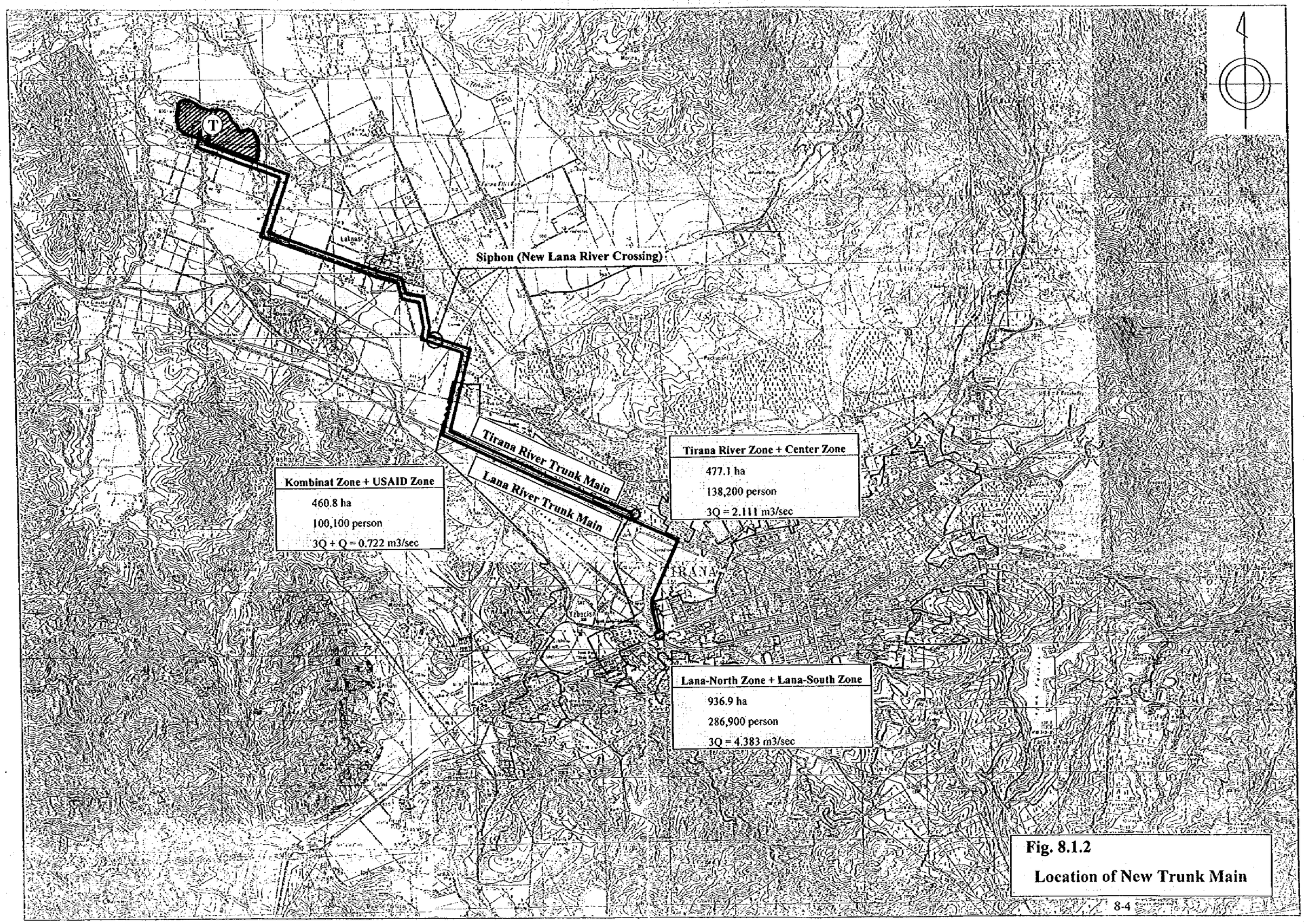


Fig. 8.1.2

Location of New Trunk Main

(4) Construction of sewer system in expansion area of sewerage system

The sewage collection system for expansion area of sewerage system will designed to be separate system.

In this preliminary design, only main sanitary sewer is taken up since the future land use, particularly road network and housing development, is not clearly defined yet to develop future sewer network. The unit length of main sanitary sewer is assumed to be 50 m/ha.

Required length and maximum diameter at the end point of main sanitary sewer in each expansion area are estimated as shown in Table 8.1.2.

Table 8.1.2 New Main Sanitary Sewer in Expansion Area of Sewerage System

Zone		Area (ha)	Length (m)	Population (person)	Sewage (m^3/sec)	Specification of Main Sewer at Maximum Size			
						Dia. (mm)	I (‰)	V (m/sec)	Q (m^3/sec)
Tirana	Tirana-1	41.7	2,085	18,700	0.095	450	5.0	1.27	0.202
	Tirana-2	4.2	210	1,100	0.006	200	5.0	0.74	0.023
	Tirana-3	12.3	615	2,500	0.013	200	5.0	0.74	0.023
	Tirana-4	22.1	1,105	4,400	0.022	250	5.0	0.86	0.042
	Sub Total	80.3	4,015	26,700	0.136				
Lana-South	Shkoza	14.6	730	6,600	0.034	300	5.0	0.97	0.069
	Student's City	29.5	1,475	5,400	0.028	300	5.0	0.97	0.069
	Selita	35.6	1,780	8,600	0.044	350	5.0	1.07	0.103
	Kombinat	15.0	750	-	-	400	5.0	1.17	0.147
	Sub Total	94.7	4,735	20,600	0.105				
USAID	USAID-1	70.0	3,500	14,000	0.071	400	5.0	1.17	0.147
	USAID-2	300.0	15,000	60,000	0.306	700	5.0	1.70	0.654
	Yzberishi-1	16.5	825	4,400	0.022	250	5.0	0.86	0.042
	Yzberishi-2	3.3	165	900	0.005	200	5.0	0.74	0.023
	Sub Total	389.8	19,490	79,300	0.404				
Total		564.8	28,240	126,600	0.645				

(5) Sewer pipe construction method

1) General conditions for sewer pipe installation

The soil in the study area is generally of uniform stratum of mainly loose medium silty clay and loose fine sand at the depth at least of 2 to 5 meters from ground surface.

Groundwater level is supposed more than 3.0 m below ground surface depending on the specific locations. Excavation for the proposed sewer facilities extend from the ground surface to a depth of approximately 2 m to 4 m below.

2) Principle construction method for large sewer pipe at deep position

The following comparison table shows the principle construction method which is applied for large and deep sewer pipe. Among the construction method, open cut method, likewise pipe jacking method, shall be a most suitable method for the target sewer pipes. Additionally, the open cut with temporally embankment or sheet piles for encasement at half-way in the river may be utilized for river crossing point.

In this connection, it is highly recommended that the construction method must be studied more deeply in the detailed design, taking into account the soil condition, groundwater level, traffic condition and riverbed condition in order to select the most suitable construction method for smooth and economical construction works.

Table 8.1.3 Comparison of the Sewer Pipe Construction Method

Construction Method	Typical Features
Open Cut Method	1) This is the most popular and economical method, but protection work is needed for safeguard of works. 2) Water Proof is not always perfect, but this method can keep the continuous work against the earth pressure.
Pipe Jacking Method	1) This method is suitable for the self-support soil and the excavation is performed by man power or mechanical equipment. 2) Excavated soil is transported outside by a muck car or automatically.
Earth Pressure Type Shield Method	1) The face is held by excavated material filled in the chamber. 2) Excavated material is taken out by screw conveyer and then transported outside by a muck car.

8.2 Sewage Treatment Plant

8.2.1 Design Criteria

(1) Sewage flow and quality

1) Sewage flow

Daily Average	106,000 m^3/day	
Daily Maximum	106,000 m^3 /day	
Hourly Maximum (Dry)	9,670 m^3/hour	(= 232,000 m^3/day)
Hourly Maximum (Rain)	26,000 m^3/hour	(= 624,000 m^3/day)

2) Sewage quality

Influent:	BOD_5	200 mg/l
	SS	200 mg/l
Effluent:	BOD_5	25 mg/l
	SS	35 mg/l

(2) Treatment method

Aerated lagoon method is applied as determined the preceding Chapter 7.

(3) Phased construction

Phase 1	(in 2001)	53,000 m^3/day
Phase 2	(in 2010)	53,000 m^3/day
Total		106,000 m^3/day

8.2.2 Location of Sewage Treatment Plant

(1) Location

Some candidate sites for sewage treatment plant are proposed and examined. Required conditions for the treatment plant site are:

a. The site should be downstream and near the Lana or the Tirana River.
b. The site should be as close to Tirana City as possible to shorten a trunk main to the plant.
c. The site should have more than 50 ha, which is needed to construct a treatment plant of 100,000 m^3/day by aerated lagoon method.
d. The site should have steady physical and environmental conditions, and the construction and operation of the sewage treatment plant should not affect other industries, such as water supply, coal mining, etc.

Proposed sites for sewage treatment plant are as follows:

Location A: Yzberishi, 4 km west of Tirana center or 1 km west of old airport.
Location B: Laknas, 10 km northwest of Tirana center or 1 km east of Laknas.
Location C: Berxulli, 11.5 km northwest of Tirana center or near the confluence of the Old Lana and the Tirana Rivers.

The location of these proposed sites are shown in Figure 8.2.1 and their local conditions are described below.

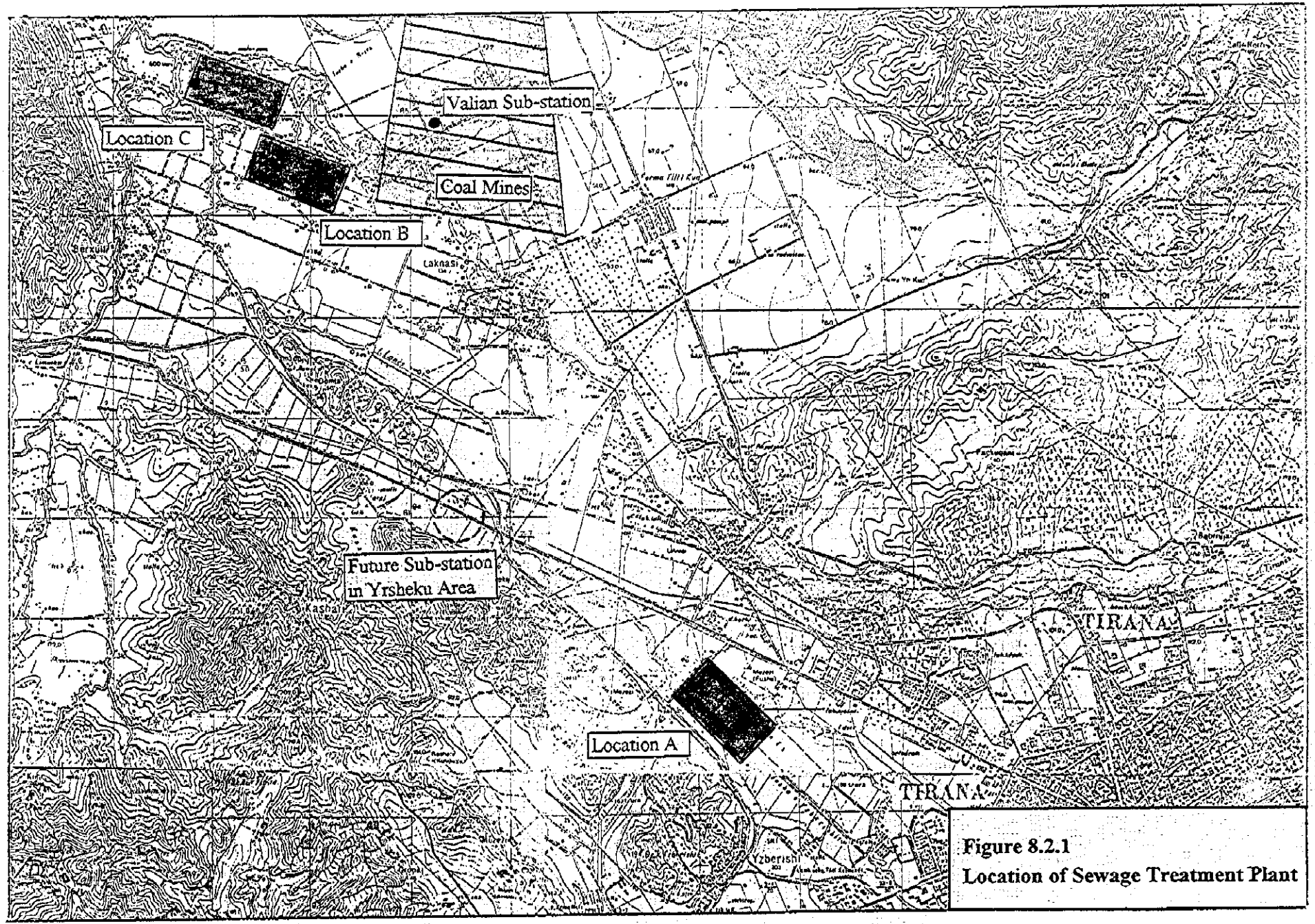


Figure 8.2.1
Location of Sewage Treatment Plant

Location A

This proposed site is presently agricultural field. However, this site is categorized as the urban area in Future Land Use Plan for Metropolitan Tirana and also nominated to Preliminary Zone Action Plan Area in the Preliminary Zone Action Plan for Western Tirana being implemented under technical assistance of USAID, 1996. Therefore, this site is not available for the proposed sewage treatment plant.

Location B

Location B is located between the Tirana and the Old Lana Rivers. The Lana River was changed its flow at just downstream of railway crossing and flows into the Tirana River about 25 years ago. Then, there is only few water flowing in the Old Lana River. Some wells for water supply had been developed in the area between Laknasi town and Domia hill, which is about 1 km west of Location B. The Enterprise of Hydrogeology pointed out a risk that if sewage leaks from the plant, it would contaminate groundwater. Location B is, therefore, abandoned to avoid the risk, even though it is minimum.

Although some areas are also examined between Location A and B along the Lana River, there is not enough area suitable for sewage treatment plant and the area along Rruga e Durresit is considered for industrial and commercial use.

Location C

Then, Location C is finally adopted as the site for sewage treatment plant, which is about 2 km downstream from the existing wells. Soil conditions are determined favorable for the purpose. is better.

(2) Topographic conditions

The proposed site situates near the confluent point of the Tirana River and the Old Lana River, approximately 11.5 km northwest from the center of Tirana City. This site has a length of approximately 1,200m in east to west direction and width of ranging from approximately 300 to 600 m in north to south direction. Northern end of the site faces to the Tirana river, while western end faces to the Old Lana River. This area is currently used for agricultural purpose.

Average elevation in the site is about 42.0 m above the sea level. Terrain is generally flat with the highest elevation of 43.8 m and the lowest elevation of 39.7 m. Average gradient of ground surface is about 0.3 % and this slope is extended toward northeasterly direction. Difference of elevation between the site and rivers is approximately 10 m.

about 55 ha conducted during the Stage 2 field work is contained in Supporting Report 8.2.1.

(3) Geological and hydrogeological conditions

The proposed site of sewage treatment plant is placed on the alluvial deposits of the first terrace of the Tirana and the Lana Rivers. The site consists of four soil layers with different lithology and geotechnical properties. These layers in downward direction are as follows:

Layer 1	Top soil (cultivated land), thickness 0.5 - 0.6 m
Layer 2	Silt to clayey silt (with sand lens), thickness 3.8 -4.1 m
Layer 3	Silty clay, thickness 12 - 14 m
Layer 4	Gravel, 20 - 30 m

Hydrogeological characteristics of the area were also surveyed as follows:

Permeability:	50 - 100 m/day
Transmissivity	500 - 100 $m/m^2/day$
Specific discharge of wells	5 - 12 l/sec/m

The permeability of the Layer 2 is of the order of 10^{-4} cm/sec, Layer 3 is 10^{-5} cm/sec. Groundwater resources in gravely aquifer is available in this area and widely utilized for water supply to Tirana City and villages in the vicinity.

Considering the above mentioned geological conditions, recommendations are prepared for construction of the sewage treatment plant:

- Application of a thin concrete cover to the lagoon, and
- Compaction of silty soil laying on the bottom of lagoon and its banking.

Compression of the soil must be carried out for the thickness of 20 cm. This compression shall be considered when the silty soil has the following properties:

- Moisture content: more than 30 %
- Dry unit weight: less than 1.50 t/m^3

The slope of banking is recommended to be:

- Concrete cover: 1:1
- Compressed silty soil: 1:2

The building foundation must be deeper than 1 m from the ground level and rest on the silty soil of Layer 2. The allowable capacity of the silty soil is evaluated at 14 t/m^2.

The above mentioned recommendations shall be considered as preliminary and detailed soil investigation for more accurate evaluation will be required for detailed design.

Preliminary survey results on geology and soil conditions including boring test are presented in Supporting Report 8.2.2.

8.2.3 Design Considerations

(1) Layout

Results of topographic survey indicate gentle slope in the plant site. The slope is down toward north and west, where Tirana and old Lana rivers are located. In order to fully utilize this slope, influent will be located at center of south end border and sewage will flow to north and discharge to Tirana river by gravity. Detailed information of topographic survey is shown in Supporting Report 8.2.1.

(2) Hydraulic profile

There is a large level difference, about 54 m, between the location of downstream of the existing interceptors (93.6 m) and sewage treatment plant site (40.1 m). By this reason, gravity flow can be used for transmission of sewage instead of having a lift pump station, although the transmission pipe has to cross the Lana River, national road and railway.

The highest water level at the Tirana River as discharge point of treated effluent is 28.5 m. In appreciation of sufficient difference of elevation between the treatment plant and this water level, no lift pump station is required for effluent disposal.

(3) Number of basin

Planned sewage flow into the treatment plant are 50,800 m^3/day in Phase 1 and 105,400 m^3/day in Phase 2, respectively. Thus, the nominal capacity of the treatment plant to be constructed is determined to be 53,000 m^3/day in Phase 1 and 106,000 m^3/day, respectively.

In each phase of construction (53,000 m^3/day), the treatment plant will have four (4) series of basins. This facility configuration is determined in consideration of that:

- Single series of treatment plant will require the minimum construction cost, while the operation will be done for full scale although sewage inflow at initial stage will be less than the planned sewage flow.

- For cleaning or repair of the treatment facility, the single series design will necessitate complete suspension of sewage treatment.
- Four series of basins, at least three-fourth (3/4) or 75 % of the treatment plant can be operated while the rest, one-fourth (1/4) or 25 % of the plant is being cleaned or repaired.

In addition to the above, some stand-y basins are considered for grit chambers, partial mixing aerated lagoons and stormwater settling basins where periodic cleaning or removal of sediments are required.

Number of basins are listed in Table 8.2.1.

Table 8.2.1 Number of Stand-by Basin by Treatment Facility

Name of Facility	Phase 1	Phase 2	Total
Grit Chamber	4 (1)	4 (1)	8 (2)
Partial Mixing Aerated Lagoon	12 (1)	12 (1)	24 (2)
Stormwater Settling Basin	4 (1)	4 (1)	8 (2)

(4) Sewage temperature

Aerated lagoon employs biological treatment process to convert finely divided and dissolved organic matters contained in sewage into flocculant which is settleable biological and inorganic solids by sedimentation. In this process, activities of suspended microorganisms is affected to less treatment efficiency under low temperature.

Temperatures of sewage and river water measured in the water quality examination (January, 1997) are shown below.

Sewage temperature (average figure from 6:00 to 22:00)

Location	New Apt. Bldg.	Old Apt. Bldg.	Indiv. Housing	Average
Temperature (℃)	12.6	9.9 & 10.7	9.6	10.7

Sewage temperature (from 6:00 to 22:00 at old apartment building)

Time	6:00	10:00	14:00	18:00	22:00	Average
Temperature (℃)	8.4	10.6	11.4	10.0	9.2	9.9

Sewage temperature is low at about 9 ℃ at early in the morning and late in the night when the ambient temperature is low and sewage flow is decreased. However, it becomes high as 10 to 11 ℃ during daytime and the sewage flow is increased.

River water temperature (average from 6:00 to 22:00)

Location	Upstream	Downstream
Tirana River	7.5	8.8
Lana River	8.3 & 9.3	9.9 & 10.9

It was observed in both rivers that the water temperature at the downstream was higher than that at upstream. This difference of water temperature is considered to be occurred due to inflow of sewage to rivers.

Based on the above mentioned survey results, the minimum sewage temperature is assumed to be about 9 to 10 ℃, and 9 ℃ is applied for the design of the complete mixing aerated lagoons.

(5) Stormwater treatment

As discussed in the preceding section, sewage is treated by aerated lagoon, but the trunk main also conveys storm water to the treatment plant. The treatment plant will only accept the design sewage flow (Q) and exceeding volume of storm water contained in the influent will be discharged to the Tirana River after sedimentation and disinfection.

(6) Sludge disposal

The sludge and floating debris to be removed in each process of sewage treatment are:

a. Grit chamber: screenings and grit
b. Partial mixing aerated lagoon: sludge
c. Stormwater settleling basin: sludge

As described in the above (3), a stand-by basin for each of treatment facilities is arranged to dry and remove these constituents periodically. The sludge is usually in the form of muddy liquid that typically contains from 2 to 5 % of solid in dry weight, and it is by far the largest in volume. Their processing and disposal is the most laborious work in operation and maintenance of the treatment plant.

Since the sludge is muddy liquid, it should be dried up to the form of solid that contains about 25 % of solid in dry weight. For their treatment, there are several methods for collection, thickening and drying with the use of mechanical facilities. Natural drying is, however, applied for the proposed project after removal and transportation by a wheel loader and dump trucks in view of low cost construction and operation. The removed sludge should be transported and disposed at solid waste dumping site for final sanitary landfill.

(7) Structure of lagoons

Complete and partial mixing aerated lagoons, storm water settling tanks and disinfection tanks are shaped by natural soil to reduce construction cost, while grit chamber is concrete structure to cope with rapid flow of influent.

Most of soil up to - 18 m from the surface in the plant site is clay or silly clay which are very low in permeability, especially thick zone of below - 4 m to - 18 m. Detailed information is shown in Supporting Report 8.2.2.

This soil condition is suitable for shaping lagoons using the original soil as well as to prevent sewage infiltration to underground and contaminate groundwater. Meanwhile, some part of surface of dike will be protect from erosion by waves at water surface level by concrete tiles.

8.2.4 Design of Facilities

The composition of the sewage treatment plant was established, considering design flow 106,000 m^3/day for target year of 2010 and Phase 1 (2001), 53,000 m^3/day. A total of two treatment unit system with a capacity of 53,000 m^3/day are planned and each unit system consists of four lines of aerated lagoons; one complete mixing aerated lagoon and three cells of partial mixing aerated lagoons.

(1) Layout

Since land for the treatment plant is located between the Tirana and the Old Lana Rivers and boundary of the land is curved, all the land can not be utilizes fully. Although 55.4 ha of land is measured by topographic survey, 25.9 ha in west side of the land is used for Phase 1 and next 20.5 ha is used for Phase 2, and remaining 9.0 ha in east side of the land will not used for the plant. Layout of sewage treatment plant is shown in Drawing 1.

(2) Capacity calculation

Specifications of sewage treatment plant is shown in Table 8.2.2, with numbers, dimensions and design parameters for each facility. Capacity calculation and sizing of respective treatment units are shown in Supporting Report 8.2.3.

(3) Hydraulic calculation

Hydraulic calculation is shown in Supporting Report 8.2.4 and hydraulic profile is shown in Drawing 2.

Table 8.2.2 Specifications of Sewage Treatment Plant

Sewage Treatment Facilities			Total
1. Grit Chamber and Screen			
Type		Parallel Flow Type	
Dimension	Width	3.00 m	
	Length	22.00 m	
	Depth	1.50 m	
Water Surface Load		1,576 $m^3/m^2/day$	
Average Velocity		0.27 m/sec	
Number of Basin		basins	8
	(stand-by)	basins	(2)
2. Complete Mixing Aerated Lagoon			
Type		Rectangular Type	
Dimension	Width	75.00 m	
	Length	104.00 m	
	Depth	3.00 m	
Aeration Power Level		1,120 kW	
Retention Time		1.77 day	
Nos. of Basin		basins	8
3. Partial Mixing Aerated Lagoon			
Type		Rectangular Type	
Dimension	Width	72.00 m	
	Length	47.00 m	
	Depth	4.00 m	
Aeration Power Level		220 kW	
Retention Time (after cleaning)		2.0 day	
Water Surface Load		1.42 $m^3/m^2/day$	
Number of Basin		basins	8
Number of Cell	total	cells	24
	(stand-by)	cells	(2)
4. Storm Water Settling Tank			
Type		Rectangular Type	
Dimension	Width	15.00 m	
	Length	38.00 m	
	Depth	3.00 m	
Retention Time		0.63 hour	
Water Surface Load		115 $m^3/m^2/day$	
Number of Basin	total	basins	8
	(stand-by)	basins	(2)
5. Disinfection Tank			
Type		Rectangular Type	
Dimension	Width	9.00 m	
	Length	121.00 m	
	Depth	3.00 m	
Required Chlorine		26 kg/hour	
Retention Time		15.08 min	
Number of Basin		basins	2
6. Administration building			
Type		One story building	
Area		224 m^2	
Number of building		building	1

(4) Flow diagram

Outline of unit treatment facility is described below and flow diagram is shown in Drawing 3.

1) Grit chamber

Grit chamber is used to remove sediment and eliminate a large amount of grit contained in sewage and as sewage also contains such admixtures as trash, garbage, cloth, sticks etc., it is necessary to remove such materials by providing a screen in the grit chamber to keep treatment facilities free from accidents and to obtain the most effective functioning.

2) Complete mixing aerated lagoon

The configuration of the aerated lagoon is a two-basin system. The first basin, complete mixing aerated lagoon, is to remove the biodegradable organic materials (BOD) in the sewage, while the second one is for sedimentation and the stabilization and storage of the settled sludge.

In the complete mixing aerated lagoon, aerators are provided to maintain all solids in suspension and to supply oxygen for the biodegradable organic materials (BOD) removal.

3) Partial mixing aerated lagoon

This lagoon is to gravity sedimentation of the solids, biological stabilization of the settled solids, and sludge storage. Aerators which are smaller than ones in the complete mixing aerated lagoon, are required to keep a certain level of dissolved oxygen for benthal stabilization of settled sludge.

4) Storm water settling tank

Owing to the use of combined sewer system, the influent contains more than the design treatment capacity of treatment plant. The excessive influent is designed to be diverted to the storm water settling tank for removal of suspended solids, and organic/inorganic matters by gravity sedimentation by which pollution loads is decreased prior to final disposal to Tirana River.

5) Disinfection tank

This facility is designed to remove bacteria, viruses and amoebic cysta from effluent by chlorine water dosing for preventing the diseases to be caused by waterborne bacteria and viruses.

8.2.5 Power Supply to the Sewage Treatment Plant

The sewage treatment plant requires power supply for operation as follows:

(1) Power supply required by implementation phase

Phase 1	2001	approx. 750 kW
Phase 2	2010	approx. 750 kW

(2) Motors to be installed (tentative - for each phase)

Aerator	22 kW x 20 units	24 hours/day
Aerator	7.5 kW x 30 units	24 hours/day
Pump	7.5 kW x 2 units	24 hours/day
Office	30 kW	10 hours/day

(3) Allowable power interruption

Power interruption period should be less than 30 minutes.

Based on this requirement some meeting were held with Albanian Electroenergetic Corporation (KESH) who is the corporation handling the generation, transmission and distribution of electric power in Albania. Through the discussion with KESH, two sub-stations will be available to supply electric power to the sewage treatment plant site in Burxulli. The first sub-station is the existing Valias Sub-station with a capacity of 2 x 5.6 MVA - 35 kV/6 kV, located near Ferma, or about 2 km east of the plant site, whereas the second will be the future 110 kV/20 kV sub-station with a capacity of 2 x 25 MVA or 2 x 40 MVA in Yrsheku area, or 5 km southeast of the site, which KESH plans to construct by the year of 2000. KESH recommended to supply electricity from the second station which will have larger capacity and much reliable supply. Location of these sub-stations are shown in Figure 8.2.1.

At present, power interruption in the area is same as Tirana City where it occurs 2 to 3 times in a week and it lasts about 20 minutes or seldom 3 hours. KESH, however, expects very minimal power interruption after construction of the new sub-station. Consequently, power supply will meet the special requirement in the area.

Upon the request for power supply, KESH will prepare an exclusive connection and watt-hour meter in the sub-station, while the consumer has to construct transmission line to the site, or the consumer can ask KESH to do it but the cost shall be born by the consumer. KESH indicated US$ 25,000/km of cable installation cost (air lines using electric poles) from

the sub-station to the plant for budgetary purpose.

There is no local technical standard in Albania, hence international standards such as IEC etc. are applied for design and manufacturing of equipment and materials. In any case, the consumer should have all responsibility within the plant.

The tariff for the sewage treatment plant which will be categorized as government sector, consists of 3 Lek/kWh for consumption and 5 Lek/kW of fixed monthly tariff for each kW of all motor installation as of January, 1997.

8.3 Staffing Requirement for Operation and Maintenance

A total of 105 personnel is assigned for sewer pipe cleaning under the present staffing set-up of the Enterprise Maintenance of Roads and Sewerage (hereinafter referred to as "EMRS"), as of January, 1997. This staffing set-up owes to the lack of adequate and enough number of maintenance tools and equipment for their assigned work.

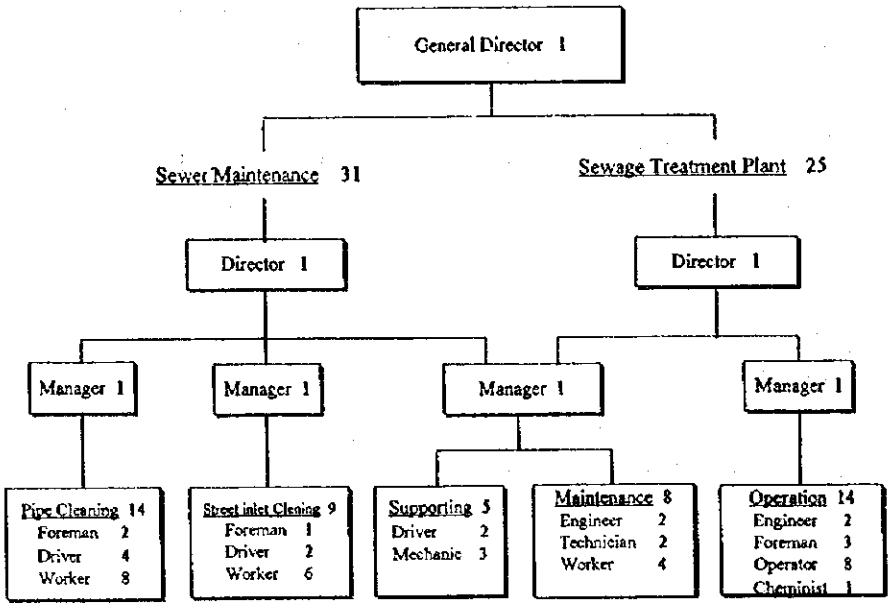
Upon implementation of the proposed project, considerable number of personnel will be required at sewage treatment plant, while sewer maintenance will necessitate less number of personnel by introduction of mechanized equipment and tools.

Considering the above mentioned present set-up and actual staffing in other countries, number of personnel required for the operation and maintenance of proposed sewerage system is estimated as follows:

Sewage Treatment Plant	25 persons
Sewer Cleaning and Maintenance	31 persons
Total Staffing Requirements	56 persons

Positioning of above personnel is shown in Figure 8.3.1. Detailed examination on the operation and maintenance of new sewerage system is described in Chapter 10.

Figure 8.3.1 Staffing Requirement for Operation and Maintenance



8.4 Staged Construction

The overall completion of the proposed sewerage system will be by the target year of 2010, while the priority project has target year of 2001 for urgent improvement of urban environment in Tirana City.

Considering the current environmental situation and budgetary constraints, staged implementation of the proposed project in two phases are recommended.

In this respect, the priority project is focused onto mitigation and improvement of water pollution in the Lana River. Construction of a sewage treatment plant is therefore included as indispensable sewerage facility to meet with the forthcoming situation which will arise by completion of the Bovilla water supply project within few years.

Likewise, the new sewerage system shall be extended to make desirable living and sanitary environment available in new urban areas.

Outline of the proposed project are summarized below.

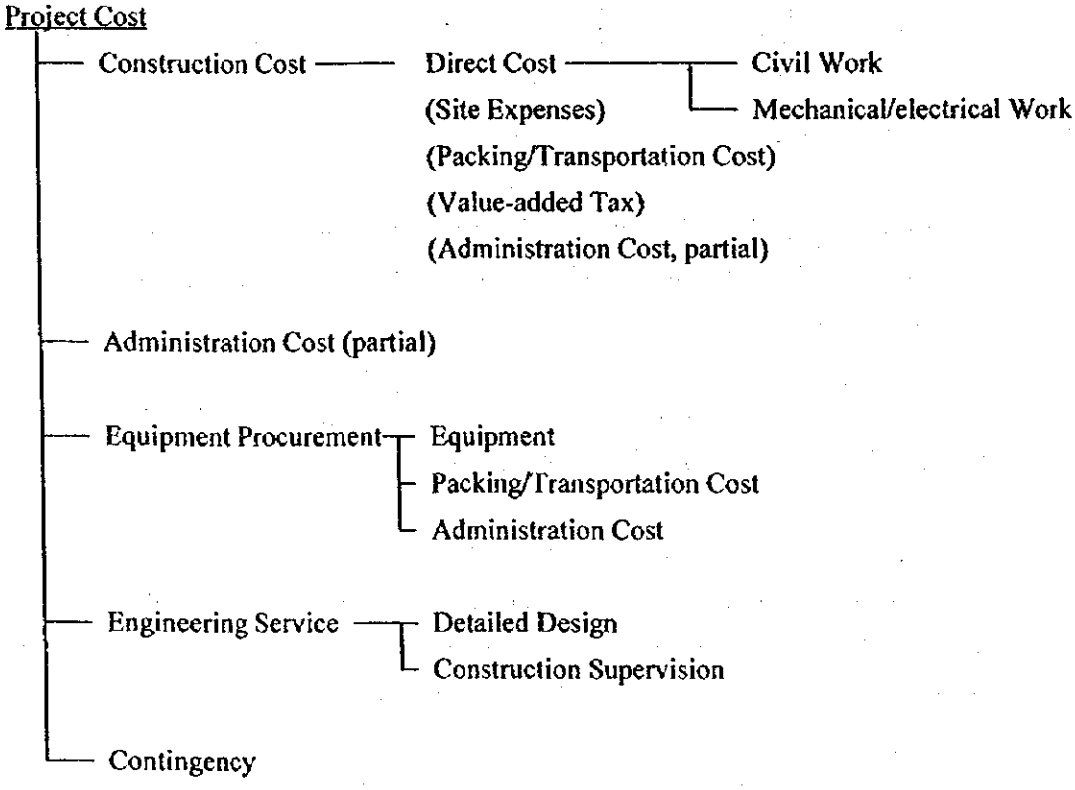
Table 8.4.1 Outline of the Proposed Project

Subject	Phase 1 (Priority Project)	Phase 2
Target Year	2001	2010
Population to be Served	254,000	525,200
Service Area (ha)	842	1,810
Planned Sewage Flow (m^3/day) (daily average-dry weather)	50,800	105,000

8.5 Project Cost

8.5.1 Composition of Project Cost

Composition of project cost is shown below:



8.5.2 Conditions for Cost Estimate

(1) Conditions

1) Basic conditions

Project cost is estimated on the basis of preliminary design of the Feasibility Study. Unit prices and lump sum prices are established considering local conditions, sub-contractors, hiring equipment, available construction equipment and materials as well as suitability of the construction method.

Assumptions and conditions applied for the cost estimate are as follows:

Price level:	as of January, 1997
Foreign exchange rate:	US$1.00 = Lek 100 = Japanese Yen ¥120
Foreign and local currency:	expressed in US $

2) Direct cost

a. Unit prices obtained from MOPWT are applied for cost estimate as of January, 1997. In compliance with the MOPWT's procedure, every cost are added 10 % for site management cost, 15 % for administration cost and 12.5 % for value added tax (VAT) to direct cost. Unit construction costs are contained in Supporting Report 8.5.1.

b. Replacement of the existing interceptor main is considered additional 50 % of construction cost of ordinary pipe laying due to complication of work under heavy traffic.

c. Administration cost is separately estimated as the cost of engineering/supervision for international contractor/s in consideration of magnitude of project for the local contractors.

3) Common expenses

Land acquisition cost for sewage treatment plant is estimated for each phase, 26 ha for Phase 1 and 21 ha for Phase 2. In each Phase, the required land should be secured prior to the commencement of the construction work. However, agreement on land acquisition for Phase 2 should be made with the land owners when Phase 1 land acquisition is made.

4) Contingency

A total of 15 % of contingency fund is considered for the project cost as physical contingency and price escalation.

(2) Scope of work to be implemented under the foreign finance

The following works are deemed to be implemented under the foreign financial assistance:

1) Procurement of engineering services for detailed engineering design and construction supervision

2) Construction contract including procurement of equipment and materials as identified in the foregoing preliminary design and project cost estimate.

(3) Scope of works to be implemented by the counterpart fund

The following indigenous works are deemed to be implemented by the counterpart fund of the Albanian Government:

1) Repair and rehabilitation of existing sewers except for interceptor main

2) Construction of lateral sewers and house connections in the proposed expansion area of sewerage system

3) Land acquisition of and relocation of local residents from the proposed site of sewage treatment plant and proposed route of trunk mains.

4) Construction of perimeter fence at the proposed site of sewage treatment plant

5) Provision of water quality examination equipment and apparatuses for BOD, COD, Phosphorus and Nitrogen, etc. (Subletting of analysis work is applicable as substitute measure.)

6) Cost of electricity and chemicals during the test operation of the sewage treatment plant, except for individual test operation of electrical equipmen.

8.5.3 Project Cost

Total cost of the proposed project is estimated at approximately 57,073 thousand US $ (5,707 million Lek).

		Unit: Thousand US $
(1)	Construction cost	
	1) Collection System	23,441
	Trunk main	14,181
	New sewer main	2,095
	Interceptor (replacement)	6,695
	Storm overflow chamber	280
	Storm water inlet	90
	2) Sewage treatment plant	13,593
	Civil work	7,572
	Mechanical/electrical works	6,021
	3) Administration cost	2,862
	Sub-Total	**39,796**
(2)	Procurement of maintenance equipment	**1,233**
(3)	Engineering cost	
	1) Detailed design	1,700
	2) Construction supervision	1,600
	Sub-Total	**3,300**
(4)	Common expenses	
	1) General and administration expenses	600
	2) Land acquisition	4,700
	Sub-Total	**5,300**
(5)	Contingency	**7,444**
	Total Cost	**57,073**
		(5,707 Million Lek)

Note: Exchange rate: 1.0 US $ = 100 Lek (as of January, 1997)
Breakdown of civil work cost of sewage treatment plant is contained in Supporting Report 8.5.2.

8.5.4 Construction Equipment and Material

Most of construction materials are imported from adjacent countries, except sand, gravel, concrete pipe, etc. The imported materials, however, are available at local market in Tirana, since the requirement on quality and quantity is not extraordinary. However, mechanical and electrical facilities, and equipment for sewer maintenance shall be imported from foreign countries.

Local products and imported materials and equipment are listed below. However, the imported materials for civil work are considered to be procured through sales agents and suppliers in Albania.

(1) Local materials

Cement, stone, aggregate, sand, crusher-run, timber, plywood, reinforcement, structural steel, concrete pipe, steel pipe, road kerb, concrete block, brick, AC roof and tile, precast building wall, fence, road/pedestrian gate, wire, nail, gabion mesh, gasoline, diesel, lubricant, bit, rod, admixture, waterstop, scaffolding, metal form, guardrail, asphalt, emulsion, and so on.

(2) Imported material

Construction equipment, track crane, vehicle, motorcycle, computer, pump, motor, transformer, switchgear, aerators, disinfection facilities, detonator, laboratory equipment, flow meter, and so on.

CHAPTER 9

PRIORITY PROJECT

CHAPTER 9 PRIORITY PROJECT

9.1 Identification of the Priority Project

Considering the present situation in Tirana in reference to the sewerage system, it is concluded that an urgent project should be considered to mitigate the environmental problem of the city. Since a rapid growth in the city in recent years and inadequate maintenance provisions have resulted in a substantial deterioration in the environment of the city as well as the urban infrastructure.

Through the field investigation and study, the serious problems in the existing sewerage system from view point of the urban environment are identified as:

1) Pollution of the Tirana and Lana Rivers due to the discharge of raw sewage, solid waste and industrial/agricultural wastes without any treatment.
2) Leakage of sewage from the sewer network.
3) Inundation/submergence of the road by the storm water.

In addition to the above, attention should be paid to the inadequate and poor maintenance of all the existing sewerage facilities, due to budgetary constraint.

For improvement of the current environmental situation in the Study Area, the most urgent and priority project shall be focused onto mitigation and improvement of water pollution in Lana River. Since it is clearly expected the increase of water consumption upon completion of the Bovilla water improvement project, the volume of sewage to be generated in Tirana City will be automatically increased to at least twice the present volume. Therefore, the construction of a sewage treatment plant is considered indispensable to meet with the forthcoming situation within few years.

9.2 Planning Fundamentals

(1) Target year

The magnitude of the rehabilitation/improvement and expansion of the existing sewerage system require phased implementation of the proposed project. The overall goal of the project under this Study is set forth in the year 2010, while urgent measures to cope with

present situation are considered to be implemented by the year 2001, five years from now.

(2) Project Area and Population

Among the whole of sewerage planning area, Lana north and south zones which have present population of 225,332 should be entitled as the target area of the priority project to attain the solution of the above mentioned problems.

In addition to the above, Shkoza, Selita e Vogel and Kombinat areas shall be included in the priority target area for expansion of the service area of the existing sewerage system in consideration of the following locality:

- Shkoza area having present population of 5,706 is located along the most upstream of Lana River within the city boundary.
- Selita e Vogel with present population of 7,871 is located at downstream of Lana River and is selected as one of the target areas for the infrastructure improvement and upgrading program being prepared under the assistance of USAID.
- Kombinat area has several food processing factories such as bread, beverages and canned foods. All these factories do not have any wastewater treatment facilities, although their operating scales are not negligibly small in respect to discharge volume of their wastewater. Thus, untreated industrial wastewater are presently discharged into nearby brook which finally flows into Lana River as one of major pollution sources.

Target area for phased implementation of the sewerage system development is exhibited in Figure 9.2.1, while breakdown of planning area and population by sewerage service zone is shown in Table 9.2.1.

Table 9.2.1 Breakdown of Planning Area and Population by Sewerage Service Zone

Zone	Area (ha)			Population (person)		
	Existing	Expansion	Total	Existing	Expansion	Total
Lana-North	396.4		396.4	124,900		124,900
Lana-South	380.6	65.2	445.8	115,100	14,000	129,100
Total	777.0	65.2	842.2	240,000	14,000	254,000

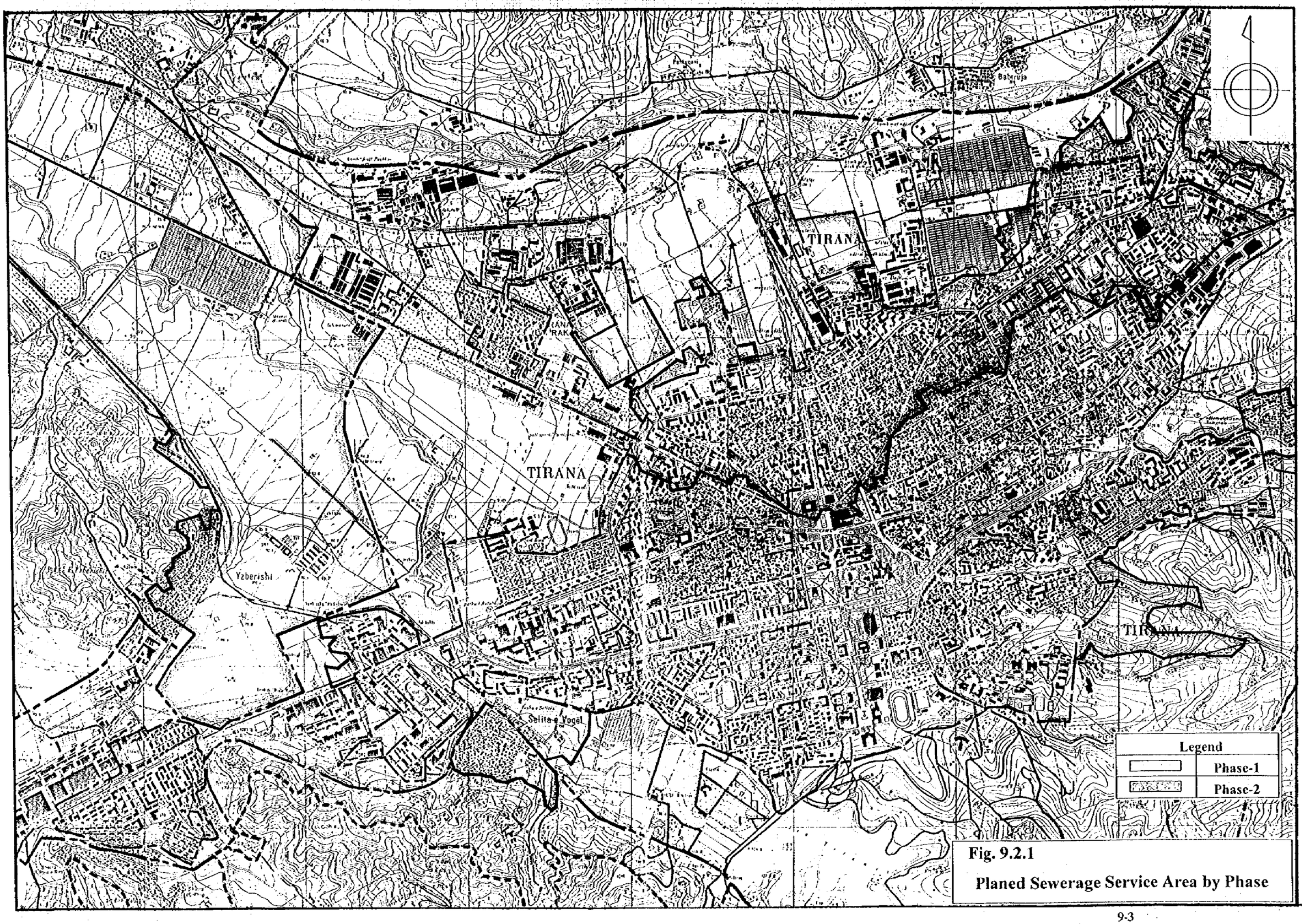


Fig. 9.2.1

Planed Sewerage Service Area by Phase

(3) Planned Sewage Flow

Table 9.2.2 shows planned sewage flow at treatment plant calculated on the daily average basis.

Table 9.2.2 Planned Sewage Flow at Sewage Treatment Plant

Zone	Population (person)			Planned Sewage Flow (m^3/day)
	Existing	Expansion	Total	
Lana-North	124,900	-	124,900	24,980
Lana-South	115,100	14,000	129,100	25,820
Total	240,000	14,000	254,000	50,800

Note : Planned Sewage Flow as Daily Average
= (Planned Population) x 200 lpcd

(4) Scope of the Priority Project

The priority project consists of following scopes:

1) Construction/Improvement of the Sewer Pipes
   - To improve and construct interceptor main and associated storm overflow chambers and storm discharge outlets
   - To construct the trunk main
   - To construct of main sewer for expansion area
   - Urgent countermeasures to mitigate the inundation
2) Construction of the sewage treatment plant
3) Procurement of the sewer cleaning/maintenance equipment

9.3 Sewage Collection System

(1) Improvement and construction of interceptor main and associated storm overflow chambers and storm discharge outlets

The target interceptor mains are located in Lana-North and Lana-South zones.

(2) Construction of the trunk main

Lana River trunk main

(3) Construction of main sewer for expansion area

Shkoza, Selita and Kombinat areas in Lana-South zone.

(4) Urgent countermeasures to mitigate the inundation

Inundation areas in Lana-North and Lana-South zones (refer to Figure 4.1.2).

Tirana River zone is excluded from this countermeasure since urbanization is not so progressive and number of households suffered from inundation are very limited. Center zone is also excluded since it requires thorough improvement of sewer system and is not suitable for urgent project.

Countermeasures to be taken up in the priority project is to construct large scale storm water inlets at both sides of roads to drain surface run-off and discharge it into Lana River. A total of 36 storm water inlets will be located with 100 m interval at 17 locations for about 1.6 km span in Lana-North zone and 19 locations for about 1.8 km span in Lana-South zone.

9.4 Sewage Treatment Plant

9.4.1 Design Criteria

(1) Sewage flow and quality

1) Sewage flow

Daily Average	53,000 m^3/day	
Daily Maximum	53,000 m^3/day	
Hourly Maximum (Dry)	4,770 m^3/hour	(= 115,000 m^3/day)
Hourly Maximum (Rain)	14,290 m^3/hour	(= 343,000 m^3/day)

2) Sewage water quality

Influent:	BOD_5	200 mg/l
	SS	200 mg/l
Effluent:	BOD_5	25 mg/l
	SS	35 mg/l

(2) Treatment method

Aerated lagoon method

(3) Location

Berxulli, 11.5 km northwest of Tirana center or near the confluence of Old Lana and Tirana Rivers.

9.4.2 Preliminary Design of Sewage Treatment Plant

(1) Layout

Layout of sewage treatment plant is shown in Drawing 1, and Phase 1 plant is located at west side of the proposed construction site.

(2) Specifications

Specifications of sewage treatment plant is shown in Table 8.2.2 with dimensions and design parameters of each facility. Required numbers of facilities are indicated under Phase 1.

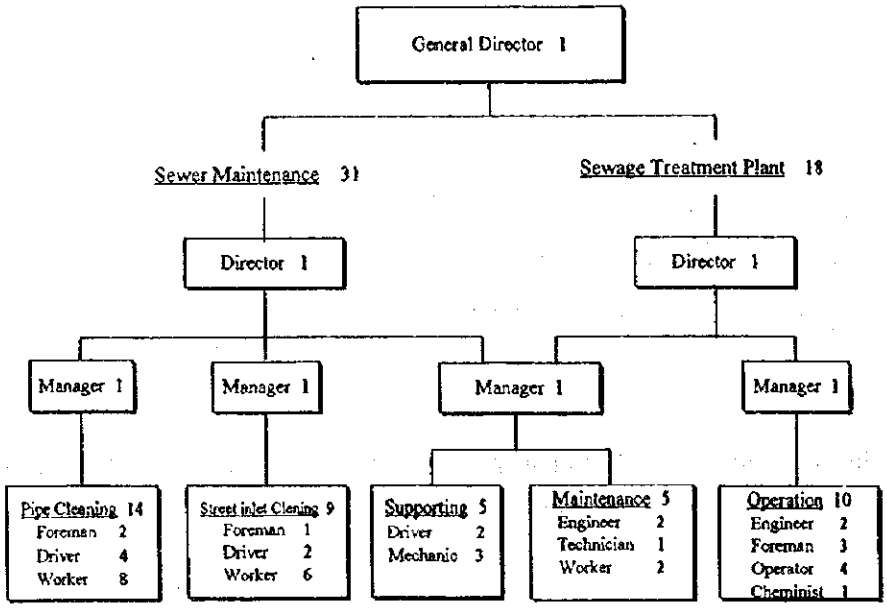
9.5 Staffing Requirement for Operation and Maintenance

Staffing requirement for operation and maintenance of the sewerage system in Phase 1 is estimated as follows:

Sewage Treatment Plant	18 persons
Sewer Cleaning and Maintenance	31 persons
Total Staffing Requirements	49 persons

Positioning of above personnel is shown in Figure 9.5.1.

Figure 9.5.1 Staffing Requirement for Operation and Maintenance of Sewerage System in Phase 1



9.6 Project Cost

Project cost for Phase 1 is estimated as follows.

(1) Construction cost	Unit: Thousand US$	
1) Collection System		13,174
Trunk main	8,849	
New sewer main	205	
Interceptor (replacement)	3,799	
Storm overflow chamber	231	
Storm water inlet	90	
2) Sewage treatment plant		7,001
Civil work	3,786	
Mechanical/electrical works	3,215	
3) Administration cost		1,431
Sub-Total		**21,606**
(2) Procurement of maintenance equipment		**1,078**
(3) Engineering cost		
1) Detailed design	1,000	
2) Construction supervision	800	
Sub-Total		**1,800**
(4) Common expenses		
1) General and administration expenses	300	
2) Land acquisition	2,600	
Sub-Total		**2,900**
(5) Contingency		**4,108**
Total Cost		**31,492**
		(3,149 million Lek)

Note: Exchange rate: 1.0 US$ = 100 Lek (as of January, 1997)

CHAPTER 10

OPERATION AND MAINTENANCE PLAN

CHAPTER 10 OPERATION AND MAINTENANCE PROGRAM

10.1 General

Appropriate operation and maintenance (O & M) of sewerage facilities are indispensable not only to keep up the function of public sewerage service, but also to prolong service life of the overall sewerage system.

O & M program contained in this chapter presents; scope of activities, institutional set-up, task description and O & M procedures. It shall be noted that those which described in this chapter be considered as the minimum requirements to attain the desirable O & M practices and further development of O & M activities be subject to rely on the progress of human resource development in this particular field.

10.2 Sewage Collection System

10.2.1 Procedure of Operation and Maintenance

There are three procedures of O & M namely, site investigation, pipe cleanings and rehabilitation of damaged sewers. The work items by O & M procedure are presented in Table 10.2.1.

Table 10.2.1 Work Items by Type of O & M of Sewer

O & M Type	Working Items
Site investigation	- Identification of damage and blockage location - Identification of the percolation point of groundwater - Investigation of the overflow point at manhole - Measurement of the volume of settled soil at the sewer bottom
Pipe cleaning	- Removal of settled soil, silt and foreign matters
Rehabilitation	- Replacement/repair of damaged sewer

The O & M for sewer should be conducted by the working program as shown below.

(1) Site investigation

The investigation plan by year should be prepared covering the entire sewer in municipality, and the actual site investigation should be implemented along the above-mentioned working items based on the investigation plan. During the site investigation, all staffs

have to be careful about the anoxic condition in manhole, and the transportation at working area.

This investigation plan should be performed repeatedly and periodically, and the investigation team should describe the site condition in a daily record.

2) Pipe cleaning program

The pipe cleaning program by year should be prepared for an entire sewers in municipality and be conducted from the priority spot based on the results of site investigation.

Generally, there are four types of pipe cleaning methods: high pressure jet cleaning machine, vacuum machine, bucket machine and manual type. A method using a high pressure jet cleaning machine and a vacuum machine is recommendable in consideration with good quality of maintenance work.

The following vehicles/equipment are proposed to procure for this purpose.

Vehicle/Equipment	Q'ty	Purpose
High-pressure Cleaning Car	2	cleaning of sewers
Sludge Vacuum Car	2	cleaning of sewers
High-pressure Cleaning Device	2	cleaning of storm water inlets
Dump Truck	2	transportation of sediments
Pickup Truck	1	control of cleaning works

The pipe cleaning for an entire sewage collection system is performed repeatedly and periodically, and the pipe cleaning team should make a daily record on the removed sediments' volume and quality, cleaning method and cleaning time for future O & M.

3) Rehabilitation plan

The pipe rehabilitation plan by year should be prepared for damaged sewers in municipality and be conducted from the priority spot according to the site investigation, considering emergency replacement/repair.

Generally, there are two types of rehabilitation works, namely replacement of damaged sewers and repair of a part of damaged sewers. The damages are caused by the natural or external factors. (damaged/deformed sewer resulting from ground subsidence, adjacent construction works, overweight vehicle, and corrosion by hydrogen sulfide etc.)

The pipe rehabilitation for damaged sewers should be contracted with local contractors according to the annual plan and when damaged sewer were found. Director of sewer maintenance should make the contractors prepare a report on the damaged conditions, causes of damage, countermeasures for damage and rehabilitation time for future O & M.

10.2.2 Organization for Operation and Maintenance

Proposed staff number for preventive maintenance is 31 persons as shown in Table 10.2.2, while the present number is 105 persons for sewer reticulation.

Table 10.2.2 Required Total Staff Number for O & M of Sewage Collection System

(unit: persons)

Position		Number	Duty
Director		1	Responsible for maintenance of sewer collection system
Sewer	Manager	1	Responsible for cleaning of sewers
	Foreman	2	Responsible for site works of each zone (east and west zones)
	Worker	8	4 workers/team x 2 teams
	Driver	4	2 workers/team x 2 teams
Stormwater Inlet	Manager	1	Responsible for cleaning of storm water inlet
	Foreman	1	Responsible for site works
	Worker	6	3 workers/team x 2 teams
	Driver	2	2 workers/team x 2 teams
Vehicle Maintenance	Mechanic	3	Maintenance of vehicles/equipment
	Driver	2	Operation of vehicles/equipment
Total		31	

10.3 Sewage Treatment Plant

The treatment method for the sewage treatment plant is aerated lagoon method which requires simple technology and less manpower for operation and maintenance, however, proper operation and maintenance is indispensable to extend their durable years and to fulfill their full performance.

In the plant, there are two substances to be treated namely, sewage and sludge. Sewage is continuously treated by aerated lagoon and chlorination, while sludge is treated by natural

drying and removal using a wheel loader and a dump truck seasonally.

10.3.1 Work Program for Operation and Maintenance

The O & M for pump station is classified into two items, daily and periodical working. The working items by O & M types are shown in Table 10.3.1.

Table 10.3.1 Work Items of Sewage Treatment Plant by O & M Types

O & M Work	Working Items
Daily work	- Measurement of inflow sewage volume - Removal of screenings at screen - Inspection of operation of aerators - Inspection of operation of chlorination facilities - Inspection of operation of electrical facilities
Periodical work	- Removal of grit and sediments at grit chamber (monthly) - Removal of sludge at partial mixing lagoons/storm water settling tanks (annually) - Inspection/repair of mechanical/electrical facilities (annually) - Overhaul of mechanical/electrical facilities (every 5 to 10 years)

The O & M for pump station should be conducted by the working program as shown below.

(1) Daily work program

The measurement of inflow volume is significant item for proper operation of sewerage facilities through the future. The screenings, soil, silt, and other substances collected at the screen and grit chamber have to be removed every day. These substances should be collected at the site in the plant and conveyed to dispose at solid waste dumping site for the purpose of conserving a adjacent environment. The inspection during operation of mechanical/electrical facilities is also very important items to notice any defects and quick maintenance works extend their durable years and proper operation through the future.

The required staff number in sewage treatment plant are shown below.

AM 8:00 to PM 4:00	one (1) Engineer and	two (2) Operators
PM 4:00 to AM 0:00	one (1) Foreman and	two (2) Operators
AM 0:00 to AM 8:00	ditto	
Standby	ditto	

Before the completion of Phase 2, only one (1) operator is required.

(2) Periodical work program

Two types of maintenance staff are required for periodical working program. The first group is ordinary workers to remove of sludge in lagoons and tanks as well as cleaning in the plant, whereas the second is technicians for maintenance of mechanical/electrical facilities.

(3) Sludge disposal

The sludge from partial mixing aerated lagoons and storm water settling tanks will be treated by natural drying and removal using a wheel loader and a dump truck seasonally.

In principle, the removed sludge will be disposed of in solid waste dumping site or landfill site.

As the sludge may contain toxic substances originating in industrial wastewater, special attention should be paid to sludge disposal of in agriculture field.

(4) Laboratory

The new treatment plant will discharge the treated water into Tirana river, but the treated water will have to comply with strict effluent regulations. Because the quality of the treated water will need to be checked immediately as required, a laboratory will be facilitated within the plant, upon the addition of a chemist to the permanent staff. Complicated water quality analysis will, however, be conducted by contract.

The examination items and frequency are as follows:

Items	Regulations	O&M	Trade effluent	Remarks
(Sewage)				
Air temperature		●		
Water temperature		●	×	
Colour		●		
Odor		●		
Transparency by cylinder test		●		
pH		●	×	
DO		●		
BOD	⊙	○		
COD	⊙	●		
SS	⊙	●		
Settleable solids		●	×	
Chlorides		×		by contract
Total solids		×		
Fixed solids		×		

Items	Regulations	O&M	Trade effluent	Remarks
Volatile solids		×		by contract
Dissolved solids		×		by contract
Total nitrogen		×		by contract
Ammonia (Free)		×		by contract
Ammonia nitrogen		×		by contract
Nitrate		×		by contract
Nitrite		×		by contract
Organic nitrogen		×		by contract
Phosphorus (total as P)		×		by contract
Coliform count		●		
Total colonies		●		
Fats			×	by contract
Mineral oils			×	by contract
Organic solvents			×	by contract
Individual heavy metals			×	by contract
Calcium carbide			×	by contract
Bitumen			×	by contract
Cyanides			×	by contract
(Sludge)				
Temperature		●		
pH		⊙		
Moisture content		●		
Hazardous substance		×		by contract

Note: Examination frequency
- ● ; more than once a day
- ○ ; more than once a week
- ⊙ ; more than twice a month
- × ; as required

10.3.2 Organization for Operation and Maintenance

Proposed staff number for operation and maintenance is 18 persons for Phase 1 and 25 persons for Phase 2, as shown in Table 10.3.2, while the present number is 105 persons for sewer reticulation.

Table 10.3.2 Required Number of Staff for O & M of Sewage Collection System

(unit: persons)

Field & Position		Phase 1	Phase 2	Duty
Director		1	1	Responsible for sewage treatment plant
Operation	Manager	1	1	Responsible for operation
	Engineer	2	2	Responsible for technical matters
	Foreman	3	3	Responsible for operation of each shift
	Operator	4	8	1 (2) operator/shift x 4 shifts
Maintenance	Manager	1	1	Responsible for maintenance
	Engineer	2	2	Responsible for mechanical and electrical
	Technician	1	2	Responsible for site works
	Worker	2	4	Cleaning
Water Analysis	Chemist	1	1	Water quality control
Total		18	25	

10.4 Operation and Maintenance Cost

The operation and maintenance program, as stipulated in the preceding sections, requires the following items and annual costs for proper sewage collection system and sewage treatment plant. Detailed cost estimate is shown in Supporting Report 10.4.1.

Table 10.4.1 Operation and Maintenance Cost

(Unit: US $/year)

Item	Phase 1	Phase 2
Sewage Collection System		
- Personnel Expenses	111,600	111,600
- Fuel Cost	28,013	28,013
Sub-Total	139,613	139,613
Sewage Treatment Plant		
- Personnel Expenses	64,800	90,000
- Electricity Cost	210,240	407,340
- Chemical Cost	60,833	109,500
- Repair Cost	32,000	60,000
Sub-Total	367,873	666,840
Total	507,486	806,453

CHAPTER 11

PROJECT IMPLEMENTATION PROGRAM

CHAPTER 11 IMPLEMENTATION PROGRAM

11.1 Implementation Program

In connection with the target year of this Study, Phase 1 as urgent and priority project is expected to be completed by the end of 2000, while Phase 2 as the overall completion is considered to be achieved by the end of 2010.

Phase 1	(1998 to 2001)	- Priority Project
	1998	Preparation of project
	1999	Detailed design, bidding
	2000	Construction & procurement of equipment
	2001	Construction
	2002	Commencement of operation

Phase 2	(2007 to 2010)	
	2007	Preparation of project
	2008	Detailed design, bidding
	2009	Construction & procurement of equipment
	2010	Construction
	2011	Commencement of operation

The project implementation and disbursement schedule with estimated annual disbursement of project cost is presented in Figure 11.1.1. The required project activities are described below.

11.2 Activities of Project Implementation

11.2.1 Preparation of project

Preparatory work for the project implementation includes:

- Budgetary arrangement within the Albanian Government for land acquisition and institutional development,
- Negotiation of grant/loan with foreign lending institution/s, and
- Selection of consultants in accordance with the agreement executed between the foreign lending institution and the executing agency of the Albanian government.

Figure 11.1.1 Project Implementation and Disbursement Schedule

Phase		Phase 1				Phase 2			
Item \ Year		1998	1999	2000	2001	2007	2008	2009	2010
Implementation Schedule									
1. Preparation of Project									
2. Pre-Construction Stage									
2.1 Detailed Design									
2.2 Bidding									
3. Construction									
3.1 Collection System									
- Interceptor									
- Trunk Main									
3.2 Sewage Treatment Plant									
- Civil Work									
- Mechanical/Electrical Work									
4. Procurement of Equipment									
Disbursement Schedule	**Total Cost (Million US$)**								
1. Land Acquisition	**4,700**		2,600				2,100		
2. Administration	**600**		100	100	100		100	100	100
3. Construction Work	**39,796**			10,803	10,803			9,095	9,095
4. Procurement of Equipment	**1,233**			1,078				155	
5. Engineering Service	**3,300**		1,000	400	400		700	400	400
6. Contingency	**7,442**		1,365	1,370	1,370		1,113	1,112	1,112
Total of Annual Disbursement	**57,071**		**5,065**	**13,751**	**12,673**		**4,013**	**10,862**	**10,707**

This preparatory work shall be commenced by the middle of 1998 and completed by the end of the same year.

It shall be noted that the institutional development of the executing agency and staffing as required for project implementation are prerequisite not only to insure successful achievement of the project objectives, but also to secure the firm commitment of financial assistance from the foreign lending institution/s. Appraisal mission of such institution will pay due attention on the preparedness and maturity of the proposed project as well as implementing capability of the executing agency both financially and institutionally.

11.2.2 Pre-construction stage

Majority of the project activities will be undertaken by the consultants hired by the executing agency. Those which to be carried out by the consultants include, but not limited to, detailed field investigations, detailed engineering design, and preparation of tender documents for bidding. These activities will be carried out from early time of 1998 to the middle of the same year.

After preparation of the tender documents, bidding for procurement of maintenance equipment and for construction work of proposed project will be executed by the end of 1999.

In parallel to the above project activities, the executing agency shall, in accordance with the detailed design, negotiate with respective land owners for land acquisition. Other important subjects, such as tariff system of sewerage service for cost recovery, shall be carried out by the executing agency as recommended in the preceding chapter of this Study.

11.2.3 Construction

Major scope of construction work are as follows:

(1) Collection System
- Trunk main
- Interceptor (repair and replacement)
- Storm overflow chamber and storm discharge outlet
- Storm water inlet

(2) Sewage treatment plan
- Civil work
- Mechanical/electrical work

Construction periods for major works are estimated as follows:

(1) Collection System	Phase 1	Phase 2
- Momilization	1.0	1.0
- Trunk main	17.5	20.5
- New main sanitary sewer	12.5	23.0
- Interceptor (replacement)	17.0	15.5
- Interceptor (replacement)	17.0	15.5
- Storm overflow chamber/outlet	3.0	0.0
- Storm water inlet	3.0	0.0
Total	24.0 months	24.0 months

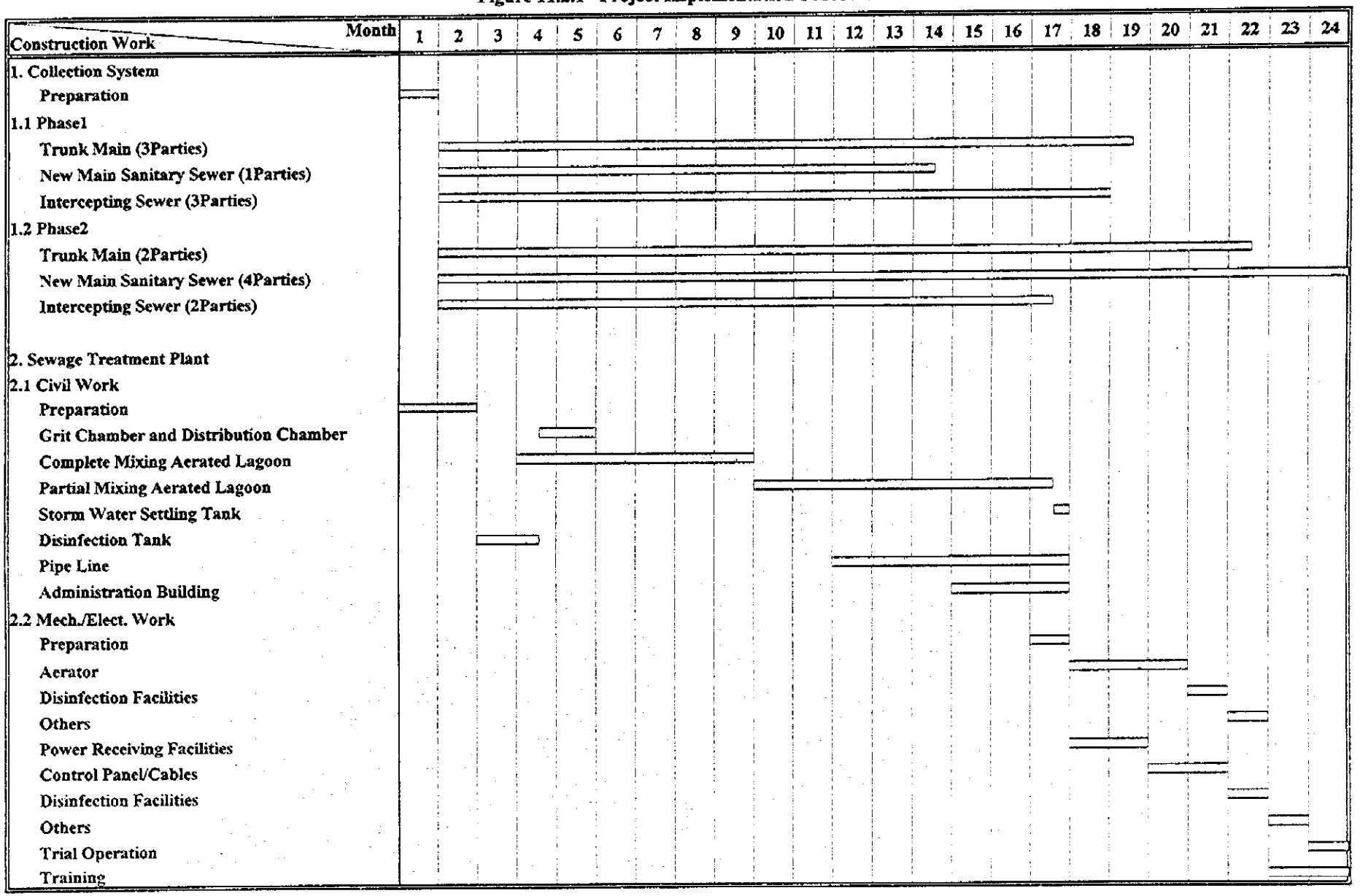
(2) Sewage treatment plan	
- Momilization	2.0
- Civil work	15.0
- Mechanical/electrical work	6.0
- Trial Operation	1.0
- Training	2.0
Total	24.0 months

Detailed construction periods for each major works are shown in Figure 11.2.1.

11.2.4 Procurement of maintenance equipment

Preparation of maintenance equipment, such as jet-cleaners, vacuum trucks, dump trucks, etc. will be prepared by the consultant during detailed design of sewerage facilities and procured within 2000 by international bidding.

Figure 11.2.1 Project Implementation Schedule



CHAPTER 12

LEGISLATIVE AND INSTITUTIONAL ARRANGEMENTS RELATIVE TO SEWERAGE SERVICE AND URBAN SANITATION

CHAPTER 12 LEGISLATIVE AND INSTITUTIONAL ARRANGEMENTS RELATIVE TO SEWERAGE SERVICE AND URBAN SANITATION

12.1 General

The overall improvement of the urban sanitary environment requires not only provision for a public sewerage system, but also on-site treatment/disposal of domestic sewage in un-sewered areas and solid waste management. These requirements should also be accompanied by legislative and institutional arrangements for firm implementation and achievement of their objectives.

This particular chapter presents views and recommendations pertaining to legislative and institutional improvements for:

- implementation of public sewerage services
- improvement of relevant urban environmental sanitation
- public education on health and hygiene aspects

12.2 Legislative and Institutional Arrangements for Public Sewerage Services

The transition to a market economy has led to the full privatization of some enterprises, and some institutions have transformed from budgetary institutions to self-financing ones. However, the organizational structure of public institutions seems to have changed little, although some have merged and others changed their functions.

The legal system has also been put under review after the transition, and certain laws and acts have been established with the purpose of regulating business activities. However, repeated changing of these regulations has made many of them overlap, while others still have omissions. As such, the legal framework pertaining to the development of the water sector is still at a preparatory stage.

12.2.1 Legislative Arrangements

Although general environmental laws and regulations have been implemented, at present a system of laws and regulations regarding the sewer sector, in particular those regarding facilities to be installed at plants, factories, etc. which discharge wastewater and waste material, has yet to be implemented, and those which do exist are insufficient. For instance, there is no control on discharging wastewater and dumping garbage into the Lana River, located along the project target area. The overview presented below outlines the framework of laws and regulations necessary in both the development and maintenance of a sewerage system and related matters. Further when defining sector obligations and those items prevented by laws and regulations, it will be necessary to create a system of penalties to enforce this, such as the closing of plant operations, fines, and forced removal of the disposed waste.

Given that the scope of these laws and regulations will have to be quite broad to cope with actual operations, setting up a task force under MOPWT, MOH and other related institutions would assist actual law enforcement.

(1) Wastewater quality and quantity standards and discharging points

- On wastewater quality and quantity standards: Wastewater quality and quantity standards should specify allowable limits of wastewater quality, such as content level of heavy metals, mineral oils, chemical waste contamination, and quantity, such as the total volume of pollutant in wastewater discharged from the respective factories/establishments. Operations of those firms who do not stay within these standards shall be shut down.

- On permission to discharge: These are to define where customers are allowed to discharge wastewater, and also to be set for the discharge of solid waste material from wastewater treatment plants.

(2) Land usage:

- On rights of usage of property owned by the private sector and respective public institutions: Laws regarding the use of private property and that held by public institutions (including roads) in the construction of facilities for the sewerage system. Also, with regards to construction projects and inspections to be held on this property, the rights of, and the restrictions placed on both construction and maintenance firms are to be made clear.

(3) Sewer system construction requirements:

- On sewerage system construction duties for urban, industrial parks, and residential planning: Urban developers of industrial parks, residential areas, and apartments and business buildings, constructors will be required to install a sewerage system (perhaps with treatment plant) at an appropriate level.

- On installing treatment facilities: Those parties which discharge wastewater at a quantity and with contents above those set by the wastewater quality standards, such as food processing factories, slaughter houses, laundry shops, live stock breeders, gasoline stations etc., will be required to install proper treatment facilities which will reduce the pollutant level to within regulated standards.

(4) Sewerage system usage requirements:

- On restrictions on the usage of sewerage facilities: Inappropriate usage of the sewerage system, such as disposing of waste through manholes into sewer pipes, or using of the sewerage system without permission, shall be prohibited.

- On discharging pipe connections to sewer pipe networks in areas with sewer service: Commercial establishment, i.e. restaurants, bars and kiosks, factories and individual households within the service area of the public sewerage system shall be obliged to discharge their wastewater into the public sewerage system.

- On protection of sewer facilities: Setting of regulations to protect the sewerage system, wastewater treatment facilities and other such machinery from any actions which could prevent full and correct usage.

- On wastewater intake: Setting of regulations by the authorities to prevent any actions which would prevent the sewer system and treatment facilities from operating at full capacity in the treatment of waste collected from areas without sewer service.

(5) Construction of sewer facilities:

- On construction standards for sewers and treatment facilities: The leakage of wastewater from facilities into the earth represents an environmental hazard. Strict regulations to ensure that standards are being met during construction of sewers and treatment facilities will be necessary.
- On license systems for construction firms, engineers and technicians: Licenses will be

required for all construction firms, engineers, and technicians for sewerage system construction projects, including house connections. Those without licenses will be prohibited from construction and maintenance operations of sewerage facilities.

(6) Sewerage tariffs and subsidy of funds:

- On sewer tariffs and other service charges: Instituting a tariff system to charge users will be necessary to ensure that the beneficiaries of the system are paying for it.

- On tax benefits for those who invest in waste treatment facilities: This would be introduced so as to provide an impetus for sewerage system users to introduce waste-reducing technology. The benefit would be based on the amount of expenditures.

- On funding for house connections and sewerage facility constructions: Providing funding for construction of wastewater on-site treatment facilities would provide an impetus behind such construction. So will, providing soft-loans (low interest, long term) to low income families to construct house connections.

(7) Owners of sewer facilities, development and maintenance:

- On ownership structure for publicly-owned sewerage facilities: Regulations to set whether a given sewerage facility (pipe network, treatment facilities) is the property of the state or district government.

- On setting the executive body for planning, maintenance and operation: Regulations to decide the executive body for planning, maintenance and operation of sewer facilities, as well as their duties and restrictions.

(8) Arbitration:

- On arbitration of disputes regarding usage, construction, operation and maintenance of facilities: Regulations for the settling of such disputes as: 1) between the facility itself and its neighbors; and 2) the building of facilities on property which is under another administration's jurisdiction.

12.2.2 Institutional Arrangements

(1) Responsibility for sewerage system development, operation and maintenance

Sewerage system service for Albania is based upon the policy set forth by the Ministry of Public Works, Territory Adjustment and Tourism (MOPWT). This policy is then put into actual execution by the major cities, i.e., Tirana, and the local municipal governments, and Enterprise Maintenance of Roads and Sewerage Systems (EMRS) is set responsible for the actual provision and maintenance of the sewerage system. While the present roles in sewerage system development and maintenance are relatively acceptable, due to the fact that the subsidies for construction of sewerage systems are drawn from the national budget, MOPWT conducts evaluations of the feasibility of each individual construction plan. As a result, in actual operation terms, some areas of the scope of authority and the division of labor between the Municipality and MOPWT remain unclear. Consequently, a redefinition of where responsibility lies in the building and maintenance of a sewerage system is necessary. This should be done in accordance with the following outline.

The following items are to be under MOPWT's jurisdiction:

1) The setting of a firm policy and basic guidelines of sewerage systems for Albania as a whole
2) The creation of construction standards for sewerage facilities
3) The setting of proper credentials of construction firms and engineers for the construction of sewerage facilities
4) The funding and distribution of subsidies to local governments
5) The enactment of a system of regulations for sewerage systems, to be set at the national level

The following items are to be under the Municipality's jurisdiction:

1) The formulation of a plan for the development of the sewerage system of Tirana city, as well as the administration of the actual execution
2) The planning of a budget for sewerage systems and administration of the actual execution
3) The provision of necessary funds for sewerage system development and EMRS's operation
4) The setting of tariffs (charges) for sewerage service and the means of their collection
5) The setting of rules and regulations regarding sewerage systems at the city level

6) The monitoring of the sewerage system's operations
7) Public information on the sewerage system, supervision of violation of laws and regulations, etc.

The following are to be under EMRS's jurisdiction, on assumption that the current system of operations is continued:

1) The monitoring of sewerage facility constructions, which are contracted out to the private sector
2) The maintenance of facilities
3) The operation and maintenance of wastewater treatment facilities, which are to be built at a later date
4) A user service center (customer service center) where customers can request the connection of discharge pipes and make comments on the sewerage system service
5) Maintaining of a list of sewerage system users who have wastewater house connections, and the drawings of sewer pipe networks and sewage treatment plant.
6) Monitoring of water quality in the sewer network and of discharges from treatment plants

(2) Introduction of a sewerage tariff system

At present, the city of Tirana has a water tariff system in effect, which collects a monthly amount from households, businesses establishments, and government organizations utilizing tap water. On the other hand, no tariffs are imposed for usage of the sewerage system, and all necessary funding is provided by the Government and the Municipality. The sewerage tariff system should be implemented. It is rational that direct beneficiaries of a service should pay the service cost. Moreover, institution of a tariff system is also necessary to secure a stable provision of funds for sewerage system development and operation, and to lighten the financial burden on the Government and the Municipality. The most feasible method of collection would be to collect sewerage tariffs in conjunction with those for water supply usage.

(3) Coordination of development plans

The most efficient and effective method of installing sewerage facilities would be to coordinate it with other development plans. However, since the population of Tirana, as well as the size of its residential areas, has been growing rapidly, the city has yet to formulate concrete urban plans which could include the installation of sewage facilities. As a result, while a long-term plan for the installation of facilities needs to be completed as

soon as possible, it has yet to be finished.

As these facilities are a vital part of the social infrastructure, and since they require massive investment, any such development plan must be made from a long-term point of view. However, prior to this a fundamental policy must first be formulated in order to determine what level and capacity these facilities are to be built. Without such a policy, it may well prove difficult to adhere to any plan developed, and will also likely be difficult to gain a consensus between the institutions involved and the people of Tirana. Moreover, were construction to be commenced without such a policy and plan is initiated, any facility actually built may prove to be insufficient or only temporary in nature.

The following measures are necessary in compiling a plan for development:

1) Ensuring that in general urban planning should include basic plans for the building of sewerage facilities
2) Ensuring that funds (tariffs, subsidies, distribution of regional bonds) are secured at the planning stage
3) Examining measures on how to include areas without sewerage facilities

(4) Private sector infusion

As part of Albania's shift to a market economy, many nationally-run enterprises are being privatized. The privatization of water suppliers and providers of sewerage services, two services which are an essential part of the social infrastructure and are necessary in maintaining a high standard of living, is also thought to be possible. The enactment of laws on the privatization of both the water supply and sewerage enterprises in March of 1996 points towards this. However, although the law was passed, at present not a single water supply or sewerage enterprise has been completely privatized. Even so, since all construction enterprises have already been privatized, the laying of the sewer pipe network, with the exception of some small-scale projects, has been completely outsourced to the private sector.

At present, EMRS is in charge of the cleaning of sewer pipes, the laying of sewer pipes (for small-scale projects), and the cleaning of septic tanks for those areas which are not connected to the sewer pipe network. It is also outsourcing a fairly large amount of its pipe-laying projects to firms in the private sector. It is thought that using the private sector in such a fashion leads to more efficient construction and maintenance, and that not only large-scale projects should be outsourced, but also works such as pipe cleaning, laying of

pipes (on a small-scale), and cleaning of septic tanks.

Going on the assumption that all such projects are to be outsourced to the private sector, EMRS will no longer function as an enterprise, per se, and will instead be able to concentrate on more limited operations, such as the administration of works outsourced to the private sector, and the monitoring of water quality for wastewater treatment facilities to be built in the future. The most efficient conclusion then would be to have EMRS function as a unit of the Municipality. Moreover, this type of arrangement will most likely be possible in one of EMRS's other major realms of responsibility, i.e., the maintenance of public roads.

12.3 Legislative and Institutional Arrangements for Improvement of Relevant Urban Environmental Sanitation

12.3.1 Need for Improvement of Relevant Urban Environmental Sanitation

Conditions of the urban environment in Tirana City have been deteriorating, corresponding to the rapid increase in the urban population and housing development, which has arisen through introduction of the market economy in 1991.

Along with the deterioration of existing sewer networks, disorderly disposal of municipal garbage has caused further water pollution in the Lana River and other open channels. Storm water inlets along major roads have also been clogged by the uncollected garbage.

Other problems frequently observed are:

- the number of restaurants and other commercial establishments recently built along the Lana River are discharging untreated wastewater directly into the Lana River, and
- the number of illegal houses constructed in recent years are considered to have inappropriate treatment/disposal of domestic sewage.

Such environmental deterioration can only be rectified through the integrated implementation of several measures, such as improvement of the existing sewerage system, solid waste management and on-site treatment/disposal of domestic sewage. Public education on health and hygiene aspects together with motivation of residents for community participation is an inevitable part of these countermeasures. In respect of this , legislative and institutional arrangements are discussed as in the following subsections.

12.3.2 Legislative Arrangements

(1) Appropriate measures for on-site treatment of domestic sewage

On-site treatment/disposal of domestic sewage shall be properly applied to households and establishments which are located or deemed to be located outside of the planned sewerage service area.

For firm implementation of this particular measure, the following legislative arrangements will be required.

1) Area classification for application of on-site treatment/disposal

Treatment efficiency varies by method of on-site treatment/disposal. The applicable treatment/disposal method shall be designated to the respective category of land use in consideration of the planned service area of the proposed sewerage system. Criteria to be applied for such designation of on-site treatment/disposal will be, but not limited to, the following:

- treatment capacity and efficiency to maintain water quality of treated effluent to be discharged into rivers and open channels,
- area requirement to construct treatment/disposal facility,
- construction cost.

This regulation will enable restriction of disorderly disposal of domestic sewage and help maintain water quality of the receiving water body.

2) Building permission

Application of building permission for housing and other structures shall be accepted by the pertinent local government authority only if an installation plan of appropriate treatment/disposal facility among the officially designated methods is included in their applied plan.

Violators of the above provision shall be subject to penalties, such as fines, cancellation of the whole building permission or suspension of use of the whole or a part of the constructed housing/structure. Suspension of water supply is another penalty measure.

The commencement of use of the constructed housing/structure shall only be given to

the owner/user when the said housing/structure is confirmed to be built in accordance with the officially approved building permission and design through an official inspection to be carried out by the said local government authority.

3) Financial assistance for installation of on-site treatment/disposal facility

Financial assistance, such as soft loans and partial subsidies, will accelerate introduction of on-site treatment/disposal facilities to households and other structures. To implement this measure, a revolving fund shall be established by the local government authority and/or the executing agency of sewerage system development. Any penalty imposed on violators of the aforementioned legislative arrangements will form a part of this revolving fund.

4) Removal and treatment of septage

Periodical removal of septage is inevitable to maintain optimal performance of septic tanks and shall be the obligation of the owner/user of the housing/structure.

For smooth removal of septage from many septic tanks, the local government authority shall establish necessary legislation's together with arrangements for building permission.

(2) Solid waste management

Presently, garbage collection services are divided between the east and west area of Tirana City and contracted out to two private companies.

Prohibition of illegal disposal of garbage shall be enhanced in the legislation to protect living and aquatic environment from pollution. A penalty clause shall be incorporated in the legislation.

Surplus soil and any other construction waste shall be regulated to be disposed off at the designated dumping sites under supervision of pertinent local government authorities. Acceptance of such waste shall be allowed upon payment of a certain service fee to the local government authority. Any other business waste shall also be accepted for dumping by type of waste upon payment of a certain service fee.

Toxic and hazardous waste shall be separately treated at particular facilities to be designated by the local government authority.

In view of minimizing the volume of garbage, recovery and recycling of resource materials will have to be introduced for both manufacturers and consumers. Manufacturers shall be obliged to introduce reusable materials for packaging and containers and to shoulder a certain share of the collection cost of resource recovery. Consumers shall dispose their waste for separate collection of resource materials, such as glass bottles, plastic, aluminum and steel cans, etc. Local government authorities shall provide waste containers for the said separate collection.

12.3.3 Institutional Arrangements

(1) On-site treatment/disposal of domestic sewage

Local government authorities, such as the Tirana City government, shall strengthen its institutional capability for enforcement of relevant legislative arrangements. Among others, the following function shall be properly incorporated:

- review and approval of application for building permission,
- inspection of building construction,
- issuance of corrective order against violation of legislation, and
- collection of approval fee for building permission and penalty imposed to violators of legislation.
- collection of septage from septic tanks.

Technical groups shall be included in the above institutional set-up to undertake:

- standardization and classification of applicable on-site treatment methods,
- review and approval of application for building permission, and onsite inspection of ongoing projects

Under the present institutional set-up, EMRS is providing septage collection service to households. Should this service be continued by EMRS, a considerable number of vacuum truck shall have to be additionally procured to meet with the increase of septage collection services. Encouragement of the private sector to participate in this septage collection service shall also be considered.

In the mean time, collected septage can be accepted at the proposed sewage treatment plant. An independent nightsoil and septage treatment facility shall be constructed beside

the proposed sewage treatment plant and primary treated effluent shall be finally processed in the proposed sewage treatment plant. This treatment facility is inevitable to avoid interference of sewage treatment since the pollution load of nightsoil and septage is larger than the planned sewage quality.

(2) Solid waste management

Inspection group for enforcement of legislation's on solid waste management shall be established at respective local government authorities.

Monitoring and administration units shall be stationed at the dumping site:

- to control acceptable type of garbage to be brought by collection trucks,
- to quantify the volume of garbage to be brought by collection companies and any other private services.

Cleaning of rivers and open channels shall be implemented utilizing the private sector, such as garbage collection companies or other private contractors.

Individual hauling of garbage such as surplus soil and construction waste to the dumping sites shall be accepted upon payment of a dumping fee to the local government authority.

Local government authorities together with private solid waste collection companies shall provide periodical collection schedules for separate collection of resource materials. Collected resource materials may be sold by the local government authority to private companies for recycling or reuse.

12.4 Public Education on Health and Hygiene Aspects

(1) Need and importance of public education

Upon the introduction of the new government administration and market economy, better public services have become an urgent requirement to attain better living and urban environmental standards. To realize this requirement, various plans and projects are being prepared and/or implemented by the respective government agencies.

In contrast to the governmental initiatives, urban development being undertaken by the private sector is in disorderly manner. Behavior of urban residents associated with their rapid increase have also become a disorderly state. These problems are observed as

follows:

- illegal construction of housing and commercial establishments including inappropriate treatment/disposal of domestic sewage,
- illegal dumping of garbage into rivers, channels and open spaces, and
- installation of suction pumps directly connected to water distribution line for high story apartments.

Active cooperation and participation of residents are therefore indispensable for successful implementation of urban environmental sanitation measures and achievement of their objectives. In this regard, public education on health and hygiene aspects is a necessary prerequisite to attain residents' awareness and community participation.

(2) Scope of public education

Public education shall include, but not be limited to, the following subjects:

- relationship between unsanitary practices and water borne/related/vector diseases
- role and objective of the public sewerage system
- role and objective of on-site treatment/disposal of domestic sewage
- importance of recovery and recycling of resource materials from garbage through separate collection
- role and objectives of community participation, such as sharing of community activities for cleaning of garbage deposit sites

To enhance the effect of community participation, the respective local government authorities and executing agency of public sewerage services shall take following measures:

- preparation of campaign materials and public announcements,
- campaign to the public through TV, radio and other available mass-communication measures,
- periodical meeting with local residents and community leaders,

Programming and implementation of a demonstrative campaign week for a particular subject with cooperation of mass-communication media as one of several options. Public education shall be implemented not only for adults, but also for school children as a part of a regular education program.