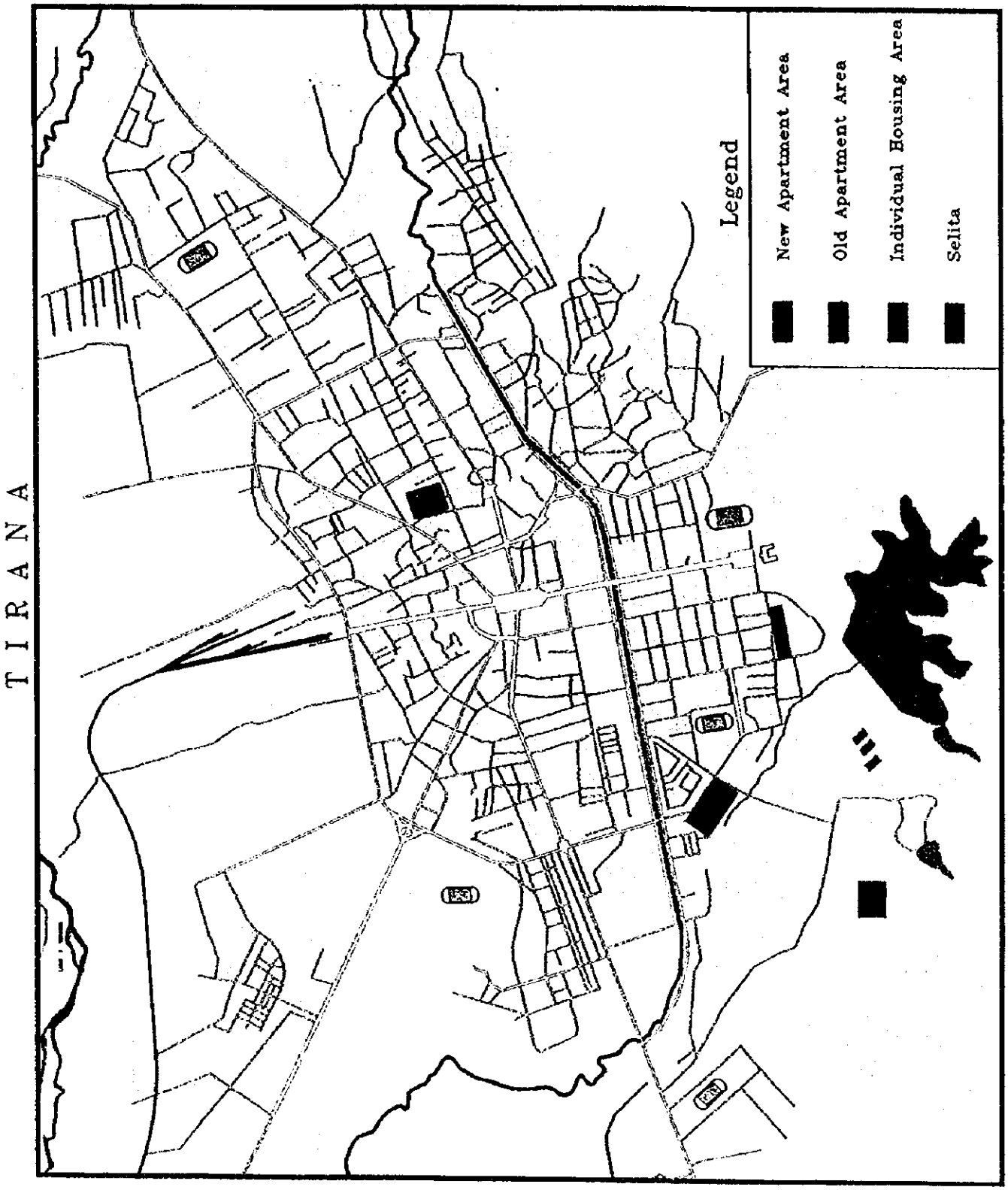


Fig. 4.4.1 Location of Areas for Questionnaire Survey

Fig. 4.4.2 Questionnaire Survey - New Apartment Area

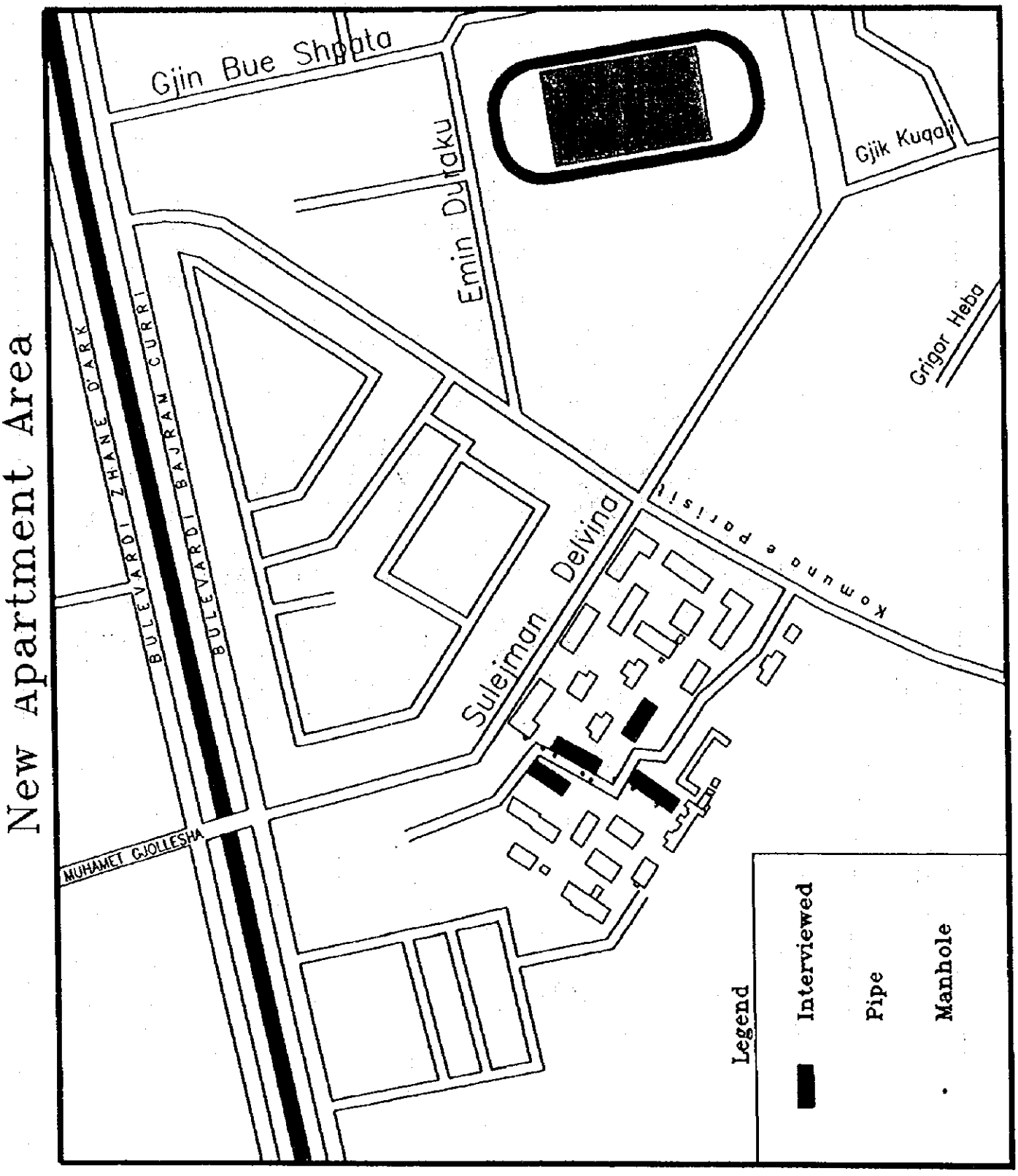


Fig. 4.4.3 Questionnaire Survey - Old Apartment Area

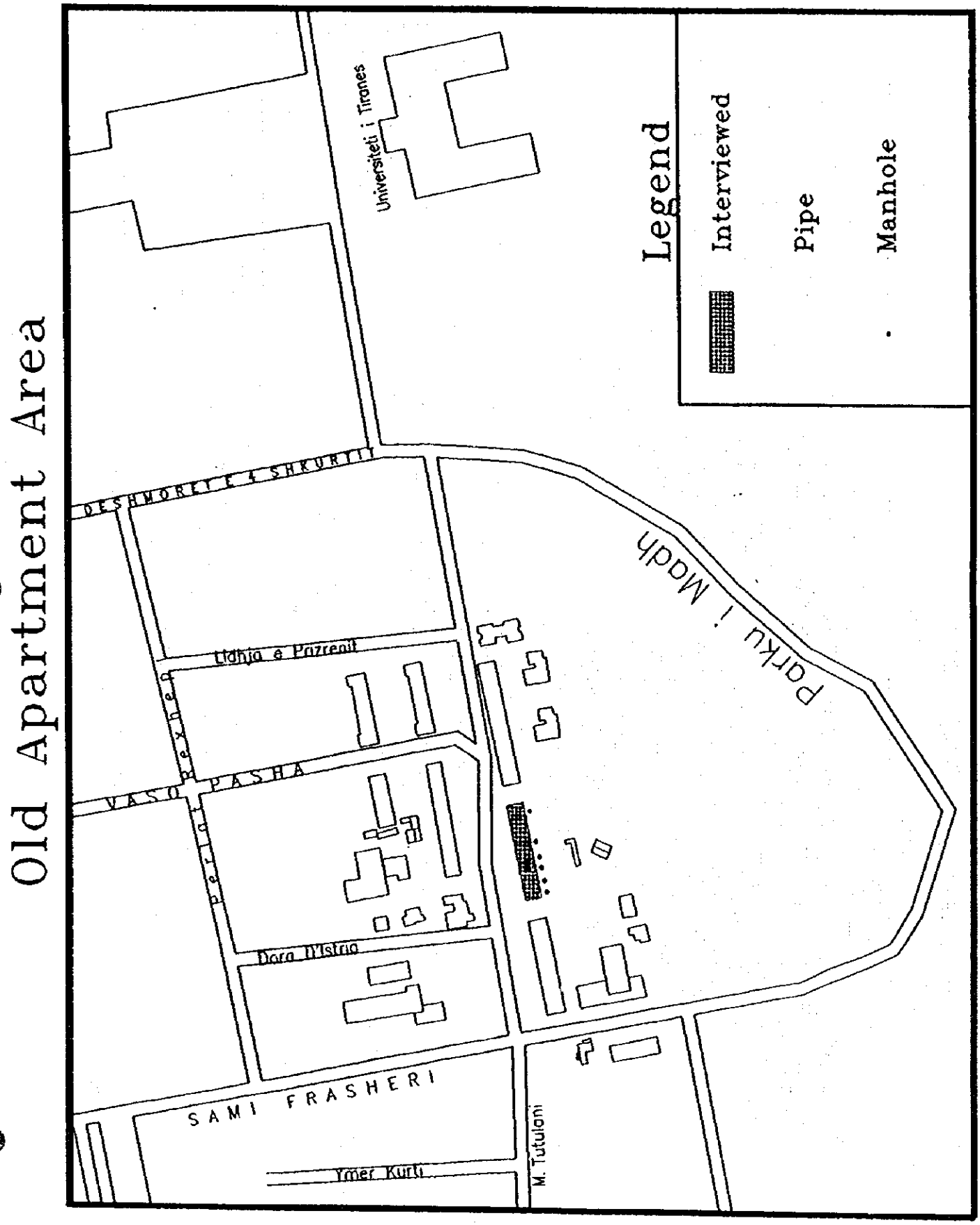
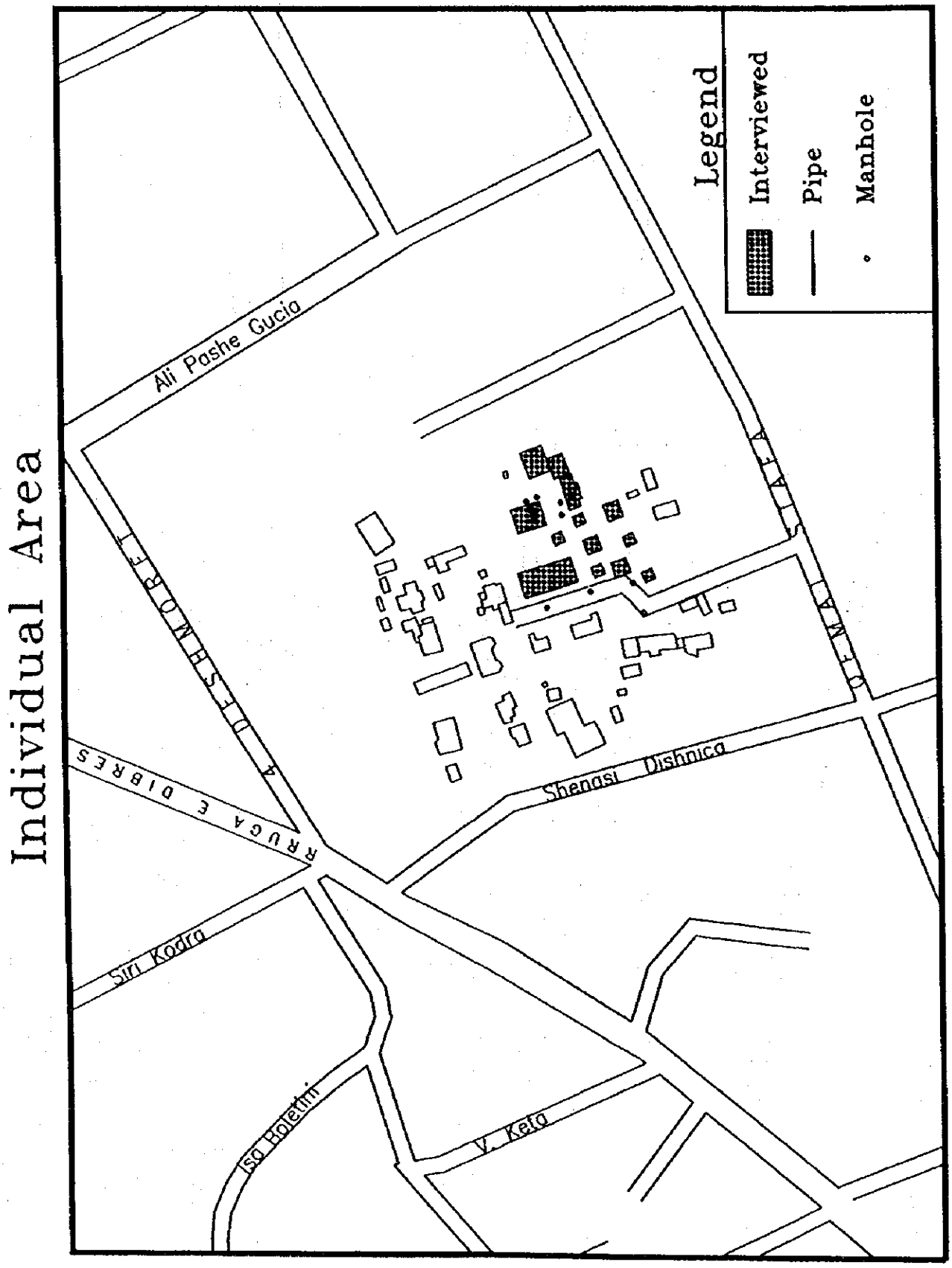


Fig. 4.4.4 Questionnaire Survey - Individual Area



Other wastewater generated from kitchen and bathroom is also discharged under similar conditions.

(3) Health conditions

About 24% (29 households) of interviewed households answered that household member had encountered to water borne/related/vector diseases (diarrhea, dysentery, skin disease, etc.) and 23 households of which was diarrhea.

Many households responded that such diseases were caused by "the bad quality of drinking water." Likewise, complaints on water quality of city water supply are commonly observed.

(4) Drinking water quality

A total of 101 households (84 %) had experienced "red water from faucet" with average frequency of once a 58 days.

Occurrence of strange odor/taste of city water supply varies by area: new and old apartment areas are about 50 %, while Selita e Vogel Village is about 80 %.

(5) Monthly income and expenditure for electricity

The average monthly income of the interviewed households was approximately 15,000 Leke and majority of interviewed households fell on less than 25,000 Leke/month. The average monthly expenditure for electricity was 1,500 Leke which is equivalent to about 10% of their monthly income

(6) Willingness and affordability to pay for water supply and sewerage services

This willingness is largely depending on income level. However, about 98 % of interviewed households showed willingness to pay as charged by meter reading, when the current water supply conditions are improved. This response is verified by other questions on priority for water supply improvement that first ranked request is "potable water supply," the second is "continuous supply," and the third is "low water rate/charge."

The affordability to pay for water supply service was 100 to 200 Leke/month and 50 to 100 Leke/month for sewerage service.

CHAPTER 5

SEWERAGE SYSTEM ORGANIZATION AND OPERATION

CHAPTER 5 SEWERAGE SYSTEM ORGANIZATION AND OPERATION

5.1 Sewerage System Organization and Operation

5.1.1 Sewerage Service System Organization

The Republic of Albania is presently going through a period of transition from a socialist to a market economy. In consequence, the operational and organizational methods of the public sector are being thoroughly renovated. As a result, the Enterprise Maintenance of Roads and Sewerage Systems (EMRS), the maintenance executing agency for Tirana's sewer network, has changed its methods of operation several times since 1991. However, its basic functions, and its road maintenance operations, have remained fundamentally the same.

EMRS is responsible for the daily maintenance work on the current sewerage system and for new additions to the sewer pipe network. However, it is difficult to define which entity is responsible for Tirana's long-term sewerage system development, but seems to be handled by both the Ministry of Public Works, Territory Adjustment and Tourism (MOPWT) and the city of Tirana (the Municipality). Funds for EMRS operations, maintenance of the sewerage system and construction of new sewer pipe networks seem to be provided by MOPWT (actually the funds come from the state government budget), while funds for daily sewerage system maintenance seem to be provided by the Municipality; however, this demarcation is not clear.

The following is a description of the three organizations (MOPWT, the Municipality and EMRS) directly responsible for the development and maintenance of Tirana's sewerage systems, as well as those of the other organizations involved.

- The Ministry of Public Works, Territory Adjustment and Tourism

  The Ministry is primarily responsible for the water supply and sewerage system at the national level, and for other infrastructure such as roads and housings. This infrastructure is vitally important to the development of the tourism industry and thus falls under MOPWT's jurisdiction. Subsidies to EMRS are first coordinated with those for other branches of social infrastructure by the Ministry, which then presents its budget requests to the Ministry of Finance. When the budget has been approved, the funds are distributed to the enterprises via the municipal government.

- The Ministry of Health and Environment Protection

  The functions of the Ministry of Health and Environment Protection (MOH) are the formulation and implementation of national policies for health care, and the provision of health care and policies on environmental protection at the regional and national level. As part of its environmental policy, MOH established the Regional Agency for the Environment within its organization to inspect environmental conditions (air, water, soil, watershed, forests, etc.) in Albania on a national scale.

- Tirana Municipality (the Municipality)

  The Municipality is responsible for the public services of Tirana. Under its General Directorate of Public Works and Services are the Road and Sewerage Directorate and the Water Supply Directorate. The Road and Sewerage Directorate is in general responsible for the water supply and sewerage system development of Tirana, as well as for the planning of sewerage facilities, and contains the supervising bodies for these services. These are: 1) the Enterprise of Water Supply; and 2) the Enterprise Maintenance of Road and Sewerage Systems. The Municipality is directly responsible for the city's public infrastructure, and one of the major problems it now faces is difficulty in keeping abreast of the growth of the city's residential areas. As a consequence, not all of these areas are connected to the sewerage system

- Enterprise Maintenance of Road and Sewerage Systems (of Tirana; EMRS)

  EMRS is a public service body responsible for laying sewer pipes and maintaining the current sewer pipe network for Tirana. It is also responsible for the asphalting of roads and paving of sidewalks. In addition to these functions, EMRS also cleans septic tanks for houses and buildings. While it earns some money cleaning septic tanks (the city owns one septic tank cleaner) and other services, most of its operational and investment funds (funds for laying new sewer pipes and asphalting roads) are subsidized by the State Government and the Municipality.

- Institute of Study and Design of Water Supply and Construction (ISDWC)

  ISDWC is a public institute which studies and designs water supply systems, sewerage systems, buildings, and factories. It is a self-financing entity that earns all necessary funds for operation from its customers in both the public and private sector on a nationwide basis, and competes with private study and design companies. However, part of its income is then taxed by the government, and since its prices on surveys and

designs are also fixed, this severely limits its competitiveness as an enterprise. Moreover, other public institutions are not always required to contract their work to the ISDWC, and combined these factors are causing it financial difficulty.

- Urbanistic Institute

  The Urbanistic Institute conducts studies and conceptual designs of the Albanian coast and urban development. It is a national institute and fully dependent upon MOPWT for its budget.

- Private construction companies

  There are many private construction companies, the bulk of which are very small in scale (many have as few as one or two engineers), all registered with MOPWT, which lay the pipe connections to sewer mains, and also do the laying of main sewer pipes. They receive sewer pipe laying construction projects from EMRS through the tender system.

"Figure 5.1.1" shows the relationships between the various organizations in the sewerage sector.

The following is a description of the water supply, city garbage collection and cleaning enterprises in the public service sector.

- Enterprise of Water Supply of Tirana (EWST)

  EWST is the only water supplier in the city of Tirana, and is the largest water supplier in Albania. It is partly dependent on the Municipality, with funds for daily operations being self-financed by the water tariff system, while investment funds are subsidized by the Government and the Municipality. A project to increase water supply capacity (subsidized by the Italian Government Funding) is underway, as are discussions of privatizing EWST with the World Banks assistance.

- Enterprise of Cleaning and Greenness, and KUATALLA

  This enterprise supervises street cleaning and takes care of plants in public areas, such as parks. It is financially dependent upon the Municipality. Under the control of this enterprise, are two private garbage collection companies. In addition to the Enterprise of Cleaning and Greenness, there is a solid waste collecting public

enterprise called KUATALLA, which collects solid waste produced from construction sites.

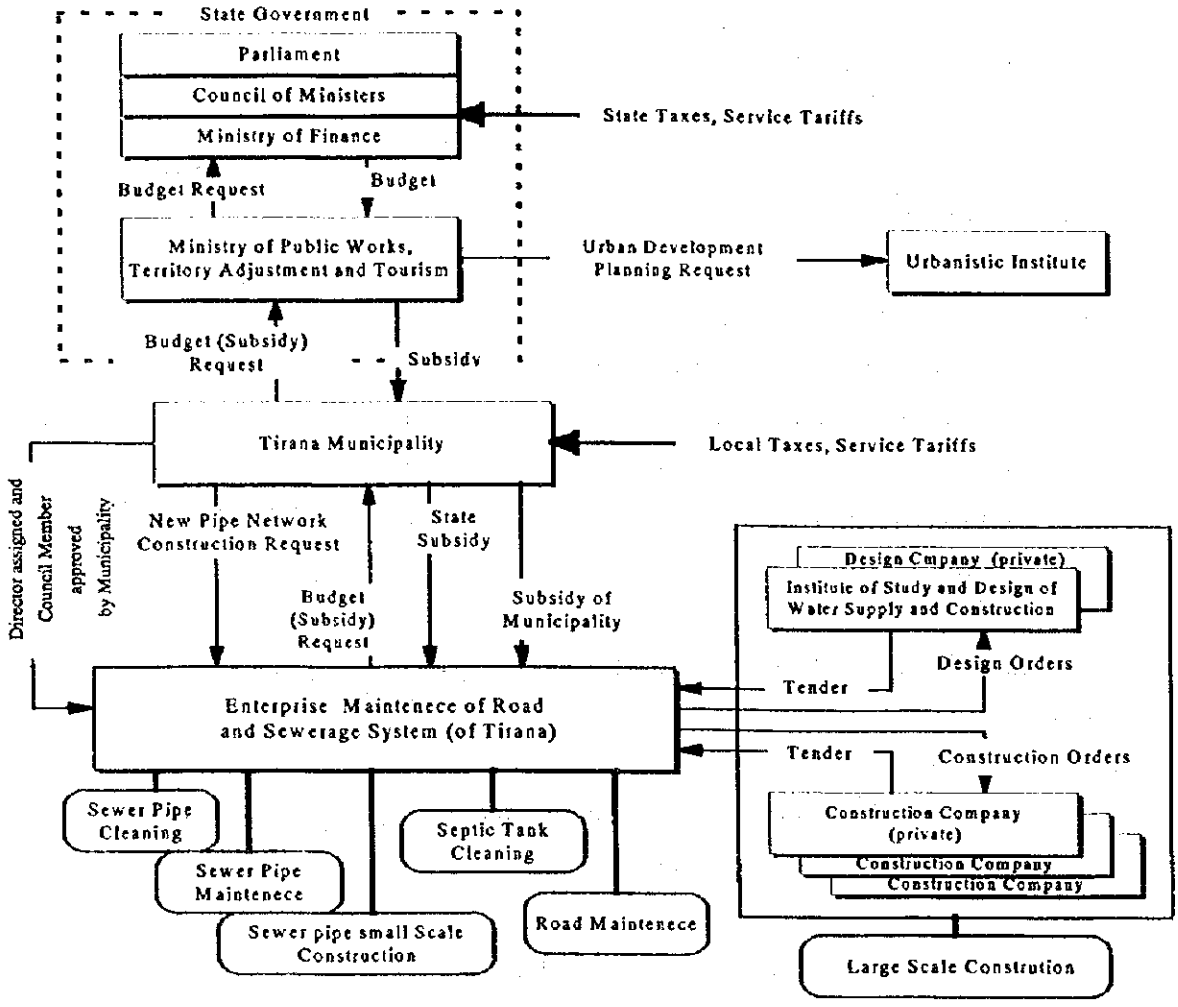


Figure 5.1.1 Relationships between Organizations in the Sewerage Sector

5.1.2 Organizations in the Sewerage Service Sector

(1) The Ministry of Public Works, Territory Adjustment and Tourism (MOPWT)

MOPWT is responsible for the water supply and the sewer network at the national level, and other social infrastructures such as roads and buildings. This infrastructure is very important for development of the tourism industry, being reason as to why tourism falls under the MOPWT jurisdiction. The Water Supply and Sewerage Directorate is one of the directorates of MOPWT. In the water supply and sewerage sector, MOPWT contributes towards the preparation of laws and regulations, sets budgetary investment

priorities, attracts non-budgetary financing, including foreign assistance for investments, and coordinates special projects of national importance such as the Durres project and the Tirana Water Supply project financed by Italy. MOPWT also advises the Council of Ministers on setting the ceiling on tariffs for services which MOPWT administers at a national level, such as those on water supply and construction.

The current directorate, the Directorate of Water Supply and Sewerage Systems, will be dissolved and a new directorate, the General Directorate of Water Supply and Sewerage, one with a more independent position, will be created for promoting the development and improvement of the water supply and sewerage system. This decision was made by the Council of Ministers in September 1996. The General Directorate of Water Supply and Sewerage Systems will have two special units within the directorate, the Project Implementation Unit and the Project Management Unit, which are responsible for current and future projects assisted by foreign nations.

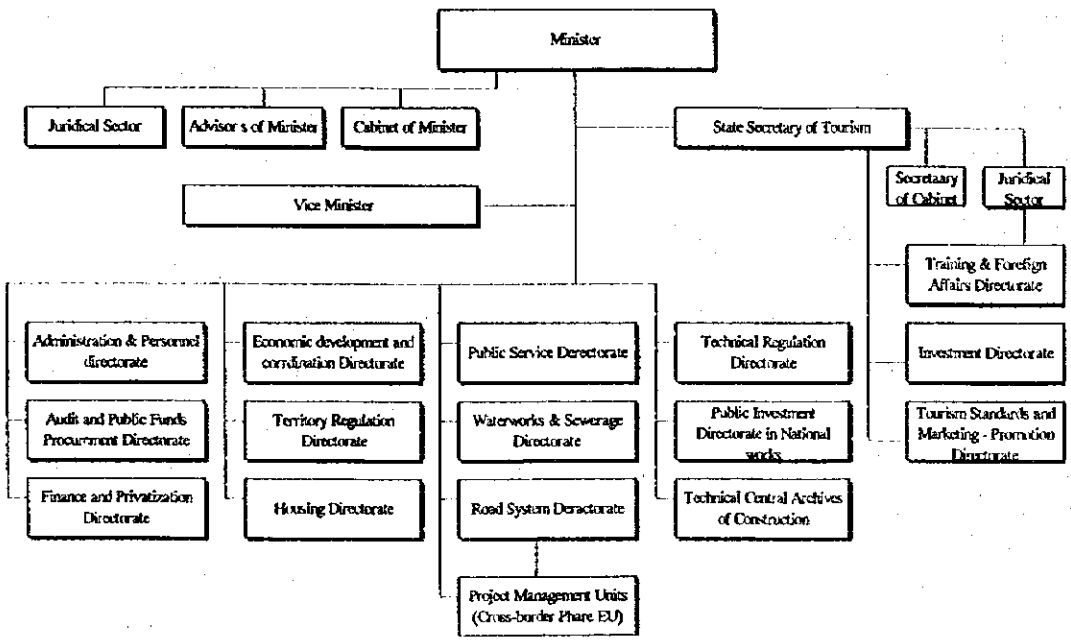


Figure 5.1.2 Ministry of Public Works, Territory Adjustment and Tourism

(2) Ministry of Health and Environmental Protection (MOH)

One of the departments of the Ministry of Health and Environmental Protection is the State Sanitary Inspector, a separate national agency with a role in the sewerage sector. It has wide-ranging power for the protection of human health, including the enforcement of hygiene and sanitary laws and regulations, and the monitoring of the application of

hygiene and health standards for labor. It also sets legal sanitary standards, and controls the quality and safety of drinking water and food. The Inspector can stop the delivery of drinking water when standards are not met and in these cases impose fines. Such monitoring and inspections are carried out by inspectors assigned at the district level. The testing of the samples is carried out in laboratories operated by the Institute of Hygiene of Epidermiology, which is under the control of MOH.

Compiling regulations and respective orders for the protection of the environment is the responsibility of the Committee for the Protection of the Environment in MOH, and the Central Institute and Academy of Science. The Committee is headed by a chairman, who is the Vice Minister of MOH, and consists of three directorates (the Directorate of Projects and Economy Public Information, the Directorate of Natural Resources and Special Protected Areas and the Directorate of Water and Air Quality and Waste Management). In addition to these administrative organizations, in 1994 the Regional Agency of Environment was established as an executive body responsible for inspecting and taking action against environmental destruction in Albania. It consists of twelve Regional Environment Protection Agencies responsible for their own respective regions. Three inspectors are assigned for the city of Tirana and its districts.

(3) Tirana Municipality

The Municipality operations are based on Law 7572 (dated June 10, 1992), entitled "On The Organization and Operation of Local Government." The inner organizational structure and operation of the different directories of the Municipality are regulated by this law and are approved by the mayor of the Municipality. The Municipal Council approves the organizational structure of the Municipality based upon this law.

In the water supply and sewerage sector, the Municipality has the general responsibility for: (1) the management of water supply and sewerage systems; and (2) the executive bodies, which are the Enterprise of Water Supply of Tirana (EWST) and the Enterprise of Maintenance of Road and Sewerage System of Tirana (EMRS). The Municipality sets priorities for budgetary investments. In addition to the funds received from the state budget, it also supplies the necessary funds to EMRS for covering its operational expenses. (EWST is now able to cover its operation costs through its tariff revenues from consumers.) As an administrative unit to the water sector agencies, the Water Supply Sector and Road and Sewerage Directorate is organized under the General

Directorate of Public Works and Services. These units are directly responsible for prioritizing investment in the water supply and sewerage systems.

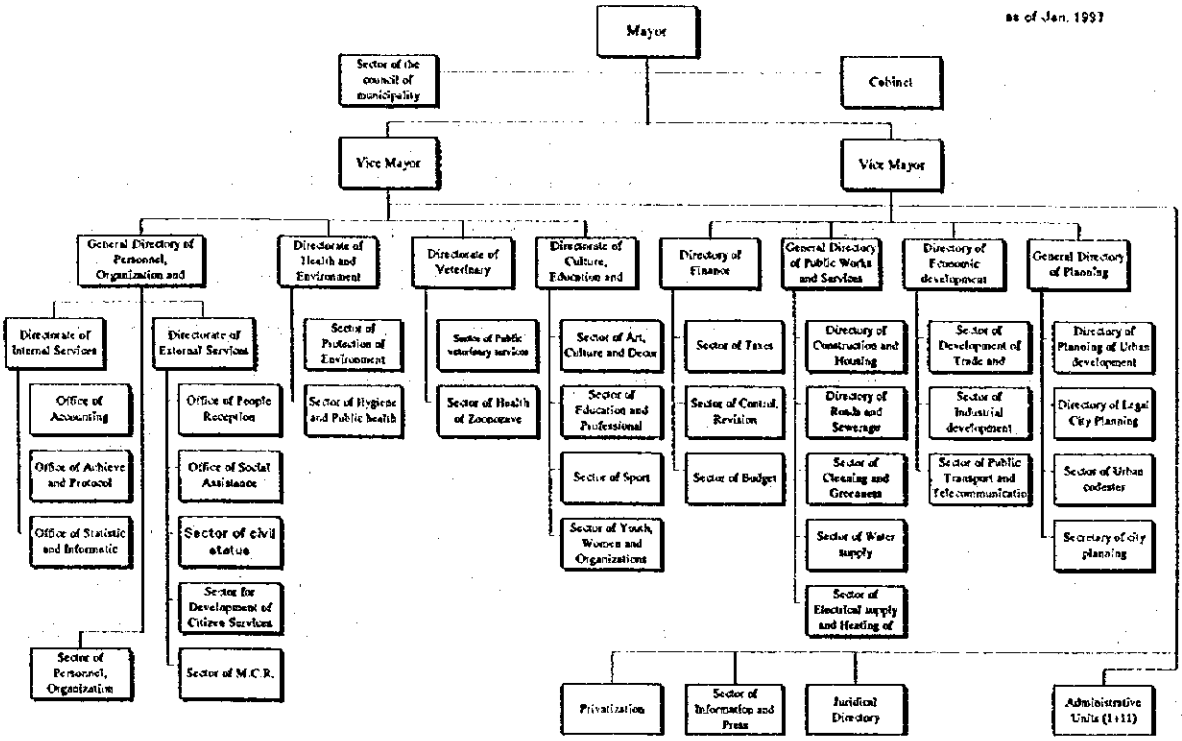


Figure 5.1.3 Tirana Municipality

(4) Enterprise Maintenance of Road and Sewerage Systems (EMRS)

EMRS is the only entity providing sewerage services for the city of Tirana. It is also responsible for maintaining the city's roads and pavement. Its 254 person staff is divided among two divisions and three sections, namely the Technical Division, the Economic Division, the Maintenance Section, the Investment Section, and the Supply and Transportation Section. It is a budgetary organization and dependent on the Municipality. Because a sewerage tariff system has not been introduced yet, EMRS receives its operating funds and investment from the Municipality, in addition to the funds from the state budget which are passed through the Municipality. The enterprise's director is assigned by the Municipal Council, and the EMRS Council member assignment is subject to Municipal Council approval.

The following is a definition of budgetary and self-financed enterprises:

- Budgetary enterprise: the enterprise is completely funded by the state government.

- Self-financed enterprise: more than 70% of its funds are covered by its own economic activity, and less than 30% is covered by funds from the state government. Major investments are completely covered by state government funds.

(5) Institute of Study and Design of Water Supply and Construction (ISDWSC)

ISDWSC is an institute financially dependent upon MOPWT. However, due to the government's decision to privatize design and construction institutes and enterprises, ISDWSC has become a self-financed entity, and its income is drawn by charging its clients. It is free to contract with both the public and private sector. Major ISDWSC projects include: (1) the study and design of water supply networks, sewerage system networks and buildings; and (2) the supervision and inspection of construction projects, both during the project and after completion. It has a staff of 94 people divided among seven divisions, which are as follows: architecture, construction, installation, water supply, sewerage systems, administration and typing. The director is assigned by MOPWT with the approval of the Council of Ministers. The members of the ISDWSC Council are also approved by MOPWT.

(6) Urbanistic Institute

The Urbanistic Institute, usually referred to as the National Planning Institute, was founded in October 1991 as a dependent institute of MOPWT. It is a budgetary institution with all of its expenses supplied by the state budget. It has a staff of 46 people divided into three divisions: Urban Planning and Study (national and regional), Master Planning of Tourism Development, and General Town Planning. The Institute's main operations are planning and studying development of tourist areas, i.e., the coast line, and of urban areas.

(7) Enterprise of Water Supply of Tirana (EWST)

EWST is the only water supplier in the city of Tirana, and the largest water supplier in Albania. It had approximately 71,000 accounts (of which 67,000 are family accounts) as of October 1996. EWST has a staff of 558 people divided among three divisions and ten sections. It is an organization dependent on the Municipality, and receives some investment funds from the Municipality budget and the State budget. However, EWST introduced the water tariff system after the government's decision to privatize it and is now collecting water consumption fees from consumers. With this income, it covers its operating costs, and is currently making a profit. Its director is assigned by the

Municipal Council. Any important matters regarding its management and operation are discussed and decided by the enterprise council, the members of which are approved by the Municipal Council.

Table 5.1.1 Water Tariffs

Consumer Type	Charge (Lek/m^3)
Residences without water meters	240 Lek/month
Residences with water meter	15
Health institutions	15
Educational institutions	30
Bread production	30-52
Other budgetary institutions	52
Commercial companies; other	55-60

By "Decision of Council of Ministers," enacted January 1,1997

- The National Water Council

  The National Water Council, headed by the Prime Minister, was established two years ago to administrate water resources at the national level in conjunction with the Technical Secretariat and the Basin Authorities at the local level. This Council's rights and responsibilities are defined by Law 8093. The Council is now in the process of making an organizational scheme to make its role effective. This scheme includes establishing six regional authorities under the Council which will be responsible for their respective regions. As defined by Law 8093, the Council is responsible for water resources, and it is not clear whether the treatment of waste water will be included in its operations.

(8) The Enterprise of Cleaning and Greenness

This enterprise is an executive agency which is dependent upon the Municipality. It has two departments, one for garbage collection, and the other for street cleaning and tending of plants in sidewalks and parks of the city. It has about 600 workers, most of whom are involved in street cleaning and taking care of plants.

The tariff system for cleaning services was initiated in January 1994, in accordance with Law 7777, enacted in December 1993. Law 7777 is actually still in effect, although Law 8101 on the new cleaning tariff system was enacted in March 1996. This new law

was to come into effect in June 1996, but was eventually not enforced as it was too complicated and proved to be impractical. The review of the tariff system for cleaning services is still under discussion. According to current law, this tariff should be collected for all entities through the Electricity Enterprise. For the two last groups (shown in the table below) this is done through the Tax Office, as was decided by the Ministry of the Finance.

Table 5.1.2 Cleaning Tariffs (Law 7777; enacted Jan. 1994)

Imposed on	Lek/year	Collected through
Residences	100 / family	Electricity Enterprise
Kiosks	1,000 / entity	the Tax Office
Other physical and legal, public and private entities	2,000 / entity	the Tax Office

Among public services offered in Tirana city, there are two private companies which cover city cleaning, one Austrian and one Italian. They are on contract with the Municipality, at the price of US$ 1.2/m^2/year, totaling US$ 75,000 per month or US$ 900,000 per year to each of them. If the required quality of services is not achieved, the Municipality does not pay the full amount. By hiring these companies, a considerable part of city cleaning operations have been taken care of. Still, some problems do remain, and are mainly in these areas: a) the quality of the services offered, which is the responsibility of the private companies; and b) payment to these companies, which is the responsibility of the Municipality.

(9) KUATALLA (a solid waste collecting enterprise)

This enterprise, an organization dependent on the Municipality, is responsible for collecting solid waste, such as that resulting from construction projects. It has a staff of 150.

5.1.3 Enterprise Maintenance of Road and Sewerage System (EMRS)

(1) Enterprise history

With Decision 361 of the Council of the Ministers (dated September 30,.1988), the Enterprise of Cleaning and Greenery and Roads and Sewerage was divided into two parts. EMRS was set up as a result of this decision in order to maintain the current sewerage system and roads in Tirana. The Republic of Albania has been in a period of transition from a socialist economy to a market economy since 1991, resulting in the operational and organizational methods of the public sector being revamped. EMRS has changed its operation system several times since , and is now regulated by the newly enacted law "On Companies" and other such laws. However, its functions remain the same as those prior to 1991, conducting maintenance of sewerage systems and roads of Tirana city as a public enterprise dependent upon the Municipality.

(2) Ownership and management

EMRS's management is fully dependent on the Municipality. However, because EMRS is a publicly owned enterprise, it is owned by the Ministry of Finance, like other public institutes and enterprises. The director is nominated by the Municipal Council, and all important operational matters are discussed and resolved by the EMRS Council. The Council consists of five members, who hold their positions for two years, and whose appointment is approved by the Municipal Council. The director is a member of the Enterprise Council, but the other members are selected from among the Enterprise personnel. In addition to appointment of the director and other members of the Council, the Municipality has essential control over all EMRS activities.

(3) Organization

EMRS is headed by its director and has a staff of 254 persons (figures as of January 1997) divided into two divisions, Technical and Financial, and three sections, Investment, Maintenance, and Supply and Transportation. Because EMRS is fundamentally structured around its maintenance and construction responsibilities, though there are road and sewerage system groups within each section, it is difficult to say who is responsible for the sewerage system and road maintenance. Although it lacks operating funds and investments to satisfy current demands, ERMS's current organizational structure seems rational given the small scale of its operations. However, the demand for sewerage systems and road maintenance and improvement is quite large, such that if and when sufficient funds are provided, it will be necessary for the

organization to restructure the service branch of its sewerage system maintenance and construction operations, as well as those for road repair. EMRS is an executive construction and maintenance enterprise and the Municipality is responsible for drawing the plans of the sewerage system and roads of Tirana. The Institute of Study and Design of Water Supply and Construction handles the task of drawing such designs for the sewerage system and roads, since no design function exists within EMRS organization. As a consequence, very old maps of the sewer network are still being used for maintenance of the sewerage system.

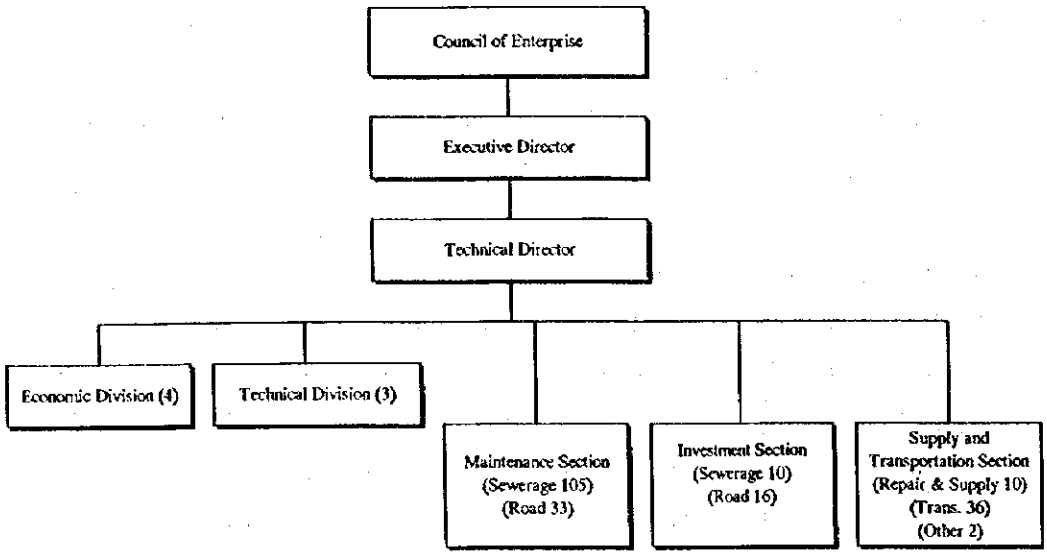


Figure 5.1.4 Enterprise Maintenance of Road and Sewerage System

(4) Operations

Presently, EMRS is carrying out two major functions. One is the construction and maintenance of Tirana's sewerage system, and the other is the maintenance of the city's roads and pavements. As for sewerage system operations, the Municipality draws up a plan for new sewerage system development, while EMRS estimates the costs. The city itself secures the necessary funds for sewerage development as part of its budget, but since these are insufficient, it applies to MOPWT for a subsidy. On its part, MOPWT prepares a grant budget that takes into account the suitability of the application, the limits of the infrastructure development budget, and other related factors. The subsidy (municipal and governmental) for the entire sewerage work is then granted to EMRS. However, large-scale sewer pipe laying projects are contracted out to private construction companies. EMRS conducts this bidding process, but waits for approval from the city

and the government before placing an order for the work in question. In effect, private companies are in charge of major construction works, while EMRS handles small-scale projects.

(5) Facilities, equipment and tools

Most sewerage systems and road construction projects are contracted out to private companies, implying EMRS needs only to have machines, equipment and tools for the maintenance work it conducts itself. Even though EMRS only conducts maintenance work, it is currently very poorly equipped. It has old trucks (some of them have been in use for roughly 40 years) and five horse-pulled carriages for carrying material and tools to and from the construction and cleaning sites. EMRS needs particularly to upgrade its machines, equipment and tools used in maintaining the sewerage system, in both quality and quantity. For instance, the only primitive sewer pipe cleaning tools available, being used include wires, shovels and hammers. Road maintenance tools are equally primitive. All machinery, equipment and tools are maintained by mechanics of EMRS. Equipment, machines and tools on hand are as shown in the table below:

Table 5.1.3 Machines, Equipment and Tools

Machine and Equipment on Hand	Quantity	Used for	
		Sewerage	Road
Vacuum car for septic tank cleaning	1	○	
Excavation machines (shovel capacity 0.25 m^3, etc.)	2	○	○
Shovel loader (capacity 0.35 m^3)	1		○
Trucks (3-5 tons)	4	○	○
Road rollers (3 large, 2 small)	5		○
Carriages (horse-pulled)	5	○	
Wires (for cleaning sewer pipes)	N/A.	○	
Other tools (such as hammers)	N/A.	○	○

(6) Human resources

Currently, very few EMRS officers have any engineering and technical background. All engineers are hydraulic engineers, although their duty is to construct and maintain all roads and sidewalks in Tirana. Other EMRS personnel have no technical or engineering education and training background, resulting in a massive deficiency of qualified personnel. Considering most construction work is contracted out, EMRS needs personnel who are capable of supervising and inspecting projects to ensure they are being carried out in accordance with specifications and standards set. Further as EMRS handles sewerage system and road maintenance work by itself, it requires

employees who are capable of analyzing the sewerage system and roads to see if they match construction standards and can hold up under actual use. Currently, there are no training programs for this, and initiating such a program would be an immense step towards gaining the necessary know-how. Although some of Albania has caught up with the advanced technology of other developed nations, finding a proper trainer within Albania seems difficult and it may necessary to recruit such persons one from abroad.

Even in the management field professionals with management, financial and accounting skills and knowledge, ordinarily required for an autonomous enterprise are absent. This is a result of EMRS' method of operations, implying that as a budgetary organization dependent upon the Municipality, there has been no prior need to analyze the quality of its work. However, since it should operate at a level where it can satisfy the needs of the people of Tirana to provide a sound sewerage system, as well as a good road system, as well as operate at cost, there is a dire need for personnel with these skills.

(7) Planning system

EMRS System organizes its work based on the year plans. Tirana City is made up of 11 regions. Requests from each region, are conveyed directly to EMRS requiring its services. Based on its inspections and requests from the population, public and private organizations, EMRS drafts a plan of the investments to be made for the following year. The plan is detailed for each investment to be made, including the budget, location and may sometimes even include the design of the investment. Apart from investment expenses, operational expenses are also included in the plan. EMRS sends this to the Tirana Municipality, General Directorate of Public Works and Services.

The Tirana Municipality receives the plan from EMRS and based on this plan and its own inspection and requests of the population, public and private organizations, the Municipality drafts a plan for the investments to be sent and approved by MOPWT. In rendering the year plan of EMRS preparation of the final draft-plan, should be made with the cooperation of the Directory of Public Works and Services and the City Planning Directory. Normally this plan should be in accordance with a long-term city development plan, however, this is not the case with the Tirana Municipality, as such a long-term City development plan for Tirana is not in existence. An Austrian Environmental Experts Group is presently working on preparing one. In 1996 a draft was presented, but the final version has yet to be delivered .

(8) Budgeting system and upper governments' subsidies allocation system

EMRS is one of the budgetary enterprise public enterprises, which financially depends on MOPWT and the Tirana Municipality. The budgetary period begins January 1st and ends December 31st. Funds are pre-assigned for operational expenses and investments. This is supposed to cover maintenance, paving of roads and of sewerage networks, and performing only small-volume work. On an average, investments of this kind alone performed by EMRS go up to 2 million Lek, especially for sewer pipe laying. Big-volume works are contracted-out to private companies. For works with value up to 5 million Lek, the bid for the contracted-out works is competence of EMRS. For projects involving more than 5 million Lek, biding is restricted by the Tirana Municipality.

Table 5.1.4 Subsidy from the State government and Tirana Municipality

(mil Lek)

Year	Funds allocated	PLAN			ACTUAL
		State Government	Tirana Municipality	Total	Total
1992	Investment	1.00	0.00	1.00	5.23
	Maintenance	0.50	0.00	0.50	14.08
	Total	1.50	0.00	1.50	19.31
1993	Investment	7.00	0.00	7.00	20.87
	Maintenance	3.00	0.00	3.00	14.72
	Total	10.00	0.00	10.00	35.59
1994	Investment	12.00	0.00	12.00	19.79
	Maintenance	4.00	4.00	8.00	31.78
	Total	16.00	4.00	20.00	51.57
1995	Investment	14.00	4.60	18.60	18.33
	Maintenance	5.00	8.70	13.70	36.34
	Total	19.00	13.30	32.30	54.67
1996	Investment	40.00	5.20	45.20	N/A
	Maintenance	5.00	9.30	14.30	40.08
	Total	45.00	14.50	59.50	---

The plan of the Municipality includes all investments and operational expenses for the following year. It also decides what portion will be financed by the State budget and by the local revenue. In 1996, the total income of Tirana city was made up of 87.6% from the State budget and 12.4% from local revenue. The Council of the Municipality decides the amount of local revenue to be allocated to each directory of the Municipality. The General Directory of Public Works and Services assigns the distribution of funds to the different sectors within the directory. Using this procedure, it approves the EMRS plan and determines the portion of funds to be taken from the State budget and the amount to be taken from the local income. Funds from the local income given to EMRS are for maintenance and for supplementary compensation. In very rare cases, this is

also used for small-volume investments of up to 10-20 million Lek. The draft-plan of the Municipality sent to MOPWT is in general the same as that of EMRS sent to the Municipality. This is because a prior discussion is made between them regarding the plan. There is a tendency to give more funds for road maintenance projects than for sewerage system projects. One of the reasons is because there is no income from the sewerage system works. *Than, roads are more visible than sewerage systems, so the problems they have.*

Meanwhile, the Council of Ministers approves the State budget and its distribution within the different branches of the economy for the entire country. Through the Ministry of Finance the respective funds are sent to MOPWT. MOPWT and the Directory of Coordination and Development, subsequently re-distributes these funds to the different directories. This distribution is made based on the available funds and on requests made by the Municipality for each sector of this Ministry. Also taken into consideration are the results of the inspection of the Ministry itself and/or requests from the population, public and private organizations made to the Ministry. It is required that the draft-plan be submitted along with a draft of the investments. Plans approved are specified for each investment and the funds assigned for one investment cannot be used for another. Not all funds required by EMRS are approved by the Ministry. This is mainly because of deficiency of State Budget funds. In some cases this is because draft-designs for the investments sent to the Ministry have not been attached with the plan.

(9) EMRS Feedback System

EMRS has the Council which takes the main decisions which are of the competence of EMRS. The Council has monthly meetings to discuss existing problems and issues. The agenda and minutes of the meetings are of concern and disclosed only within the Council. Only relevant topics are announced to the employees. In other cases, a memo is sent from the meeting to the Municipality and/or Ministry of Construction. The head of the departments and responsible personnel of each region have weekly meetings where work performed, pending work to be performed according to the plan of EMRS, and what will actually be done are discussed.

Requests from the general public, public and private organizations are received by EMRS and these cases are discussed at the meetings. If EMRS is unable to support them, the requests are sent to the Municipality and/or MOPWT. Such inputs are used for making changes in cases of emergencies, during the current year and for planing of the coming

year. MOPWT has its own controlling system which is planned according to the decision of the Council of EMRS. The Municipality also does checking and inspection at EMRS. It is the administrator of the funds sent to EMRS. The State Control Commission has also the right to control and audit the enterprise. The feedback from such controlling make up part of the role of the feedback system of EMRS.

Auditing at EMRS is done as follows: 1) internally; 2) by the Municipality; 3) by the Auditing Branch of the Financial Directorate; and 4) by the State Controlling Commission. Some of this is announced beforehand, while other inspections are conducted unannounced. These are conducted on work performance, budget handling, and movement of funds and goods.

1) Internal Auditing

Internal auditing is handled by the director and the Board of Directors and aims to improve EMRS' overall performance. Usually, an enterprise should have its internal auditors. Depending on the size, an enterprise can:

- have a separate department of internal auditors
- have internal auditors within its financial department
- use other companies personnel as appointed occasionally, when EMRS does not have personnel specifically hired as auditors

The EMRS Council holds its weekly meetings every Monday. The main topics of this discussion include: 1) work accomplished during the previous week; 2) the level of work performance; and 3) what will be done during the coming week, in accordance with the plan for the rest of the month. Each participant presents his/her division's work, discussing any problems currently being faced and what that division's tasks for the future are. The Technical Council, a sub-council of the EMRS Council, is composed of a director, a chief engineer, heads of each department, and the head of each branch.

The meeting described above is mainly an information-sharing procedure and one part of analyzing the current state of affairs at EMRS. The other component of this analysis is internal auditing and inspection. Once a year, the Board of Directors approves a one-year plan for internal auditing and inspection. The director signs the plan and the financial department is responsible for enforcing it. The head of this

department does this by himself and sometimes with other personnel. The Internal Auditing Plan for 1996 was as follows:

Table 5.1.5 Pre-planned Audits

Issues to be followed	Division to be audited	Interval	Department responsible
Follow-up of construction works according to SEO, bookkeeping, technical documentation and inspection of the quality of construction	Investment division	Each three months	Technical and financial department
Auditing of wages and compensation according to respective categories	All divisions	Continuously	Financial department
Examination of supporting documentation for transportation, use of vehicles and machines	Transport division	Continuously	Transport department
Physical inventory of the storage facility and its results	Storage division	April-May	Inventory commission
Audit of small inventory and fixed assets	Storage division	December	Inventory commission
Provision and distribution of materials, mainly cement	All divisions	Continuously	Financial department
Monitoring of cash flow and supporting documentation	Cashier	Continuously	Head of financial department
Work discipline, use of work hours	All divisions	Continuously	Financial department

The table above shows the content of pre-planned audits. There are also unannounced audits, which are done by the Board of Directors or the director's order, or on the initiative of the head of the financial department. Unannounced audits are done mainly to check cash flow, cash disbursement and cash receipts, cash limits considerations and general ledger entries. Usually, these are done monthly, or when there is an indication of some irregularity. This check is done by the head of the financial department. At the end of each audit, a report is prepared which is kept within the financial department, and in the event a problem has been discovered, this is presented to the director, the Board of Directors, or the Technical Council.

Once a year, usually in April, an inventory check is conducted. It is performed by a commission of three people, consisting of the head of the financial department, an economist and one other specialist. The inventory commission is appointed by the Board of Directors and files its report to them. This check continues for three to four weeks, working three to four hours per day covering the storage facility and the inventory in use, doing a physical check and *one of the supporting documentation.*

Another audit is done on the maintenance branch of operations. This mainly involves checking transportation costs, such as gas, tires and other materials needed for transport vehicles. The purpose is to find out how often materials are being supplied, their book entries, the criteria for supply use, and if these supplies are being used properly This audit is done on a per-case basis, and a report is prepared and stored at the financial department. If an irregularity is noticed, a discussion is held by the Technical Council to find the reason for the discrepancy, who is responsible for it, and how payment will be made.

2) External Auditing

The Municipality also conducts audits and inspections of EMRS, since it is the administrator of the funds sent to EMRS. The Municipality auditors conduct these audits to check up on fund usage at EMRS, and to confirm that this does not violate any legal regulations. According to the law, public enterprises must be audited by the municipal organs at least once every three years. The last such audit was done in 1995, covering fiscal year 1994 and the first trimester of fiscal year 1995. The report from this audit concentrated mainly on how profits from 1993 and 1994 were used, and was conducted by checking cash and bank documentation, and personnel compensation. It also checked some accounts at the end of the first trimester of 1995, the movements of tangible fixed assets and storing of some inventories. EMRS' own auditing system was also checked. Finally some auditing duties were given to EMRS.

The State Auditing Commission is also a public organ which can audit EMRS. This is normally done when a major problem has occurred.

(10) EMRS accounting system

MOPWT's accounting department consists of four female officers. At present, the accounting department has not been equipped with computers and all accounting information has been recorded and maintained manually by these officers. As mentioned in the preceding section, EMRS requests its accounting data processing to be conducted by the Center in Tirana. The Center processes all accounting information in its computer, prepares EMRS's annual financial statements and returns it to EMRS.

As for management accounting, effective accounting measures to enhance productivity have yet to be implemented. For instance, the accounting department does not prepare

internal accounting information by division, i.e., sewerage maintenance department, road maintenance department etc..

(11) Financial statement analysis of EMRS

Tangible fixed assets are the most important assets for the maintenance of EMRS's financial condition. Ratio of the tangible fixed assets (net of accumulated depreciation) to the total assets were about 90%, 91%, and 93% in 1993, 1994, and 1995, respectively. All tangible assets were financed by subscribed capital. Following is a summary of the information of tangible assets of EMRS.

Table 5.1.6 Summarized information of EMRS's tangible assets

(Lek)

	1993	1994	1995
Tangible assets			
Land, squares, buildings, general installation		187,254	1,332,370
Technical installations, machinery and equipment, tools		4,524,403	11,340,434
Others in use		215,056,476	233,056,476
Accumulated depreciations		-2,332,537	-2,781,401
Total tangible assets	198,087,828	217,435,596	242,947,879
Total assets	220,164,595	237,879,418	261,350,673
Tangible assets ratio to total assets	89.97%	91.41%	92.96%
Subscribed capital	200,725,858	220,518,286	246,942,913

Source: EMRS "LLOGARITE VJETORE (Gjendja Financiare)" 31 Dec. 1994 and 1995.

The balance as of 31 December 1993 was not broken down. "Technical installations, machinery and equipment, tools" included 'Technical installations, machinery, equipment, tools', 'Transport vehicles', 'Office & computer equipment' and 'Working & production live stock'. "Others in use" included 'Maintenance/reconstruction/paving of roads and sewer pipes'.

1) Acquisition cost of tangible assets

Tangible assets are classified in the balance sheet as in subsidiary ledgers. They are recorded in the same ledger as the economic inventory. Each of the assets is grouped in the ledger according to its classification. The fixed assets ledger is updated each year-end according to a physical inventory, which is performed by a special commission of the employees from EMRS. The assets ledger includes the group each asset is classified under, the name of the asset and its historical value. As in the balance sheet "GJENDJA DHE NKRYSHIMET E AKTIVEVE TE

QENDRUESHME ME VIEREN BRUTO" (Balance and changes of fixed assets on the historical value), each group of tangible assets contains:

- Buildings - the buildings of the Head Office, a store-house, an office for emergencies, buildings of small-volume production of materials for paving, etc.
- Technical installations, machinery, equipment, tools- machinery, equipment and tools used for the works EMRS does.
- Transport vehicles - including all the transportation vehicles
- Office & computer equipment - including all office equipment. The enterprise does not have any computers.
- Working & production live stock - including horses and carriages.
- Maintenance/reconstruction/paving of roads and sewer pipes - including works of EMRS invested from the budgetary funds on road maintenance/pavement and sewer pipe laying.

The totals of each group of assets in the ledger agree with the figures in the balance sheet. As regards the item "Maintenance/reconstruction/paving of roads and sewer pipes", the ledger was updated till 1992 and all investments works are included in detail. After 1992, the assets ledger has been prepared each year. In this ledger, the investments road maintenance and sewer pipes of the previous years are included as a total while the investments of the year are included in detail.

Regardless of the sector they are included in, either maintenance of roads or sewerage system, investments of EMRS are shown in the balance sheet together. There are no separate ledgers or separate statistics prepared for each sector. Per fixed assets ledger, the works on road maintenance and sewer pipes were registered since 1965. The first record of the ledger is an item which contains "Works up to 1965". After this first record, the items recorded are investments made by EMRS, made in detail for each project. Because the assets are included all together (there are about 320 manual records) only a manually work can separate the investments on sewer pipes from the ones road maintenance. These investments reach a value of about 170 million Lek.

It is possible to identify investments made by EMRS for the period 1992-1995 from registers maintained by EMRS itself which show EMRS has performed about 64 million Lek worth of investments. About 19% of these works were performed on

the sewerage system. As explained, this number is not readily available for the period before 1992.

It is important to take note of the fact that starting from 1992 (including 1992), EMRS started to contract out big-volume work projects to private companies. But, as only investments performed by EMRS are included in the balance sheet, works contracted-out to private entities are not recorded as assets on EMRS's balance sheet. Investments done by private entities in this period are estimated to reach approximately 100 million Lek. These works were checked and taken-over by EMRS (in the technical department they are registered as property of the company) but are not included in the balance sheet. Accounting of these funds is balanced in at zero at the end of the year because: this money comes from the state budget and goes straight to the private entities (exactly the same amount); and the budget funds' account is closed at the end of the year. As a result, these investments are neither included as assets nor charged as expenses in the balance sheet.

2) Depreciation of tangible assets

According to the book "PLANI KONTABEL 1 PERGJITHSHEM" a straight line method should be used for calculating the depreciation of fixed assets. An exception is made in the case of EMRS where a document issued by the Ministry of Home Trade and Tourism, "New Depreciation rates Fixed Assets", dated 25.02.1992, is used as the base document for calculating the depreciation.

The method as explained by the responsible personnel, is as follows:
Calculation of the depreciation uses the "New Depreciation rates of Fixed Assets" table. These rates are applied to each group and not to each asset. If an assets is acquired at the beginning of the year, it is depreciated for the entire year. If it is acquired after the middle of the year, depreciation is calculated for half the year. After the first year of acquisition, all assets are grouped together and no accurate information on the status of the depreciation of an asset is available. The possibility also exists that calculation of the depreciation continues even after the asset has totally depreciated

Depreciation at EMRS is calculated as follows;

MOPWT does not have a depreciation ledger of fixed assets. It is also interesting to note that depreciation is never applied on the "Maintenance/reconstruction/paving of roads and sewer pipes" group. It is only applied to other groups. Application is to each group and not to each individual asset, in the following manner:

The total of each group, times(*)
the respective Depreciation rate of the group, times (*)
70%, equals (=)
The depreciation fund for the respective year

Notes:

1. The depreciation method from the previous economics system states that 70% of the depreciation fund was used for investments and 30% for big-volume reconstruction. With the new accounting system, the depreciation funds is not divided in the same way in the B/S, but the rate of 70% is still in use. This method is not documented (at least no source can be identified). This method was applied in 1995 following calculations made the previous year.

2. Depreciation rates used are not explicitly as in the table and are (in percent);

   Buildings 3
   Technical installations, machinery, equipment, tools 15
   Transport vehicles 15
   Office & computer equipment 10
   Working & production live stock 10

3. In fact, asset movements of the previous year are not taken into consideration when calculating the depreciation.

   The depreciation fund of the previous year, plus (+)
   the depreciation fund for the respective year, minus (-)
   total out-of-use assets during the respective year, equals (=)
   The total depreciation fund, which is recorded in the B/S.

The above mentioned explanation gives the relation between the "GJENDJA DHE NDRYSHIMET E ADTIVEVE TE QENDRUESHME ME VLEREN BRUTO" and "PASOYRA E AMORTIZIMEVE" tables

3) Other item

1 Income taxes : MOPWT is a component of the public sector, but, is currently subject to corporate income taxes under the State revenue system.

2 Capital Transactions : The following items concerning Subscribed capital in 1995 include:

- The development fund
- Investment funds for buildings, economic inventory, machinery, etc.
- Investment funds for road maintenance and sewerage system, and work conducted by EMRS itself.

It is mentioned that the "Investments fund for road maintenance and sewerage system, the work done by EMRS itself" should be entered under the item "Subsidies for Investments", but has been grouped under Subscribed capital.

3 Funds/Reserves : The net profit of the company is divided and the amount set as reserves/funds is determined using the "CAKTIMI I FITIMIT" table (Profit Determination). Each of these reserves/funds is registered on the B/S, under Liabilities & Equity, at the account Other Own Funds (Public Enterprises). Other Own reserves/Funds movements are described as;

The funds of the previous year, plus (+)
the amount of funds determined to be used for the year, minus (-)
the funds used during the year, equals (=)
The reserves/funds, as recorded on the B/S

5.2 Legislation

5.2.1 Legislative and Administrative Structure

Albania was known as the Socialist People's Republic of Albania till April 29, 1991, after which its was changed to the Republic of Albania. On this date, the Albanian Parliament (People's Assembly) approved a package of laws called "For the Main Constitutional Dispositions" (Dispozitat Kryesore Kushtetuese), which, was approved by law 7491 (enacted on the same date) still in force.

After shifting to a market economy, the entire legal system was put under review and certain laws and regulations established. However, since many of these have been changed repeatedly, some regulations overlap each other, while others still have gaps. Thus, the legal framework for the development of the public water services is still at a rather preparatory stage.

The Albanian legal system is based on the European system, and the legislative and administrative structure is as follows:

1. Constitutional laws
2. Laws adopted by Parliament
3. Decrees of the President approved by Parliament
4. Decisions, orders and instructions of the Council of Ministers
5. Orders, regulations and instructions by Ministers
6. Prefectural decisions and orders
7. Decisions and orders set by councils at the district, municipal, and community level
8. Decisions and orders set by municipal and community leaders

Legislative authority : The Parliament (People's Assembly) is the highest and most powerful organ of the state and the only legislative body in Albania. The current Parliament consists of 140 deputies elected for a four-year terms.

The Parliament has the authority to :

- define domestic and foreign policy
- adopt new laws and constitutional regulations and amend current ones
- enact economic and social programs for national development, and approve the national budget, which is compiled by the Council of Ministers

- declare partial or general mobilization of the armed forces, a state of emergency or a state of war in the case of armed aggression against the Republic of Albania or when such action is necessary to fulfill obligations set by international treaties
- ratify and refuse to ratify main treaties
- grant amnesty
- hold popular referendums
- elect and impeach the President of the Republic
- control the activity of the Council of Ministers and General Prosecutor's office
- oversee the activity of media under its authority, such as Albanian radio and television, the Albanian News Agency and other official media or public information sources (the status of these institutions is defined by law)
- determine the national administrative and regional structure
- create or dissolve ministries or equivalent bodies

5.2.2 Laws and Regulation in the Water Sector

The following laws pertain to the management of public enterprises, the water sector and environmental protection.

(1) Laws related to the management :

- LAW 7512 (dated August 10, 1991): "ON SANCTION AND PROTECTION OF PRIVATE PROPERTY, FREE INITIATIVE, FREE PRIVATE ACTIVITIES AND PRIVATIZATION" This is the first law on the privatization of state-owned enterprises, and is composed of 31 articles. Its main objective is to establish a new economic system and transform a centralized state-controlled economy into an economic system based on the principles of the free market, in accordance with articles No. 10, 11, 12, 13 and 16 of Law 7491 (dated April 29, 1991), "On major constitutional provisions."

- LAW 7572 (dated June 10, 1992): "THE ORGANIZATION AND FUNCTIONS OF LOCAL GOVERNMENT" This law sets the organization and functions for the local government in every community, municipality and district. The organization and functions of the local government are based on the principles of self-government, local autonomy, rule of law, and free elections. Organs of the local government act

as independent organs and oversee public activities in their respective areas. This law also states that the role of the local government is to ensure the implementation of urban development plans and to ensure that local transportation systems, road systems, and postal services are all smoothly functioning. However, there is no article concerning water supply and sewerage systems.

- LAW 7582 (1992): "ON STATE ENTERPRISE" This law gives the definition of a State Enterprise: 1) the state is its only owner; 2) its leading body is a council, whose members are appointed for a period of 4 years by the responsible government institutions; 3) the director of the council represents the enterprise; 4) changes in the ownership of the state enterprise are possible if they conform with the law; and 5) the responsible government institution decides whether to divide or combine enterprises.

- LAW 7638 (1993): "ON COMMERCIAL COMPANIES" This law gives the definition and legal frameworks for establishing, operating, steering and auditing commercial enterprises, i.e., general partnerships, limited partnerships, public companies, etc.

- LAW 7926 (1995): "ON TRANSFORMATION OF STATE ENTERPRISES INTO TRADING COMPANIES" This law states the following: 1) that the Ministry of Finance is the holder of all state capital; 2) that the Directorate for State Companies, responsible for privatization, was established to act as a trustee for all public companies as long as they are not privatized or transformed into community enterprises; and 3) in such a case, a board of directors will be established, the members of which are nominated by the Ministry of Finance and the governing organ to which the public enterprise belongs.

- LAW 7973 (1995): "ON CONCESSION AND PARTICIPATION OF PRIVATE SECTOR IN PUBLIC SERVICE AND INFRASTRUCTURE" This law states that all state enterprises may concede to private companies the functions of the enterprise, such as production, water treatment, water distribution, administration, etc. This law does not exempt the sectors which are exempted from privatization in Laws 7512 and 7926. In this law, the following type of concessions are specified: concession, lease contracts, management contracts, service contracts, BOO, BOT, BOOT, ROT and BLT.

- LAW 8102 (dated March 28, 1996): "ON REGULATORY FRAMEWORKS FOR WATER SUPPLY, SEWERAGE SYSTEMS AND THE WASTE WATER TREATMENT SECTOR" This law's main objectives are to protect the public interest and to attract private investment in the area of water works and sewerage services. This law provides the regulatory framework for management and operation of all companies/institutes who function as water suppliers or provide sewerage services. The regulatory framework consists of a license system which applies to any companies operating as water suppliers or which provide sewerage services, and defines the water tariff system to be used by these companies, plus these companies' operational responsibilities. This law also defines the functions of the Regulatory Agency, which regulates water suppliers and providers of sewerage services, and the functions of the National Water Supply Regulatory Commission, which supervises the Regulatory Agency.

- LAW 8103 (dated March 28, 1996): "ON PRIVATIZATION OF WATER SUPPLY, SEWERAGE SYSTEMS AND THE WASTE WATER SECTOR" This law is utilized in cases where general decisions regarding privatization have been made and other decisions will be required in the future. With respect to the transformation of the public service enterprises into commercial utilities (either public or privately owned companies), regulations are under preparation and supported by the World Bank.

(2) Laws and regulations on environmental protection:

- GENERAL REGULATION (dated October 16, 1974): "ON TECHNICAL REGULATIONS FOR INDUSTRIAL WATER DISCHARGE" This regulation applies to industrial water discharge which flows into the rivers and lakes of Albania. It was issued by the Ministry of Industry and Mining and approved by Ministry of Health. Prior to it, on February 5, 1974, "LIMITS OF THE PERMITTED CONCENTRATIONS OF TOXIC MATERIALS, DISCHARGES INTO SURFACE WATER WHICH IS TO BE USED FOR DRINKING AND FOR OTHER SOCIAL/CULTURAL ACTIVITIES" was prepared by the Ministry of Industry and Mining and approved by the Ministry of Health. These limits have now been revised and will be reissued in a couple of months.

- HYGIENE/SANITATION REGULATION (dated October 28, 1983): "ON PROTECTING, BUILDING, UTILIZING, MAINTAINING, AND SUPERVISING

THE DRINKING WATER SUPPLY" This regulation was issued by the Ministry of Health and Environmental Protection. It defines the criteria and hygiene/sanitation standards for projecting, building, using, maintaining and supervising the works which supply the population with drinking water. It is scheduled to be revised within a few months.

- DECISION 228 (1992): "ON POLLUTION CONTROL IN URBAN AREAS" This decision is regarded as an outline for the development of a regulatory framework to control pollution caused by liquid, solid or gaseous substances.

- LAW 7664 (1993): "ON ENVIRONMENTAL PROTECTION" This is an umbrella law with the objective of preparing specific laws, regulations and standards governing pollution control and environmental protection. Previous legislation has been very deficient in this regard. Decree 5105 (1973) "ENVIRONMENT PROTECTION FOR THE POPULATION" and Decision 205 "MEASURES TO BE TAKEN FOR PROTECTING THE ENVIRONMENT FOR THE POPULATION," prepared by the Ministry of Industry and Mining, were the first legal acts and regulations on environmental protection. The new law "ON ENVIRONMENTAL PROTECTION," approved by Parliament in 1993, was modeled upon the legislation of different European nations and in consultation of experts from international organizations.

- DECISION 541 (dated September 25, 1995): "ON THE RESPONSIBILITY OF MINISTRIES, AGENCIES, AND PHYSICAL AND JURIDICAL PERSONS TO MONITOR AND PROTECT THE ENVIRONMENT" This Decision orders Ministries, Institutes and Agencies to monitor the level of contamination of air, water, land, etc., and each juridical and physical person is to continuously observe and document the discharge of material which affects the environment and exceeds recommended levels.

- LAW 8093 (dated March 28, 1996): "ON WATER RESOURCES" This law provides the maintenance and development of water resources, and ensures their good use. At the same time, this law also covers the sharing of water resources, and their protection from pollution. Institutional frameworks at the national and regional level are defined by this, creating a national policy for supervising and managing water resources.

(3) Other water supply and sewerage system regulations:

- DECISION 102 (1992): "ON WATER DEMAND" This defines the volume of water consumption at 150 l/day per capita. This figure has to be considered in the design of any water supply system in the future. With respect to pricing policy, the former regulation on standard consumption at the government fixed rate is still in force.

- DECISION 236 (1993): "ON THE ADMINISTRATION OF WATER SUPPLY FOR DOMESTIC AND NON-DOMESTIC USERS" This states the following: 1) that sales contracts have to be made between water suppliers and non-domestic water consumers; and 2) that installation of water meters and metering will be carried out at the expense of the consumer. Further regulations are given regarding those who fail to pay and on illegal connections.

- LAW 7846 (dated July 21, 1994): "ON CONSTRUCTION, ADMINISTRATION, MAINTENANCE AND OPERATION OF IRRIGATION AND DRAINAGE SYSTEMS" This law sets regulations on dams, rivers and reservoirs, protective barriers on rivers, drainage networks, irrigation systems, and pump systems.

- DECISION 404 (dated September 5, 1994): "ON TARIFFS FOR STUDYING, PROJECTING, MANAGING AND REPAIRING CONSTRUCTION WORKS" This tariff regulation is to be applied to studying, projecting, managing and repairing construction works supported by the State.

- DECISION 905 (dated December 30, 1996): "ON TARIFFS ON DRINKING WATER" This is a replacement for the previous Decision on Water Tariffs, and sets the increases in tariff rates which water suppliers may charge water consumers. Tariff rates are classified by consumer type, such as families and institutions.