4.8 Public Transport Development Plan

The growth of urbanization tends to change urban lifestyles and people's values for goods and services. In this context, public transport services should satisfy various types of demands in the city. For planning the public transport development in this Study, there are two major strategic projects that have been given by the MOT:

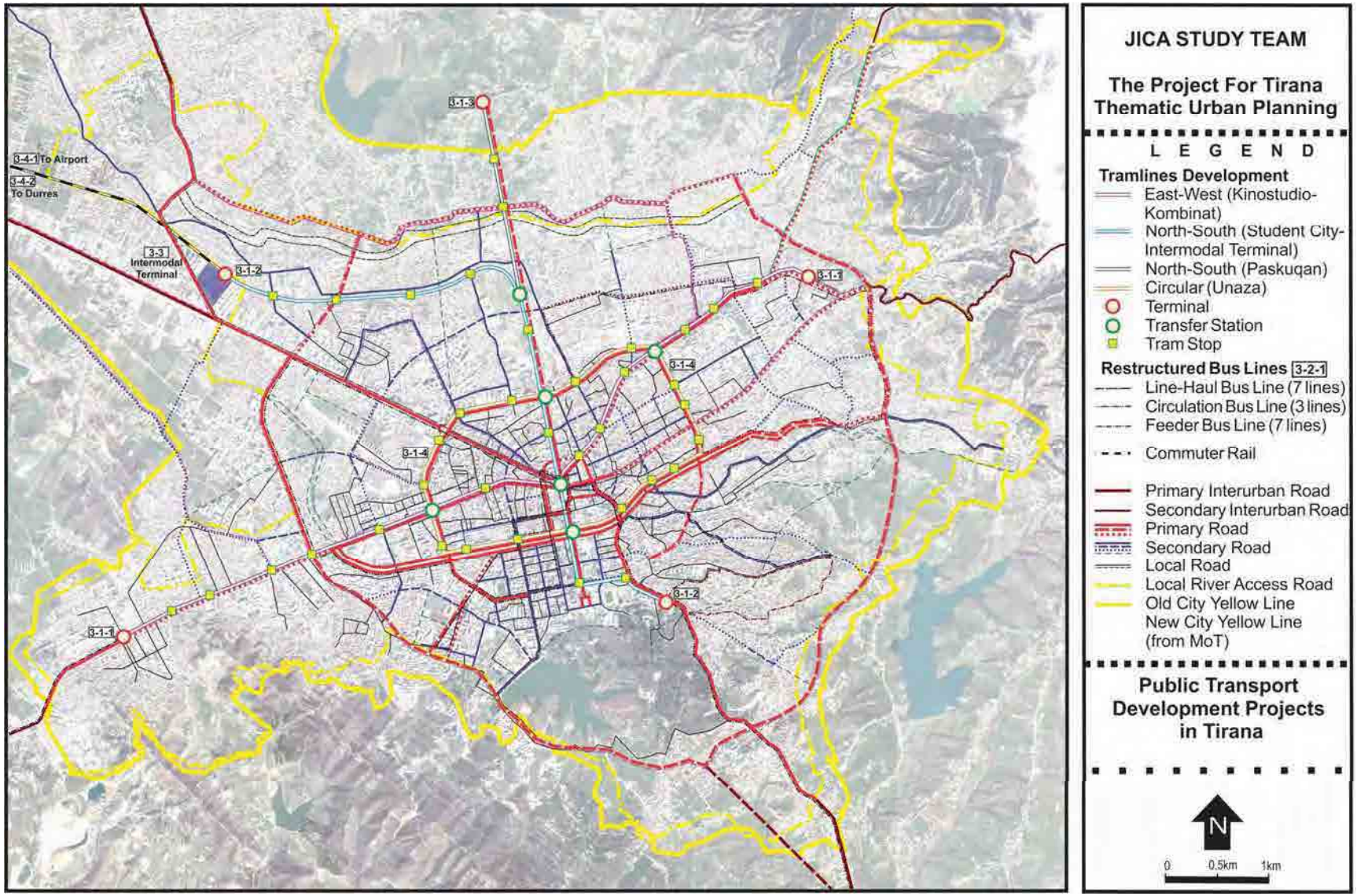
- Development of an intermodal transportation terminal along with relocation of Tirana railway station, and
- Development of two tramlines: east-west (Kinostudio – Kombinat) and north-south (Intermodal Transportation Terminal – Student City).

The public transport development is proposed to support the above core projects and to further expand the public transport network from aspects of tramlines development, bus transportation development, intermodal development, and commuter rail development. It is listed in Table 4.8.1 and presented in Figure 4.8.1. Furthermore, tramlines and bus transportation development projects were included in the future transit network, and the future demand was forecast as presented in Figure 4.8.2.

Table 4.8.1 List of Public Transport Development Projects

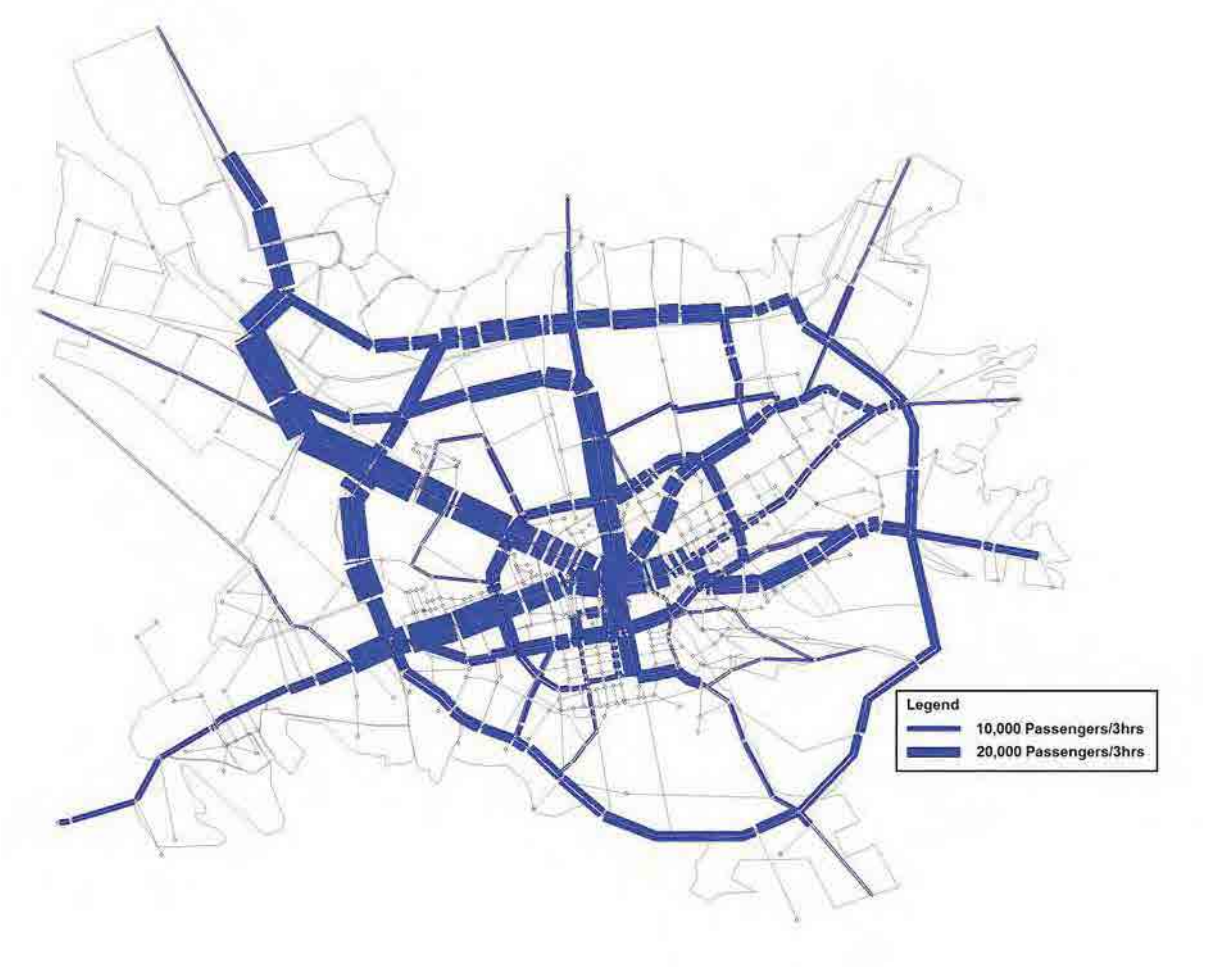
RUT-3-1	Tramlines Development
RUT-3-1-1	East-West (Kinostudio-Kombinat) Tramline Development
RUT-3-1-2	North-South (Student City-Intermodal Terminal) Tramline Development
RUT-3-1-3	North-South (Paskuqan) Tramline Development
RUT-3-1-4	Unaza (Circular) Tramline Development
RUT-3-2	Bus Transportation Development
RUT-3-2-1	Restructruring City/Commune Bus Lines
RUT-3-2-2	Transit Mall Development in the Center
RUT-3-2-3	Bus Location System Development
RUT-3-3	Intermodal Transportation Terminal Development
RUT-3-3-1	Relocation of Tirana Railway Station
RUT-3-3-2	Intercity Bus Terminal Development
RUT-3-4	Commuter Rail Development
RUT-3-4-1	Airport Rail Link Development
RUT-3-4-2	Tirana-Durres Commuter Railway Development

Source: JICA Study Team



Source: JICA Study Team

Figure 4.8.1 Public Transport Development Projects in Tirana



Source: JICA Study Team

Figure 4.8.2 Passenger Demand Forecast of the Proposed Future Transit Network (2027)

4.8.1 Tramlines Development

The MOT is planning to develop the above-mentioned tramlines as the core of the public transport network. High service frequency, punctuality, speed, comfort, affordability, consistent fare system, and intermodality of the tramlines are essential elements that attract not only the commuters who take the bus but also those who use private modes of transportation. Including the two aforementioned lines, the following four tramlines have been listed for public transport development to enhance the network utility:

- North-South Tramline (Intermodal Transportation Terminal – Student City): It is to support the new business and commercial activities along the north-south boulevard (Zogu I Boulevard) as well as to transport passengers between the planned Intermodal Transportation Terminal and the city center. This tramline should be connected at the center of Tirana (Skanderbeg Square) to the east-west tramline by taking over the existing passengers of the whole Uzina Dinamo e Re line.
- East-West Tramline (Kinostudio – Kombinat): It is to replace the existing line-haul bus line, namely Kinostudio – Kombinat line, which constitutes the axis that links the

northeastern and southwestern areas of the city through the center with the second largest number of passengers (approx. 43,000 passengers/day).

- Extension of North-South Tramline (Paskuqan direction): Extension of the above north-south tramline matches with the new road development corridor with large-scale residential, industrial, commercial, and recreational developments planned by the MOT. ROW of this line has been reserved in the staged north-south boulevard development though the details are not clear yet. The passenger demand volume on this line may be uncertain while it has the greatest potential to serve as the core of the transit-oriented development (TOD), which will allow high floor area ratios around the tram stations to induce intensive land use and development.
- Circular Tramline (Unaza): It is to replace the existing circular bus line, namely Unaza line, which is currently carrying the largest number of passengers (approx. 54,000 passengers/ day). Hence, a large passenger demand can be expected, bringing about an integrated effect with other north-south and east-west tramlines and resulting in formulation of a more comprehensive network.

New, comfortable, safe, and air-conditioned trams should be operated at least at the same intervals as the currently operated bus lines, namely, 4-7 minutes to avoid excessive, or long, waiting periods. Future average and maximum sectional passenger volume in one morning peak hour on each of the four tramlines proposed above is forecast in Table 4.8.2. Three tramlines, namely, North-South (Intermodal Transportation Terminal – Student City), East-West (Kinostudio – Kombinat), and Circular (Unaza) Tramlines are expected to have over 10,000 passengers per hour which is generally considered as enough number of passengers for a tram or LRT project to become viable. On the other hand, extension of North-South Tramline (Paskuqan direction) is expected to have a small number of passengers. Hence, regular bus lines will do to serve the Paskuqan extension unless significant additional large-scale developments are realized along this corridor.

Table 4.8.2 Sectional Passenger Volume Forecast on Proposed Four Tramlines (2027)

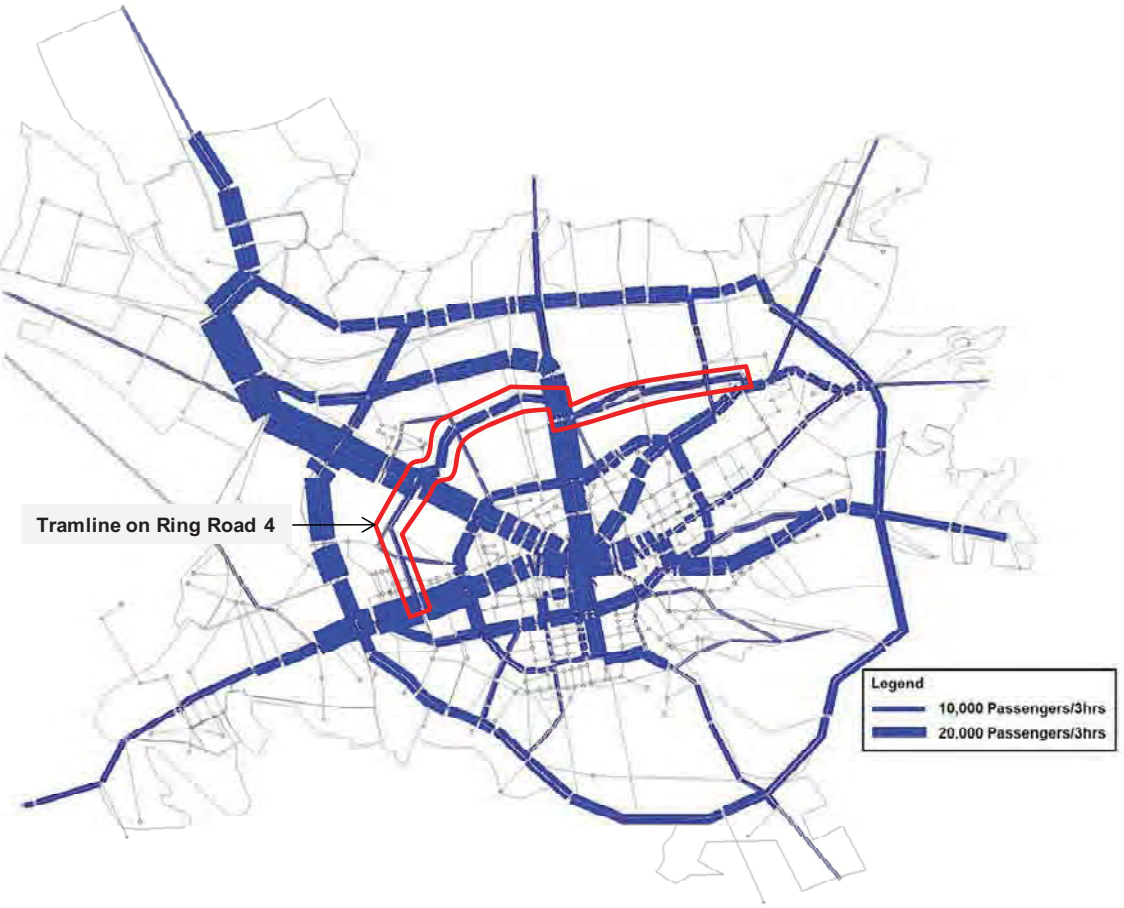
[unit: persons/hour]

Tramlines	Average	Maximum
East-West (Kinostudio-Kombinat)	16,100	25,900
North-South (Student City-Intermodal Terminal)	15,000	24,700
North-South (Paskuqan Extension only)	3,700	6,200
Unaza (Circular)	10,700	14,400

Source: JICA Study Team

With regard to the development of Ring Road 4, the MOT was also interested in the future passenger demand on another tramline on Ring Road 4, if it is difficult to develop as planned by the MOT. Since Ring Road 4 will be relatively narrow compared to the other ring roads, the MOT is considering development of a tramline-only road in the north and west sections of Ring Road 4 that is closed to car traffic. Thus, future average and maximum sectional passenger volumes in one morning peak hour on each of the five tramlines in the case with a tramline on Ring Road 4 are forecast in Table 4.8.3. The average number of passengers forecast on Ring Road 4 is below 5,000 passengers per hour, and even the maximum number of passengers

(projected in the section between Dritan Hoxha road and Don Bosko road) is below 10,000 passengers per hour, which is a generally accepted threshold to determine whether to develop bus transport or larger-scale rail-based transport. Hence, the tramline on Ring Road 4 may not be supported from a passenger demand point of view.



Source: JICA Study Team

Figure 4.8.3 Future Transit Network with a Tramline on Ring Road 4 (2027)

Table 4.8.3 Sectional Tram Passenger Volume Forecast with a Tramline on Ring Road 4 (2027)

[unit: persons/hour]

Tramlines	Average	Maximum
East-West (Kinostudio-Kombinat)	15,900	26,600
North-South (Student City-Intermodal Terminal)	15,100	24,400
North-South (Paskuqan Extension only)	3,700	6,200
Unaza (Circular)	10,200	13,200
Tramline on Ring Road 4	**4,600**	**9,200**

Source: JICA Study Team

In any case, it should be noted that the future passenger demand will also vary depending on the

attractiveness and convenience of the new tramline system including its accessibility and intermodality with other transportation modes. Above all, attention should be paid to intermodal transfer functions between different transport modes, that is, between connecting (feeder) bus lines and tramlines, and between private transport modes and tramlines (i.e., Park & Ride system). For this, it is highly necessary to improve the transfer convenience levels of transport facilities by providing pedestrian walks, car and bicycle parking facilities, and station squares. Thus, the tramline terminal stations should serve as gateway stations to the CBD, and such intermodal developments should also be included in the cost for those tramline development projects to increase the ridership.

4.8.2 Bus Transportation Development

While the number of private vehicles has been rapidly increasing in Tirana, the improvement of the current level of bus services is urgently needed.

As mentioned earlier, the current on-street parking should be removed and the partial dedicated bus lanes should be extended more continuously on the urban primary roads to form a continuous, smooth network for buses, thereby serving as a BRT. By keeping stable bus operating speeds from heavy traffic, time schedule can also be foreseen, consequently reducing the waiting time and attracting more passengers. It should also be noted that the dedicated bus line network will be a prototype of rail-based mass transit such as tramlines by converting the dedicated bus lanes to rail tracks when the demand grows in a longer term.

(1) Bus Route Restructuring

The aforementioned tramline system should be developed in the form of network in order that people can reach destinations within the system. This means that a single route at high service level may not attract people to use public transport. A public transport network should consist of several trunk lines with supporting feeder services and should cover the whole Tirana metropolitan area as much as possible. Therefore, when the tramlines have been introduced as a core public transport system, the current bus route structure should be redesigned in a hierarchical manner to support the tramlines and eventually to enhance the usage of the public transport network.

Among others, current bus services in Tirana, especially line-haul bus services connecting the suburban areas and central Tirana are provided not only the city buses but also commune buses connecting Tirana and the surrounding communes. Service standards for these commune bus lines are not well regulated. Though the commune buses are not supposed to pick up passengers traveling within Tirana, the commune buses are also serving passengers in Tirana.

As clear demarcation of serving passengers in Tirana and in the surrounding communes is becoming more complex and difficult, it is necessary to reconsider and rationalize the existing bus route structure, including the possibility of suburban feeder bus services as well as the possibility of a regional transportation management authority which covers the whole Tirana metropolitan area and the surrounding communes.

The bus routes should be categorized into three types from a planning point of view, namely: (1) line-haul bus services, (2) circulation bus services, and (3) feeder bus services. The existing bus

route structure should be reconsidered in light of existing and future passenger demand patterns, core public transport system of the city, and coverage of population of the Tirana metropolitan area.

An example of restructured bus routes for future is presented in Figure 4.8.1. New bus lines of type (3) should serve the planned tram stations to increase the ridership of the tramlines, thus enhancing the usage of the core public transport system. Meanwhile, it is recommended that new types of bus lines (i.e., (1) and (2)) be introduced providing speedy, comfortable transport services with limited stops especially for corridors that are not served by rail-based transport.

(2) Bus Location System

As high frequency service is expected for the BRT-type operation, constant bus operation is one of the important factors to accommodate passenger demand. However, a constant interval between buses may not be kept without an adequate bus operation management. In other words, buses tend to form a platoon under the high frequency service. Furthermore, in the current city bus operation contract with private bus operators, though the quantity and level of bus services have been stipulated, the MOT may not be efficiently monitoring the bus services.

The introduction of bus location system will resolve this issue. As part of a bus location system, buses should be equipped with Global Positioning System (GPS) equipment so that the regulatory agency (operation center) can know the bus location and its operation speed based on the location of buses on routes. The system also provides bus operation information for bus operators and bus passengers.

Particularly for bus passengers, the following guidance information should be provided at bus stops, on board the bus, via the internet, etc.:

- Static information: bus route map, time table, fare system; and
- Dynamic information: real-time bus location and operation information.

It should also be noted that the real-time bus location system could be integrated with the planned traffic signal control system, realizing the bus priority signals to avoid conflict with turning movements of private vehicles.

(3) Fare System Improvement

One aspect in public transport that discourages commuters from using the public transport system is the cumulative cost of the aggregate transfers, such as bus fares, which often negatively burdens especially low- and middle-income commuters. Reduction of the total public transport cost will lead to an increase in ridership. One possible way of reducing cost is by introducing a transfer discount ticket system between different bus (and future tram) operators. Applying a common ticket (or a smart card) system will greatly improve users' utility, as well.

Originally, the bus fare was regulated to take all the revenue and expenditure of bus operation into account. In fact, low-income households cannot afford to pay higher fare level for their travels. If public transportation fare increases, they will suffer from the price increase significantly and they should sacrifice the other important expenses. On the other hand, bus operators have faced difficulties in providing sufficient level of service at such a low fare as the

oil price has been rising in the world market.

The government, however, sometimes cannot provide sufficient subsidies due to limited financial sources to fill the gap between actual operation cost and revenue. Therefore, it is proposed to provide subsidy directly to the low-income households rather than to transportation operators. In turn, the government may allow a higher fare level which enables bus operators to provide their services in a financially sound condition, though the methodology for identification of the transportation-poor should be carefully studied.

Another possible measure is reimbursement of out-of-pocket transportation expenses for employees. If the government allows business entities to deduct transportation allowance from the profit, the burden of business institution would be decreased. Impacts on government revenue as well as economic benefits should also be carefully examined.

4.8.3 Intermodal Transportation Terminal Development

As mentioned earlier, attention should also be paid to intermodal transfer functions between different transport modes, that is, between connecting (feeder) bus lines and tramlines, and between private transport modes and tramlines (i.e., Park & Ride system).

Since the tramlines are to serve as the core public transport network, intermodal transfer functions at tram stations should be improved to enhance transfer convenience for passengers from one public transport mode to another. The following measures deserve to be implemented for this purpose:

- Improve the user-friendliness of transport facilities by providing pedestrian walks, car and bicycle parking facilities, and other transport services;
- Enhance transfer convenience levels by improving physical conditions, such as shortening walking distances from tram to another mode, providing information on timetables and operational conditions, and providing station squares;
- Create safe and comfortable waiting spaces for transferring passengers; and
- Integrate the transportation fare system by introducing a transfer discount ticket system between tram and bus for convenient use of public transportation.

As an alternative to the feeder bus lines, a Park & Ride system could be used for station access. This is important especially where feeder bus services are not available due to distance or in thinly populated areas. This underscores the necessity of providing parking facilities near tram stations, especially at the tramline terminals. The major candidate stations with large-scale parking facilities are Intermodal Transportation Terminal, Student City, Kinostudio, Kombinat, and Paskuqan Park, as indicated earlier in Figure 4.7.7 and Figure 4.8.1. These stations will serve as gateway stations to the CBD, in which car or bicycle users can park their vehicles and take the commuter train to go to work, or for other trip purposes to the city center.

Since there is no integrated intercity bus terminal yet in Tirana, integration of the intercity and international bus and van lines into one terminal with proper facilities such as toilets, ticket windows, waiting rooms, shops, restaurants, taxi stands, and parking facilities is highly necessary, though it would be more practical to gradually shift vans to new, larger, air-

conditioned buses. Thus, the new Intermodal Transportation Terminal should be developed in the location where the existing Tirana railway station is to be relocated (approx. 85,000m^2), as planned by the MOT. All the intercity and international bus and van lines to the northern, western, and southwestern directions should be integrated into this terminal in order to help to prevent large vehicles from entering the CBD of Tirana. More importantly, the new terminal needs to be connected to the tramline and several city bus lines for smooth transfer to central Tirana or to other destinations.

Furthermore, introduction of new transit terminals where some city bus lines as well as other public transport meet and passengers can transfer or access by private vehicles should be realized. Among others, in the city center, a transit mall (Figure 4.8.4) could be developed in the pedestrian streets inside the inner ring corridor, allowing only pedestrians and bicycles as well as public transportation vehicles to move more freely, attracting more passengers.

[Wellington, New Zealand]

Source: Wellington City Council

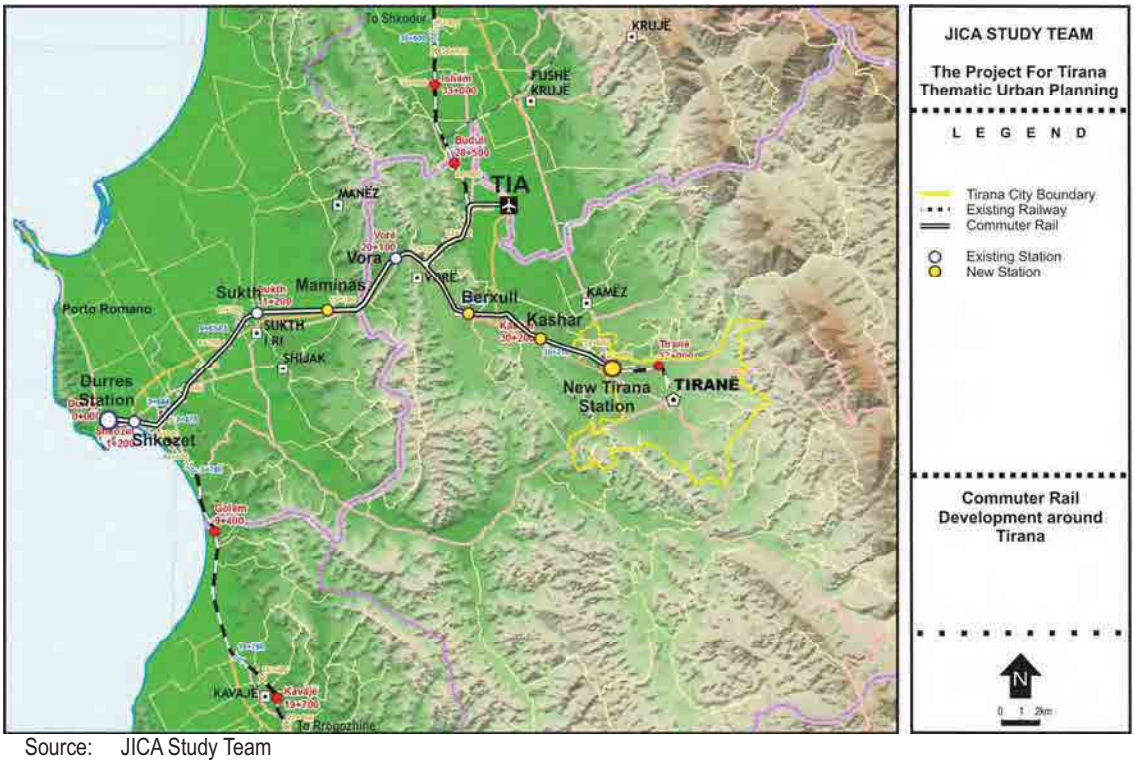
[Istanbul, Turkey]

Source: JICA Study Team

Figure 4.8.4 Examples of Transit Malls

4.8.4 Commuter Rail Development

Rail-based transportation has a great potential for fast, reliable, and comfortable transportation services regardless of road traffic congestion. In accordance with the relocation of Tirana station to the Intermodal Transportation Terminal planned by the MOT, this Study also proposes the improvement of the existing railway network to attract people who currently use private modes of transportation for intercity travel around Tirana and who are about to shift to private vehicles. As proposed in the Urban Regulatory Plan (2009), the improvement of existing railway lines up to Durres and the construction of new airport lines (Figure 4.8.5) will significantly enhance the usage of intercity passenger transportation which currently consists of only buses or vans.



Source: JICA Study Team

Figure 4.8.5 Proposed Commuter Rail Development around Tirana

The existing Tirana station is to be relocated to a New Tirana station for better operation of the commuter, long-distance, and freight trains. The existing Tirana station area will be redeveloped as part of the Tirana Main Boulevard extension (and Tirana River rehabilitation) project. On the other hand, the New Tirana station is to be integrated into the Intermodal Transportation Terminal, which will serve as a new multimodal hub including intercity bus and van services, city bus lines, and a tramline as well as taxis and parking facilities.

In addition, there is still room for improvement in the existing railway system including its infrastructure and facilities such as rolling stock, tracks, signaling/telecommunications, grade crossings, and electrification. In order to increase the existing railway passenger demand, it is necessary to provide enough attractive services in terms of frequency, compatibility, comfort, accessibility to stations, and intermodality with feeder bus and private vehicles. Improving the existing railway has a great advantage since new land acquisition is not much required. The necessary key improvements are as follows:

- Elevating part of the existing railway sections in Tirana to avoid grade crossings;
- Double-tracking and electrification of the existing railway for commuting services between Tirana and Durres;
- Increasing the maximum running speed to 120 km/h by replacing manual spacing of trains with an automatic block system and signaling system that can space the trains three minutes apart with a better level of safety for Tirana – Durres. A centralized signal substation should also be developed in Tirana or in Durres to manage all the lines;
- Developing new commuter rail stations on the existing railway lines between Tirana and Vora/Durres;

- Improving/developing station squares and approach roads to provide easier access to the stations for all modes of transportation;
- Modernizing the train stations, especially the New Tirana station, as part of intermodality consisting of more appropriate track layouts and improvements of station facilities for better passenger services (e.g., information system, length, width and height of platforms);
- Constructing a railway link (approx. 2 km) between Vora – Shkodra line and TIA which will enable the direct operation from the New Tirana or Durres stations using the renovated existing line;
- Constructing a shortcut at Vora to directly connect Tirana and Shkodra (i.e., TIA) directions for continuous commuter train operation; and
- Purchasing high-performance electrified, self-propelled trains (EMU: Electrified Multiple Units) for the regular "commuter" services on the New Tirana – Durres and TIA lines.

The modernization of the infrastructure, improvement of operational conditions, along with investments in modern, high-performance trains will improve regular "commuter" services to/from Tirana, especially between Tirana and Durres and between Tirana/Durres and TIA. Significant travel time can be saved for passengers on this corridor.

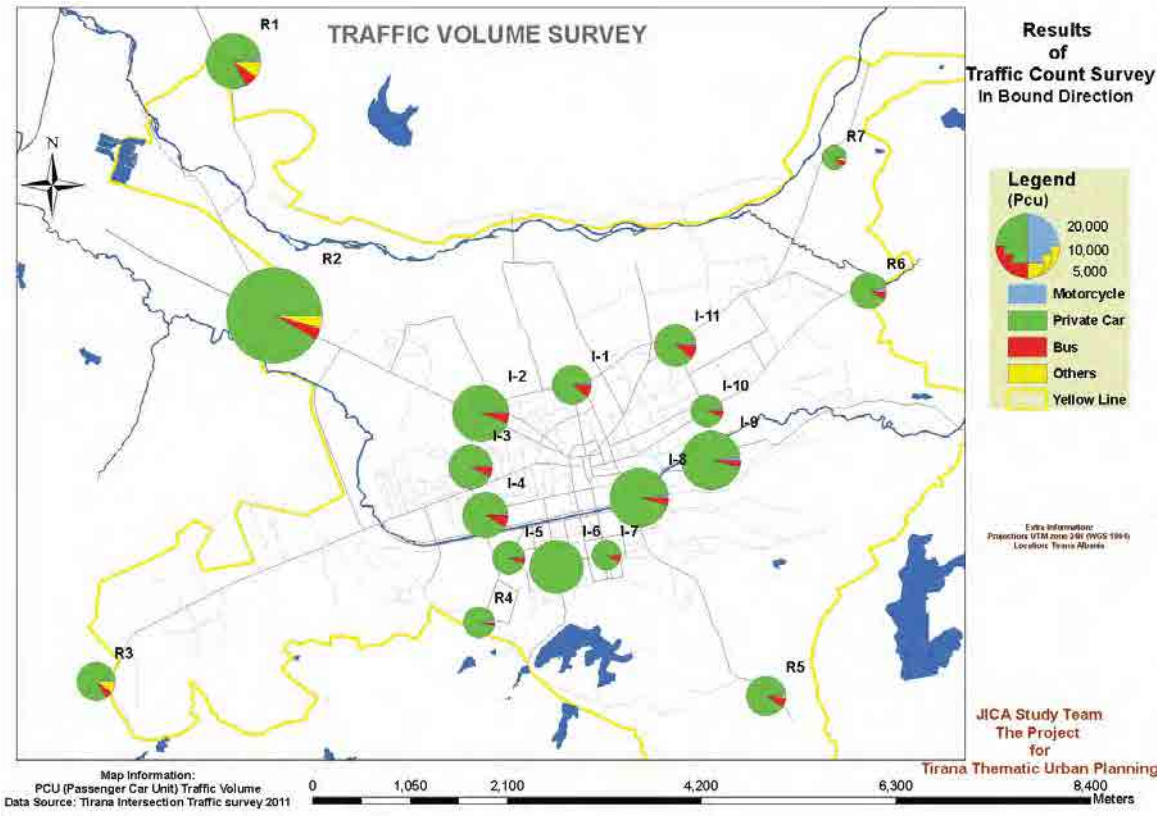
Enhancement of the overall public transport system entails not only improving the rail-based system but also ensuring that the surrounding land is used in such a way as to encourage the railway use. Both land use and transport infrastructures should be integrated under the Transit Oriented Development (TOD) concept, and the promotion of high-density commercial land use around stations will benefit both urban economy and business of the railway operator.

4.9 Freight Transportation System

4.9.1 Major Truck Routes

As the main roads with a high capacity, primary urban roads are used by many commuting vehicles. Moreover, since the primary urban roads connect the major industrial and warehouse areas in Tirana such as Kombinat, Qyteti i Nxenesve (City of Pupils), Ish Frigoriferi (Ex-Refrigerator), and 5 Maji Road via interurban roads to Durres Port and other major cities in Albania, they also serve as a freight transportation corridor.

For freight trucks, since the Outer Ring Road has not been completed yet, there are virtually no other routes but to pass through Tirana. Although trucks (excluding vehicles with a 3.5-ton or lower loading capacity) are banned from entering the CBD inside the Middle Ring Road except in the nighttime, their entering the CBD results in high traffic generation mixed with many slow, heavy vehicles on the existing primary urban roads, as shown from the transportation survey results in Figure 4.9.1. Such a burden on the existing primary urban roads should be alleviated by providing alternative roads for both trucks and passenger vehicles.

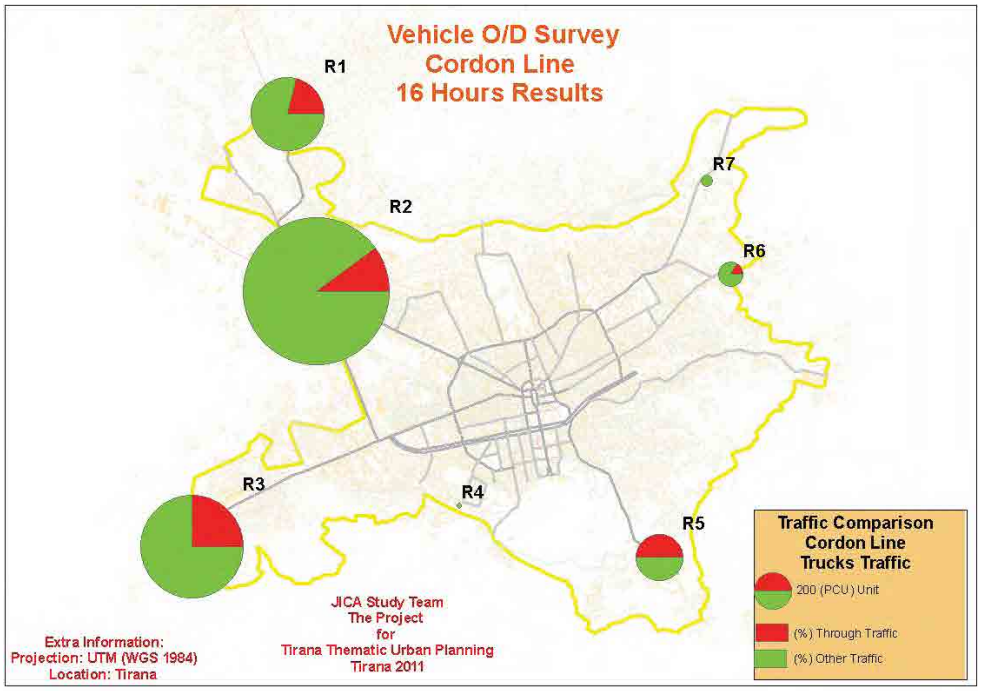


Source: 2011 Transportation Survey, JICA Study Team

Figure 4.9.1 Vehicle Composition of Traffic on the Primary Urban Roads in Tirana

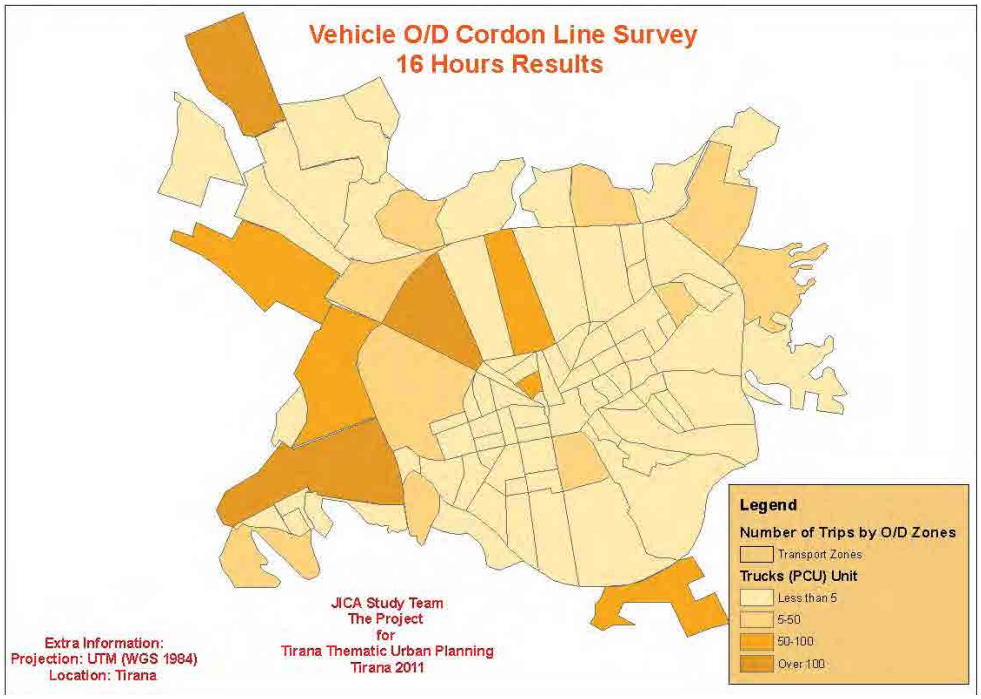
Though the current Middle Ring Road serves as a freight corridor to bypass the CBD of Tirana, there is no clear freight transport corridor in the existing road network of Tirana. Meanwhile, the traffic composition in Figure 4.9.1, the truck volume in Figure 4.9.2, and the truck trip generation in Figure 4.9.3 show that ODs of truck trips to/from Outside Tirana mostly concentrate in TAZs in the west of Tirana such as Kombinat, Qyteti i Nxenesve, Kamza,

Lapraka, and along the Durres highway. Thus, trucks usually pass through the western part of the primary road network, which is also used by many commuting vehicles. This significantly impacts the traffic flow, as large, slow moving trucks take up considerable space on the roads.



Source: 2011 Transportation Survey, JICA Study Team

Figure 4.9.2 Volume of Trucks to/from Tirana and Trucks Passing through Tirana



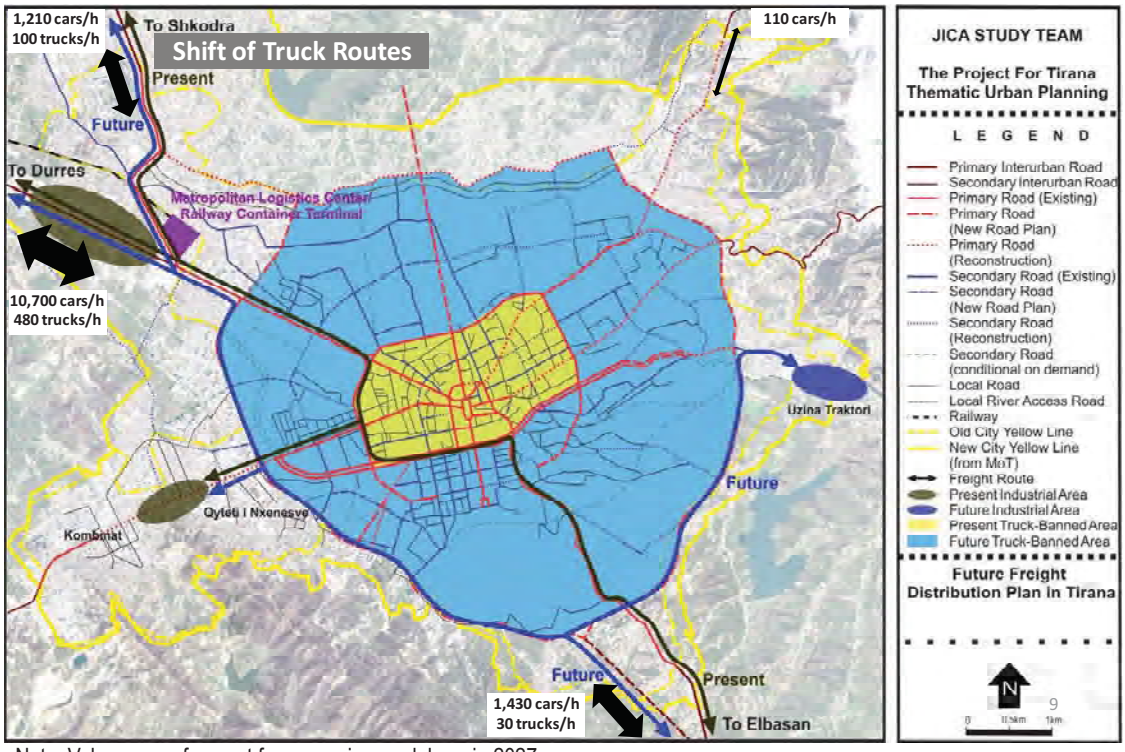
Source: 2011 Transportation Survey, JICA Study Team

Figure 4.9.3 Trip Generation of Trucks to/from Outside Tirana by TAZ

4.9.2 Future Freight Distribution Plan

To ensure smoother freight distribution and truck traffic, future truck routes in Tirana are proposed in light of the existing and planned industrial estates and the road developments, as seen in Figure 4.9.4. Future car and truck volumes that will pass the major boundaries of the Tirana metropolitan area are also projected for 2027 and shown in the figure. While Tirana Bypass is planned outside the study area in ANTP2, those volumes basically match with the traffic volume projections in ANTP2.

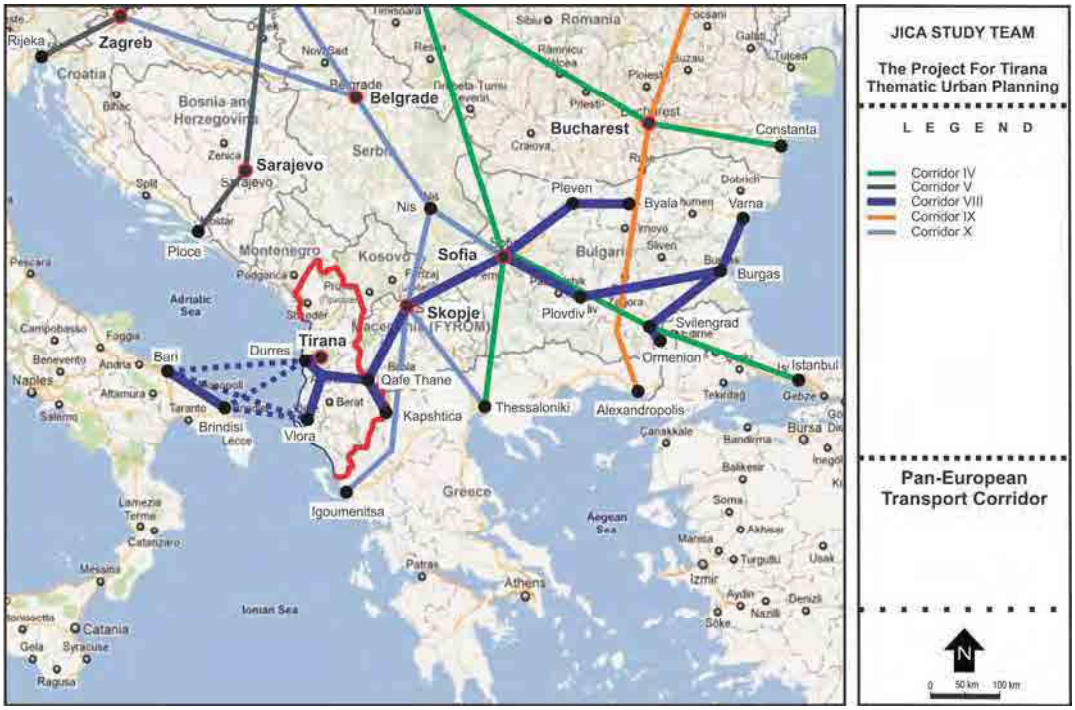
The future truck network will be based on the primary roads, which will also serve nearby industrial estates. It will also provide an alternative truck route which will skirt around central Tirana and prevent mixing of freight with other vehicles on other roads.



Note: Volumes are forecast for a morning peak hour in 2027.
Source: JICA Study Team

Figure 4.9.4 Future Freight Distribution Plan in Tirana

It should be noted that the Outer Ring Road will serve not only the industrial estates but also freight traffic between Durres and Elbasan. Though the current volume is small, in near future, more and more trucks transporting between Durres and in the direction of Elbasan and eastwards on the Pan-European Transport Corridor VIII (Figure 4.9.5) are expected to shift to a faster route through Tirana after the new primary interurban road/tunnel to Elbasan has been completed.



Source: JICA Study Team, based on Pan-European Corridor VIII Secretariat

Figure 4.9.5 Pan-European Transport Corridor in Balkan Region

Thus, after the Outer Ring Road has been completed, it is better to expand the current truck-banned area (excluding vehicles with a 3.5-ton or lower loading capacity) inside the middle corridor to the area inside the outer ring corridor by designating the Outer Ring Road as a freight route. Certain hours of the day such as nighttime may be reserved to be excluded from this operation for trucks to directly serve the area inside the outer ring corridor. In the daytime, it could be served by smaller trucks dispatched from a "metropolitan logistic center" that is described below. Even if smaller trucks are allowed to enter the truck-banned area in the daytime, reduction of those goods distributing trucks should be minimized by providing common goods disposal facilities on/off the streets.

Furthermore, a truck terminal, as a "metropolitan logistic center" to distribute goods to many places in Tirana, should be developed somewhere along the primary road, especially on the freight transport (Durres-Elbasan) corridor. For this, since the development of an intermodal transportation terminal along with relocation of Tirana railway station has already been planned by the MOT with approximately 85,000 m^2 of available land, it could be integrated with the railway infrastructure and developed in this location.

The New Tirana station should also be reformed as a container terminal, since it has enough land space for a new railway marshaling yard. In this project, the New Tirana station also needs to be equipped with freight handling facilities. All containers designated to be transported to Durres Port or other destinations in Albania by railway should be brought to this terminal by truck and then arranged for long-haul trips using container handling equipment such as stacker or a rubber-tired gantry crane (RTG crane). This space should be enough to arrange trains with freight wagons designed to carry 40-ft containers.

4.10 Organizational and Institutional Arrangements

4.10.1 Establishment of a Transportation Authority

Establishment of a new agency, such as a transportation authority, is strongly recommended to make consistent a metropolitan-wide transportation system development plan and to manage transportation demand in the Tirana metropolitan area. However, if it needs time to establish such a new agency, a planning commission is to be established to pursue the tasks in short term. The Study recommends establishing a transportation authority for the Tirana metropolitan area in the short term and to envisage the next step to be the establishment of an urban development authority.

(1) Tirana Transportation Planning Commission

The Tirana Transportation Planning Commission is to be set up under the direction of the central ministries, consisting of transport-related personnel from local governments including the MOT. This executive body shall consist of heads of respective local governments, as well as representatives from the ministries, such as the Ministry of Public Works and Transport and the National Territorial Planning Agency. Its main functions are:

- To coordinate respective transportation planning and studies at local governments into an integrated metropolitan transportation plan;
- To conduct research and survey, among others, a more comprehensive household travel survey which will collect information of all trips on a weekday in the metropolitan Tirana area, for transportation planning; and
- To review and update the integrated metropolitan transportation plan including this Study and manage the data and the planning methodology acquired through the Study.

A permanent secretariat including technical experts should be set up to support the commission and carry out daily operations. Funding for the commission and the personnel shall be in the form of contribution by the commission members.

(2) Metropolitan Tirana Transportation Authority

A Metropolitan Tirana Transportation Authority is to be established as an independent public corporation which has main accountability to the public, not only to the central or local governments. The authority would be endorsed by government law to stand as an independent public corporation. It oversees all land transportation issues and has main responsibilities for the following:

- To formulate metropolitan transportation policies;
- To formulate integrated transportation planning, including road network development, public transport development, TCMs, and urban transportation system management;
- To implement the integrated transportation planning and programs especially to realize the bus route restructuring for the Tirana metropolitan area;
- To issue licenses and control public transportation with bus operation license, public transport business license, terminal or station development permission, and so on;
- To regulate public transport services such as tram, bus, and so on;

- To support development of interurban road network; and
- To carry out TDMs such as parking pricing.

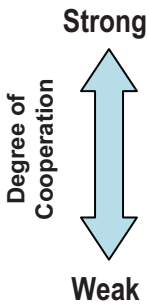
The Transportation Authority would be operated by the revenue from transportation business such as public transport fares and parking charges or subsidy from the central and local governments. As an independent corporation, however, its primary task is to achieve and maintain financial sustainability, and it should be underlined that a disclosure of financial status is one of the most important aspects to secure its position as a public corporation offering public services to users in the Tirana metropolitan area. As a public corporation, it could also raise fund from the capital market by issuing corporate bonds.

(3) Cooperation between Public Transport Operators

The establishment of such a metropolitan transportation authority may be difficult for various reasons. However, for coordination of different city and commune bus lines for the Tirana metropolitan area and for an integrated fare system, examples that are often applied in the cities of Germany may be useful. Examples of cooperation between public transport operators in the metropolitan regions in Germany are presented in Table 4.10.1.

Examples of transport federation (*Verkehrsverbund*), which is the strongest in the degree of cooperation, are observed in Hamburg, Berlin, etc. It is one form of transportation authority that focuses only on cooperation in public transport operation and its planning. It aims at realizing comprehensive public transportation systems that the citizens are attracted to by forming an alliance among transport operators. Its main task is to work cooperatively on route planning, common fare system, timetable scheduling, service level, marketing, financing, etc. based on the citizens' needs. Thus, a number of public transportation issues shall be resolved based on consensus with stakeholders including the citizens.

Table 4.10.1 Examples of Cooperation between Public Transport Operators in Germany



Type of Cooperation	Common Tariff	Bus Line Planning	Schedule Planning	Remarks
Transport Federation	Yes	Yes	Yes	Legally independent body with revenue
Transport Alliance	Yes	Yes	Yes	Managed by transport operators
Tariff Alliance	Yes	No	Cooperation	Sharing revenues based on prior agreement
Partial Cooperation	No	No	Cooperation	Various cooperation as the need arises

Source: JICA Study Team, based on (Knieps, 2009) and (Krause, 2009)

(4) Undertakings by the Transportation Authority

1) Public Transport Development

Tramlines are expected to be a key public transport system in the Tirana metropolitan area and substantial patronage would also be obtained from outside the city of Tirana. Moreover, the existing city bus lines are proposed to be restructured and integrated with the commune bus lines, extending beyond the boundary of Tirana. Considering these circumstances, the infrastructure construction work will be taken care of by the

Metropolitan Tirana Transportation Authority, and a new public or private enterprise will undertake the operation and management of the tramlines. The Transportation Authority will share the cost for the infrastructure development of the tramlines, while the cost for rolling stocks and operation and maintenance cost are the expenditure for the enterprise.

2) Road Development

Usually, urban road construction/reconstruction and the other related facility development such as dedicated bus and bicycle lanes will be implemented under the responsibilities of the local governments. Thus, consistent implementation of the project beyond the administration boundary is required. Therefore, the Transportation Authority will undertake management of development for continuous construction/reconstruction of primary roads in which ROW of dedicated bus and bicycle lanes should usually be reserved. Actual road maintenance work of the roads will be undertaken by the local government, though necessary expenses for the bus and bicycle lanes may be appropriated by the Transportation Authority.

3) TDM (Parking Pricing)

TDM policies such as parking pricing will be adopted against the vehicles currently running in the CBD of Tirana. A considerable number of vehicles, however, come from the outside of the city of Tirana. In this context, implementation and management of TDM policies should be undertaken by the Transportation Authority including preparation studies.

4.10.2 Private Sector Involvement in Transportation Development

Public transportation enterprises such as Albanian Railways (HSH: Hekurudha Shqiptare), a state-owned railway company, should be rationalized. Particularly, if the aforementioned commuter rail development is to be implemented, an independent enterprise should be established for the commuter rail operation. Although privatization is yet to be discussed further, the rationalization and efficiency of the railway business are the conditions for the private-sector participation.

Furthermore, regulations on private investment in transportation sector should be reviewed and modified to provide a sound investment environment for the private sector in transportation business. This also includes provision of development rights to private investors in the surrounding area of railway or tram stations, making it possible to internalize the development benefits of transportation system development. This may relieve the financial burden of the investors, and could promote the transportation business with a view to overcoming financial problems. However, it should be done in a well-planned and controlled manner consistent with the land use plan. The role and responsibility sharing system between the public and private sectors should also be clearly determined.

4.11 Listing of Priority Actions/Projects

Although the most crucial criterion is economic feasibility of the investment, it is not an easy task to economically evaluate all the projects over different sub-sectors. Thus, the projects are evaluated by quantitative and qualitative measures through a multi-criteria analysis. The evaluation criteria are set forth in Table 4.11.1.

Table 4.11.1 Evaluation Criteria

Evaluation Criteria	Note
Coherence with Visions	Although all proposed projects must be relevant to the visions and planning objectives for developing Tirana, the current strategic project designated by the MOT to achieve the visions should be given a priority.
Urgency	Projects that are expected to contribute to the urgent transportation issues should be given a priority.
Necessity	All proposed projects are considered based on needs of the citizens. However, projects that can more widely and more greatly respond to people's needs may be given a priority. As a proxy for the population of beneficiaries, future transportation demand for each project may be used.
Implicit Feasibility	Socioeconomic, technical, and institutional feasibilities need to be considered for prioritization, because these factors are closely related to the implementability and sustainability of a project. This criterion is not necessarily tangible but implicit. For roads, projects that are expected to greatly relieve the present/future traffic congestion may be given a priority.
Social Acceptance	Projects which are accepted by all people may be given a priority. However, there are some projects that are highly necessary for the society, but not welcomed by citizens, for example, restructuring of tariff structure for public services such as bus fare. A priority shall be considered in balance between both sides of needs. In the road sector, plans that have been widely recognized in the previous Regulatory Plan of 1989 are given a priority.

Source: JICA Study Team

Each project is evaluated with a scoring method, referring to these five criteria explained above, as shown in Table 4.11.2. A plus sign (+) is marked for a criterion that is met by a project, and it is equivalent to one point. Thus, the total score of each project is calculated. No weighted point system is applied at this stage. Basically, road or tramline development projects with three points or more and other projects with two points or more are prioritized as short-term projects.

Thus, phasing of the projects has been made based on the scores, as shown in the right columns of Table 4.11.2. Development terms (i.e., short, medium, and long terms) indicate the starting period of projects. Prospective priority projects and action plans in the road and urban transportation sector are also listed as short-term projects. Furthermore, considering the cost, necessary work period, and sequences of the projects, a realistic implementation schedule of the projects has been studied and presented in Table 4.11.3.

Table 4.11.2 Scoring Priority Evaluation for Proposed Projects

Proposed Projects			Coherence with Visions		Urgency		Necessity (Future Demand*)		Implicit Feasibility		Social Acceptance		Total score	Project Schedule		
														Short	Medium	Long
RUT-1	Road Development Plan															
RUT-1-1	Northern Extension of the Main Boulevard															
RUT-1-1-1	Northern Extension of the Main Boulevard - Part 1		+	Ongoing			+	6,100	+	0.59			3	●		
RUT-1-1-2	Northern Extension of the Main Boulevard - Part 2		+	Strategic				900		0.09			1		●	
RUT-1-2	Development of Outer Ring Road															
RUT-1-2-1	Development of Outer Ring Road - South Section		+	Ongoing	+	Priority zoning	+	2,500		0.25			3	●		
RUT-1-2-2	Development of Outer Ring Road - North Section (with River Access Road)		+	Strategic	+	Priority zoning	+	6,200	+	0.60			4	●		
RUT-1-2-3	Development of Outer Ring Road - East Section				+	Priority zoning		1,100		0.11			1		●	
RUT-1-3	Development of Inner/Middle Ring Roads															
RUT-1-3-1	Development of Inner Ring Road				+	Priority zoning	+	18,100		1.31	+		3	●		
RUT-1-3-2	Development of Intermediate Ring Road						+	4,000		0.89	+		2		●	
RUT-1-3-3	Development of Middle Ring Road				+	Priority zoning	+	3,300		0.65	+		3	●		
RUT-1-4	Development of Radial Roads															
RUT-1-4-1	Development of Radial Road: Dibra Road		+	Strategic	+	Tramway	+	3,400		0.49	+		4	●		
RUT-1-4-2	Development of Radial Road: Hoxha Tahsim & Xhanfize Keko Road				+	Bus lane	+	4,500	+	0.66	+		4	●		
RUT-1-4-3	Development of Radial Road: Komuna e Parisit & Medar Shtylla Road				+	Bus lane	+	2,100	+	0.31	+		4	●		
RUT-1-4-4	Development of Radial Road: Aleksander Moisiu Road		+	Strategic	+	Tramway	+	3,100		0.46	+		4	●		
RUT-1-4-5	Development of Radial Road: Ali Shefqeti Road						+	3,200		0.76	+		2		●	
RUT-1-4-6	Development of Radial Road: Myslym Keta Road							1,900	+	0.33	+		2		●	
RUT-1-4-7	Development of Radial Road: Kavaja Road		+	Strategic	+	Tramway	+	12,700		1.42	+		4	●		
RUT-1-5	Development of Other Secondary Roads															
RUT-1-5-1	Development of Secondary Roads: CBD Area							1,200	+	0.52	+		2		●	
RUT-1-5-2	Development of Secondary Roads: Northern Area						+	3,000	+	0.71	+		3	●		
RUT-1-5-3	Development of Secondary Roads: Eastern Area						+	2,700		0.63			1		●	
RUT-1-5-4	Development of Secondary Roads: Southeastern Area						+	2,100		0.47			1		●	
RUT-1-5-5	Development of Secondary Roads: Southwestern Area						+	2,000		0.54	+		2		●	
RUT-1-5-6	Development of Secondary Roads: Western Area						+	4,100		0.91	+		2		●	
RUT-1-5-7	Development of Secondary Roads: Outer Western Area						+	3,300		0.73	+		2		●	
RUT-1-5-8	Development of Secondary Roads: Northeastern Area							700		0.22			0			●
RUT-1-6	Improvement of Bottleneck Intersections															
RUT-1-6-1	Improvement of Bottleneck Intersection: Dibra Road				+	Bottleneck	+	4,000	+	1.18	+		4	●		
RUT-1-6-2	Improvement of Bottleneck Intersection: Hoxha Tahsim Road				+	Bottleneck	+	3,000	+	0.88	+		4	●		
RUT-1-6-3	Improvement of Bottleneck Intersection: Elbasan Bridge				+	Bottleneck	+	5,400	+	1.04	+		4	●		
RUT-1-6-4	Improvement of Bottleneck Intersection: Vasil Shanto Bridge				+	Bottleneck	+	6,200	+	1.22	+		4	●		
RUT-1-6-5	Improvement of Bottleneck Intersection: Myslym Shyri Road				+	Bottleneck	+	3,200	+	0.93	+		4	●		
RUT-2	Transportation Control Measures (TCM)															
RUT-2-1	Development of Pedestrian Streets/Traffic Cell System															
RUT-2-1-1	Pedestrian Streets/"Traffic Cell System" inside Inner Ring Road								+				1		●	
RUT-2-1-2	Pedestrian Streets/"Traffic Cell System" in Blok District								+		+		2	●		
RUT-2-1-3	Pedestrian Facility Development for Better Environment				+	Pedestrian Safety			+		+		3	●		
RUT-2-2	Development of Bus/Bicycle Priority System															
RUT-2-2-1	Development of Dedicated Bus Lanes								+		+		2	●		
RUT-2-2-2	Development of Bicycle Lanes								+		+		2	●		
RUT-2-3	Parking System Development															
RUT-2-3-1	Development of Parking Facilities/Parking Information System				+	Parking problems			+		+		3	●		
RUT-2-3-2	Parking Pricing System in CBD				+	Parking problems			+				2	●		
RUT-2-4	Development of Urban Traffic Control (UTC) Center		+	Ongoing					+		+		3	●		
RUT-3	Public Transport Development Plan															
RUT-3-1	Tramlines Development															
RUT-3-1-1	East-West (Kinostudio-Kombinat) Tramline Development		+	Strategic			+	16,100			+		3	●		
RUT-3-1-2	North-South (Student City-Intermodal Terminal) Tramline Development		+	Strategic			+	15,000			+		3	●		
RUT-3-1-3	North-South (Paskuqan) Tramline Development							3,700					0			●
RUT-3-1-4	Unaza (Circular) Tramline Development						+	10,700			+		2		●	
RUT-3-2	Bus Transportation Development															
RUT-3-2-1	Restructruring City/Commune Bus Lines				+	Bus lane			+		+		3	●		
RUT-3-2-2	Transit Mall Development in the Center								+				1		●	
RUT-3-2-3	Bus Location System Development								+		+		2	●		
RUT-3-3	Intermodal Transportation Terminal Development															
RUT-3-3-1	Relocation of Tirana Railway Station		+	Strategic							+		2	●		
RUT-3-3-2	Intercity Bus Terminal Development		+	Strategic					+		+		3	●		
RUT-3-4	Commuter Rail Development															
RUT-3-4-1	Airport Rail Link Development										+		1		●	
RUT-3-4-2	Tirana-Durres Commuter Railway Development										+		1		●	
RUT-4	Freight Transportation System															
RUT-4-1	Truck Ban Expansion/Truck Unloading Area										+		1		●	
RUT-4-2	Metropolitan Logistic Center Development										+		1		●	
RUT-4-3	Railway Container Terminal Development										+		1		●	
RUT-5	Organizational and Institutional Arrangements															
RUT-5-1	Establishment of Metropolitan Tirana Transportation Authority															
RUT-5-1-1	Establishment of Tirana Transportation Planning Commission								+		+		2	●		
RUT-5-1-2	Household Travel Survey for Tirana Metropolitan Area								+		+		2	●		
RUT-5-1-3	Review and Update of Integrated Transportation Master Plan								+		+		2	●		
RUT-5-1-4	Shift to Metropolitan Tirana Transportation Authority								+		+		2	●		
RUT-5-2	Institutional Setup															
RUT-5-2-1	Study on Private Sector Involvement in Transportation								+		+		2	●		
RUT-5-2-2	Preparation of Laws, Bylaws, Regulations, etc., for Private Sector Involvement								+		+		2	●		

Note: * For road, unit is PCU/3 hours/direction in 2027, and projects of which volume is over 2,000 are given a point.
For tram, unit is persons/hour/2 directions, and projects of which volume is over 10,000 are given a point.

Source: JICA Study Team

Table 4.11.3 Implementation Schedule for Road and Urban Transportation Sector

Proposed Projects			Short-term					Mid-term					Long-term				
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
RUT-1	Road Development Plan																
	RUT-1-1	Northern Extension of the Main Boulevard															
		RUT-1-1-1 Northern Extension of the Main Boulevard - Part 1		■	■												
		RUT-1-1-2 Northern Extension of the Main Boulevard - Part 2							■	■							
	RUT-1-2	Development of Outer Ring Road															
		RUT-1-2-1 Development of Outer Ring Road - South Section	■	■	■												
		RUT-1-2-2 Development of Outer Ring Road - North Section (with River Access Local Road)			■	■	■	■									
		RUT-1-2-3 Development of Outer Ring Road - East Section						■	■	■	■	■					
	RUT-1-3	Development of Inner/Middle Ring Roads															
		RUT-1-3-1 Development of Inner Ring Road	■	■													
		RUT-1-3-2 Development of Intermediate Ring Road						■	■	■							
		RUT-1-3-3 Development of Middle Ring Road		■	■												
	RUT-1-4	Development of Radial Roads															
		RUT-1-4-1 Development of Radial Road: Dibra Road	■	■	■												
		RUT-1-4-2 Development of Radial Road: Hoxha Tahsim & Xhanfize Keko Road			■	■	■										
		RUT-1-4-3 Development of Radial Road: Komuna e Parisit & Medar Shtylla Road		■	■	■											
		RUT-1-4-4 Development of Radial Road: Aleksander Moisiu Road				■	■										
		RUT-1-4-5 Development of Radial Road: Ali Shefqeti Road							■	■							
		RUT-1-4-6 Development of Radial Road: Myslym Keta Road							■	■							
		RUT-1-4-7 Development of Radial Road: Kavaja Road	■	■	■												
	RUT-1-5	Development of Other Secondary Roads															
		RUT-1-5-1 Development of Secondary Roads: CBD Area						■	■	■	■	■					
		RUT-1-5-2 Development of Secondary Roads: Northern Area		■	■	■											
		RUT-1-5-3 Development of Secondary Roads: Eastern Area						■	■	■	■	■					
		RUT-1-5-4 Development of Secondary Roads: Southeastern Area										■	■	■			
		RUT-1-5-5 Development of Secondary Roads: Southwestern Area						■	■	■	■	■					
		RUT-1-5-6 Development of Secondary Roads: Western Area						■	■	■	■	■					
		RUT-1-5-7 Development of Secondary Roads: Outer Western Area						■	■	■							
		RUT-1-5-8 Development of Secondary Roads: Northeastern Area											■	■	■	■	■
	RUT-1-6	Improvement of Bottleneck Intersections															
		RUT-1-6-1 Improvement of Bottleneck Intersection: Dibra Road	■														
		RUT-1-6-2 Improvement of Bottleneck Intersection: Hoxha Tahsim Road	■														
		RUT-1-6-3 Improvement of Bottleneck Intersection: Elbasan Bridge	■														
		RUT-1-6-4 Improvement of Bottleneck Intersection: Vasil Shanto Bridge		■													
		RUT-1-6-5 Improvement of Bottleneck Intersection: Myslym Shyri Road		■													
RUT-2	Transportation Control Measures (TCM)																
	RUT-2-1	Development of Pedestrian Streets/Traffic Cell System															
		RUT-2-1-1 Pedestrian Streets/"Traffic Cell System" inside Inner Ring Road							■	■	■						
		RUT-2-1-2 Pedestrian Streets/"Traffic Cell System" in Bllok District			■	■											
		RUT-2-1-3 Pedestrian Facility Development for Better Environment		■	■	■											
	RUT-2-2	Development of Bus/Bicycle Priority System															
		RUT-2-2-1 Development of Dedicated Bus Lanes		■	■	■	■	■	■	■							
		RUT-2-2-2 Development of Bicycle Lanes		■	■	■	■	■	■	■	■	■					
	RUT-2-3	Parking System Development															
		RUT-2-3-1 Development of Parking Facilities/Parking Information System	■	■	■	■	■	■	■	■	■						
		RUT-2-3-2 Parking Pricing System in CBD		■	■	■											
	RUT-2-4	Development of Urban Traffic Control (UTC) Center	■	■	■												
RUT-3	Public Transport Development Plan																
	RUT-3-1	Tramlines Development															
		RUT-3-1-1 East-West (Kinostudio-Kombinat) Tramline Development		■	■	■	■										
		RUT-3-1-2 North-South (Student City-Intermodal Terminal) Tramline Development					■	■	■	■							
		RUT-3-1-3 North-South (Paskuqan) Tramline Development											■	■	■		
		RUT-3-1-4 Unaza (Circular) Tramline Development							■	■	■	■					
	RUT-3-2	Bus Transportation Development															
		RUT-3-2-1 Restructruring City/Commune Bus Lines	■	■				■	■		■	■	■	■			
		RUT-3-2-2 Transit Mall Development in the Center							■	■	■						
		RUT-3-2-3 Bus Location System Development		■	■												
	RUT-3-3	Intermodal Transportation Terminal Development															
		RUT-3-3-1 Relocation of Tirana Railway Station		■	■												
		RUT-3-3-2 Intercity Bus Terminal Development	■	■	■												
	RUT-3-4	Commuter Rail Development															
		RUT-3-4-1 Airport Rail Link Development						■	■	■	■	■					
		RUT-3-4-2 Tirana-Durres Commuter Railway Development						■	■	■	■	■					
RUT-4	Freight Transportation System																
	RUT-4-1	Truck Ban Expansion/Truck Unloading Area								■	■						
	RUT-4-2	Metropolitan Logistic Center Development						■	■								
	RUT-4-3	Railway Container Terminal Development							■	■	■						
RUT-5	Organizational and Institutional Arrangements																
	RUT-5-1	Establishment of Metropolitan Tirana Transportation Authority															
		RUT-5-1-1 Establishment of Tirana Transportation Planning Commission		■	■	■											
		RUT-5-1-2 Household Travel Survey for Tirana Metropolitan Area		■													
		RUT-5-1-3 Review and Update of Integrated Transportation Master Plan			■	■											
		RUT-5-1-4 Shift to Metropolitan Tirana Transportation Authority			■	■	■										
	RUT-5-2	Institutional Setup															
		RUT-5-2-1 Study on Private Sector Involvement in Transportation			■	■											
		RUT-5-2-2 Preparation of Laws, Bylaws, Regulations, etc., for Private Sector Involvement			■	■	■										

Source: JICA Study Team

4.12 Master Plan Costs

4.12.1 Cost Estimate

The preliminary cost of the Master Plan for the road and urban transportation sector has been estimated taking into account the above-mentioned implementation schedule of the proposed projects.

Fund requirement for the Master Plan is summarized in Table 4.12.1 and Figure 4.12.1, including capital investment costs and operation and maintenance costs during the period from 2013 to 2027. An amount of 197 billion Lek is required for the period between 2013 and 2027 in market prices of May 2012 excluding inflation, of which 178 billion Lek and 20 billion Lek are required for the investment and for the operation and maintenance, respectively. The road development requires the highest cost amounting to 90 billion Lek, or 45% of the total cost. The public transport development including the tramlines development and the intermodal transportation terminal development requires 79 billion Lek. Road and public transport developments including TCMs account for 97% of the total cost.

From the viewpoint of the timing of cost distribution, 32%, 57% and 11% of the total cost need to be allocated in the short-term period until 2017, the intermediate period (2018-2022) and the long-term period (2023-2027), respectively, as shown Table 4.12.2. Annual distribution of the Master Plan cost is indicated in Figure 4.12.1.

The share of the Master Plan cost accounts for 2.0% of the GRDP of the Tirana region[4] throughout the period from 2013 to 2027. The cumulative GRDP is estimated at 9,697 billion Lek at 2012 constant prices for the period from 2013 to 2027 based on the socioeconomic framework assumed in this Study.

Table 4.12.1 Road and Urban Transportation Master Plan Cost (2013-2027)

[Unit: million Lek]

Sub-Sector	Investment Cost	Operation and Maintenance Cost	Total	Share
Road Development	87,620	2,090	89,711	45%
Transportation Control Measures (TCMs)	14,901	8,571	23,472	12%
Public Transport Development	71,726	7,235	78,961	40%
Freight Transportation Development	2,590	295	2,885	1%
Organizational and Institutional Arrangements	1,006	1,407	2,413	1%
Total	177,843	19,599	197,442	100%

Note: The cost is estimated at 2012 market prices, and price escalation is not included.
Source: JICA Study Team

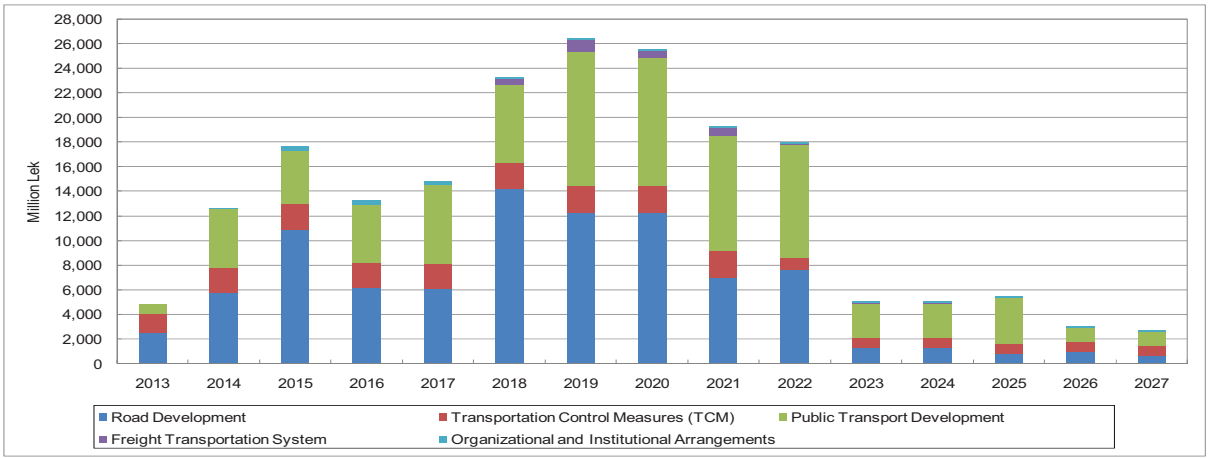
[4] Source: Institute of Statistics

Table 4.12.2 Road and Urban Transportation Master Plan Cost by Development Term

[Unit: million Lek]

Sub-Sector	Development Term			
	Short Term (2013-2017)	Medium Term (2018-2022)	Long Term (2023-2027)	Total
Road Development	31,494	53,322	4,894	89,711
Transportation Control Measures (TCMs)	9,692	9,697	4,083	23,472
Public Transport Development	21,048	46,316	11,596	78,961
Freight Transportation Development	0	2,683	202	2,885
Organizational and Institutional Arrangements	1,044	684	684	2,413
Total (%)	63,279 32%	112,703 57%	21,459 11%	197,442 100%

Source: JICA Study Team



Source: JICA Study Team

Figure 4.12.1 Annual Cost of Master Plan (2013-2027)

4.12.2 Funding Allocation

For allocation of the funds for the Master Plan by the public and private sectors, the following assumptions have been made.

1) Road Development

Since there will be no toll road in the Tirana metropolitan area, no private initiative development is assumed. For land expropriation, the central government is assumed to be responsible for all the cost.

2) Transportation Control Measures (TCM)

The MOT is responsible for the development of the dedicated bus lanes. As for the bus operation, it is assumed that the MOT will give a concession for operation to the private bus companies through bidding. That is, the cost for the bus lane-related facility development will be covered by the MOT and partly by the central government (for land expropriation for road widening), while management and operation of bus services will be provided by eligible private companies. Concession revenue of the bus operation will recover the cost for dedicated bus lane facility development such as bus stops and bus

location system.

As for development of parking facilities, the private sector is responsible for the construction of parking facilities in the public space under a concession from the MOT. Concession revenue of the parking operation will recover the cost for parking pricing and parking information systems.

3) Public Transport Development

The scheme for the management and operation of the proposed tramlines has been discussed including a possibility of private initiative development. However, it is assumed that a new public or private enterprise will take responsibility on the management and operation. The following responsibility is assumed:

- Though the tramlines will be developed basically on the existing roads, the cost for necessary land expropriation (for additional tracks, depots, workshops, Park & Ride facilities, etc.) will be provided by the central government;
- Basic infrastructure facilities, such as civil and track works, electrical works and buildings along with maintenance works and procurement of rolling stock, will be carried out by the enterprise; and
- All revenues accruing from passenger and commodity transportation business and affiliated works will belong to the enterprise.

As for the commuter rail development, it is assumed that the existing Albanian Railways (HSH) will be privatized especially for the commuter rail operation.

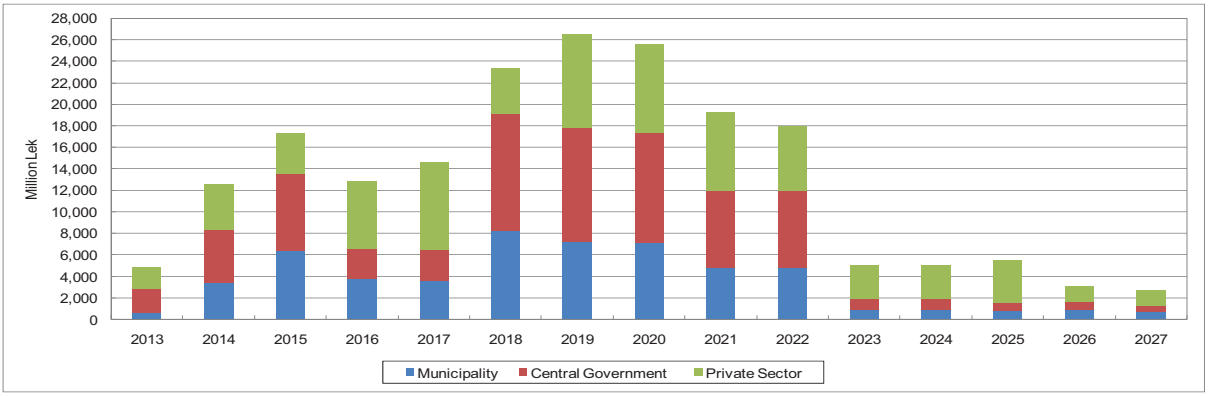
Taking into consideration the private sector involvement and revenue as described above, the funding allocation for the Master Plan is estimated by public/private sector as shown in Table 4.12.3. Annual funding allocation by public/private sector is presented in Figure 4.12.2. Total Master Plan cost amounts to 197 billion Lek, of which 72 billion Lek, or 36% of the total cost, could be reduced from the total cost burden with the introduction of private initiative development. Consequently, the funding requirement of the public sector for the implementation of the Master Plan is estimated at 126 billion Lek at 2012 market prices excluding inflation for the period 2013-2027. The funding requirement of the MOT for the Master Plan is estimated at 55 billion Lek, or 28% of the total cost.

Table 4.12.3 Cost Allocation for Master Plan by Public/Private Sector (2013-2027)

[Unit: million Lek]

Sub-Sector	Public Sector (MOT)	Public Sector (Central Gov't)	Private Sector	Total MP Cost
Road Development	46,839	42,872	0	89,711
Transportation Control Measures (TCMs)	4,114	0	19,358	23,472
Public Transport Development	2,580	24,015	52,366	78,961
Freight Transportation Development	859	2,026	0	2,885
Organizational and Institutional Arrangements	165	2,248	0	2,413
Total (%)	54,556 28%	71,162 36%	71,724 36%	197,442 100%

Source: JICA Study Team



Source: JICA Study Team

Figure 4.12.2 Annual Cost Allocation for Master Plan by Public/Private Sector (2013-2027)

5. Solid Waste Management

5.1 Current Status and Salient Feature in Solid Waste Management (SWM)

5.1.1 Waste Amount and Composition Survey

(1) Preparation for the Survey

1) Background of the Survey

As in many cities in the world, solid waste management (SWM) in Tirana Municipality is facing several problems that can directly affect the environment and health of the residents. Amongst these problems are inefficient urban infrastructures of the municipality including SWM service. Under the circumstances, the Government of Republic of Albania has made every effort to develop the urban infrastructures as a part of the national strategy and requested the technical cooperation of the Government of Japan to conduct the Project for Tirana Thematic Urban Planning. The objectives of the Study include the formulation of action plans under the short-term (five year action plan) and the mid-term plan (ten year plan) for development of the urban infrastructures including SWM facilities.

2) Objective of the Survey

The Solid Waste Amount and Composition Survey (WACS) is carried out as a part of the study to formulate the plan for development of SWM facilities of Tirana Municipality. The results of WACS shall provide the basic information on the characteristic of solid wastes such as waste generation amount and composition required for devising the action plans for SWM.

3) Scope of Work of the Survey

The contractor under the supervision of the JICA expert carried out WACS. The survey consists of the following components including the analysis of data and preparation of the report.

- Domestic Waste Amount and Composition Survey
- Incoming Waste Amount and Composition Survey at Sharra Disposal Site
- Illegal Dumping Waste Survey

The contents and manner of conduct of each survey is briefly explained as follows:

a) Domestic Waste Amount and Composition Survey

Waste amount generated from four typical income groups was the target waste samples. The income groups, number of samples and survey method for waste amount and waste composition surveys are summarized in Tables 5.1.1 and 5.1.2.

Table 5.1.1 Table Summary of Domestic Waste Generation Amount Survey

Area	Number of Samples per Day	Period (days)	Total Number of Samples
High Income Residential Area	25	8	200
Middle Income Residential Area	25	8	200
Low Income Residential Area	25	8	200
Informal Settlement Area	25	8	200
Total	100	32	800
Method of Survey	The survey was conducted for 8 consecutive days. Waste sample was collected from each house by sack or bucket or other appropriate container and measured. The weight was recorded individually.		

Source: JICA Study Team

Table 5.1.2 Summary of Domestic Waste Composition Survey

Area	Number of Samples per Day	Period (days)	Total Number of Samples
High Income Residential Area	1	8	8
Middle Income Residential Area	1	8	8
Low Income Residential Area	1	8	8
Informal Settlement Area	1	8	8
Total	4	32	32
Method of survey	All the collected wastes of the same day from each income group (25 households of each income group) form one (1) composite sample. Sampling was conducted for eight (8) consecutive days.		

Source: JICA Study Team

b) Incoming Waste Amount and Composition Survey at Sharra Disposal Site

All the waste collected from the six collection service areas in Tirana Municipality were measured by the truck scale installed at Sharra disposal site. Also, private vehicles loaded with waste other than domestic waste were also measured in terms of the net weight of the solid waste and recorded by the type of waste. The survey was carried out for seven consecutive days. In addition, 60 waste samples were taken from six waste collection service areas for waste composition survey. The number of samples and survey method are shown in Table 5.1.3.

Table 5.1.3 Summary of Incoming Waste Amount and Composition Survey

Collection Area	Number of samples	Period (days)	Method of survey
Incoming Waste Amount Survey			All the collection vehicles entering to the disposal site were measured in terms of the net weight of the loaded waste classified by type of waste and the collection area. The survey was carried out for 7 consecutive days.
Waste Collection Area-1	All vehicles	7	
Waste Collection Area-2	All vehicles	7	
Waste Collection Area-3	All vehicles	7	
Waste Collection Area-4	All vehicles	7	
Waste Collection Area-5	All vehicles	7	
Waste Collection Area-6	All vehicles	7	
Private Collection Vehicles	All vehicles	7	
Incoming Waste Composition Survey			Ten domestic waste samples each from the respective waste collection area were taken from the collection vehicles serving the target waste collection areas. The method of waste composition survey followed the procedures carried out for the domestic waste composition survey.
Waste Collection Area-1	10	-	
Waste Collection Area-2	10	-	
Waste Collection Area-3	10	-	
Waste Collection Area-4	10	-	
Waste Collection Area-5	10	-	
Waste Collection Area-6	10	-	

Source: JICA Study Team

c) Illegal Dumping Waste Survey

The contractor carried out the survey of locating the illegal waste dumping areas within the jurisdictional area of Tirana Municipality. The survey was conducted for five days. Results of the survey were used as the basic information to formulate the urgent cleanup project of the town area. The middle and large scale illegal waste dumping areas in terms of more than one truck load were surveyed. The site where waste is discarded from time to time and is collected within a one-month time may not be considered as survey site but was plotted as a temporary collection point. Prior to the survey work, the contractor collected the information from the Tirana Municipality authorities concerned and from the waste collection service providers. The areas were then measured by the length, width and height and waste amount with a measuring tape and by visual inspection. The location of dumping areas were measured by a (GPS) and properly plotted on the map(s).

4) Selection of the Contractor

Three candidate contractors were chosen based on the information of MOT and the Team considering the following qualifications to perform the survey:

- Incorporated under the law of Albania,
- More than two technical staff,
- Experience of the projects in the field of environment, and
- Capability of the chief surveyor to perform the survey.

Interview was conducted with each company regarding its background, major field of activities, company staff, etc. to evaluate the capacity of the company to perform the survey.

Based from the interview, the Team selected three companies and requested for their quotation for the survey. Requests were sent to the three companies on July 29 to submit the survey quotation by August 4 to fill in the quotation format prepared by the Team. All three companies submitted the quotation in time and the Team acknowledged receipt of such via email. After some mathematical check and evaluation, the lowest bidder started on with the contract negotiation. Both parties confirmed that the quotation amount is correct and agreed to proceed to the signing of the contract. The survey contract was signed with the following company on August at 5 at the office of the Team in MOT.

Contractor of Waste Amount and Composition Survey
DIAVA CONSULTING shpk : Kutia Postare 228/1 Tirana, Albania
e-mail; adiku@hotmail.com info@diava-consulting.com、www.diava-consulting.com
Phone No. Tel/fax. +355 4 2231437, Mobil; +355 684023424
Administrator: Abdulla Diku

(2) Implementation of the Survey

1) Implementation of Domestic Waste Amount and Composition Survey

Land value map was used to designate the area of each income group. The survey contractor with the letter of authorization issued by MOT visited about 250 households to explain the purpose of the survey and the method to the residents to have their cooperation. About half of the households agreed to cooperate and, finally, 100 households were selected. During the period of waste sampling from September 23 to 30, 2011, the contractor conducted interviews to obtain the necessary data to estimate the unit waste generation rate per capita per day. The interview sheet was prepared with the following items:

- Name of house owner, name of interviewee, address & telephone no.,
- Number of family members and inhabitants,
- Type of house & floor area,
- Monthly income & expenditure, and
- Complaint/Comment on the waste collection services, etc.

Waste sampling was carried out for eight days with 25 houses for four income groups or equivalent to 800 domestic waste samples. The procedure for the waste amount and waste composition survey was as follows:

- Distributing of the support materials, such as plastic bags,
- Collecting waste from the selected households daily and labelling them as to the household source,
- Transporting 25 households samples to the sorting yard at Sharra Disposal Site,
- Weighing waste sample of each household and recording them,
- Sorting composite waste from each income group into 26 categories,
- Weighing the waste of each category and recording them,
- Taking about 2kg of waste sample for moisture content test at the laboratory,

- Mixing the sorted waste again and putting it into a container for measuring the total volume of the waste sample by computing bulk density, and
- Statistical analysis of the data and reporting.

The survey staff consists of six workers, one technician and one environmental engineer deployed for sorting, weighing, and measuring volume and recording.

2) Implementation of Incoming Waste Survey at Sharra Disposal Site

The operation started with identifying the compactors of six waste collection areas arriving at Sharra. The staff of the waste management enterprise assigned to waste disposal cooperated with the contractor and coordinated with the collection vehicle driver for their cooperation. Determination of the sampling vehicles of six waste collection areas was carried out from September 10 to 15 and the field survey for sampling and waste composition was conducted from October 6 to 21, 2011. The procedure of the waste composition survey for incoming waste to Sharra was carried out as follows:

- Selecting the compactors from the six waste collection areas,
- Designating the compactors for the day of sampling,
- Communicating with the compactor driver for the time of arrival to Sharra,
- Instructing the driver to unload about 1t of waste on the ground for sampling,
- Mixing and/or levelling all the unloaded waste to make it a homogeneous heap of waste as much as possible,
- Dividing the waste heap into nine areas and taking waste samples from the three representative areas till the total waste sample becomes about 200 kgs.,
- Sorting all waste samples into 26 categories,
- Weighing the waste of each category and recording them,
- Taking about 2kg of waste sample for moisture content test at the laboratory,
- Mixing the sorted waste again and putting it into a container for measuring the total volume of the waste sample by computing bulk density, and
- Statistical analysis of the data and reporting.

Loading waste amount survey for all the waste collection vehicles was carried out after the installation of the truck scale facilities and new approach system in the premise were completed.

3) Implementation of Illegal Dumpsite Survey

All the processes for identifying the illegal waste dumping sites were conducted from October 2 to 30, 2011. The survey commenced with collection of information from the supervisors of waste collection companies and from the citizens. Then, the surveyors visited the sites and measured the location by GPS and the area by laser measurement device for the width, length and the height of each illegal dump site from October 11 to 20. The analysis and documentation were carried out thereafter for estimating the accumulated waste volume and the number of vehicles required for removal of accumulated waste at the illegal dump sites.

(3) Result of the Survey

The provisional results of waste amount and composition survey are provided below. To avoid large volume of waste accumulation, daily observation data were processed for analysis.

1) Waste Generation Rate per Capita per Day

Daily composite sample from 25 households from each income group for seven days were processed and summarized in Table 5.1.4. The per capita waste generation ration of all the income groups ranges from 0.053kg/day to 0.814kg/day for 100 households during the seven days. The mean per capita waste generation rate varies from 0.295kg/day for informal settlement group to 0.426kg/day. The weighted mean per capita waste generation rate was estimated at 0.357kg/day per capita obtained with reference to the population ration[1] in each income group with 6% for high income group, 60% for middle income group and low income and 34% for informal settlement groups. This value is only for the waste discharge from domestic waste generation source; commercial, business and other waste generation sources are not included.

Table 5.1.4 Estimation of Waste Generation Rate (kg/capita/day)

Item	High Income Group	Middle Income Group	Low Income Group	Informal Settlement	Weighted Mean-Tirana
Maximum	0.814	1.338	0.666	0.810	-
Mean	0.426	0.370	0.348	0.295	0.357
Minimum	0.180	0.112	0.056	0.053	-

Source: JICA Study Team

2) Waste Composition

Results of the waste composition survey are summarized in Table 5.1.5 and shown in Figure 5.1.1. In addition, the waste composition for the incoming vehicle at Sharra done in 2009 and 2010 with three samples each are comparatively shown in Figure 5.1.2. The previous surveys were conducted by the staff of the MOT-owned waste management enterprise for the capacity development program in connection with the expansion project of Sharra Disposal Site. The results of the waste composition of incoming waste survey by the JICA Study Team and the waste management enterprise are quite similar in the ratio of organic waste, plastics, paper, etc. As a whole, household waste shows a higher ratio in combustible waste compared with the waste samples from incoming vehicles with a ratio of about 92% and 80%, respectively. As for compostable/biodegradable waste, the total of food waste and yard waste, accounts for 48% in household waste and 37% in incoming waste.

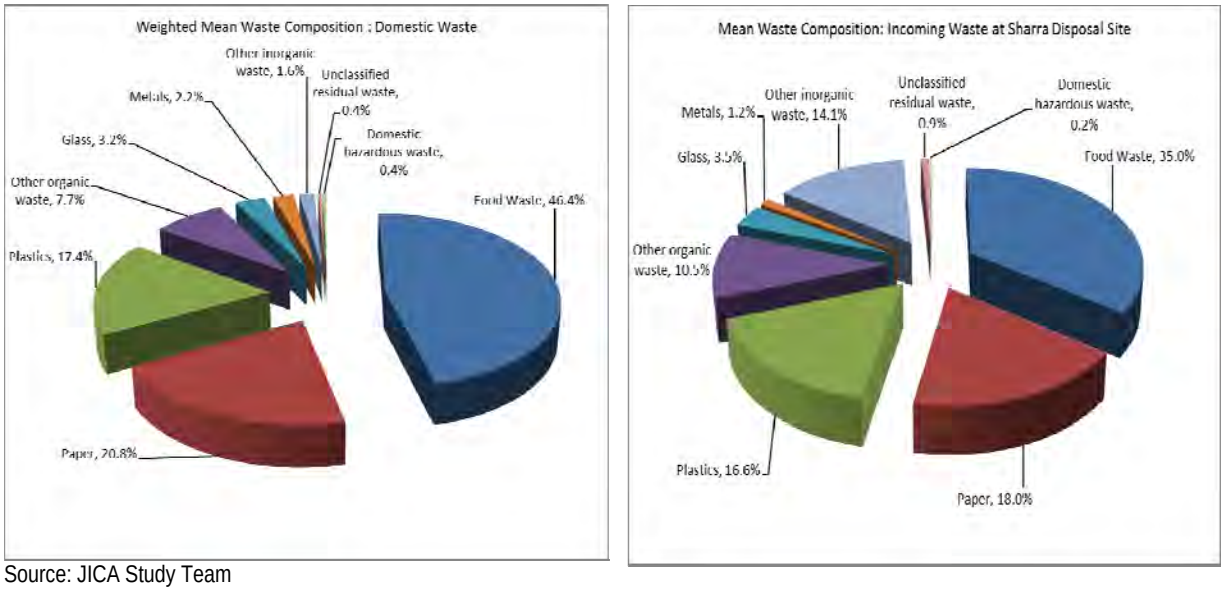
[1]Page 26, Progress Report, Tirana City Development Strategy Project, GOA / World Bank by Mott MacDonald, June 2011

Table 5.1.5 Waste Composition of Domestic Waste and Incoming Waste at Sharra (2011)

Waste Composition	Breakdown Waste Composition	Weighted Mean: Domestic Waste*1	Weighted Mean: Incoming Waste*2
Food Waste		46.39%	34.95%
Paper	Recyclable Paper	4.18%	3.43%
	Recyclable Cardboard	5.69%	5.66%
	Mixed Paper	5.11%	5.17%
	Diapers	5.80%	3.76%
	Subtotal-Paper	20.79%	18.04%
Plastics	Plastic Sheet	1.80%	2.83%
	Recyclable Plastics	2.43%	3.75%
	PET Bottles	5.82%	4.54%
	Other Plastics	7.33%	5.48%
	Subtotal-Plastics	17.39%	16.60%
Rubber & Leather		1.67%	2.34%
Textiles		3.15%	3.53%
Yard Waste		1.74%	1.85%
Lumber & Logs		0.48%	1.85%
Other Org. Waste		0.63%	0.98%
Combustible/Organic Waste - Subtotal		92.23%	80.13%
Glass	Returnable Bottles	1.07%	0.52%
	Other Live Bottles	1.46%	1.59%
	Glass Bins	0.01%	0.01%
	Broken Glass	0.68%	1.41%
	Glass-Subtotal	3.21%	3.53%
Metals	Tin Cans (steel cans)	1.01%	0.42%
	Aluminum Cans	0.52%	0.16%
	Copper	0.00%	0.01%
	Other Metals	0.62%	0.63%
	Metal-subtotal	2.16%	1.22%
Dirt, Ash, Stone, Sand		1.60%	14.09%
Incombustible/Inorganic Waste - Subtotal		6.97%	18.84%
Unclassified Residual Waste		0.36%	0.87%
Batteries - Dry Cells		0.17%	0.06%
Other Domestic Hazardous Waste		0.26%	0.09%
Domestic Hazardous Waste-Subtotal		0.43%	0.15%
Total		100.00%	100.00%

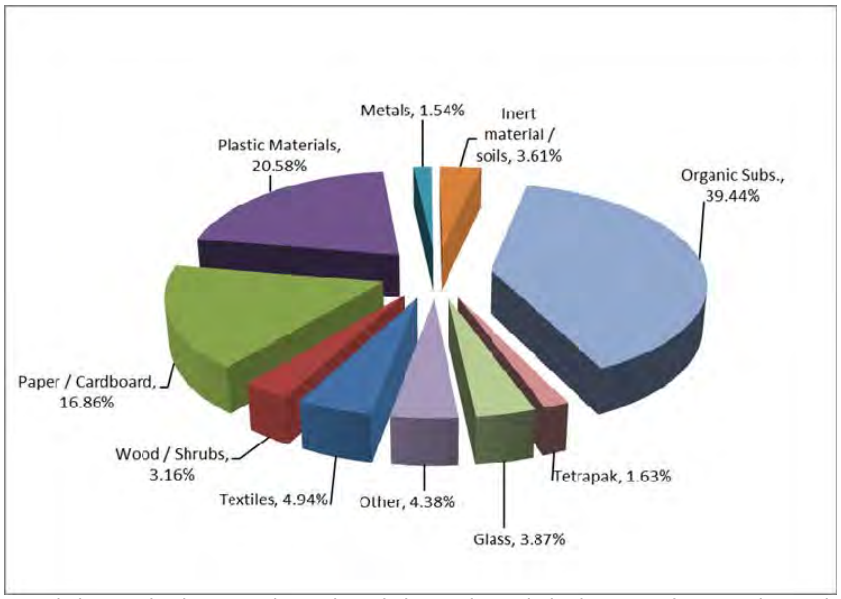
Note:
*1:Weighted mean computed by the population ratio of each income group for 28 domestic waste samples
*2: Weighted mean computed by the waste collection amount of each collection areas for 60 incoming waste samples at Sharra

Source: JICA Study Team



Source: JICA Study Team

Figure 5.1.1 Waste Composition of Domestic Waste and Incoming Waste at Sharra (2011)



Source: Survey carried out under the expansion project of Sharra Disposal Site (average of 2009 and 2010 data)

Figure 5.1.2 Incoming Waste Composition at Sharra by MOT Waste Management Enterprise

One of the aims of the WACS in Tirana is focused on positively finding out the ratio of recyclable materials in municipal waste. Therefore, the sorting for paper and plastic categories are subdivided into recyclable paper & plastics categories and dirty paper & plastic categories which are generally not collected by the waste pickers. Table 5.1.6 shows the percentage of all the recyclables in domestic waste and incoming waste derived from the results of the waste composition survey. Potentially, the total recyclable materials account for about 23% of the domestic waste and 21% of the incoming waste. The explanation for this trend is that the picking of recyclable materials is carried out from waste bins in the town and it is observed that metals are recovered well from the waste bins. Assuming the target level of recovery ratio at 75%, recyclable material can be recovered up to 15% of the municipal waste discharged in Tirana.

Table 5.1.6 Summary of Recyclable Waste

Recyclable Materials	Domestic Waste	Incoming Waste at Sharra
Recyclable Paper	4.18%	3.43%
Recyclable Cardboard	5.69%	5.66%
Paper-total	9.88%	9.10%
Recyclable Plastics	2.43%	3.75%
PET Bottles	5.82%	4.54%
Plastics-total	8.25%	8.29%
Returnable Bottles	1.07%	0.52%
Other Live Bottles	1.46%	1.59%
Glass Bins	0.01%	0.01%
Glass-total	2.54%	2.12%
Tin Cans (steel cans)	1.01%	0.42%
Aluminum Cans	0.52%	0.16%
Copper	0.00%	0.01%
Other Metals	0.62%	0.63%
Metals-total	2.16%	1.22%
All Potential Recyclables	22.82%	20.72%

Source: JICA Study Team

3) Moisture Content and Bulk Density

Moisture content and bulk density were measured in connection with the waste composition analysis. Table 5.1.7 shows the results of moisture and bulk density for 28 samples from households and 60 samples from incoming vehicles at Sharra.

Moisture content of domestic waste ranges from 49% to 67% with the average value at 59% while that of the incoming waste at Sharra ranges from 50% to 72% with the average value at 63%. Moisture content becomes higher after discharge to the waste bins.

Bulk density of domestic waste ranges from 105 to 255kg/m^3 with the average value at 165 kg/m^3, while that of the incoming waste ranges from 144 to 180kg/m^3 with the average value at 161 kg/m^3. The difference of the results of bulk density between domestic waste and incoming waste was not observed distinctively except for the result of the high income group data exceeding the bulk density of 200kg/m^3.

Table 5.1.7 Summary of Moisture Content and Bulk Density Analysis

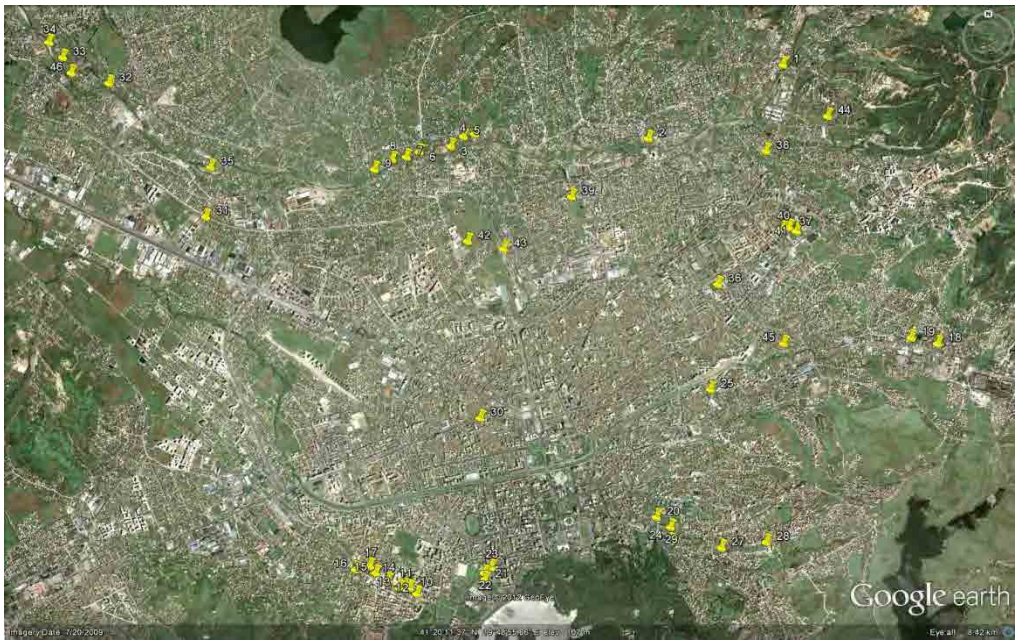
Waste Sample Source		Moisture Content (%)			Bulk Density (kg/m³)		
Income Group	Number of Samples	Minimum	Mean	Maximum	Minimum	Mean	Maximum
High Income	7	55.9	59.6	64.8	149	211	255
Middle Income	7	51.9	59.1	63.4	139	167	199
Low Income	7	48.7	58.8	66.8	105	136	188
Informal Settlements	7	50.1	56.7	61.2	108	145	179
All Domestic Waste	28	48.7	58.6	66.8	105	165	255
Collection Area	Number of Samples	Minimum	Mean	Maximum	Minimum	Mean	Maximum
East-1	10	53.2	64.8	72.2	145	162	179
East-2	10	55.6	62.9	67.7	152	158	169
East-3	10	50.3	61.5	71.2	144	159	180
West-1	10	57.2	62.1	68.9	151	162	177
West-2	10	55.2	61.3	69.1	150	159	166
West-3	10	50.8	62.4	68.8	155	167	176
All Incoming Waste	60	50.3	62.5	72.2	144	161	180

Source: JICA Study Team

4) Illegal Dumpsite

Based on the information of the municipality waste collection supervisors and the community people, a total of 46 middle to large scale illegal dumpsites were identified in the entire area of Tirana. Most of these illegal dumpsites are located in the peripheral area especially along the river banks of the Tirana River and upstream and downstream of the Lana River. The total waste amount discarded at these 46 illegal dumpsites is estimated at approximately 16,000m^3 and mostly consisted of a mixture of construction demolition waste and domestic waste. Figures 5.1.3 and 5.1.4 show the photographs of representative illegal dumpsites and the location of illegal dumpsites.

Figure 5.1.3 Typical Illegal Dumpsites in Tirana Municipality



Source: JICA Study Team

Figure 5.1.4 Identified Location of Illegal Dumpsites

5.1.2 Activities of SWM

(1) Waste Collection

1) Waste Collection Service Providers

The Municipality of Tirana is divided into six waste collection areas. There are three groups providing waste collection service in MOT. The first group is the waste collection companies contracted with MOT to perform the task of waste collection in each waste collection area. In addition to the waste collection and transport services, these companies provide street sweeping and the washing of main roads. The current waste collection contract started in 2008 and the contract period will finish in 2013. The second group is the MOT-owned waste management enterprise instructed by General Directorate No.1 of Tirana; consists of 179 employees who collect wastes from parks, public area, market and construction sites. This municipality enterprise also undertakes landfill operation at Sharra Disposal Site under the supervision of the Directorate of SWM, MOT. The third group collects waste from military compounds, industries, cemetery, etc. using their own vehicles and/or the contracted waste collection and transport service providers. Table 5.1.8 shows the outline of the main waste collection service providers of each waste collection area.

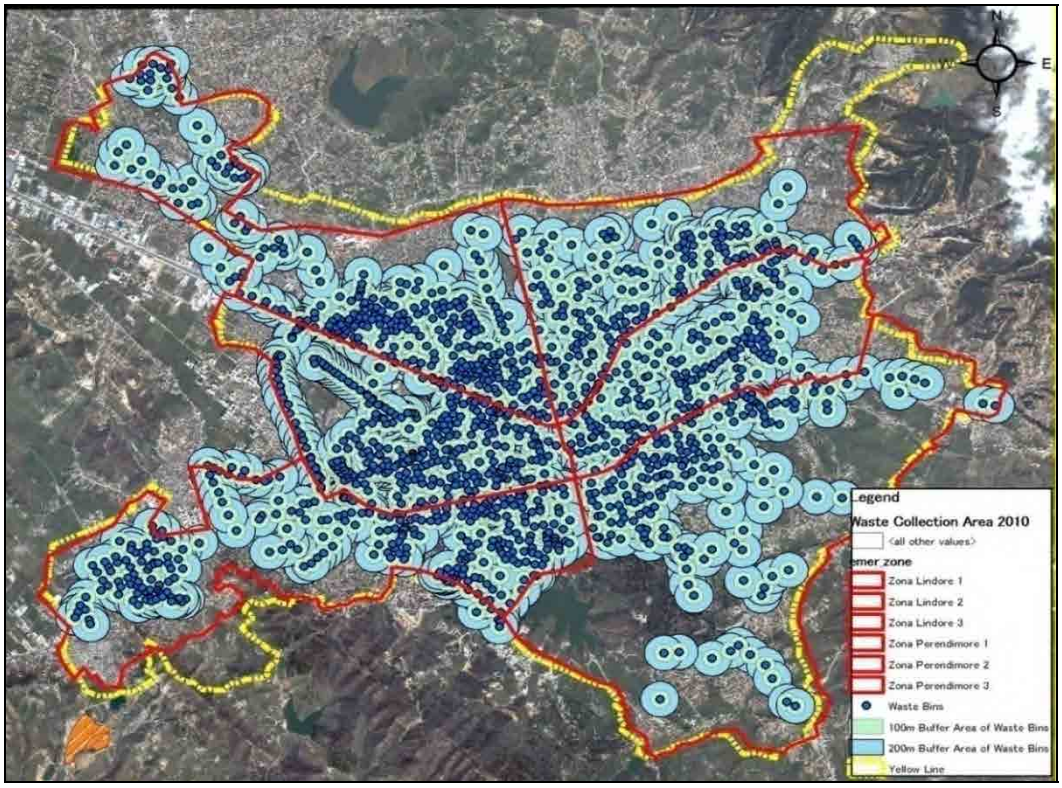
Table 5.1.8 Outline of Waste Collection Service Providers

Item	Name of Companies					
	Infinit	TTA Alba Lam	TTA Alba Lam	Korsel sh p.k	Fusha	Ecologica Albania sh. pk
Collection Area Mini-municipality	East-1 No. 4, 8 & 9	East-2 No. 2, 3, 4& 8	East-3 No. 1 & 2	West-1 No. 9 & 11	West-2 No. 7 & 10	West-3 No. 5 & 6
Contract Period	Sept. 2008-Sept. 2013	Sept. 2008-Sept. 2013	October 2005 -	Sept. 2008-Sept. 2013	Sept. 2008-Sept. 2013	Sept. 2008-Sept. 2013
Contract Amount (M. Lek/year)	188.1	188.1	188.1	171.5	171.6	191.3
Number of Drivers	20	20	13	16	16	20
Number of Collection Crew	22	24		25	25	24
Number of Street Sweepers	60	60		60	70	65
Total	102	104	13	101	111	109
Waste Collection Amount (t/year)	2008: 7,062 2009:23,050 2010:21,175	2008:126,780 2009: 51,878 2010: 59,421	24000	2008: 90,330 2009: 43,187 2010: 32,940	2008: 91,900 2009: 45,013 2010: 44,395	2008: 32,300 2009: 48,993 2010: 50,127
Waste Collection Vehicles	6 compactors: 4.8 – 11m^3	5 compactors: 6 - 15m^3		6 compactors: 10-16m^3	6 compactors: 14-19m^3	8 compactors: 7.7-10m^3
Mini-municipality No.: Waste Collection Population:	No.4: 47,756 No.8: 21,297 No.9: 13,715	Total of No.2,3 & 8 : 96,240		Total of No. 9 & 11: 112,381	No.7: 59.943 No.10: 24.635	No.5: 73,637 No.6: 59,838
Estimated ratio of waste other than municipal waste	20%	50%		34%	34%	33%
Collection Area (ha)	541ha	404ha	1,174ha	700ha	433ha	687ha
Number of Collection Points	154	167	184	307	266	322
Number of Waste Bins	483 (1.7m^3)	562	276	700 (1.7m^3)	635 (1.7m^3)	835(1.7m^3)
Waste Collection Operation Hours	22.30-05.30, 11.30-14.30	22.30-05.30, 11.30-14.30	22.30-05.30, 11.30-14.30	22.30-05.30, 11.30-14.30	22.30-05.30, 11.30-14.30	22.30-05.30 11.30-14.30
Collection Frequency	7 days/week	7 days/week	7 days/week	7 days/week	7 days/week	7 days/week

Source: Directorate of SWM, MOT

2) Waste Bins

MOT uses waste containers called waste bins with the storage capacity of 1.1m^3, 1.7m^3, 2.4m^3 and 3.2m^3. The total number of waste bins is approximately 3,500 units. All the waste bins are collected at least once a day and the waste bins in the areas discharged with more waste are collected twice a day. Waste bins are placed mainly in the collection area. However, assuming the service area of waste bins with 100m/200m radius from each place as shown in Figure 5.1.5, there appears to be some areas without waste bins especially in the peripheral areas.



Source: JICA Study Team

Figure 5.1.5 Location of Waste Bins and 100m & 200m Radius from the Waste Bins

Placement of waste bins set at an appropriate interval is also problematic for those located nearby shops, bar and cafe, etc. Scattering of spilled waste or thrown wastes around the waste bins causes complaints from both the user and the collector. In addition, stealing of wheels and burning of waste bins are reported from time to time. Residents wish to have a scheduled disinfection around the site of waste bins.

3) Waste Collection Amount

Waste collection amount is not measured at present. However, the numbers of waste bins collected every day is recorded by each waste collection service provider under the supervision of Department of Environment Management, MOT. Table 5.1.9 shows the estimated waste collection amount based on the number of waste bins collected for the monthly report of September 2011. Estimation was made on the assumption that 70% of waste bins are filled and the bulk density of discharged waste is in the range of 100 - 150kg/m^3. The result of

calculation shows that the average waste collection amount by the waste collection contractors reached 667t per day in September or 18,700t per month. In addition, the MOT-owned waste collection enterprise and other private waste collection service providers are collecting wastes from the sources other than waste bins. The total waste collection amount including all the waste collection services is estimated at about 600-800t/day.

Table 5.1.9 Estimated Waste Collection Amount by Waste Collection Contractors (September, 2011)

Waste Collection and Transportation Company	Waste bin volume (m3)	Monthly contract Number of bins (unit)	Collected Number of bins (unit)	Estimated net waste amount per bin (t)	Estimated Waste Collection Amount	
					(t/month)	(t/day)
Infinit (East 1)	1.7	18,270	17,547	0.149	2,610	87
TTA Alba-Lam (East 2)	1.7	26,010	25,638	0.149	3,814	127
TTA Alba-Lam (East 3)	3.2		1,388	0.280	389	13
	2.4		7,577	0.210	1,591	53
Korsel sh.p.k (West 1)	1.7	26,700	26,319	0.149	3,915	130
Fusha (West 2)	1.7	22,260	22,128	0.149	3,292	110
Ecologica Albania sh.p.k (West 3)	1.7	30,180	29,562	0.149	4,397	147
Total					18,661	667

Source: Department of Environment Management, MOT

(2) Waste Reduction, Reuse and Recycling (3R)

1) Waste Reduction

The National Waste Management Plan of Albania set the target for waste reduction to "zero growth of waste generation" by 2020 and maintains the target to achieve an actual waste reduction thereafter. However, the implementation plan has not yet been formulated and MOT also has not yet formulated the waste reduction plan and programs.

2) Recovery of Recyclable Materials

MOT started the demonstrations on segregation of recyclable waste in the compound of city hall. Three recovery bins comprised of plastics, aluminum, and other waste were placed beside the entrance to the city café & bars of the city hall. In addition, the pilot study of this three-bin system is now under consideration to be implemented in the Skanderbeg Square and the adjacent parks.

Waste pickers recover recyclables from the waste bins in town. They collect small and valuable recyclables such as aluminum cans, steel cans, solid plastics, clothes, other reusable items and sell these at the stations determined by the dealers and/or recyclers. Full-scale survey of waste pickers has not yet been carried out until now and information on their actual activities such as the number of waste pickers, recovery amount, and income are unknown.

MOT-owned landfill management enterprise estimates about 200 waste pickers recovering

recyclable materials at Sharra landfill site. Approximately, 60 to 70 waste pickers are observed regularly at day time and the number of waste pickers increases to about 100 from midnight to dawn when the waste from the main streets are carried-in. Their activities are not as a group but rather individual or family-based for picking recyclables. They collect mainly plastics, paper, metals and glass. There are four stations in Sharra determined by the dealers and the waste pickers selling the recovered materials at some stations. The present buying price of the recovered materials by the dealers are 16 Lek/kg for mixed plastics, 70-80 Lek/kg for aluminum, and 30 Lek/kg for steel.

The other information from the survey by the NGOs[2] obtained the selling price of recovered materials from Sharra as tabulated in Table 5.1.10. This information on the selling price by item is almost the same as those obtained from the staff of waste management enterprise except for the price of steel. Selling price of steel in 2010 was 15 Lek/kg but scrap steel is currently sold at 30 Lek/kg.

Table 5.1.10 Selling Price of Recyclable Materials at Sharra Disposal Site (2010)

No.	Category/Item	Selling price (Lek/kg)
1.	Plastic	14
2	Plastic Bottles	18
3.	Glass	5 – 25
4.	Cardboard	3
5.	Batteries	30
6.	Lead	30
7.	Copper	400
8.	Bronzes	100
9.	Steel	15
10.	Aluminum Cans	60
11.	Other Aluminum Material	75

Source: Study Report of Roman People Situation, Who Live and Work at Disposal Site of Sharra - 2010

The same NGO groups conducted the survey on collection amount of recyclable materials from 39 waste pickers at Sharra Disposal site. Interviews were made with 39 waste pickers aged 7 to 67 years (with an average age of 32) working for eight hours in the day or night shift. As shown in Table 5.1.11, they collect 10.3t per day or 265kg per day per person. Assuming the total number of 160 waste pickers, 60 persons at daytime and 100 persons at night time, the total recyclable materials recovered at Sharra reaches at 42t per day and the recovery ratio of recyclable materials at Sharra will be 6-7% of the estimated incoming waste amount of 622t per day as of September 2011.

[2]Study Report of Roman People Situation, Who Live and Work at Disposal Site of Sharra - 2010, financed by Italian Cooperation and implemented by Independent Forum of Albanian Women World Children Foundation, ARSIS, and Association for the Social Support of Youth

Table 5.1.11 Summary of the Quantity of Recyclable Materials at Sharra (2010)

Item	Plastics	Metals	Paper	Glass	Wood	Total/Avg.
Number of Waste Pickers	30	29	1	20	3	39
Collection Amount: Total (kg)	8,285	480	1,000	569	3	10,337
Collection Amount per Person (kg)	276	17	1,000	28	1	265

Source: Study Report of Roman People Situation, Who Live and Work at Disposal Site of Sharra - 2010

One of the dealers in Tirana, G-P-R Albania sh.p.k, set up the buying stations at Sharra Disposal Site to buy recovered mixed plastics from the waste pickers. The final sorted amount of plastics by the dealer reaches 480t per month or 16t per day as shown by the following basic information of the business.

- Processing capacity : 1.5 - 2.0t/hour of Flex material
- Type of recyclables : Mixed plastics (PET, HDPE, and PP)
- Points of collection : 2 points (Sharra and Selite)
- Number of staff: 40 employees for secondary sorting of plastic and processing
- Amount of plastic export: PET: 180t/month, HDPE : 120t/month, PP : 180t/month
- Country of export: China, Austria, Germany, Italy
- Others: New processing line with the same capacity will be expanded in two to three months. Recyclable plastic is not sufficient for expansion of the business and the dealer will try to import plastics from the region/countries and India.

3) Reuse

Beer bottles are reused except for the imported ones. Wine bottles are also recovered and reused by the people for home-made wine. Second-hand clothes, dolls, ornaments, etc. are sold at the street or shops in the outskirt areas.

4) Recycling

The recyclers organize Albania Recycling Association (ARA). Thirty four registered recyclers are established and categorized in the table below. Among the members of ARA, only nine establishments are doing business actively while three establishments have closed or were suspended.

Table 5.1.12 Number of Registered Recycles

Category	No.	Status of Activity	
		Active	Closed or Inactive
Paper	3	2	-
Plastics	13	4	2
Aluminum	4	-	-
Steel	11	2	-
Bricks	1	-	-
Wood	1	-	1
Textile	1	1	-
Total	34	9	3

Source: JICA Study Team

The largest paper recycler in Duress, Edipack sh.p.k, started operation in 2003 for production of corrugated paper and cardboard and expanded the operation of paper mill for

paper in 2009. The processing capacity of the plant is 70t per day but the available waste paper is only 10-15t per day on the average so the recycler imports the rest from the neighboring countries.

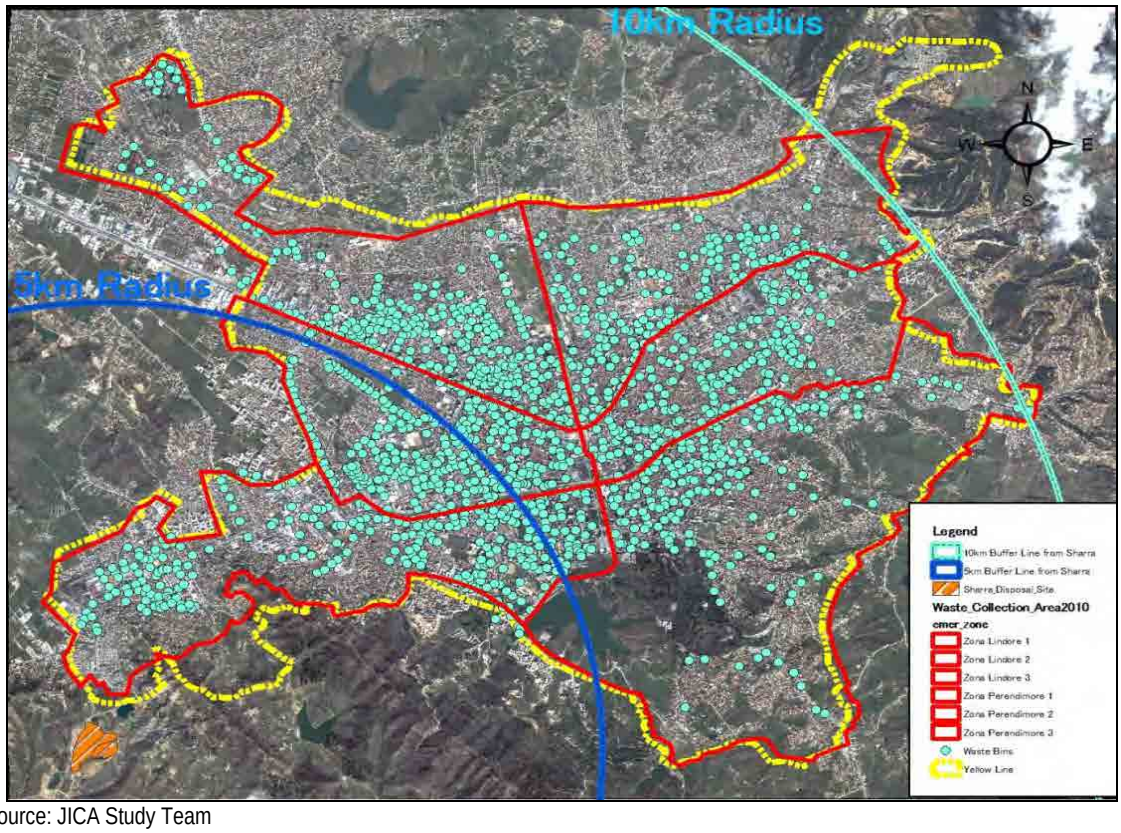
(3) Intermediate Treatment

Intermediate treatment of municipal waste has not been carried out in MOT until now. The Landfill Directive 1999/31/EC obliges the Member States to reduce the amount of landfilling biodegradable waste to 35% of 1995 levels by 2016. Tirana Waste Area Management Plan proposes that all municipalities and communes implement composting of biodegradable waste by the end of 2012. Accordingly, MOT must prepare the implementation plan for composting of biodegradable waste immediately in order to comply with the super-ordinate plans and the stipulation under the law.

(4) Final Disposal

1) Location of Sharra Disposal Site

Sharra Disposal Site is located in Sharra Commune in the South West of Tirana Municipality. The distance from the centre of Tirana is about 7km and it takes only 20 minutes by car. The location is ideal in terms of the distance from the centre of municipal waste discharge. Figure 5.1.6 shows the location of Sharra with reference to the location of waste collection area by the radius of 5km and 10km from the disposal site. As it is easily understood, the waste collection areas W-2 and W-3 are covered within the 5km radius and the rest of the waste collection areas are covered within the 10km radius.

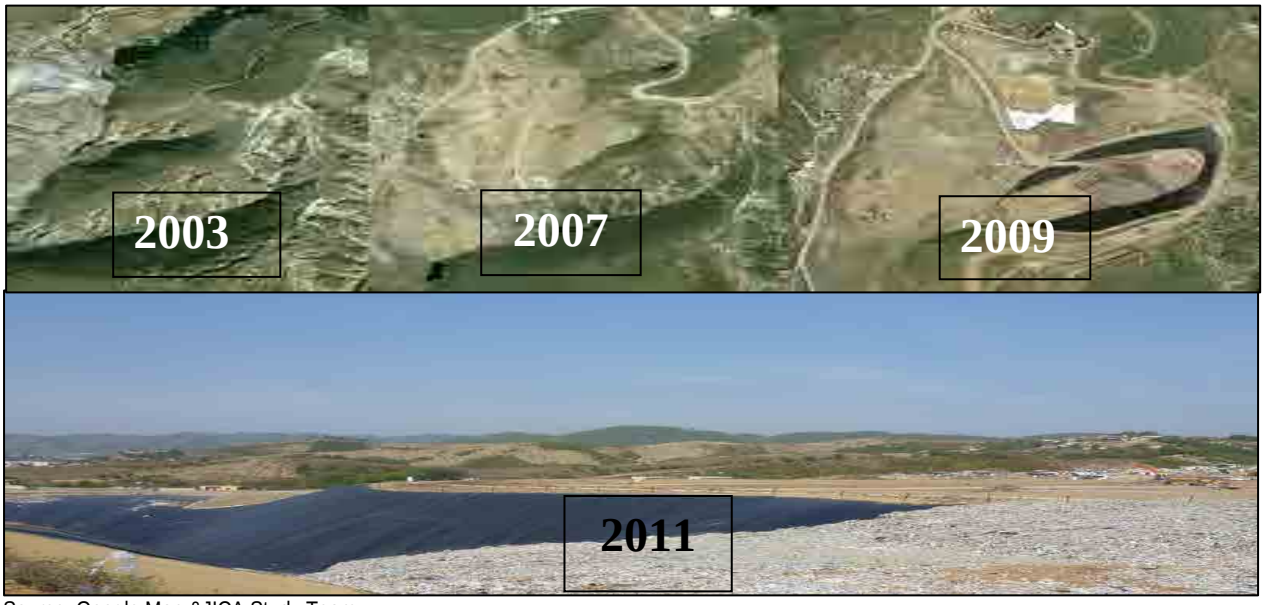


Source: JICA Study Team

Figure 5.1.6 Waste Collection Area and 5 km & 10 km Radius from Sharra Disposal Site

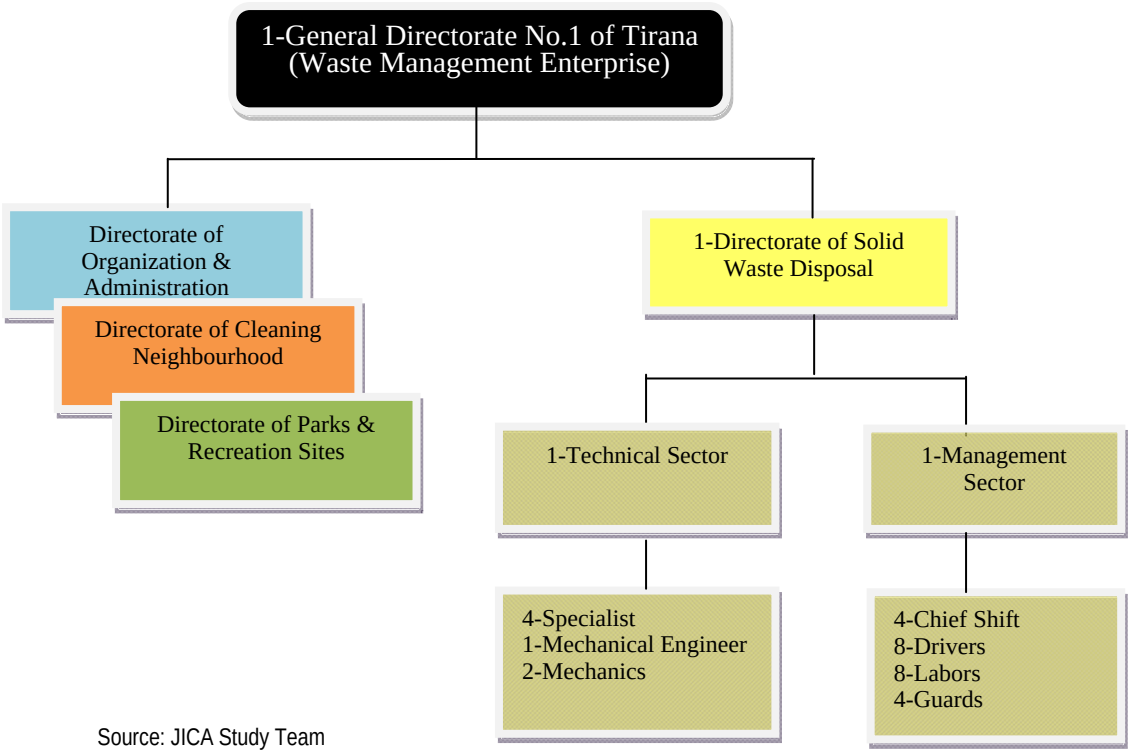
2) Waste Disposal Operation

The old site was used mostly for industrial waste landfill before the 90s. The General Directorate No. 1 of Tirana ordered the waste management enterprise incorporated in 1994 to take the responsibility for the landfill operation. However, the landfill operation was carried out in an uncontrolled manner and waste burning occurred spontaneously until September 2008 when the closure of old dumpsite and the expansion of the landfill site with modern technology were completed. Figure 5.1.7 shows the changes of Sharra Disposal Site from 2003 to 2011. The Directorate of Waste Disposal under the waste management enterprise presently carries out the landfill operation of Sharra. Nowadays, the Directorate of SWM consists of 34 staff including the Director. As shown in Figure 5.1.8, there are two Sectors in the Directorate to undertake landfill operation and management, and the support for mechanical works of the landfill machine, vehicle and equipment. The current landfill site, approximately 22.5ha is located in an expanded area adjacent to the old landfill site that was closed safely. The project was financed by the loan amounting to 6 million Euros from the Italian Cooperation. This project also includes procurement of machines, equipment, training for capacity development, etc.



Source: Google Map &JICA Study Team

Figure 5.1.7 Change in the Status of Sharra Disposal Site



Source: JICA Study Team

Figure 5.1.8 Organization Chart of Directorate of Solid Waste Disposal

3) Landfill Machine and Vehicle

Four units of landfill machine and vehicle including a landfill compactor, a bulldozer, an excavator and a dump truck, were procured under the loan project of Italian Cooperation. In addition, there are four units of existing machines to support the landfill operation. Old machines breakdown from time to time, however, the mechanics of the waste management enterprise did light repair and maintain works for these machines. Table 5.1.13 shows the list of landfill machine and vehicles.

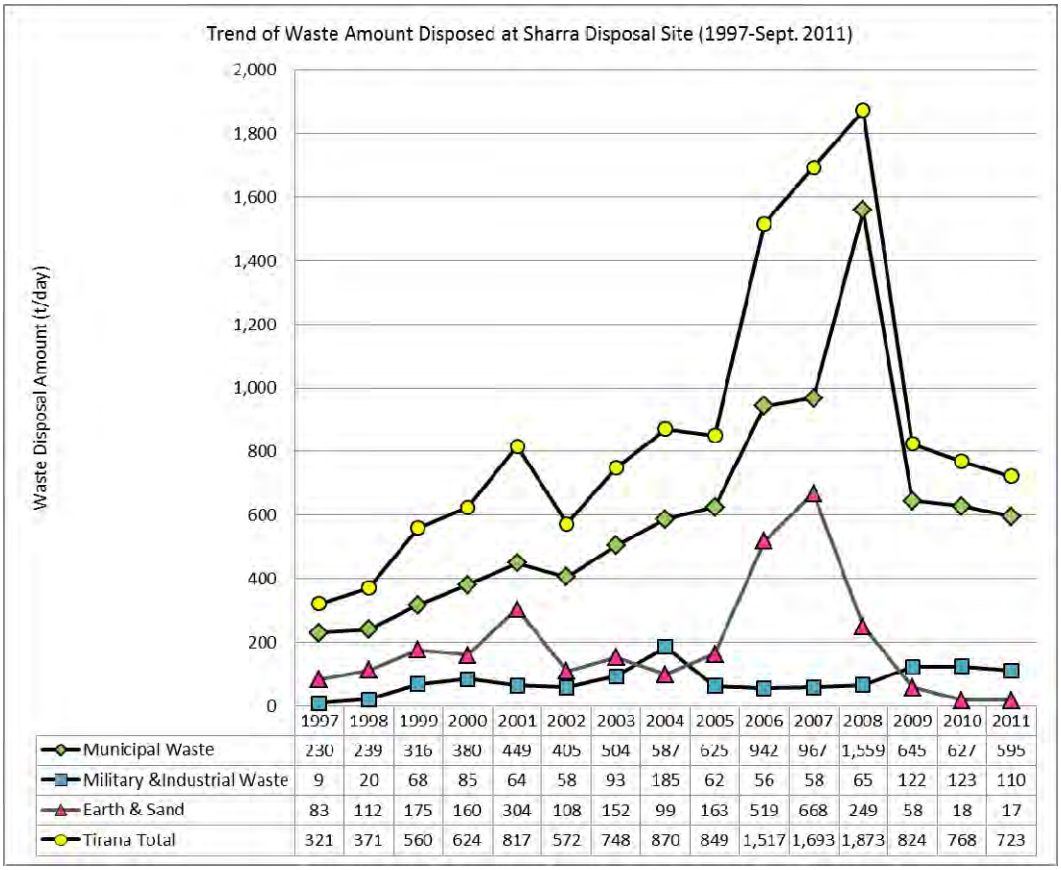
Table 5.1.13 List of Existing Landfill Machine and Vehicle at Sharra Disposal Site

No.	Type of Machine	Maker	Model Number	Year of Production	Power/ Capacity	Procurement Date	Working hours/km	Status
1.	Landfill Compactor	BOMAG	BC572R8-2	2008	227Hp	16.06.2008	3500	Not In service (need for repair and change of injectors)
2.	Landfill Compactor	Caterpillar		2011		31.8.2011		In service
3.	Bulldozer	NEWHOLLAND	D180PSXLT	2008	180Hp	15.04.2009	3850	Not in service since April 2011 (defect in electric plant)
4.	Vibrating Roller	KINEZE	CSS216PA	1998	150Hp	29.12.2005	No data	In service
5.	Mechanical Diggers	HITACHI	4GFZW220	2008	164Hp	09.04.2008	1070	In service (need for new tires)
6.	Mechanical Diggers	KINEZE		1998	150Hp	2005	4000	In service. (need for new tires)
7.	Caterpillar Excavator	JONYHANG		1997	210Hp	2006	950	In service
8.	Truck	FIAT IVECO	380T4S	2008	13t	09.04.2008	8750 km	In service
9.	Pickups	IVECO	4910	1993	2.5t	17.12.1993		In service

Source: JICA Study Team

4) Daily Waste Disposal Amount

The waste management enterprise records all the incoming collection vehicles at Sharra landfill site. The recording sheet has portions for the groups of collection service providers, collection area, vehicle number, scale of the vehicle by the number of wheel axis, etc. Figure 5.1.9 shows the analysis of the record from 1997 to September 2011 for the incoming waste amount brought in from the MOT collection area. The graph shows the amount of municipal waste, waste from military area and industries, and earth and sand from construction activities. Waste disposal amount was only 320t/day in 1997 and the disposal amount increased rapidly up to 850t/day in 2005. Increase of waste disposal amount in three years is tremendous, jumping from 1,520t/day in 2006 to 1,690t/day in 2007, and 1,870t/day in 2008. Then the estimated disposal waste amount dropped from 820t/day in 2009, 770t/day in 2010 and 720t/day in 2011. The drastic increase taking place during 2006-2008 can be explained to some extent by the active clean-up program in those years, in addition to the sharp economic growth in terms of GDP. However, the increase in waste disposal amount is beyond the common sense and it is necessary to review these data as well as the method of estimation of the waste disposal amount for confirmation.



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Municipal Waste	230	239	316	380	449	405	504	587	625	942	967	1,559	645	627	595
Military &Industrial Waste	9	20	68	85	64	58	93	185	62	56	58	65	122	123	110
Earth & Sand	83	112	175	160	304	108	152	99	163	519	668	249	58	18	17
Tirana Total	321	371	560	624	817	572	748	870	849	1,517	1,693	1,873	824	768	723

Source: JICA Study Team, 2012

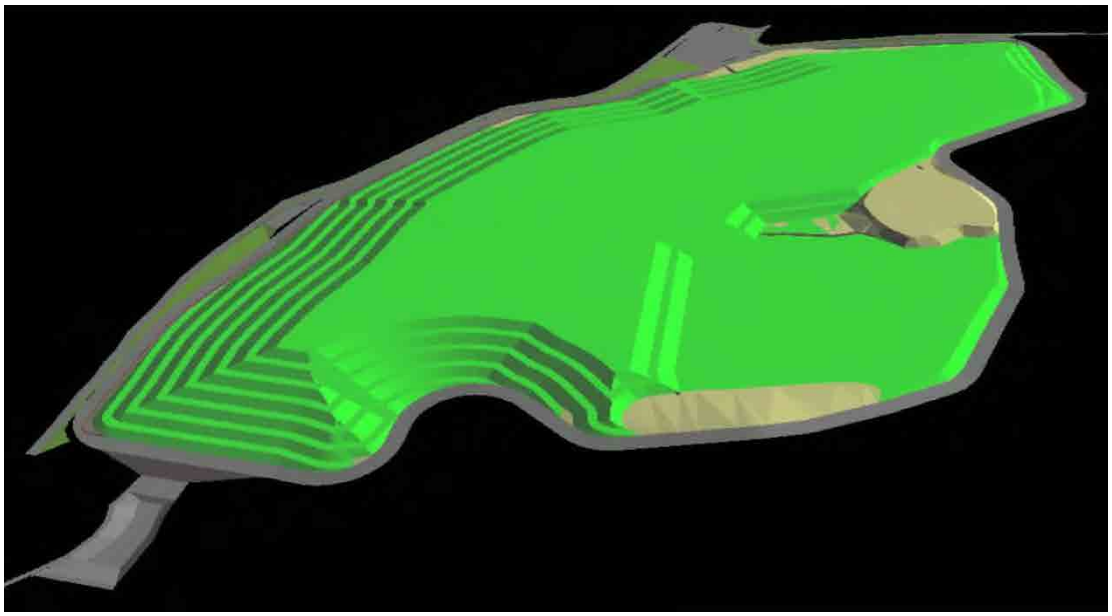
Figure 5.1.9 Trend of Daily Waste Disposal Amount at Sharra Disposal Site (1997- Sept. 2011)

5) Life of Sharra Disposal Site

Information obtained from the implementing agency for the improvement and expansion of Sharra Disposal Site, TEI Sp. A., Milan, Italy, revealed that the total planned landfill

volume in a 3-phased development work is 2.45 million cubic meters as shown in Figure 5.1.10 for the final configuration of the landfill.

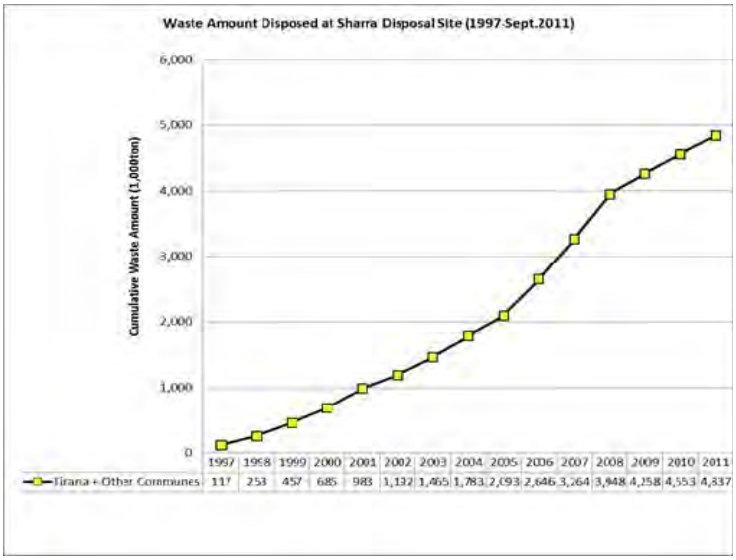
According to the report prepared by International Finance Cooperation (IFC)[3], the life of the landfill is approximately seven years. Hence Sharra Disposal Site is estimated to end in 2015. Figure 5.1.11 shows the cumulative landfill amount by weight from 1997 to September 2011. Calculating the filled weight since the start of landfill at the expanded area in September 2008 to September 2011, the total filled waste amount reaches to about 1.1 million tons. Assuming the bulk density of filled waste at 0.75t/m^3, the cumulative filled waste volume is estimated to be 1.5 million cubic meters in the last three years. Consequently, the remaining available landfill volume is estimated to be about 1 million cubic meters as of the end of September 2011 and the remaining available landfill volume will be filled up in about three years.



Source: TEI Sp. A., Milan, Italy, Implementing Agency for Expansion of Sharra Disposal Site

Figure 5.1.10 Final Configuration of Sharra Landfill

[3] "Report on Preliminary Assessment of the Tirana Solid Waste Disposal, March 2010", International Finance Corporation (IFC)



Source: JICA Study Team, 2012

Figure 5.1.11 Cumulative Landfill Amount at Sharra (1997-Sept. 2011)

(5) Waste Management Financial Status

1) Budget of Waste Management

The waste management cost for the period of 2000-2010 is summarized in Table 5.1.14. The cost has been increasing year by year from 333.6 million Lek in 2000 to 1,048.1 million Lek in 2010. Furthermore the proposed amount in 2011 reaches 915.3 million Lek. In the same period, the total budget of MOT also increased from 3,830.4 million Lek in 2000 to 3,704.1 million Lek in 2011. During the said period, the increase ratio of waste management budget was 3.1 times the total budget increase ratio of approximately 2.0. In the 2011 proposed budget, the waste management budget accounted for 24.71% of the total budget of MOT.

Table 5.1.14 Trend of Waste Management Budget 2000-2011

Year	Total Budget of Tirana Municipality (Lek)	Waste related Budget of Tirana Municipality (Lek)	Ratio of Waste related Budget to the Total Budget of Tirana Municipality (%)
2000	3,830,356,000	333,646,000	8.71
2001	4,320,586,000	300,869,000	6.96
2002	4,059,067,000	353,307,000	8.70
2003	4,766,014,000	342,459,000	7.18
2004	6,511,487,000	421,928,000	6.48
2005	8,272,988,000	447,033,000	5.40
2006	6,750,104,000	445,615,000	6.60
2007	6,417,627,000	475,068,000	7.40
2008	6,318,446,000	947,832,000	15.00
2009	5,390,196,254	995,518,785	18,46
2010	5,085,516,083	1,048,121,817	20,60
2011	3,704,069,258	915,315,000	24.71
Proposed for 2012	7,049,346,000	850,000,000	12.06

Source: Directorate of Finance and Administration, MOT

2) Waste Fee

Collection of waste fee or cleaning fee started in 2002 for households and in 2003 for commercial and business establishment. The waste tariff since the initial stage is tabulated

in Table 5.1.15. The waste fee increases every year to supplement the cost of waste management services by MOT.

Table 5.1.15 Waste Tariff of MOT

Domestic Waste : Household	
2002-2003:	300 Lek/household/year;
2004:	300 Lek/household/year;
2005:	1,000 Lek/household/year;
2006:	1,400 Lek/household/year;
2007:	2,100 Lek/household/year;
2008:	3,600 Lek/household/year;
2009:	4,500 Lek/household/year;
2010:	5,000 Lek/household/year.
Commercial & Business Waste : Establishments	
2003-2007	1,500 - 150,000 Lek/year
2008-2010	1,000 - 225,000 Lek/year

Source: Directorate of Finance and Administration. MOT

Collection ratio of waste fee was more than 90% in the period 2002-2005 but decreases every year as shown in Table 5.1.16. The decrease may be attributed to the beneficiaries, especially the households, who had refrain from paying waste fee due to their complaint on the quality of service. As a result, the waste fee collection ratio dropped to about 43% in 2010.

Table 5.1.16 Collection Ratio of Waste Fee in MOT

Year	Number of Tax payers		Planed	Actual	Collection Ratio (%)
	Household	Private Establishment			
2002	10,385	9,301	180,000,000	171,521,000	95.3%
2003	48,016	10,303	250,000,000	232,139,276	92.9%
2004	32,689	12,364	250,000,000	281,009,121	112.4%
2005	53,053	13,686	356,200,000	356,050,245	99.96%
2006	47,827	15,033	396,160,000	316,027,081	79.8%
2007	46,236	16,724	597,000,000	411,030,847	68.8%
2008	71,431	20,827	1,022,600,000	591,209,154	57.8%
2009	43,707	20,457	1,120,000,000	616,909,025	55.1%
2010	21,994	22,284	1,141,000,000	489,809,864	42.9%
2011	29,175	18,500	1,128,000,000	465,399,307	41.3%
2012	29,175	18,500	963,400,000	-	-

Source: Sector of Annual and Mid-term Budget, Directorate of Strategic Planning, MOT

5.2 Problems and Planning Issues

As a result of data and information analysis, several problems and issues are pointed out for the municipal waste management services of MOT. These problems and issues shall be studied further for the urgent implementation of plans and projects of MOT to solve the environmental and health hazards.

5.2.1 Identified Problems and Planning Issues

A legal framework for waste management was established under the Integrated Solid Waste Management (ISWM) Law approved in November 2011. However, the detailed rules, regulations, standards, criteria, etc. have not yet been prepared for actual implementation of the municipal waste management activities. Tirana Municipality has no master plan for municipal waste management. Appropriate development of the facilities, procurement activities and the SWM service cannot be implemented systematically without a master plan, phased action plans and a budgetary plan. Accordingly, MOT will have to undertake the following:

- formulate detailed rules, regulations, standards, and criteria for implementing the SWM activities in MOT to comply with the requirements of the law, and
- formulate an ISWM plan and implement the action plans and the priority projects to be formulated in the master plan.

5.2.2 Problems and Issues on Waste Collection

Wastes are discarded in the peripheral area of the municipality especially the areas along the banks of Tirana River and up-stream and down-stream sections of the Lana River. These areas have no waste bins or the waste bins are very far from the users. Considering the situation, MOT will have to conduct the following:

- To study the required number of waste bins and the location to place the waste bins convenient for the users;
- To study the 3-bin system to comply with the super-ordinate plans to separate dry recyclable materials, wet recyclable materials (biodegradable waste) and other residual mixed wastes;
- To study alteration for implementing the current waste collection services for collection of the new waste bins;
- To instruct the residents to discharge waste properly to the waste bins and prohibit them from disposing in public area; and
- To survey and formulate the urgent implementation plan to remove the illegal dump sites.

5.2.3 Problems and Issues on 3R and Intermediate Treatment

Until now, MOT does not take initiatives for the 3R activities. Waste reduction has not yet been promoted in the society although reuse and recycling activities are implemented by the private sector. In addition, waste treatment is also not implemented by MOT. In order to comply with the law and super-ordinate plans to reduce the waste volume for landfill, MOT will have to undertake the following:

- To prepare the plans and programs for education and public information for the waste generators to raise awareness on waste reduction and sorting of recyclable waste at source and implement the plans and programs immediately:
- To study the measures to fulfil the target of 25% recycling level by 2015 through recycling and composting of biodegradable waste;
- To organize composting activity groups for education and instruction on composting at the pilot study area in the town and/or through collaboration with the farms in the neighbouring area of Tirana; and
- To establish links of MOT with the recycling industry, dealers, waste pickers, and residents to support and assist recovery of more recyclable materials and do recycling.

5.2.4 Problems and Issues on Waste Disposal

The life of the existing waste landfill site, Sharra Disposal Site, is estimated to end in 2013-2015 depending on the conditions of waste diversion activities to divert municipal waste from final disposal through waste reduction and recycling. Considering the time to be spent for siting, design, construction work till the start of operation of a new landfill site, MOT is inevitably tasked to do the following:

- To start siting the new landfill area, planning, designing, constructing new disposal facilities before the current Sharra disposal site reaches its full capacity; and
- To study the measures to reduce organic waste disposal in landfill to less than 35% by 2016 in compliance with Landfill Directive 1999/31/EC.

5.2.5 Problems and Issues on Waste Fee

Collection of waste fee started in 2002 and the collection ratio was initially good. However, the collection ratio dropped to 43% in 2010. The Beneficiary Pay Principle (BPP) is an applied principle in public services nowadays in the world. Accordingly, MOT will have to pursue the following:

- To conduct a survey among waste generators on the possible reasons for the decline of waste collection fee payment and a study on the measures on how to improve the quality of waste collection services;
- To increase and/or establish the transparency of waste management account including the waste fee, waste collection contract, waste disposal expenditures; and
- To establish the accounting system available to compute the cost of waste collection and waste disposal operations.

5.3 Review of Existing Policies and Previous Studies

5.3.1 National Policy Framework of SWM Activities

(1) Super-ordinate Strategy (National Polices)

1) General

The Albanian National Waste Strategy was formulated under the Implementation of the National Plan for Approximation of Environmental Legislation Project (INPAEL Project) assisted by EU and submitted to GOA on 25 May 2010. The national strategy was reviewed by the government and approved in June 2011. The following sub-sections summarize the key points of the national strategies regarding municipal waste management.

2) Requirements of the Waste Framework Directive

Waste Framework Directive is the overarching legislation from the EU dealing with waste. Directive 2008/98/EC on waste adopted in November 2008 foresees a new approach to waste management based on prevention of adverse impacts of waste generation and management to human health and the environment, and aiming to limit the production of waste, as well as encouraging the use of waste as a resource by recycling and recovery. In order to attain this purpose, a waste management hierarchy is established by the Directive as a priority order covering the following:

- Prevention
- Preparing for re-use
- Recycling
- Other recovery, e.g. energy recovery
- Disposal

3) Target Level of Reuse and Recycling in Waste Framework Directive

The Waste Framework Directive of EU stipulates the target levels for reuse and recycle, which are summarized as follows:

- Separate collection must be set up at least for paper, metal, plastic and glass by 2015;
- Prepare for reuse and material recycling at least for paper, metal, plastic and glass from households and possibly from other origins by 2020 to a minimum of overall 50% by weight;
- Prepare for re-use, recycle and other material recovery, including backfilling operations using waste to substitute other materials of non-hazardous construction and demolition waste by 2020 to a minimum of 70% by weight; and
- The Landfill Directive 1999/31/EC obliges Member States to reduce the amount of landfilling biodegradable waste to 35% levels by 2016.

4) Strategic Priorities for Waste Management

Several national strategic aspirations on environmental sector including waste management were prepared by the government from 2006 to 2008. For example, “National Environment Strategy (NES) published by the Ministry of Environment, Forestry &Water Administration (MOEFWA) on behalf of the GOA in November 2006,” “National Strategy

for Development and Integration 2007 – 2013 published by the Council of Ministers in March 2008," etc.

The Albania National Waste Strategy was prepared to have a coherent one-piece strategic document to formulate and implement the National Waste Management Plan through combining the above strategic documents to provide a clear National Waste Strategy. The Strategy covers the period 2010 to 2025 as the important period prior to and immediately following EU Accession. The Strategy is formulated based on the four founding policy pillars of the National Policy on waste, i.e., Planning, Education, Resourcing, and Legislation. During the period, Albanian Government will take waste management as a priority issue and conduct significant efforts actively for full approximation of waste management sector to the EU laws and support the integration of Albania into the European Union (EU).

5) Priorities of the Government Program on Waste Management

Chapter 2.2.3 states the priorities of the government programs in the following areas:

- Adopt European Community legal standards,
- Enforce waste legislation,
- Invest in environmental protection,
- Financial Support for Environment Infrastructure,
- Manage environmental resources,
- Improve communication and awareness, and
- Improve monitoring system.

6) Need for Improvement Stated in the Reports of EC for Albania

Chapter 2.3 of Albania National Waste Strategy summarizes the number of strategy document prepared by EC for Albania. These documents identify and accept waste management as a high priority issue to improve and/or implement the following:

- encourage the construction of infrastructure for urban waste handling, selective collection of waste, recycling and disposal;
- emphasize the fact that uncontrolled dumping and burning of waste continue to pose environmental and health risks; and
- emphasize that a clear strategy for the safe disposal of hazardous waste is developed.

7) National Policy for Integrated Waste Management

In order to effect change and to bring about long term sustainable waste management for Albania, MOEFWA focused the improvement on four policy pillars as follows: Planning, Education, Resourcing, and Legislation. These policy pillars are implemented through the following planning phases:

1. Planning in Waste Management

1.1 Phase I – Preparation of the National Waste Management Plan

The National Waste Management Plan is the basis of the following framework and plan.

- A national framework for the development of local and area waste plans addressing the matters of national importance including hazardous waste, recovery, recycling operation, etc.
- Local waste management plan focusing on collection and disposal of urban wastes including segregation and recycling. The plan may be coordinated between two or more local authorities

The National Waste Management Plan will create the following main administrative structures to underpin the plan and its aims and objectives.

- National Waste Committee (political)
- National Waste Advisory Group (technical)
- Waste Area Groups

1.2 Phase II - Preparation of Local and Regional Waste Management Plans

Local and regional plans are prepared for the short-term and medium-term. These plans need to include following items:

- Appropriate and effective collection and transport procedures;
- An inventory of existing sites, their state and remediation plans;
- Affordable standards for construction of landfill sites which minimize pollution;
- Mechanisms for increasing revenues from waste collection;
- Steps to raise public awareness of damage caused by dumping waste;
- Clean-up of illegal dumping sites; and
- Rehabilitation of existing disposal site.

The guidance, standards for collection, treatment, disposal, design criteria, and other technical support will be provided to the local authorities to ensure that the plans are of an adequate quality and that their results are comparable.

2. Education in Waste Management

2.1 Public Awareness Campaigns

The campaigns will aim to followings.

- To raise general awareness of the consequences of indiscriminate waste dumping and open burning;
- To change attitudes and behaviour for waste collection, segregation, recycling and disposal; and
- To enforce campaign against illegal dumping.

2.2 Vocational Trainings

Enhance the professional capacity of local and regional authorities and private sector employees in the field of environment for devolving responsibilities to local and regional authorities. Individuals completing the training course allow them to apply for a formal qualification in the field of environmental management.

3. Resources for Waste Management

Human and financial resources shall be provided for the successful implementation and operation of waste management.

4. Legislation in Waste Management

In addition to the above three policy pillars, legislation is required as the foundation to set the rules and regulations to implement and attain the goals of waste management system in Albania. The Albanian Government committed to a process of full EU membership and the Ministry of Environment has been working towards transposition of key EU directives into Albanian legislative instruments. This work is likely to continue well into 2012.

8) Challenges to Ensure Integrated Waste Management System

The following four challenges are foreseen in setting up a mechanism to ensure the integrated waste management system in Albania.

a) Economic challenges:

- Cost of waste treatment facilities and maintenance
- Economies of scale (e.g., size and capacity of facilities)

b) Environmental challenges:

- Opportunity to reduce waste to landfill (investing primarily on separate collection at source, Transfer Stations/Centers for further stream-wise separation, reuse, recycling/recovery)
- Reduce demand on natural resources for products (through recycling)

c) Social challenges:

- Community demand for recycling programs
- Community demand for consistent services within Qark's boundaries

d) Legal challenges:

- Increasing regulatory requirements (e.g., for landfills)
- Potential for new statutory requirements (e.g., Environment Protection: Waste) Policy)

9) Arrangement of Central Government to Address Challenges

The central government, with the lead role played by MOEFWA, has to respond to the needs and concerns of other line ministries, the Councils of Qarks, the communities and the other stakeholders. The arrangement of the central government should include clarification of the players' roles and responsibilities on waste management and reforms to enhance the government's performance. In addition, proper and efficient implementation of the policy on integrated waste management calls for the establishment of the following three level groups to perform their functions:

- An Inter-Ministry Committee on Waste (at central and political level);
- A National Waste Advisory Group on Waste (at central and technical level); and
- Waste Area Groups (at local and technical level at each Qark/Waste Area).

10) Financial Sources for ISWM

a) External Sources

The development of an ISWM is envisioned to be done in two stages, i.e., Stage 1 Pre-EU Accession and Stage 2 Post-EU Accession. In Stage 1, the funding will be provided through the central government funding program plus the finances pledged by the collective international donor community, either as donations or specific loan finance agreements. In Stage 2, the funding will primarily come from the central government funding program and the EU Infrastructure funding programs. Private capital through Public Private Partnerships (PPP) arrangement is considered as an alternative financial source.

b) Waste Tariff

Waste charge is applied by the local government unit (LGU) to both residential and commercial customers as well as industrial entities. The setting of tariffs is governed by Law No. 9632 dated October.30, 2006, on Local Taxes Chapter VII, Article 35 and Law No. 8652 dated July 31, 2000. Basically, the Municipal or Communal Council determines the type of tariffs, level and rules of collection, and their administration. Currently, there is no specific central regulatory authority that reviews and approves tariffs or changes in tariffs. The revenues raised through the waste tariffs are far from the required budget for waste management, and most of the municipalities need to secure other financial sources to finance the activities. Waste tariffs will likely rise to reflect the costs to comply with the EU legislation.

c) Environmental Fund

The Environment Fund will be established in line with the government program. The main purpose of an Environmental Fund is to act as a central collection and distribution point for some or all of the revenues arising from environmental charges, fines, taxes and other sources, including donors. The distribution of funds to projects can then be done on clear and transparent criteria.

11) Accountability, Monitoring and Evaluation

In order to take the steps for the transition to a modern managing system of waste management in Albania, the Albanian National Waste Strategy states the following key issues to be tackled by the central government, local government, residents, private sectors and all other stakeholders:

- Involvement of stakeholders through provision of information and cooperation;
- Coordinating policies, national, regional, local and action plans;
- Monitoring of implementation through environmental, performance, financial and administrative indicators; and
- Establishment of reporting system for overall performance of waste management.

(2) Super-ordinate Plan

1) General

The National Waste Management Plan of Albania was formulated under the INPAEL Project assisted by EU and submitted to GOA on August 19, 2010. It was reviewed by the government

and approved on January 19, 2011. The Plan is a blueprint with realistic objectives towards sustainable development and management of waste in Albania. The key points of the plan for municipal waste management are reflected in the programs of the government.

2) Priorities in the Government Programs

Currently, government programs in the field of environment are formulated for the purpose of complying with the European Community legislations over the coming decade to support accession to the EU. In this respect, the Government Program of 2005 – 2009 sets priorities for environmental protection and sustainable use of natural resources. In the implementation of the Government's plans and programs, key issues related to waste management are stated as follows:

- Enforcement of the laws particularly on the polluters pays principle through reform of environmental agencies and institutions to increase the punitive measures against polluters and damagers of environmental assets;
- Neutralization and/or rehabilitation of all the "environmental hot spots," caused by old and abandoned industries. In specific cases, families exposed to the risks from these sites will be relocated;
- Environmentally friendly incentives for economic operators and individuals will be adopted in compliance with the principles of the free market through fiscal incentives to promote pollution reduction by businesses and individuals, investments in clean technology, conservation of energy, etc. The government will establish a special Environmental Fund to be financed by environmental taxes and fines, as well as by donations; and
- Raising public awareness for the people in environmental situation and risks. The civil society and independent organizations will be invited to offer their inputs in the drafting and implementation of environmental policies and, in particular, for monitoring of environmental situation in the country.
- Currently, the Governmental Program 2009-2013 is under implementation. The program emphasizes the following:
- Increasing investments for environmental protection through the funds from the central government, local budget, donors, private sector;
- Development of modern SWM and construction of regional sanitary landfills according to EU standards;
- Improvement of waste collection and treatment in the Qarks of Tirana, Durres, Fier, Korce, Elbasan and Vlore, as well as the smaller urban centers within the four year period;
- Preparation and implementation of the incentive and supportive policies for the empowerment of the waste recycling sector;
- Rehabilitation of the polluted sites, by past industries, and main hot spots such as the Vlora PVC, Metallurgical plant of Elbasan, Patos-Marinza, Gjanica, Rubik, etc.;
- Approximation of the country's legislation with the EU in the field of environment will be targeted at 80%; and
- Improvement and empowerment of environmental monitoring shall cover all the components related to environment for sustainable development of the country.

To realize the Government's visions, policies and strategies, the strategic priorities and policies have focused on the following areas:

- Adopt European Community legal standards;
- Enforce environmental legislation;
- Invest in environmental protection;
- Financial support for environmental infrastructures;
- Improve communication and awareness; and
- Improve monitoring system

3) National Waste Policy and Strategy

In order to realize the vision of GOA for the sustainable development of the country, MOEFWA envisage the following four policy pillars for the implementation of waste management policy and strategy through the National Waste Management Plan.

- Planning
- Education
- Resourcing
- Legislation

This National Waste Management Plan is the basis for a national framework for the development of local and area waste plans. Hence, the plans at regional (waste area) and local levels must include:

- appropriate and effective collection and transport procedures;
- an inventory of existing sites, their state and remediation plans;
- affordable standards for construction of landfill sites, which minimize pollution;
- mechanisms for increasing revenues from waste collection; and
- steps to raise public awareness on the damage caused by dumping wastes.

In implementing the national policy, the target levels of waste generation and waste recycling are set to:

- stop growth of municipal waste production by 2020;
- achieve 25% recycling and composting of municipal waste by 2015;
- achieve 55% recycling and composting of municipal waste by 2020;
- recover energy from 15% of municipal waste;
- reduce land-filling of municipal waste from 90% to around 30%;
- provide widespread waste minimization advice to businesses; and
- develop markets for recycled material to help boost recycling industry.

4) Objectives of the National Waste Management Plan

The aims of the National Waste Management Plan are set out to lessen the impact of waste on the environment and to remedy the environmental degradation and the injustices suffered by those who have lived in a wasteful society.

The plan will highlight achievement of EU landfill reduction targets by 2015, 2020 and 2025. The National Waste Management Plan also establishes two interim targets to focus on municipal waste.

- To increase the amount of waste collected by local authorities that is recycled or composted to 25% by 2015
- To increase the amount of waste collected by local authorities that is recycled or composted to 55% by 2020

The plan is set out to achieve these targets through the implementation of the waste hierarchy - Prevention, Preparing for Reuse, Recycling, and Recovery and Disposal. In practice, this shall be carried out by the organizations under a coordinated mechanism to be formulated and implemented by the plans and programs according to:

- Inter Ministry Committee on Waste;
- National Waste Advisory Group;
- Waste Areas and Waste Area Groups; and
- Stakeholder Involvement and Engaging the Albanian Public.

In addition, the following strategic principles are applied for the plan:

- Proximity and Self-Sufficiency;
- Polluter Pays; and
- Best Practicable Environmental Option (BPEO).

The National Waste Management Plan is realized through a more elaborated Area Waste Plans to be formulated and implemented by twelve regional authorities. The plan shall be subjected for approval by the Minister. The plan also shall establish a statutory system of landfill allowances for local authorities to enforce a reduction of waste disposal amount in the land-filling of biodegradable waste. The major changes through implementing the National Waste Management Plan is expected to have a massive shift from the waste producer and consumer culture. The plan includes sustained national and local education and awareness campaigns for the Albanian public.

5) Albania's Target for Waste Prevention

Waste Prevention in Albania targets to achieve zero waste generation by 2020 and to continue this progress thereafter with an actual waste reduction.

6) Planned Outcomes

From 2011 to 2020, the 12 Area Waste Plans will set out a radical change in the recovery of resources through:

- waste prevention;
- material recycling;
- composting;
- conversion of waste to energy; and
- residual waste for disposal to landfill.

Overall, the National Waste Management Plan envisages an increase in the recovery of

resources of municipal waste from the current level to:

- 25% by 2015:
- 55% by 2020; and
- 75% by 2025.

7) Implementation of Municipal Waste Action Plans

The National Waste Management Plan is implemented through the following three phase periods:

- Phase-1 : 2010-2015;
- Phase-2 : 2016-2020; and
- Phase-3 : 2021-2025.

8) Summary of Implementation of Municipal Waste Action Plans

Table 5.3.1 summarizes all the action plans including municipal waste, hazardous waste and non-municipal waste.

Table 5.3.1 Action Plans and Time Schedule under National Waste Management Plan

Action	Completion
Establishment of a National Waste Advisory Group by the Minister of Environment	End 2010
Establish a Hazardous Waste Working Group under the auspices of the National Waste Advisory Group to undertake a hazardous waste inventory	End 2010
Establish a waste awareness campaign team under the auspices of the National Waste Advisory Group	End 2010
Develop a National Waste Data Strategy	End 2010
Develop a program of Directives Transposition	End 2010
Development of project fiche for legislative transposition program	End 2010
Finalization of the draft of the National Waste Policy and Strategy	Early 2011
Finalization of the draft of the National Waste Management Plan and associated Waste Area Profiles	Early 2011
Dissemination of approved National Waste Management Plan	Early 2011
Preparation of Waste Area Plan for Tirana Durres and Elbasan Waste Areas	Early 2011
Inaugural Meeting of the National Waste Advisory Group chaired by the Minister of Environment	Mid 2011
Development of project fiches for healthcare waste management and end-of-life vehicles	Mid 2011
Feasibility study on establishing composting as a means to treat the organic waste fraction within municipal waste of Albania	Mid 2011
Feasibility study on the concept of a three-bin system being implemented in all waste areas to separately collect: 1. Dry Recyclables; 2. Wet Recyclables; and 3. Other Wastes	Mid 2011
Develop a waste awareness campaign program of activities related to actual time lines of infrastructure development and waste management operations on the ground	Mid 2011
Establish a Waste Legislation Working Group under the auspices of the National Waste Advisory Group	End 2011
2nd Meeting of the National Waste Advisory Group chaired by the Minister of Environment	End 2011
Develop a new Hazardous Waste Action Plan on the basis of the hazardous waste elements in the waste plan and on the outcome of the waste inventory	End 2011
Feasibility study on multi waste area cooperation on waste to energy plant in Elbasan	End 2011
Develop waste awareness campaigns on priority waste stream projects	End 2011
Develop and circulate for consideration a budget proposal for the above-mentioned activities by the National Waste Advisory Group	End 2011

Action	Completion
One Hazardous Waste landfill for inorganic wastes is designed, EIA conducted, and tender documents prepared	Mid 2012
Establish national reference laboratory for Hazardous Waste collection and transport services.	End 2012
Provide incentives to waste producers to minimize the wastes generated by their operations	End 2012
Registering of Hazardous Waste generators and recording Hazardous Waste quantities.	End 2013
Establish an Environmental Fund project	End 2013
Provide supervision and a Ministry contact point for the project team on the transposition of the Directives.	End 2013
Preparation of Waste Area Plans for Lezhe, Shkoder, Kukes, Diber, Korce, Berat, Gjirokaster, and Vlore Waste Areas	End 2014
Construction of Hazardous Waste landfill equipped with the facilities needed for chemical stabilization of acids, bases, heavy metal solutions and moderate quantities of soil easily contaminated with soluble elements.	End 2015
Establish a public entity for offering Hazardous Waste collection and transport services with regional reception centers.	End 2015
Public information and awareness campaign in all waste areas planned and implemented	End 2015
Introduce full cost recovery approach	End 2015
Implementation of the Environment Fund	End 2015
Prepare National Technical Guidance for specific wastes with high-priority waste groups receiving early attention	End 2015
Enforcement campaigns in chemical industry and transport of chemicals.	Mid 2016
Implement the three-bin collection system in all waste areas	End 2018
Upgrade of the waste collection system in all waste areas	End 2018
Implement compostable waste segregation projects in all waste areas	End 2018
Feasibility study for arranging incineration of organic Hazardous Waste	End 2018
Preparation and implementation of investment projects establishing and/or rehabilitating regional Hazardous Waste landfills jn mining and metallurgical industry	End 2019
Close and monitor municipal waste dumps in all waste areas	End 2020
Develop regional landfills according to waste areas plans	End 2020
Implementation of hot spots remediation projects	End 2020
Construction of incineration plant for organic Hazardous Waste	End 2020
Introduce a Landfill Tax/Landfill Allowance Scheme	End 2021
Implementation of measures for dealing with some Priority Waste Stream	End 2022
Prepare and implement projects for reclamation of municipal dump sites	End 2023

Note: Action plans other than municipal waste are in shaded cells in the table.
Source: National Waste Management Plan, IMPAEL Project

9) Funding Sources

The National Waste Management Plan proposes that the financial sources for implementing the plans and project be divided into two phases shown as follows.

Financial Stage 1: (2010 to 2015)

- State, municipal or communal budgets
- EU pre-accession: Instrument for Pre-accession Assistance (IPA)
- Grants from other international donors

Financial Stage 2: (2015 to 2025)

- EU post-accession: grants from the structural funds (ERDF and CF)
- Loan from an international financing institution (IFI) such as the World Bank or the EBRD
- Loan from a commercial bank
- Bonds issued by local government authorities
- Private capital (through PPP arrangements)

10) Costs of Municipal Waste Management System

Based on the projection of future waste generation cost, the total for implementing the waste management in the country is estimated as follows:

- Capital costs 264 million Euros
- Average O&M costs 64 million Euros per year
- Total annual management system costs 101 million Euros per year (equivalent to 31.6 Euros per person)

11) Cost recovery, polluter pays principle, and affordability

Future budget allocation for waste management starts with the polluter pays principle. Article 14 of Directive 2008/98/EC of November 19, 2008 on waste and repealing certain Directives provides for the costs of waste management borne by:

- the original waste producer,
- the current or previous waste holders, and
- the producer or distributor of the product from which the waste came.

However, the capital expenditure will be required for the collection, transport and disposal facilities, and GOA (central, regional and local) will take the initiative to establish the facilities.

12) Partnerships and Stakeholder Roles

The roles of stakeholders in delivering the National Waste Management Plan are presented below.

The government will:

- provide leadership, setting the direction of the policy;
- develop the regulatory and planning framework;
- provide funding for local authority implementation plans that achieve the aims of this plan and deliver value for money;
- work in partnership with EFA, local authorities, waste industries and others to deliver the National Waste Management Plan; and
- promote by example the benefits of purchasing recycled products.

EFA will:

- maintain the framework for effective and integrated participation of stakeholders set up by the National Waste Strategy, including the Waste Area Groups;
- promote and facilitate partnerships across all relevant activities;

- provide technical assistance and deliver projects where appropriate; and
- regulate, where possible the delivery of the plan.

Local Waste Areas need to:

- deliver their Area Waste Plans, working in partnership, where appropriate, with other members of their Waste Strategy Area Groups and other area groups;
- allocate adequate resources for waste management and public communication;
- promote by example the benefits of purchasing recycled products; and
- prepare Waste Area Plans.

Households and commercial premises need to:

- reduce household waste production, buy recycled goods and avoid disposable and over packaged goods, where possible;
- take responsibility for their waste and recognize the need for waste management facilities;
- report over packaged goods to their local trading standards office;
- participate in local authority recycling schemes, to segregate, recycle and compost their waste whenever possible;
- use, established, reuse, and refurbishment schemes including charity shops for their end-of-life goods; and
- compost appropriate materials at home.

Manufacturers and industry need to:

- be aware of the National and Area Waste Plans and the challenges and opportunities they present;
- initiate waste prevention and minimization initiatives and train staff accordingly;
- comply with obligations to manage their waste and recover resources, for example, under statutory or voluntary producer responsibility initiatives;
- seek to use recycled materials wherever it is beneficial to do so; and
- pre-treat waste when necessary, prior to disposal.

The waste industry needs to:

- work with and support the National and Area Waste Plans;
- provide the types of facilities deemed appropriate by the Area Waste Plans when working in partnership with local authorities;
- work in partnership with others to develop improved services and infrastructure for the management of non-municipal wastes; and
- seek continual improvement in the technologies they use for managing and treating waste.

NGOs and the community sector need to:

- work in partnership with local authorities, businesses and the waste industry to maximize the partnership benefits of these sectors working together;

- support community-led initiatives to maximize the recovery of value and social benefits from end-of-life products and materials; and
- help promote good practice to the public.

13) Public Relations and Monitoring

The National Waste Management Plan shall be informed to the public through;

- Annual Stakeholder Seminar; and
- Web-based publication of the activities.

Waste Area Plans and National Waste Management Plan shall be monitored and reviewed using the following indicators:

- Environmental Infrastructure Performance Indicators;
- Financial Indicators; and
- Administrative Indicators.

(3) Legal and Institutional Matter on SWM

1) Law on Integrated Solid Waste Management

a) General

The Law on Integrated Waste Management was approved by the Albanian Government in the end of June 2011. The law was deliberated at the Parliament and approved on September 16, 2011. However, the President of Albania commented on the law especially on Article 49 which is related with transit of non-hazardous waste and the law was deliberated again at the Parliament. The resolution for approval of the law was made by the Parliament finally in November 2011.

The law transposes fully the EU Directive 2008/98/EC on waste management. This subsequently transposes partially most of the EU directives, decisions and regulations, and provides the correct legal basis for full transposition of all the EU legislation in the waste management sector. In addition, most of the rules and regulations prescribed directly and indirectly under several existing laws are also merged into this law. The following paragraphs outline some of the important articles to be complied within the course of formulation of the ISWM plan for the Municipality of Tirana.

b) Purpose

The purpose of the law is prescribed under Article 1 in Chapter 1 as follows;

"Article 1 Purpose

1. The purpose of this law is to protect human health and the environment by preventing or reducing the negative impacts from waste generation and from the management of waste and by reducing the overall impacts of the use of resources and by improving the efficiency of such use, and to ensure the environmentally sound management of wastes".

c) Definition of Terms

Article 2 defines the terms used in the law. For example, waste, household waste, hazardous waste, and the likes are defined but there is no definition of municipal waste to be collected by LGUs.

d) Waste Management Priorities and Hierarchy

Article 6 in Chapter 1 prescribes the priorities or the hierarchy for management of waste as follows.

"Article 6 Waste Management Priorities

1. Waste management law, policy and programs shall have the following hierarchy of priorities:
prevention of waste;
preparation for re-use;
recycling;
other recovery, like energy recovery; and
disposal.

2. This hierarchy shall take into account the general principles of environmental protection as set out in Articles 5-13 of the Law on Environmental Protection, and the requirements of this Law.

3. When applying the waste hierarchy set out in paragraph 1, the Ministry and all relevant authorities shall take measures to encourage the options that deliver the best overall environmental outcome.

4. Specific by-laws for specific waste streams may depart from the waste hierarchy set out in paragraph 1 where this is justified by a life-cycle analysis of the overall impacts of the generation and management of such wastes, so as to provide the best overall environmental outcome".

The above waste hierarchy does not refer to the term of waste collection and waste treatment or intermediate treatment in other word. Waste collection service is the most basic service in cleaning the town and it shall be carried out in combination with waste disposal. Meanwhile, waste treatment carried out with waste to energy can be regarded as the project grouped in the fourth hierarchy including the small scale incineration project only with thermal recovery to supply hot water.

e) National Waste Management Plan

Article 10 in Chapter 2 prescribes that the National Waste Management Plan shall be enacted in accordance with the environmental protection objectives and principles set out in the Law on Environmental Protection Qark (Regions) and Local Waste Management Plans.

In Albania, the country is divided into 12 Qarks. To implement waste management in the country, the National Waste Management Plan adopted the strategy to implement waste management in 12 waste areas based on the existing boundary of Qarks. Article 12 of the law prescribes the framework of Area Waste Management Plan as well as the framework of Local Waste Management Plan for individual municipality and commune.

f) General Requirements for Integrated Waste Management

Articles in Chapter 3 prescribe the general requirement to enforce the integrated waste management in the country. The fundamental principle in the general requirements envisages the establishment a Sound Material-Cycle Society for saving natural resources and the responsibility of waste generator (producer). Those Articles in Chapter 3 are composed of the following items:

- Article 16 Extended Producer Responsibility;

- Article 17 Recovery of Waste;
- Article 18 Re-use and Recycling of Waste;
- Article 19 Disposal of Waste; and
- Article 20 Costs of Waste Management.

g) Waste Management Responsibility

Article 21 and Article 22 under Chapter 4 Waste Management prescribe the responsibilities of original waste generators, holder, dealer, operators or any person carrying out waste treatment. According to the articles, the government specifies the conditions of responsibility and in which cases the original producer retains responsibility for the whole treatment and also shares the responsibility with the holder of the waste or delegated between the different actors of the treatment chain. ISWM is also prescribed for establishing with adequate and appropriate installations and system covering all the processes from collection to final disposal.

h) Hazardous Waste Management

Chapter 5 of the law covers management of hazardous waste from production, collection, storage, control, mixing, labeling, transfer, etc. to handle hazardous waste generated by the households. Chapter 5 is also not considered in the JICA study except for hazardous waste such as cell battery, fluorescent lamps, etc. generally discharged in mixed waste from the households.

i) Specific Waste Streams

The Articles in Chapter 6 prescribes about specific wastes including bio-waste, packaging waste, disposal of PCBs, batteries and accumulators, end-of-life vehicles, electrical and electronic equipment wastes, sewage sludge, healthcare waste, animal by-products, inert waste, waste from the extractive industries, waste from titanium dioxide industries, ship-generated wastes and cargo residues, most of which are generated or disposed by other household waste generators. Bio-waste is one of the nuisances as mixed in household waste and the law prescribes the framework for segregating, converting and recycling to reduce the amount of bio-waste from landfill. Article 28 prescribes bio-waste.

j) Landfill of Waste

Landfill is prescribed from Article 43 to Article 46 in Chapter 7. The landfill is categorized into three types, i.e., a) landfill for hazardous waste, b) landfill for non-hazardous waste, and c) landfill for inert waste. According to the law, only waste subjected to treatment can be landfilled and landfill for hazardous waste can only be used for municipal waste and other non-hazardous or stable natural wastes. Landfill for inert waste can only be used for inert waste. It also prescribes the wastes that cannot be used for landfill such as liquid waste, explosives, chemicals, tiers, automobile batteries, etc.

k) Incineration of Waste

Stipulation of incineration of waste is not in detail and the government will adopt rules and regulations upon proposal of the Minister. Article 46 as quoted from the law prescribes the following:

"Article 46 Incineration of waste

1. The Government, acting on a proposal of the Minister, shall adopt regulations on the incineration of waste, including:
a. specify the requirements for incinerators and co-incinerators of waste;
b. waste acceptance procedures;
c. operating conditions;
d. control and monitoring procedures;
e. closure and after-care procedures;
f. additional requirements for the application for an environmental permit; and
g. additional conditions for the environmental permit".

l) Import and Export of Wastes

From Article 48 to Article 51 in Chapter 9 prescribes the conditions for import and export of wastes. The following are the important matters under the articles related with import and export of waste.

- The import of hazardous waste into the Republic of Albania is prohibited in all circumstances.
- Only non-hazardous waste or inert waste may be imported into the Republic of Albania.
- Only non-hazardous waste or inert waste may be transited through the Republic of Albania.
- The export of wastes from the Republic of Albania shall be permitted only with authorization issued by the Minister.

m) Technical Standards for Waste Treatment

Article 52 in Chapter 10 prescribes the framework of the standards for treatment of waste to be established by the government acting on a proposal of the Minister. The technical minimum standards to be adopted shall:

- be directed to the main environmental impacts of the waste treatment facility;
- ensure that waste is treated in accordance with this law and Article 5, in particular;
- take into account best available techniques; and
- as appropriate, include elements regarding the quality of treatment and the process requirements.

n) Environmental Permit for Waste Treatment

Article 53 in Chapter 11 prescribes the requirements for an environmental waste treatment permit. It states that any person intending to carry out waste treatment activities is required to obtain the relevant environmental permit in accordance with the Law on Environmental Permitting.

o) Licensing for Waste Management Activities

Articles 57 and 58 prescribe the licensing and its requirements for any person who wishes to transport waste or act as waste dealers and brokers. Those requirements are:

- The license shall be valid for a period of three years;
- The license shall be issued by the National Licensing Centre upon approval from the National Environment Agency; and

- The Government, acting on a proposal of the Minister, shall adopt regulations for the implementation of this article.

p) Others

The law also prescribes the disclosure of waste statistic report, prohibition, sanctions, penalties and transitional and final provisions in the articles from Chapters 13 to 15.

2) Institutional Setup Stipulated under the ISWM Law

The ISWM Law stipulates the functions, roles and responsibilities of the relevant organizations as summarized in Table 5.3.2.

Table 5.3.2 Functions of Organizations Related with SWM

Organizations	Authorities, Functions, Roles, Responsibilities
Council of Ministers	-may adopt measures to determine the criteria for specific substances or objects to be regarded as a by-product and not as waste. -shall adopt a catalogue of waste. -approves National Waste Management Plan, Regional Waste Management Plan and Local Waste Management Plan and shall adopt detailed measures for the implementation. -shall adopt measures for waste prevention programs. -adopt measures to ensure the extended producer responsibilities. -may decide if the costs of waste management are to be borne partly or fully by the waste generators, distributors and producers to share these costs. -shall adopt the rules for the transfer of non-hazardous waste, including requirements for the information to be included in a waste transfer note. -shall adopt targets and deadlines to meet those targets to reduce the amount of bio-waste going to the landfill. -shall adopt measures to prevent the production of packaging waste through setting up the systems for re-use or recovery of packaging waste. -shall adopt requirements for the types of waste that can be accepted at different classes of landfill. - acting on a proposal from the Minister, shall adopt requirements for the operation of landfills, including the waste acceptance procedures, control and monitoring procedures, etc. -shall implement other roles stipulated under the law.
MOEFWA (Minister)	-shall prepare and publish a draft of National Waste Management Plan on the website of the Ministry and make it available to the public and also distribute the draft of the National Waste Management Plan to the relevant ministries for comments. Final draft of the National Waste Management Plan is submitted to the Council of Ministers for approval. -reports annually to the Council of Ministers on the implementation of the Local Waste Management Plan. -shall promote the re-use of products and prepare for re-use activities. -shall adopt measures for the implementation of the law in particular the costs recovery from the original waste producer or by the current or previous waste holders. -prohibit or limit the import of waste destined to incinerators that are classified as recovery. -shall, every 3 years, prepare a report on the state of enforcement of the law including the waste management activities in Albania.
Ministry of Finance	-shall adopt measures for the implementation of waste management borne by the original waste producer or by the current or previous waste holders.
Ministry of Agriculture	-shall adopt requirements on the use of sewage sludge in agriculture so as to prevent harmful effects on soil, vegetation, animals and humans. -shall adopt requirements on the management of animal by-products not intended for human consumption.
Ministry of Health	-shall adopt requirements on the management of healthcare waste.

Organizations	Authorities, Functions, Roles, Responsibilities
	-shall adopt requirements on the management of animal by-products not intended for human consumption.
Ministry of Public Works and Transport	-shall adopt requirements on the management of inert waste. -shall adopt requirements to prevent or reduce the discharges of ship-generated wastes and cargo residues into the sea.
National Environment Agency	-may request from each transferor and transferee the records of transfers of non-hazardous waste, -must receive from each transferor and transferee, once a year, the information on non-hazardous waste transfers. -issue the authorization to transit the non-hazardous waste or inert waste. - refuse to grant an environmental permit from the point of view of environmental protection. -shall carry out inspections of installations in accordance with the provisions of the Law on Environment Protection. -approves the waste transport license, issued by the National Licensing Centre. -approves the waste transport license for waste dealer or broker, issued by the National Licensing Centre. -shall maintain and keep up to date statistics on the generation, recovery and disposal of waste.
Qark	-shall adopt a waste management plan consistent with the National Waste Management Plan. -approves the rules on controlling the management of specific local waste streams. -shall report annually to the Ministry on implementation of the National and the Regional and Local Waste Management Plan within their territorial jurisdiction. -shall publish a draft of the plan and make it available to the public on the website of the local government or regional council as the case may be. -shall approve the relevant plan but the local government shall take into consideration the results of any Strategic Environment Assessment (SEA), prior to its approval. -approves the Local Waste Management Plan.
LGU/Group of LGU	-shall adopt a waste management plan consistent with the National Waste Management Plan and the Qark Waste Management Plan. -may adopt the rules controlling the management of specific wastes including paper and cardboard, glass, food and beverage containers, metal, plastics, or leaves upon approval of by Qark. -shall report annually to the relevant Qark on the implementation of the local waste management plan. -shall publish a draft of the plan and make it available to the public through the website of the local government. -shall approve the relevant plan but shall take into consideration the results of any SEA, prior to its approval.

Source: ISWM Law, 2011

5.3.2 Findings from Previous Studies and Research

(1) Tirana Waste Area Management Plan

1) Target Area of Tirana Waste Management Plan

The Tirana Waste Management Plan was formulated under the INPAEL project assisted by EU and submitted to the Albanian Government on July 2, 2010. The waste area of Tirana encompasses only two districts; Tirana and Kavaje. Tirana District has three municipalities; Tirana, Kamez and Vore, and a total of 16 communes. Kavaje District has two municipalities; Kavaje and Rrogozhine, and eight communes. The resident population in

this waste area is estimated at around one million.

2) Waste Area Specific Objective

The Report explains and proposes the following specific objectives to include in the formulation of the Tirana Waste Area Management Plan.

- Adopt European Community legal standards
- Enforce environmental legislation
- Invest in environmental protection
- Financial support for environmental infrastructure
- Manage environmental resources
- Improve communication and awareness
- Improve monitoring system
- Waste management
- Waste and waste data

3) Plan of Action, Including Measures for Achieving Objectives

a) Outline of Tirana Waste Management Plan

The Report of Tirana Waste Management Plan reiterates the SWM plans referring to most of the sections from the Albania National Waste Strategy and National Waste Management Plan. The planning specifically for Tirana Waste Area is described only in Chapter 3. Table 5.3.3 outlines the actions of the Tirana Waste Management Plan for the Tirana Waste Area to comply with the objectives set in the National Waste Management Plan for Albania.

Table 5.3.3 Tirana Waste Management Plan for Compliance with the National Waste Management Plan

No.	Action Plan	Description	Target
1.	Assessment of landfill gas production at Sharra I	Assessment of the production of landfill gas at Sharra I and design of a gas harvesting methodology to retrospectively collect and utilize the gas currently being produced.	End 2010
2.	Local Waste Management Plans	All municipalities and communes are to develop and publish a local waste management plan outlining the specifics of waste management operations and infrastructure requirements to meet the terms of the National waste management plan. A Waste Area Working Group should be established and a waste management audit of performance and waste quantity should be undertaken.	End 2011
3.	Feasibility Study for Final Disposal Option	The Waste Area, through the Qark Council or the Tirana Municipality, should develop a project fiche for the feasibility study on the final solution to waste disposal. This can either be a waste area approach or a multi waste area approach as outlined in this plan. In either case, it should include a sound feasibility study on the use of the existing cement manufacturing facility at Fushe Kruje.	End 2011
4.	Implementation of the three-bin system	All municipalities are to commence implementation of the three-bin waste collection system underpinned by a comprehensive public information campaign including educational resource inputs.	End 2012
5.	Establish waste recycling	All municipalities are to establish the infrastructure to facilitate the	End

No.	Action Plan	Description	Target
	facilities for dry recyclable wastes	recycling of the collected dry recyclable wastes.	2012
6.	Establish composting facilities at both municipal (central) and communal (home) level.	All municipalities and communes are to implement composting of all biodegradable wastes collected through the three-bin system. The facilities at communal level can be either, central or home-based, and the municipalities should also offer the same options. The initiative should be underpinned by a robust public awareness campaign to include educational resource inputs.	End 2012
7.	Identification of priority waste stream projects	Municipalities and Qark should collectively identify and develop projects to deal with the priority waste streams outlined in the National waste management plan.	End 2013

Source: National Waste Management Plan, IMPAEL Project

b) Collection System

The Plan proposes to introduce separate collection of municipal waste by 3-bins system placed in the collection area for discharging different types of waste in each colored bin assigned as follows:

- Brown or Green Bin for organic compostable material,
- Blue Bin for dry recyclable material, and
- Black Bin for municipal waste residues.

c) Waste Management Facilities

The Plan describes that each waste collection area authority will be served by recycling facilities, composting facilities and sufficient waste collections points adopting the three-bin system and the detail of the waste management facilities will be outlined in the local waste plans.

d) Responsibilities of Each Government Organizations

The Tirana Waste Area Plan describes the responsibilities of municipalities, communes and Qark Councils for implementation of waste management activities as proposed in the following roles:

Services and/or Facilities by Municipalities and Communes

- Waste collection authority
- Recycling and composting facilities

Regional Facilities

- Landfill sites
- Waste to energy plants

Qark Council

- Coordinating body for the activities of the waste area group
- Reporting the municipality and commune waste data to MOEFWA on an annual basis

e) Cost Economy and Financing

The cost for implementing the Tirana Waste Area Plan is not estimated in the report but the following costs in Table 5.3.4 show a reference for the cost of an average waste area with a population of 300,000.

Table 5.3.4 Cost of Waste Management for a 300,000 Population Municipality

Component	Capital cost (€)	O&M costs (€)	Total annualized cost (€/y)
Separate collection of recyclables	3,308,533	1,791,703	2,247,540
Biowaste collection	982,490	687,201	816,295
Residue collection	982,490	1,051,817	1,180,910
Transfer stations	1,350,000	127,800	106,611
Transport to landfill	0	262,186	262,186
Landfill	7,800,000	500,000	1,659,985
Sorting plant	1,500,000	250,000	515,192
Composting plant	8,120,000	1,124,000	2,383,649
TA, information and awareness campaigns (5%)	2,404,351		
Total of 'average' waste area	24,043,512	5,794,707	9,172,368

Source: Tirana Waste Area Management Plan, IMPAEL Project

The Plan proposes a budget allocation of waste management in the future through the polluter pays principle with reference to Article 14 of Directive 2008/98/EC of 19 November 2008 on waste and repealing certain Directives. It provides for the costs of waste management borne by:

- the original waste producer,
- the current or previous waste holders, and
- the producer or distributor of the product from which the waste came.

(2) Preliminary Assessment of the Tirana Solid Waste Disposal

1) General

The report was prepared and submitted to MOT in March 2010 by IFC. The report summarized the main findings and proposed recommendations of SWM activities of MOT in the following issues:

- On legal framework and regulatory regime, incomplete legislation and regulation and inconsistent definitions;
- Lack of environmental standards for waste collection, transportation and disposal;
- Lack of national plan, local plans and national strategy on waste;
- Estimation of Sharra remaining operating life with options for new disposal capacities;
- Designation of new site; and
- Private sector participation: need for sector restructuring and reform.

As of today, since the submission of report by the IFC, most of the issues and recommendations have been taken into consideration in the Albanian National Waste Strategy, National Waste Management Plan and the ISWM Law. However, one of the key issues of MOT, i.e., final disposal, has not yet been developed with a concrete plan for solving the forthcoming end-of-life of Sharra disposal site. The succeeding paragraphs summarize the waste disposal findings and recommendations in the IFC report.

2) Estimation of Life of Sharra Landfill Site

IFC report carried out estimation of the life span of Sharra Landfill Site based on the trend curve projected in the period of 2009 - 2030. The factors for projection are annual waste generation/collection amount derived from the future population and per capita waste generation/collection amount per day and the available landfill volume approximately at 1.65 million m^3. The estimated population, per capita waste generation/collection amount and daily waste generation/collection amount are, 791,800t/day, 0.85kg, 673t/day in 2009 and 1,172,000t/day, 1.0 kg and 1,172t/day in 2030, respectively. According to this calculation, Sharra Site will end in 2015 as shown in Figure 5.3.1.

Source: Figure 11, Preliminary Assessment of the Tirana Solid Waste Disposal, IFC, March 2010

Figure 5.3.1 Estimated Remaining Life of Sharra Disposal Site

3) Options for New Disposal Capacities

The IFC report presents the future alternative landfill site proposals listed as follows.

- To expand the current Sharra landfill
- To establish a new site for a new municipal disposal facility
- To participate in a disposal facility under regional cooperation

4) Private Sector Participation and Waste Charge

The IFC report recommends implementation of the landfill project through PPP and the introduction of a waste charge to the beneficiaries based on the cost-recovery principles, and with separate components for waste collection and disposal services.

(3) Sharra Landfill Project

Six million Euros was financed by bilateral assistance of the Italian Cooperation loan to the Ministry of Public Works and Transport for improvement of SWM in Tirana. The project aims at removing landfill gases from the Sharra landfill site and elimination of waste contamination caused by leachate from the site in addition to the expansion of Sharra Landfill Site. Therefore, the project includes preliminary and feasibility studies, detail design, expansion of Sharra Disposal Site, supply of equipment and tools for operation and management of landfill and a

series of training to strengthen the organization and legal framework of SWM of MOT. The Sharra Landfill Site has expanded new cell and started operation since 2009 although some of the associated facilities such as truck scale and biogas burning facilities are still under construction as of November 2011. The landfill at the new cell is expected to last until 2015/2016.

(4) Urban Regulatory Plan

Urban Regulatory Plan of Tirana prepared in December 2008 shows the Sharra Disposal Site for the site of public facilities but it does not present any SWM planning.

5.3.3 Activities of Other Donors on SWM

With regard to SWM, the international donor agencies are assisting in the implementation of the national plan for approximation of environmental legislation with the EU directives on landfill project. Table 5.3.5 shows the studies or the projects related with SWM carried out with the assistance of international donor agencies.

Table 5.3.5 Summary of Activities of Donors in SWM

Organization	Project	Status
EU	Albania National Waste Strategy (2010)	Albania National Waste Strategy was approved by the government.
EU	National Waste Management Plan (2010)	National Waste Management Plan was approved by the government.
EU	Tirana Waste Area Plan (2010)	Tirana Waste Area Plan has not yet been submitted for approval.
IFC	Preliminary Assessment of the Tirana Solid Waste Disposal (2010)	IFC wishes to promote the project proposed in the report.
Kreditanstalt fur Wiederaufbau (KfW)	Feasibility Study and Detail Design for Constructing Regional Landfill	600,000 Euros for F/S and another 600,000 Euros have been allocated for the project. TOR was prepared at the end of December 2011 and consultant firm hiring was expected on March 2012.
Italian Cooperation	Closure of Old Sharra Dumpsite and Expansion of New Landfill Cells (2008 – 20011)	Old dumpsite was closed. Expansion of new cell is almost completed and started landfill. Installation of associated facilities such as truck scale and biogas burning facilities are still on-going with a 6 million Euro loan from Italian Cooperation.

Source: JICA Study Team

5.4 Quantitative Demand Analysis for SWM

5.4.1 Estimation of Solid Waste Amount

(1) Objective Service Area

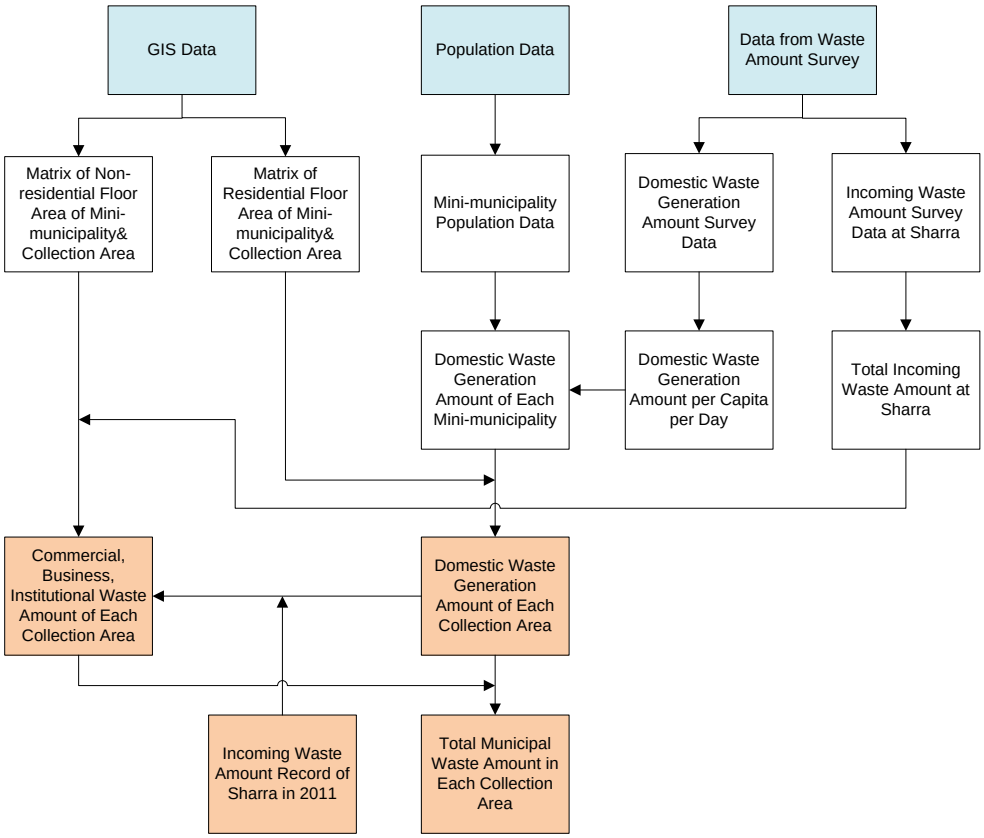
The estimation of population and solid waste amount for the delineated service area are the principal bases for the planning of any waste-related facility. The resultant estimation significantly affects the size of facilities and equipment, layout design, project phasing and total project costs. The municipality of Tirana is divided into 12 mini-municipalities and the current collection service carried out for six waste collection areas cover almost the entire administration area. LGUs is responsible for waste management within its jurisdictional area or the administration area under the relevant laws. Accordingly, the objective area for estimation of waste generation amount is determined within the administration area of MOT.

(2) Procedures for Estimation of Solid Waste Amount

In order to estimate the waste generation amount, population data, GIS data and the data obtained from the waste amount and composition survey conducted by the JICA study team are utilized and the estimation followed the procedures shown in Figure 2.2.1. The waste amount is estimated firstly for domestic waste amount in addition to the estimation of waste from the establishments including commercial, business, institutional and other waste generation sources. The details of the estimation of waste amount are explained below.

1) Planned Population of MOT

Based on the present population data as of 2011 obtained from the Technical Group of Regulatory Plan of MOT, the future population in MOT and the respective mini-municipality are estimated and summarized in Table 5.4.1. The annual population growth rate was assumed at 3.0%, 2.5% and 2.0% for the period of every five years starting from 2011. As a result of population prediction, the total population of MOT increases from 562,439 in 2011 to 841,361 in 2027. The estimated planned population is commonly used as basis for urban infrastructure planning including road and traffic, water supply, sewerage, and SWM.



Source: JICA Study Team

Figure 5.4.1 Procedures for Estimation of Municipal Waste Amount

Table 5.4.1 Planned Population in Mini-municipalities (2011-2027)

Mini-municipality	Predicted Population in Muni-municipality																
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Mini-municipality-1	35,678	36,855	38,102	39,348	40,594	41,840	43,087	44,285	45,483	46,681	47,879	49,077	50,154	51,232	52,309	53,386	54,464
Mini-municipality-2	83,619	86,379	89,007	91,634	94,262	96,890	99,518	101,942	104,367	106,792	109,217	111,642	113,749	115,857	117,965	120,073	122,181
Mini-municipality-3	36,496	37,700	38,900	40,101	41,301	42,501	43,701	44,846	45,991	47,136	48,281	49,426	50,448	51,471	52,494	53,517	54,540
Mini-municipality-4	47,013	48,564	49,798	51,032	52,266	53,500	54,734	55,881	57,028	58,176	59,323	60,470	61,474	62,478	63,481	64,485	65,489
Mini-municipality-5	76,268	78,785	80,390	81,995	83,600	85,204	86,809	88,271	89,732	91,194	92,655	94,117	95,374	96,631	97,889	99,146	100,403
Mini-municipality-6	59,506	61,470	63,684	65,897	68,111	70,325	72,538	74,685	76,831	78,977	81,124	83,270	85,213	87,157	89,100	91,044	92,987
Mini-municipality-7	62,365	64,423	66,746	69,069	71,392	73,715	76,038	78,291	80,543	82,796	85,049	87,302	89,342	91,382	93,422	95,462	97,503
Mini-municipality-8	36,856	38,073	39,275	40,478	41,681	42,884	44,087	45,233	46,379	47,526	48,672	49,818	50,842	51,865	52,889	53,912	54,935
Mini-municipality-9	48,041	49,626	51,979	54,331	56,684	59,036	61,389	63,770	66,151	68,532	70,913	73,295	75,528	77,761	79,995	82,228	84,461
Mini-municipality-10	23,520	24,296	24,816	25,335	25,855	26,374	26,894	27,369	27,844	28,319	28,794	29,269	29,679	30,089	30,499	30,909	31,319
Mini-municipality-11	53,077	54,828	56,812	58,795	60,778	62,761	64,744	66,668	68,592	70,516	72,439	74,363	76,106	77,849	79,592	81,335	83,078
Total	562,439	581,000	599,509	618,015	636,524	655,030	673,538	691,241	708,941	726,645	744,346	762,047	777,909	793,772	809,635	825,497	841,361

Source: JICA Study Team

2) Planned Population of Waste Collection Service Areas

Mini-municipality area and waste collection service area are overlapping each other, i.e., a collection service area is divided basically by the street network and covers the areas of several mini-municipalities. Table 5.4.2 shows the residential floor area matrix of the mini-municipalities and the collection areas and Table 5.4.3 shows the ratio computed from Table 5.4.2. The service population in each collection area is obtained from the mini-municipality population in Table 5.4.1 and the residential/non-residential floor area ratio in Table 5.4.3 and shown in Table 5.4.4 and Figure 5.4.2. Planned collection population in six service areas ranges from 77,000 to 138,000 in 2012. This increases in the range of 111,000 to 190,000 in 2027. West-3 collection area shows the largest service population of 138,000 in 2012, which increases to 190,000 in 2027. This is followed by East-3 collection area showing 106,000 and 151,000 in 2012 and 2027, respectively.

Table 5.4.2 Residential and Non-Residential Floor Area in Waste Collection Area

	Collection Area East-1		Collection Area East-2		Collection Area East-3		Collection Area West-1		Collection Area West-2		Collection Area West-3		Total	
Mini-Municipality	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area
No.1	0	0	109,195	2,107	1,194,902	186,402	0	0	0	0	0	0	1,304,097	188,509
No.2	0	0	563,205	207,738	2,624,662	565,159	0	0	0	9,492	1,553	8,892	3,189,420	791,281
No.3	2,027	5,559	1,345,637	238,377	19,349	0	0	0	0	0	0	0	1,367,013	243,936
No.4	1,519,906	247,730	360,656	149,631	0	0	0	0	0	0	0	0	1,880,562	397,361
No.5	0	0	0	0	5,154	1,814	0	0	17,897	4,997	2,639,330	565,697	2,662,381	572,508
No.6	0	0	0	0	0	0	0	0	47,871	149	1,419,971	433,334	1,467,842	433,483
No.7	0	0	0	0	0	0	9,850	7,267	2,377,962	516,948	736	0	2,388,548	524,215
No.8	831,984	213,463	496,228	69,578	0	0	0	0	0	0	0	0	1,328,212	283,041
No.9	531,268	138,005	3,176	19,530	0	0	1,373,842	375,854	57	0	0	0	1,908,343	533,389
No.10	0	0	0	0	0	0	119,555	19,917	731,038	203,280	0	0	850,593	223,197
No.11	0	0	0	0	0	0	1,887,479	427,518	0	0	0	0	1,887,479	427,518
Total	2,885,185	604,757	2,878,097	686,961	3,844,067	753,375	3,390,726	830,556	3,174,825	734,866	4,061,590	1,007,923	20,234,490	4,618,438

Source: JICA Study Team

Table 5.4.3 Residential and Non-residential Floor Area Ratio in Waste Collection Area

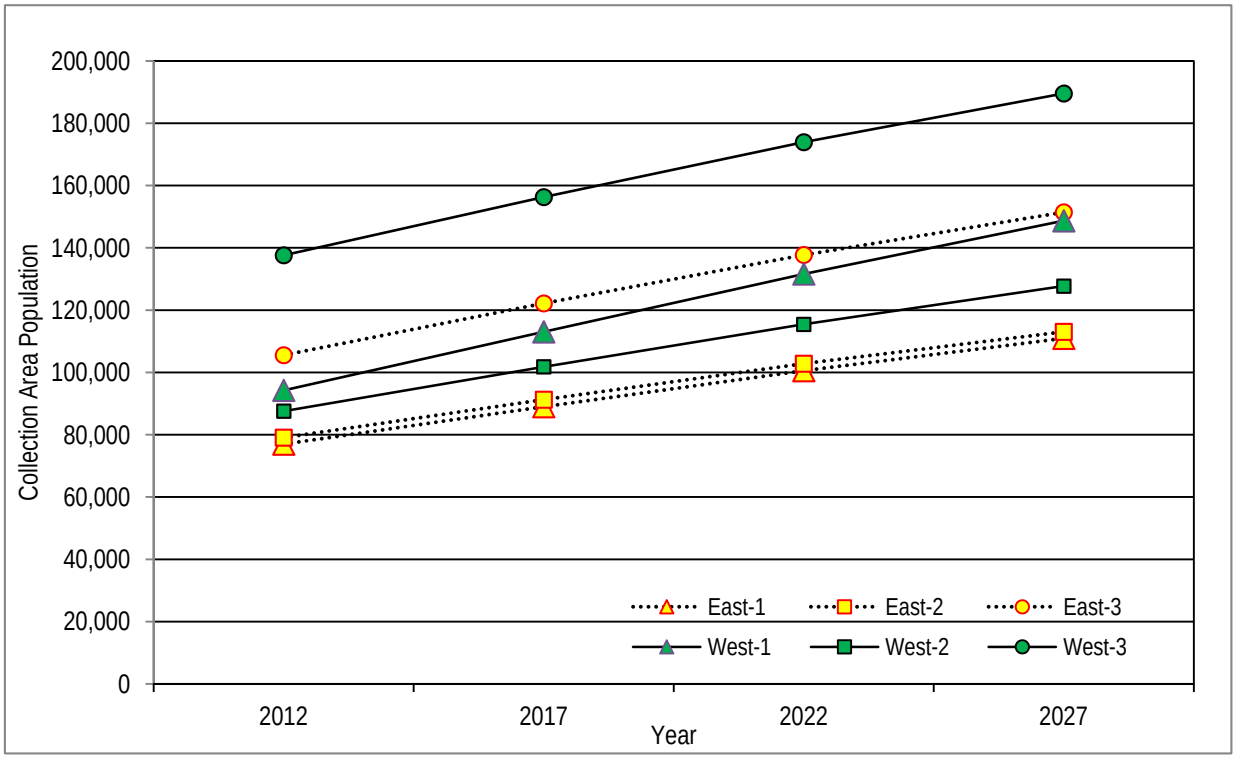
	Collection Area East-1		Collection Area East-2		Collection Area East-3		Collection Area West-1		Collection Area West-2		Collection Area West-3		Total	
Mini-Municipality	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area	Residential Area	Non-Residential Area
No.1	0.00%	0.00%	8.37%	0.05%	91.63%	4.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	4.08%
No.2	0.00%	0.00%	17.66%	4.50%	82.29%	12.24%	0.00%	0.00%	0.00%	0.21%	0.05%	0.19%	100.00%	17.13%
No.3	0.15%	0.12%	98.44%	5.16%	1.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	5.28%
No.4	80.82%	5.36%	19.18%	3.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	8.60%
No.5	0.00%	0.00%	0.00%	0.00%	0.19%	0.04%	0.00%	0.00%	0.67%	0.11%	99.13%	12.25%	100.00%	12.40%
No.6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.26%	0.00%	96.74%	9.38%	100.00%	9.39%
No.7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.41%	0.16%	99.56%	11.19%	0.03%	0.00%	100.00%	11.35%
No.8	62.64%	4.62%	37.36%	1.51%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	6.13%
No.9	27.84%	2.99%	0.17%	0.42%	0.00%	0.00%	71.99%	8.14%	0.00%	0.00%	0.00%	0.00%	100.00%	11.55%
No.10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.06%	0.43%	85.94%	4.40%	0.00%	0.00%	100.00%	4.83%
No.11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	9.26%	0.00%	0.00%	0.00%	0.00%	100.00%	9.26%
Total	-	13.09%	-	14.87%	-	16.31%	-	17.98%	-	15.91%	-	21.82%	-	100.00%

Source: JICA Study Team

Table 5.4.4 Planned Population of Waste Collection Areas

Collection Area	2011Data				Predicted Population in Collection Area															
	Area (Km^2)	Population 2011	Population Density (per Km^2)	Population Ratio of Collection Area (%)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
East-1	5.41	74,511	13,773	13.25%	76,970	79,378	81,785	84,193	86,600	89,008	91,317	93,627	95,937	98,247	100,557	102,632	104,708	106,784	108,859	110,935
East-2	4.04	76,544	18,947	13.61%	79,070	81,510	83,950	86,390	88,829	91,269	93,577	95,885	98,192	100,500	102,808	104,856	106,904	108,952	111,000	113,048
East-3	11.74	102,167	8,703	18.17%	105,539	108,864	112,188	115,513	118,837	122,161	125,274	128,386	131,498	134,610	137,722	140,461	143,200	145,938	148,677	151,416
West-1	7.04	91,225	12,958	16.22%	94,236	97,995	101,754	105,514	109,273	113,032	116,746	120,460	124,175	127,889	131,603	135,020	138,437	141,853	145,270	148,687
West-2	4.33	84,775	19,579	15.07%	87,573	90,416	93,259	96,101	98,944	101,787	104,519	107,250	109,982	112,713	115,445	117,901	120,357	122,813	125,269	127,725
West-3	6.87	133,216	19,391	23.69%	137,612	141,346	145,080	148,813	152,547	156,281	159,807	163,333	166,860	170,386	173,912	177,040	180,168	183,295	186,423	189,550
Total	39.43	562,439	14,264	100.00%	581,001	599,508	618,016	636,523	655,031	673,538	691,240	708,942	726,643	744,345	762,047	777,910	793,772	809,635	825,498	841,360

Source: JICA Study Team



Source: JICA Study Team

Figure 5.4.2 Trend of Planned Population in Waste Collection Areas

3) Planned Domestic Waste Amount

Domestic waste amount is estimated based on the waste generation amount per capita per day obtained from the WACS conducted by JICA Study Team. Output of the WACS for the waste generation amount from households indicate the average waste generation rate per capita per day at 357g in 2011. Waste generation rate tend to increase corresponding to the increase of personal income and economic growth. The tendency of the increase rate is not available due to waste minimization or 3R program carried out widely in the world and the waste generation rate per capita is dropping in the countries actively executing the waste minimization programs. However, assumption is made at 1% per year for the increase rate of waste generation per capita per day in MOT since the result of the WACS

for domestic waste is still at a low level and further economic growth is expected. Table 5.4.5 shows the result of estimation of domestic waste amount computed from the population in Table 5.4.4 and the per capita waste generation rate at 357g in 2011 with the annual increase of waste generation rate by 1 %. As a result, the domestic waste generation amount in MOT is estimated at 210t/day in 2012 and increase to 353t/day in 2027 as shown in Table 5.4.5.

Table 5.4.5 Planned Domestic Waste Amount (t/d)

Collection Area	Domestic Waste Amount (t/day)															
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
East-1	28	29	30	31	33	34	35	36	38	39	40	41	43	44	45	46
East-2	29	30	31	32	33	35	36	37	38	40	41	42	43	45	46	47
East-3	38	40	41	43	45	46	48	50	51	53	55	57	58	60	62	63
West-1	34	36	37	39	41	43	45	47	49	50	52	54	56	58	60	62
West-2	32	33	34	36	37	39	40	42	43	45	46	47	49	50	52	54
West-3	50	52	53	55	57	59	61	63	65	67	69	71	73	75	77	79
Average Per Capita Waste Generation Amount (g/c/d)	361	365	368	372	376	379	383	387	391	395	399	403	407	411	415	419
Domestic Waste Amount (t/d)	210	219	228	237	246	256	265	274	284	294	304	313	323	333	343	353

Source: JICA Study Team

4) Estimation of Commercial, Business and Institutional Waste Amount

According to the waste collection amount from six collection areas, the total municipal waste from domestic waste, commercial, business and institutional sources is estimated at 683t/day in March 2012. Domestic waste amount estimated in Table 5.4.5 shows 210t/day. Assuming that the balance between total collection amount and the domestic waste amount is waste from other sources, then the amount of commercial, business and institutional waste is computed at 473t/day in 2012. Accordingly, the commercial, business and institutional waste account for 69% of total municipal waste in MOT. Future waste generation amount from the commercial, business and institutional waste sources is estimated based on the aforesaid ratio and the result is tabulated in Table 5.4.6. As a result, the waste amount of commercial, business and institutional sources increases from 473t/day in 2012 to 796t in 2027, which shows the increase ratio of 168% in 15 years.

Table 5.4.6 Planned Commercial, Business and Institutional Waste Amount (t/d)

Collection Area	Commercial, Business & Institutional Waste Amount (t/day)															
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
East-1	62	65	67	70	73	76	78	81	84	87	90	93	95	98	101	104
East-2	70	73	76	79	83	86	89	92	95	99	102	105	108	112	115	118
East-3	77	80	84	87	91	94	97	101	105	108	112	115	119	122	126	130
West-1	85	89	92	96	100	104	107	111	115	119	123	127	131	135	139	143
West-2	75	78	82	85	88	92	95	99	102	106	109	112	116	119	123	127
West-3	103	108	112	117	121	126	130	135	140	145	150	154	159	164	169	174
Commercial and Other Waste Amount (t/d)	473	493	514	534	555	577	598	619	641	663	686	707	729	751	773	796

Source: JICA Study Team

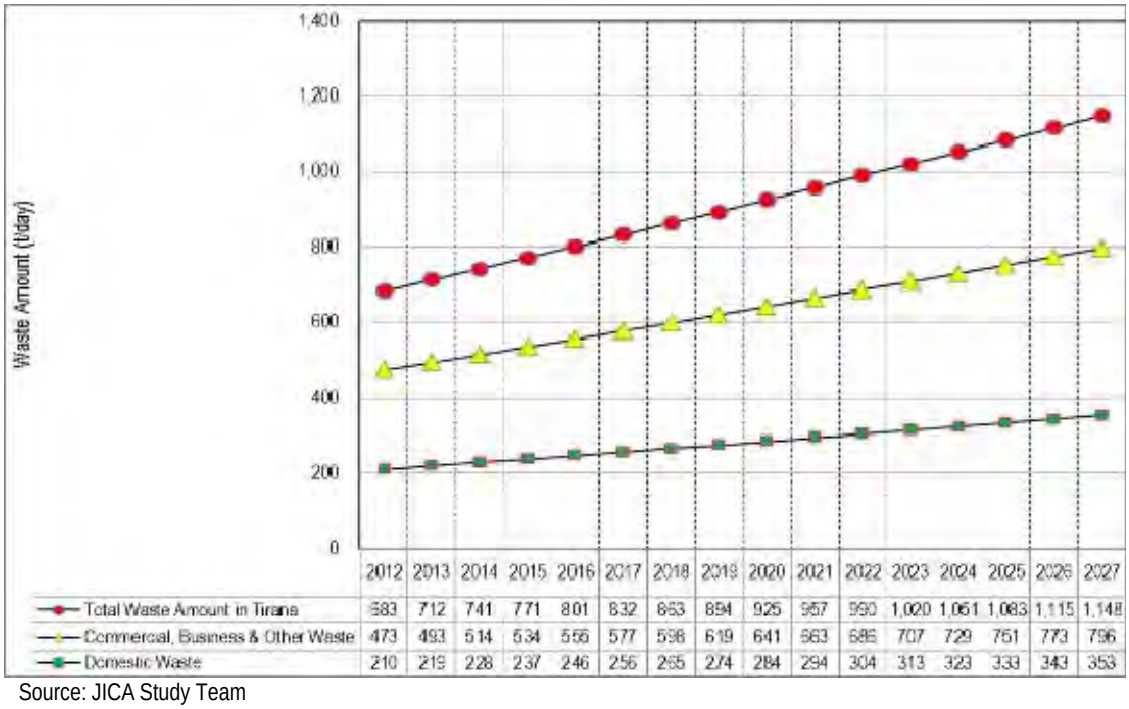
5) Total Municipal Waste Amount

The municipal waste amount is obtained for the total of domestic waste amount and commercial, business and institutional waste amount. Table 5.4.7 and Figure 5.4.3 show the total municipal waste amount estimated for the period of 2012-2027, which will be the basic figure for SWM planning. The municipal waste amount increases from 683t/day in 2012 to 1,148t/day in 2027. Counting backward the waste generation rate, the per capita waste generation rate of municipal waste increase from 1,176g/day in 2012 to 1,365g/day in 2027, which shows almost the same or even higher rate compared with the large cities in the world.

Table 5.4.7 Total Municipal Waste Amount (t/d)

Collection Area	Total Waste Amount (t/day)															
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
East-1	90	94	97	101	105	109	113	117	121	126	130	134	138	142	146	151
East-2	99	103	107	112	116	120	125	129	134	138	143	147	152	156	161	166
East-3	115	120	125	130	135	140	146	151	156	161	167	172	177	182	188	193
West-1	119	124	130	135	141	147	152	158	164	170	176	182	187	193	199	205
West-2	107	111	116	121	126	130	135	140	145	150	155	160	165	170	175	180
West-3	153	159	165	172	178	185	192	198	205	212	219	226	232	239	246	253
Total Municipal Waste Amount (t/day)	683	712	741	771	801	832	863	894	925	957	990	1,020	1,051	1,083	1,115	1,148

Source: JICA Study Team



Source: JICA Study Team

Figure 5.4.3 Trend of Planned Municipal Waste Discharge Amount

5.4.2 Estimation of Future Solid Waste Composition

Waste composition is a fundamental data to formulate 3R planning. The waste composition survey under the WACS conducted by JICA Study Team was carried out for the waste categories especially for the recyclable waste categories, as presented in section 5.1.1 of this report. The results are summarized here for recyclable waste categories and other non-recyclable waste categories for domestic waste and incoming waste at Sharra and tabulated in Table 5.4.8 for the purpose estimating the future waste composition based on the categories in the table.

Table 5.4.8 Summary of Waste Composition of WACS (2011)

Waste Categories	Domestic Waste	Incoming Waste
Number of Samples	32	60
Food Waste	46.32%	34.94%
Paper (Recyclable: Clean Paper)	9.88%	9.10%
Paper (Non-recyclable dirty paper)	10.91%	8.94%
Plastics(Recyclable clean plastics)	8.25%	8.29%
Plastics (Non-recyclable dirty plastics)	9.13%	8.31%
Other organic waste	7.70%	10.55%
Glass	3.25%	3.53%
Metals	2.17%	1.22%
Other inorganic waste	1.97%	14.97%
Domestic hazardous waste	0.41%	0.15%
Total	100.0%	100.0%

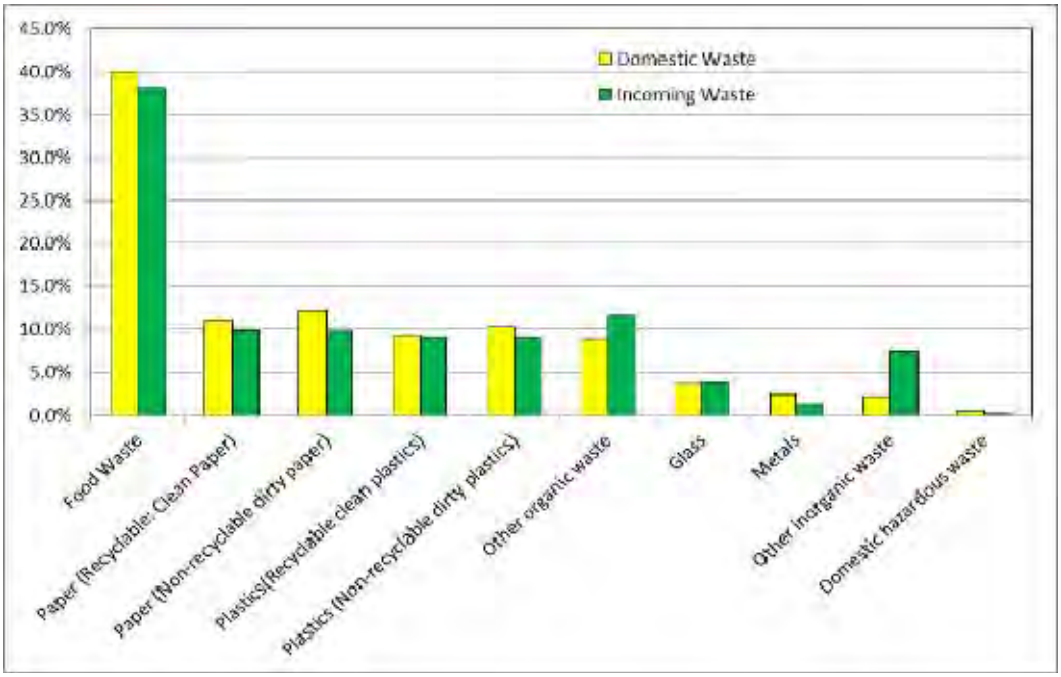
Source: JICA Study Team

The future waste composition is estimated based on the assumption of a change in life style and the consequences that will be brought about in waste composition. The other assumption is made from the ratio of food waste with 40% in domestic waste and other inorganic waste with 7.5% for incoming waste at disposal site. The composition of incoming waste at disposal site is made on the condition that the present SWM system of collection and disposal will continue even in future. Table 5.4.9 and Figure 5.4.4 show the result of the estimation of the planned waste composition of domestic waste and incoming waste at the disposal site. The main components in the future are food waste at 40%, paper at 23.2%, and plastics at 19.4% in domestic waste. Composition of incoming waste is estimated at almost the same ratio but other inorganic waste consisting of sand, dirt, concrete debris and other inert materials is estimated to decrease from the present ratio at 15% to a half level at 7.5%.

Table 5.4.9 Planned Waste Composition in Future

Waste Categories	Domestic Waste	Incoming Waste
Food Waste	40.0%	38.0%
Paper (Recyclable: Clean Paper)	11.0%	9.9%
Paper (Non-recyclable dirty paper)	12.2%	9.7%
Plastics(Recyclable clean plastics)	9.2%	9.0%
Plastics (Non-recyclable dirty plastics)	10.2%	9.0%
Other organic waste	8.7%	11.6%
Glass	3.6%	3.8%
Metals	2.4%	1.3%
Other inorganic waste	2.2%	7.5%
Domestic hazardous waste	0.5%	0.2%
Total	100.0%	100.0%

Source: JICA Study Team



Source: JICA Study Team

Figure 5.4.4 Planned Waste Composition in Future

5.5 Planning Concept and Directions of the ISWM Master Plan

This section presents the national framework to formulate the ISWM of Tirana Municipality including the national framework in legal system, functions of LGUs in waste management, overall national strategy, national plan, the framework to formulate the master plan including the components of the proposed plans and action plans for the urgent and short-term plan, mid-term plan and long-term plan, which shall be formulated under the national framework on SWM. Consequently, this reflects the planning objectives, strategies or the logical basis to formulate the local waste management plan and prioritization of proposed action plans for waste collection, intermediate treatment, waste disposal, waste reduction, resource recovery, reuse and recycling, enhancement of financial capability, etc. These are to be integrated for the establishment of an effective and efficient SWM system for the municipality. The 3R and intermediate treatment shall be especially regarded as the key contributing elements for the establishment of a sound resource recycling society (SRRS) in Albania through the SWM activities.

5.5.1 Responsibility of Local Government Units (LGUs) on SWM

Existing laws prescribe obligations of the LGUs for SWM services. Article 10 in The Law No.8652 dated July 31, 2000 “On the Organization and Functioning of the Local Government” prescribes the waste management activities for collection, transportation, treatment, and disposal at local level with their own proper functions in the area of investments and public services (amended by the Law No. 9208 dated March 18,.2004). The Law no. 10431, dated June 9, 2011 “On Environment Protection”, prescribes that the LGUs are responsible for formulating local waste management rules based on the national regulations approved by the central government, local waste management plans, etc.; for defining wastes collection and developing the site, in accordance with the environmental criteria and development plans for providing the disposal sites for both waste and hazardous substances. Article 22 of the law prescribes that the municipalities shall have the sector(s) on city cleaning and waste management. Furthermore, the Law no 8094, dated 21.03.1996 “On Public Disposal of Waste” Article 20, prescribes that the LGUs shall have responsibility for organizing waste disposal and shall have the authority to contract with the company(s) for cleaning of the cities. The same law in its “On Public Removal of Waste” Articles 31 and 34, also prescribes that the municipalities and communes set the tariffs for removal of waste in the territorial jurisdiction and assign the persons for collection waste.

5.5.2 The Law on Integrated Waste Management

As aforementioned, the purpose of this law is to protect human health and the environment by: (i) preventing or reducing the negative impacts from waste generation and from the management of waste; (ii) reducing the overall impacts of the use of resources; (iii) improving the efficiency of such use; and (iv) ensuring the environmentally sound waste management. For this purpose, the law transposes fully the EU Directive 2008/98/EC, some of the EU directives, decisions and regulations, and most of the rules and regulations prescribed directly and indirectly under several existing laws into this law. Accordingly, the principles or the framework in the formulation and implementation of an appropriate SWM are prescribed under the articles of this law. The main items of these articles are summarized as follows:

(1) Waste Management Priorities

The hierarchy of waste management in this law is prescribed to follow the general principles of the Environmental Protection Law and the Ministry and all relevant authorities are to take measures to deliver the best overall environmental outcome. This hierarchy suggests that waste minimization or 3R is regarded as the main stream in the formulation and implementation of the waste management plan of LGUs. This covers the following.

- Prevention of waste
- Preparing for re-use
- Recycling
- Other recovery, for example by energy recovery
- Disposal

(2) Preparation of Local Waste Management Plan by LGUs

LGUs are required to adopt a waste management plan called Local Waste Management Plan within its administrative area. This Plan is to be consistent with the National Waste Management Plan and the Prefecture (Qark) Waste Management Plan in accordance with the stipulations in Article 10 and Article 12 of the law. Under the Articles, the LGUs are to fully disclose the plan to the public on the website of the local government. It also stipulates that before approval of the plan by the LGU, the Prefecture (Qark) Government shall take into consideration the results of any Strategic Environmental Assessment through the comments from the public and from other relevant authorities.

(3) Extended Producer Responsibility

The producers' or waste generators' responsibilities are stipulated in Article 16 of the law requiring them to take into consideration the key elements of the 3Rs of Tirana Municipality ISWM Plan as follows:

- Any person who professionally develops, manufactures, processes, treats, sells or imports products (the producer of the product) has extended producer responsibility.
- Producers have the responsibility for measures that strengthen waste prevention, re-use, recycling and other recovery measures of waste.
- Producers have the responsibility for measures that may encourage the designing of products in order to reduce their environmental impacts and to reduce the generation of waste during the production and use of products.
- Producers have the responsibility for measures that may encourage the development, production and marketing of goods that are suitable for multiple use, technically durable and suitable for proper and safe recovery and environmentally compatible disposal.

(4) Costs of Waste Management

With regard to the cost of waste management, the law stipulates that the cost of waste management shall be born in accordance with the polluter pays principle as set out in Article 12 of the Law on Environment Protection. In particular, the costs of waste management shall be borne by the original waste producer or by the current or previous waste holders.

(5) Waste Management Responsibility

Article 21 and Article 22 of the law prescribe the responsibilities of the original waste generators, holder, dealer, operators or any person that carry out waste treatment. According to the articles, the government specifies the conditions of the responsibility and specifies in which cases the original producer retains responsibility for the whole treatment and also shares in the responsibility with the holder of the waste or delegated between the different actors of the treatment chain. ISWM is also prescribed for establishing an adequate and appropriate installations and system covering all the processes from collection to final disposal.

(6) Incineration and Landfill of Waste

As waste diversion is considered to lessen waste volume for final disposal, waste incineration is the most effective technique to reduce waste volume and prolong the life of waste disposal facilities as well as the effects of stabilizing the residual waste as ashes. The law stipulates waste incineration and landfill as follows:

- Article 47 of the law stipulates that incineration of waste shall adopt the rules and regulations including the requirements of incinerator, co-incineration, waste acceptance procedures, operation conditions, control and monitoring procedures, etc.
- Landfill is prescribed under Article 43 to Article 46 of the law to categorize into three types, landfill for hazardous waste, landfill for non-hazardous waste, and landfill for inert waste. According to the law, only waste subjected to treatment can be landfilled and landfill for hazardous waste can only be used for hazardous waste, landfill for non-hazardous waste can only be used for municipal waste and other non-hazardous or stable nature wastes, landfill for inert waste can only be used for inert waste. It also prescribes the wastes that are not acceptable for landfill such as liquid waste, explosives, chemicals, tires, automobile batteries, etc.

5.5.3 Albania Waste Management Strategy

The Albanian National Waste Strategy basically prepared by the INPAEL Project assisted by EU was approved by the government in June 2011. The key points of the strategies related with formulation of Tirana Municipality ISWM Plan are summarized in the following paragraphs.

(1) Waste Management Hierarchy

The Albanian waste management hierarchy, which complies with the EU Directive 2008/98/EC, was adopted in November 2008 as a challenging new approach to waste management based on prevention of adverse impacts of waste generation and management on human health and the environment. It aims to limit the production of waste as well as encourages the use of waste as a resource by recycling and recovery. In order to attain this purpose, the waste management hierarchy is established by priority order shown as follows.

- Prevention
- Preparing for re-use
- Recycling
- Other recovery, e.g. energy recovery
- Disposal

(2) Target Level of Reuse and Recycling

The target level of reuse and recycling also complies with the target level set in the EU Directive as follows:

- Separate collection must be set up at least for paper, metal, plastic and glass by 2015;
- Preparing for reuse and material recycling at least for paper, metal, plastic and glass from households and possibly from other origins by 2020 to a minimum of overall 50% by weight;
- Preparing for the re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials of non-hazardous construction and demolition waste by 2020 to a minimum of 70% by weight; and
- The Landfill Directive 1999/31/EC obliges the member states to reduce the amount of landfilling biodegradable waste to 35% of 1995 levels by 2016.

(3) Priorities of the Government Program on Waste Management

The approved Albania Waste Management Strategy stipulates the priority order of the government program to implement the SWM as follows:

- Adopt European Community legal standards;
- Enforce waste legislation;
- Invest in environmental protection;
- Financial support for environment infrastructure;
- Manage environmental resources;
- Improve communication and awareness; and
- Improve monitoring system.

(4) National Policy for Integrated Waste Management

In order to effect change and to bring about long term sustainable waste management of Albania, MOEFWA focused on the improvement of the following four policy pillars:

- Planning in Waste Management;
- Education in Waste Management;
- Resourcing in Waste Management; and
- Legislation in Waste Management.

(5) Challenges to Ensure Integrated Waste Management System

The following four challenges are foreseen in the setting up of a mechanism to ensure the integrated waste management system in Albania:

1) Economic challenges:

- Cost of waste treatment facilities and maintenance; and
- Economies of scale (e.g., size and capacity of facilities).

2) Environmental challenges:

- Opportunity to reduce waste to landfill (investing primarily on separate collection at source, Transfer Stations/Centers for further stream-wise separation, reuse, recycling/recovery); and
- Reduce demand on natural resources for products (through recycling).

3) Social challenges:

- Community demand for recycling programs; and
- Community demand for consistent services within Qark's boundaries.

4) Legal challenges:

- Increasing regulatory requirements (e.g., for landfills); and
- Potential for new statutory requirements (e.g., Environment Protection Policy regarding waste).

(6) Financial Sources for ISWM

The development of ISWM is to be done in two stages by the following financial sources:

External Sources

1) Stage 1: Pre-EU Accession

- The central government funding program
- The finances pledged by the collective international donor community, either as donations, or specific loan finance agreements

2) Stage 2: Post-EU Accession

- Primarily from the central government funding programme
- The EU infrastructure funding programmes
- Private capital through PPP arrangement

Waste Tariff

Waste charge is applied by the LGU to both residential and commercial customers as well as industrial entities. Basically, the Municipal or Communal Council determines the type of tariffs, level and rules of collection, and their administration. The revenues raised through the waste tariffs are far from the required budget for waste management and most of the municipalities need to secure other financial sources to supplement the fund for the activities.

Environmental Fund

The Environment Fund will be established in line with the government program. The main purpose of an Environmental Fund is to act as a central collection and distribution point for some or all of the revenues arising from environmental charges, fines, taxes and other sources, including donors. The distribution of funds to projects can then be done on clear and transparent criteria.

(7) Accountability, Monitoring and Evaluation

The Albanian National Waste Strategy state the following key issues to be tackled by the central government, local government, residents, private sectors and all other stakeholders:

- Involvement of stakeholders through provision of information and cooperation;

- Coordinating policies, national plan, regional plan, local plan and action plans;
- Monitoring of implementation through environmental indicators, performance indicators, financial indicators and administrative indicators; and
- Establishment of reporting system for overall performance of waste management.

5.5.4 National Waste Management Plan

The National Waste Management Plan of Albania prepared by the INPAEL Project assisted by EU was approved on 19 January 2011. The following paragraphs describe the key points for the LGUs to implement the ISWM, especially for the target level and the time for implementation.

(1) National Waste Policy and Strategy

The Albanian Government envisages four policy pillars, i.e., planning, education, resourcing and legislation; for the sustainable development of the country and implement the National Waste Management Plan through MOEFWA. The National Waste Management Plan sets out the basis for a national framework for the development of local and regional (waste area) waste management plan to include:

- appropriate and effective collection and transportation procedures;
- an inventory of existing sites, their state and remediation plans;
- affordable standards for construction of landfill sites which minimize pollution;
- mechanisms for increasing revenues from waste collection; and
- steps to raise public awareness of damage caused by dumping waste.

For implementing the national policy, the target levels of waste generation and waste recycling are set as follows:

- To stop the growth in the amount of municipal waste produced by 2020;
- To achieve 25% recycling and composting of municipal waste by 2015;
- To achieve 55% recycling and composting of municipal waste by 2020;
- To achieve 75% recycling and composting of municipal waste by 2025;
- To recover energy from 15% of municipal waste;
- To reduce land-filling of municipal waste from around the present 90% to around 30%;
- To provide widespread waste minimization advice to businesses; and
- To develop markets for recycled material to help recycling become viable and reduce costs.

(2) Organization and Coordination Mechanism

The plan set out the organization and coordination mechanism to achieve the targets through implementation of the waste hierarchy; i.e., prevention, repairing for reuse, recycling, recovery and disposal. The organizations and coordination mechanism include the following:

- Inter Ministry Committee on Waste;
- National Waste Advisory Group;
- Waste Areas and Waste Area Groups; and
- Stakeholder Involvement and Engaging the Albanian Public.

In addition, the following strategic principles are applied for the plan:

- Proximity and Self-Sufficiency;
- Polluter Pays; and
- Best Practicable Environmental Option (BPEO).

(3) Implementation of Municipal Waste Action Plans

The National Waste Management Plan set the schedule for implementation in three phase periods as follows:

- Phase-1 : 2010-2015
- Phase-2 : 2016-2020
- Phase-3 : 2021-2025

(4) Financial Sources

The National Waste Management Plan proposes the financial sources for implementing the plans and project to be divided into two phases as follows:

Financial Stage 1: (2010 to 2015)

- State, municipal or communal budgets
- EU pre-accession: Instrument for Pre-accession Assistance (IPA)
- Grants from other international donors

Financial Stage 2: (2015 to 2025)

- EU post-accession: grants from the structural funds (ERDF and CF)
- Loan from IFI such as the World Bank or the EBRD
- Loan from a commercial bank
- Bonds issued by local government authorities
- Private capital (through PPP arrangements)

(5) Public Relations and Monitoring

The National Waste Management Plan shall be disclosed to the public through:

- Annual Stakeholder Seminar, and
- Web-based publication of the activities.

Monitoring and reviewing of the Waste Area Plans and National Waste Management Plan shall be made using the following indicators:

- Environmental Infrastructure Performance Indicators,
- Financial indicators, and
- Administrative Indicators.

5.5.5 Tirana Waste Area Management Plan

The Tirana Waste Area Management Plan has prepared under the INPAEL Project assisted by EU in June 2010 and delivered to the Tirana Prefectural Government. The prefectural government is in a process for approval by the Prefectural Council. This will then be submitted

to the MOEFWA for approval by the central government for implementation.

5.5.6 EU Directives on SWM

Most of the EU Directives on SWM are incorporated into the law, Albania National Strategies, National Waste Management Plan and the draft Tirana Waste Area Management Plan. The following target levels are the key items stipulated in the EU Directives for planning and implementation of ISWM by MOT.

Key EU Directives for ISWM		2015	2020
- 2008/98/EC-Reuse and Recycling Art.11	:	50 %	70 %
- 1999/31/EC- Biodegradable waste to landfill, Art 5.2	:	35 %by 2016	

5.5.7 Coordination with Relevant Development Plans

(1) Relationship to Urban Regulatory Plan of Municipality of Tirana

MOT has reviewed the Urban Regulatory Plan prepared by the previous administration and decided to formulate a new plan including the neighboring communes. SWM plan in the Urban Regulatory Plan has not yet configured the action plans for future development. This ISWM Plan, in preparation under the JICA assistance project, is expected to be incorporated into the Urban Regulatory Plan by MOT.

(2) Relationship to the Regional Waste Disposal Plan

The draft of Waste Area Plan for Tirana was completed in 2010 by the INPAEL Project. But the document has not yet been approved and not ready for further implementation for the Tirana Region. However, the ISWM Plan for Tirana Municipality, in preparation under the JICA assistance project, has taken in consideration and included the proposals and orientations presented in this paper, for the future management of solid waste in Tirana Municipality. Meanwhile, KfW, upon request of MOEFWA will carry out the Feasibility Study and the Detailed Design for constructing the regional waste landfill for Durres – Tirana – Kavaja. As long as this project doesn't have any progress so far, there is no orientation or proposal that may be considered by the ISWM Plan of Tirana Municipality.

5.5.8 Framework for Tirana Municipality ISWM Plan

This section presents several kinds of frameworks to formulate the solid waste master plan of MOT known as the Tirana Municipality ISWM Plan. These frameworks consist of; i) the mission and objectives of SWM, ii) six planning policies, iii) object target year, iv) objective types of waste, v) objective area for planning, and vi) components and strategies of Tirana Municipality ISWM Plan.

(1) Mission and Objectives of SWM

In formulation of the Tirana Municipality ISWM Plan, the mission of SWM is defined to fulfill the following.

- Maintenance of public cleanliness and sanitation to keep public spaces aesthetically acceptable and to provide healthy living conditions to the citizen.
- Contribution to the establishment of sound resource recycling society.

- Conservation of the environment as a heritage for the future.

These missions are the backbone for planning and implementation of the action plans to be proposed in the Tirana Municipality ISWM Plan. These objectives shall be realized through the management of solid waste based on the consideration of waste flow of purposeful, systematic control of the functional elements of collection, transportation, waste segregation at sources, recovery of recyclable materials, reuse, recycling, intermediate treatment, and final disposal associated with the management of solid wastes from the waste generation sources to the final disposal.

(2) Planning Policies

The goal of the Tirana Municipality SWM Plan is to establish an ISWM system composed of practical action plans initiated and implemented primarily under the responsibility of MOT with the shared responsibilities and roles among the stakeholders.

With this goal, the concept of establishing a SRRS will be considered in formulation of the SWM master plan otherwise known as the Tirana Municipality ISWM Plan. The master plan will target municipal solid waste and non-hazardous solid waste, which are currently disposed in the waste bins and at the existing disposal site.

In structuring the ISWM plan, the following are the basic planning policies to be materialized in formulation of the plan:

- Participation of stakeholders in SWM;
- Introduction of 3R activities;
- Maximizing the activities of waste collection service providers;
- Minimizing the development scale of intermediate treatment and waste disposal facilities;
- Lessening the SWM financial burden on the Municipality of Tirana; and
- Enhancement of human resource and capability.

The above planning policies are delineated in the following sections.

1) Participation of Stakeholders in SWM

Among the items that need deeper discussion are the various roles of the stakeholders to the respective process of SWM activities for segregation of waste at source, recovery of recyclable materials, separate waste collection, composting of biodegradable waste, final disposal, etc. In order to increase the efficiency of an ISWM system fostering the social norms among the stakeholders in carrying out their respective responsibilities will be necessary. For example, rather than identifying residents/communities as the beneficiaries of waste collection services, residents themselves should fulfill their obligations for recovering recyclable materials in waste and discharging wastes properly to the designated place. In other words, the beneficiary himself should be a responsible citizen under this social norm and the beneficiary should shoulder the suitable burden incumbent upon him to support the ISWM system in Tirana Municipality. For implementation of the action plans, MOT needs the support from the respective stakeholders involved in the SWM. In formulation of the plan, the principal responsibilities of the stakeholders in each process of

waste management activity are defined in Table 5.5.2 for examination, discussion and consent prior to institutionalization.

Table 5.5.1 Basic Responsibilities of Stakeholders in SWM Activities

Parties Concerned	Responsibilities and Roles
1. Central Government	1) To enforce and institutionalize the Law on Integrated Waste Management 2) To implement National Waste Management Plan to cope with the present and future aspects 3) To set technical standards 4) To research advanced SWM technologies 5) To ensure that the rules and regulations are applied and followed 6) To provide guidance to LGUs 7) To enact, enforce the overall law system to setup the system for establishing SRRS in Albania 8) To study and implement the measures for stabilizing/compensating the price of recyclable materials
2. MOT	1) To formulate local policy and prepare local strategies and plans (urgent, short-term, mid-term and long- term) 2) To finance investment of SWM and sustain operation and maintenance 3) To setup a fair waste charge system and levy waste fee 4) To formulate the rules and regulations in by-law 5) To formulate the guidelines with respect to: a) method of discharging waste (types of containers, separation, and the collection day for the type of separated waste, etc.), b) set up the centers/spots for resource recovery (define the types of waste for recovery, reuse and recycle), and c) reporting requirements of commercial, business, industrial and institutional waste generators for hazardous wastes, i) To encourage and educate the citizens for obtaining support/cooperation to implement the SWM schemes of the municipal government ii) To encourage/support the private sector for establishing a corporation to recover and recycle exclusively for paper and plastics through PPP iii) To encourage/support the actors of recycling industries conducting resource recovery, separate collection, reuse and recycling activities
3. Citizens and Community Groups	1) To comply with the rules of waste segregation at sources, waste discharge, separate collection and resource recovery procedures set by the municipality government 2) To reduce generation amount of waste through environmental friendly lifestyle 3) To recover recyclables and bring to the resource recovery centers or recovery spots 4) To accept polluters pay principle and pay waste charges 5) To reuse, purchase and use recycling products/goods
4. Establishments (commercial, business, and institutional waste generators)	1) To comply with the rules, guidelines, standards, etc. set out by MOT for implementation of waste minimization plan 2) To collect, treat and dispose own wastes except for the general waste accepted by MOT as municipal waste 3) To conduct segregation of recyclable waste at their own workplaces and store temporarily 4) To accept the progressive rate waste charging system for the waste discharge amount 5) To submit reports on their waste (types, quantity, pre-treatment and other information) as required by the municipality government
5. Establishments (industrial waste generators)	1) To comply with the rules, guidelines, standards, etc. set out by MOT for implementation of waste minimization plan 2) To collect, treat and dispose own wastes except for the general waste accepted by MOT as municipal waste 3) To separate production processes waste from general waste 4) To conduct segregation of recyclable waste at their own workplaces and store temporarily 5) To accept the progressive rate waste charging system for the waste discharge amount 6) To submit reports on their waste (types, quantity, pre-treatment and other information) as required by the municipality government

Parties Concerned	Responsibilities and Roles
6. Recycling-related Industry(recycling factories/corporation, waste pickers, dealers and separate collection service providers)	1) To implement separate collection in compliance with the rules and guidelines set out by MOT (separate collection service provider) 2) To recover recyclable materials and deliver to the designated places (waste pickers and dealers) 3) To use recyclable materials in production of goods (recycling factories/recycle corporation) 4) To establish a corporation to recover and recycle exclusively for paper and plastics through PPP (recycling factories/ separate collection service provider)

Source: JICA Study Team

2) Introduction of 3R Activities

Nowadays, 3R is a basis for establishing an effective and efficient SWM system for the LGU. The ISWM Law also incorporates this concept for enactment of the law to tackle the SWM issues. Accordingly, 3R activities shall be considered as one of the key frameworks in formulation of the SWM plan by the LGU. Implementing the 3R activities requires establishment of the SWM system based on an integrated approaches including the conventional and advanced systems. In order to form a resource recovery society in Albania, the formulation of the Tirana Municipality ISWM Plan will have to consider the following key issues for the reduction of landfill waste amount and saving the finite natural resources:

- To comply with the target level set in the laws, national strategies and national plan,
- To involve the waste generators, stakeholders and the society to the 3R activities through raising public awareness programs,
- To utilize the existing actors such as waste pickers and recycling industries to the maximum extent through the supports and assistance by MOT and the central government,
- To establish the 3R system by fulfilling the roles and responsibilities of the waste generators, producers, MOT and the central government for the activities of waste generation source control, waste discharge control and material recovery and recycling control, and
- The initial activities of 3R are to be implemented at the representative pilot study areas and the good practice models expanded to the neighbouring areas and to the entire city area.

3) Maximizing the Activities of Waste Collection Service Providers

Currently, the five private companies under their respective five-year contract are providing waste collection service in the six collection areas of MOT. In the ISWM plan that works out the direction to enhance the recovery of valuable resources in waste, MOT shall consider the measures to increase the recovery rate by enhancement of the waste collection service contract to include the introduction of separate waste collection service. However, the plan to incorporate the measures shall consider the support and strengthening of the private sector (including waste pickers) for the recovery of valuable resources.

Implementing the separate collection by the private waste collection service providers will mean a change from the current terms and conditions. The service providers will be forced to change the waste collection system as part of the waste discharge method changes. The service providers have to cope with the increase of waste amount in the future to mobilize

more numbers of waste collection vehicles and staff. Accordingly, the planning for introduction of separate collection shall be carried out deliberately. In the formulation of the waste collection plan, the current division of six waste collection areas will be followed in principle. The required number of collection vehicles in each waste collection area shall be determined from the predicted waste amount of each waste collection area to consider the capability of the collection service providers in addition to the study on the additional terms and required modification for the contents of new waste collection service contracts in the future.

Separate waste collection plan will be formulated based on the categories of the following types of wastes in consideration to the waste stream of intermediate treatment and waste disposal:

Categorization of Waste Type for Separate Collection

- Dry Recyclable Waste (paper, plastics, glass and metals)
- Organic Waste (Food Waste and Yard Waste without mixtures of hard-biodegradable wastes)
- Combustible Waste (In future: All other organic waste including dirty/unclean paper and plastics)
- Incombustible/Inert Waste (including dirty paper and plastics in the initial stage),
- Bulky Waste
- Domestic Hazardous Waste (Dry cells, Fluorescent Lamps, etc.)

4) Minimizing the Development Scale of Intermediate Treatment and Waste Disposal Facilities

Waste minimization or 3R by reduction of waste generation amount and maximizing recovery of recyclable materials at sources of discharged waste will result in the decrease of waste amount for collection, intermediate treatment and final disposal. This will also realize a corresponding decrease in the cost of waste management. Successful implementation of waste minimization will be a key issue to achieve good cost performance for the total SWM system. In other words, development of the intermediate facilities and the final disposal facilities, with the minimum size and less operation and maintenance cost, cannot be achieved without the successful result of waste minimization plan.

For the purpose of minimizing the development scale of solid waste facilities, the strategic approaches include, but not limited to, the following in the formulation of the plans:

- Ensure compliance with the requirements and time frame stipulated in the laws, national strategies and super-ordinate national and regional plans for SWM,
- Utilize environmentally-sound method to maximize recovery and recycling of resource materials in waste and waste volume through reduction of waste amount generation amount, segregation of resource materials at source, separate collection, secondary segregation and other systems comprising the ISWM system,

- Retain primary enforcement responsibility with MOT and cooperative activities among the stakeholders including central government agencies, private sectors, communities, residents, NGOs, recycling industries, etc.,
- Establish institutional system and strengthen the capabilities and secure sufficient number of the actors to conduct the activities in accordance with the plans and the timeframe,
- Secure sufficient financial sources and transparency of SWM account for implementation of annual plans and projects as scheduled, and
- Promote and strengthen the integration in public and school education for raising awareness of the residents and all the stakeholders on SWM.

5) Lessening the SWM Financial Burden of Tirana Municipality

In the fiscal year 2010, the domestic waste charge is 5,000 Lek per household per year while the waste tariff for the business establishments is determined in the range of 1,000 to 225,000 Lek per year. The revenue from the waste fee reached at 490 million Lek in 2010. The previous fiscal year in 2009, the total revenue from the waste charge amount at 617 million Lek although the waste charge rate to the household was set at 4,500 Lek per year and the business establishment waste charge was the same rate with that of the 2010. An expenditure for waste related services were 1,048 million Lek in 2010. Accordingly, the revenue from the waste fee is a little less than 50% of the expenditure in 2010. Present waste tariff system does not sufficiently meet the cost recovery in SWM services. Improvement of SWM services through the implementation of ISWM action plans will need more costs to cope with the establishment of modern SWM services in MOT. Setting the waste tariff relates with the income level and willingness to pay by the beneficiaries and it will be a reality to introduce the full cost recovery waste charge at this stage. Generally, the following stage-wise charging is introduced for the public service fee:

Standard Stage-wise Charging of Public Service Fee

- First Stage: Recovery of actual operation and maintenance costs
- Second Stage: Recovery of salaries of the staff in addition to the above costs
- Third Stage: Recovery of depreciation cost in addition to the above costs (Full cost recovery)

Formulation of the plan will commence with the estimation of the unit cost per ton-waste for each process of SWM services. This will include the unit cost for waste collection, intermediate treatment and final disposal as the basic costs to determine the waste fee and for preparation of waste tariff.

6) Enhancement of Human Resource and Capability

Recruitment of sufficient number of capable staff will be a key element to implement the action plans for modernizing the SWM service in MOT. Proposed plans, programs and the projects shall be carried out based on the timeframe set out in the ISWM Plan to achieve the target level of each activity by the implementing groups. Establishment of a Project Task Team for SWM will be proposed to take the primary role among the implementing groups for promoting the implementation of the action plans. The staff shall have orientation program to fully understand the concepts and contents of the action plans and

timeframe for implementation. The staff of the Project Task Team for SWM as well as the staff and the managers of relevant Sectors and Directorates shall participate in the intensive training courses for raising their capability in technical and managerial matters. Formulation of the plan for enhancement of staff capability shall include the clear definition of roles and responsibilities of the staff.

(3) Planning Target Year

The Tirana Municipality ISWM Plan shall be implemented in accordance with the stepwise action plans formulated for the plans, programs and projects for the development of facilities and procurement set forth in the following timeframe:

- Urgent and Short-term Plan : 2013-2017
- Mid-term Plan : 2018-2022
- Long-term Plan : 2023-2027

(4) Objective Types of Solid Wastes

MOT is responsible for the management of municipal wastes defined as solid wastes that may be recovered, collected, treated and disposed of by ordinary methods. In the formulation of the Tirana Municipality ISWM Plan, the types of municipal wastes are defined as follows:

- Domestic waste including bulky waste and domestic hazardous wastes normally generated from daily living activities,
- Commercial and business waste of small amount less than 30kg per discharge,
- Wastes generated from public/ institutional buildings and public places,
- Market waste,
- Street sweepings,
- Discarded dead animals and droppings,
- Earth, sand, inert materials, and
- Other waste accepted by MOT as municipal wastes.

Non-municipal wastes that are not listed above such as medical waste and industrial hazardous waste shall be responsibly disposed of by the waste generators.

(5) Objective Area for Planning

MOT is responsible for waste management for the entire city area covering 11 mini-municipalities as a basic public service. However, waste collection service areas will be prioritized using the basic selection factor of population density. Accordingly, the objective service area will be expanded gradually to adjacent non-service areas where the population density is increasing or the waste discharging density is increasing to a predetermined level.

5.5.9 Planning Objectives and Strategies of Tirana Municipality ISWM Plan

Among the several measures, the following plans and programs are selected for the project components possibly effective to improve and enhance the SWM activities towards the establishment of an ISWM system in MOT.

Technical Approach

- Waste Collection and Transportation Plan
- Waste Minimization Plan (3R Plan)
- Intermediate Treatment Plan
- Waste Disposal Plan

Institutional and Financial Approach

- Institutional Capacity Development Plan
- Financial Strengthening Plan
- Raising Public Awareness Plan

In the formulation and implementation of the plans presented above, the objective and strategy of the respective plans are defined as follows.

(1) Waste Collection and Transportation Plan

1) Planning Objectives

- The primary objective of waste collection is to maintain cleanliness of the entire administrative jurisdiction area so as to improve public sanitation and health and to protect the environment in addition to stop illegal dumping in the public areas.
- The objective of separate waste collection service is to enhance recovery of resource materials in waste to contribute to the establishment of a sound resource recycling society.

2) Planning Strategies

- MOT is firstly to maintain the waste collection service areas provided at present.
- Secondly, MOT shall provide the service areas in the peripheral areas where waste discharge density is higher and waste bins are not provided at present.
- Waste collection service shall be provided for the remote areas where/ when the waste discharge density become higher.
- As requested by waste generators, MOT shall provide waste collection services for the bulky municipal wastes and other types of waste regarded as municipal waste on special waste charge.
- MOT shall restructure, upgrade and maintain the waste collection service by the private waste collection service providers towards establishment of separate waste collection and transportation under full control by MOT.
- Separate waste collection shall be introduced initially with 3-bin system and shift to 4-bin system prior to the introduction of waste to energy system in the future.

(2) Waste Minimization Plan (3R Plan)

1) Planning Objectives

- Overriding objective of waste minimization, including waste reduction, reuse and recycling, is to minimize the discharge of possible pollutants (waste) to the environment and reduce the cost burden to the environmental conservation in addition to lighten the cost burden to MOT by reducing the solid waste amount for collection, intermediate treatment and disposal.

- The objective of resource recovery, reuse and recycling is to use recyclable resource materials in waste for saving finite natural resources for next generation.

2) Planning Strategies

- The waste reduction, resource recovery and recycling shall be carried out initially with the 3-bin system and commence waste segregation at sources as a basic system under the conditions to perform the responsibilities and the roles of all the stakeholders including the government sectors, MOT, the residents and establishments.
- Recovery of recyclables shall be shifted to 4-bin system as the waste to energy system is operational in the future.
- The functions of community groups such as mosque/church groups, schools, organization for youth, etc. shall be facilitated to the maximum extent for the activities of waste reduction, resource recovery and recycling.
- Strengthen the function of resource collection stations or establish the material recovery centers such as material recovery facilities, waste bank, redemption centers, etc. situated at several locations in the town area.
- Assist/ Support the activities of the waste pickers, dealers and recycling industries to link with the 3R activities of MOT.

(3) Intermediate Treatment Plan

1) Planning Objectives

- The objectives of intermediate treatment are to stabilize and decompose wastes and reduce residual volume of wastes in addition to transform/ convert wastes for recovery of resources.

2) Planning Strategies

- Segregation at source, material recovery and separate collection systems shall be done before the waste enters the intermediate treatment processes.
- Intermediate treatment processes shall be designed for resource recovery process as much as possible including the options of incineration and electricity generation, composting, bio-gasification, etc. to convert waste to energy and/or recycling products.
- Introduction of composting shall be initiated with home composting, community composting, pilot central composting and, finally, the development of large scale central compost plant.
- Introduction of composting shall be collaborated with the groups on farming, nursery, parks, forestation, etc. for appropriate use and distribution of final products.

(4) Waste Disposal Plan

1) Planning Objectives

- Waste disposal shall be the last process of waste management to deposit and store eternally the waste of no value for recovery of resources and/or waste conversion for further use and protect the surrounding area from secondary pollution.

2) Planning Strategies

- Treated or residual non-hazardous waste and inert waste are the objective waste for development of final waste disposal facilities for Tirana Municipality.

- Final waste disposal facilities shall be developed in consideration of the waste diversion amount in accordance with the planned waste disposal amount derived from the step-wise implementation of recovery of resources and/or intermediate treatment.
- The sanitary landfill is evaluated to be the most appropriate disposal method from both economic and environmental point of view for development of non-hazardous waste landfill and MOT shall develop the final waste disposal facilities before the end-of life of Sharra disposal site.
- Development of new landfill facilities shall be carried out for more than one candidate disposal site and propose the future development area based on the result of clear siting study.
- Possible secondary pollution of the disposal site shall be mitigated to meet with the standard practices complied with the EU guideline or other international standards.
- Development of landfill area shall be made stage-wise and the adjacent area shall be procured for future expansion of considerably a long-term period and/or development of intermediate facilities to continue the overall waste treatment and disposal operation at the new site.

(5) Institutional Capacity Development Plan

1) Planning Objectives

- The objective of institutional capacity development is to establish the most suitable institutional and organizational arrangements to enable the Municipality of Tirana to effectively and efficiently execute the SWM formulated with the Tirana Municipality ISWM Plan and to define the implementing actions over the long-term planning period.

2) Planning Strategies

- Institutional capacity development shall be focused on strengthening the organizational structure, managerial and technical practices for sustainable operation and maintenance of the proposed SWM system.
- Institutional capacity development is carried out mainly for the Project Task Team proposed to be established under the Directorate of SWM in MOT for strengthening the capacity to implement the Tirana Municipality ISWM Plan.

(6) Financial Strengthening Plan

1) Planning Objectives

- The objective of financial strengthening is to secure initially the budget for the required operation and maintenance cost of the proposed ISWM plan and to materialize an independent financing for the establishment of cost recoverable SWM in the final stage for implementation of future projects.

2) Planning Strategies

- Current waste tariff shall be reviewed in consideration of unit cost to be estimated respectively for waste collection, intermediate treatment and waste disposal and the willingness to pay and the total expenditure for public service fees with reference to the result of social awareness survey on waste management.
- Optimum charging system of waste fee shall be introduced for the financial resources of SWM to cover at least the operation and maintenance costs in the initial stage, add

the personnel expenditure in the second phase and, finally, impose the waste charge for full cost recovery including depreciation cost of the capital investment costs.

- Transparency of SWM account shall be established to disclose all the expenditure and revenue for the base to determine the waste charging rate.

(7) Raising Public Awareness Plan

1) Planning Objectives

- The objective is defined to raise awareness of the citizens and all the stakeholders for participation by the actors fulfilling their roles in the SWM activities proposed in the Tirana Municipality ISWM Plan to be carried out under the primary responsibilities of MOT.

2) Planning Strategies

- To make the staff of the implementing body and the managerial staff of MOT fully understand the ISWM Plan. They will be required to have a clear idea to which points are important to ask for cooperation from the society for the successful implementation of the action plans and programs.
- Implementation of education programs to promote a better understanding among the citizens, community groups and all the stakeholders involved in SWM activities through public and school educations and public campaign by introducing a workable regular education programs including site visit of actual operation of SWM services.

5.6 Overall Waste Stream Based on "3R"

5.6.1 Goal of the Tirana Municipality ISWM Plan

The ISWM is formulated with the aims to realize a sustainable development and management of the purposeful, systematic control of the functional elements of waste generation, segregation, waste discharge, recovery of recyclable wastes at the waste generation sources; separate collection and transportation, and processing, transformation, storage and sanitary landfill associated with the management of solid wastes from the point of waste generation sources to final disposal through institutional capacity development, financial strengthening and the introduction of public private partnership; and raising public awareness by fulfilling the roles of all the parties concerned. In other words, the Tirana Municipality ISWM Plan is aiming at the establishment of an effective and efficient SWM system based on the development of "3R+ Waste-to-Energy" for the main technical approach and SWM financial strengthening for the main institutional/financial approaches arranged in a hierarchical order. Human life has been established on consumption of natural resources and waste generation appeared as a consequence. Considering the finite natural resources, the men of today must save the natural resources and hand these over to the next generation. Saving natural resources or implementing the ISWM is a great activity for contribution to the establishment of sound resource recycling society and the final goal of the men today.

5.6.2 Proposed Tirana ISWM Flow

In accordance with the basic concept presented in the previous section, "3. Framework of Tirana Municipality ISWM Plan", Figure 5.6.1 summarizes the proposed flow chart for composing the Tirana Municipality ISWM Plan based on the waste stream for collection, 3R activities, intermediate treatment and final disposal.

Basically, the waste flow is divided into the processes of: 1) collection, 2) reduce, recovery, reuse and recycling, 3) intermediate treatment, and 4) final disposal. Each process is also subdivided into the categories/facilities comprising the process.

The waste generators are categorized into: 1) households, commercial, business and institutional, 2) fresh food market, 3) hotel and restaurant, 4) shopping center, 5) park, 6) bulky waste, 7) street sweepings, and 8) domestic hazardous waste as the objective waste generation sources. Waste reduction will be targeted to the first four waste generators listed above.

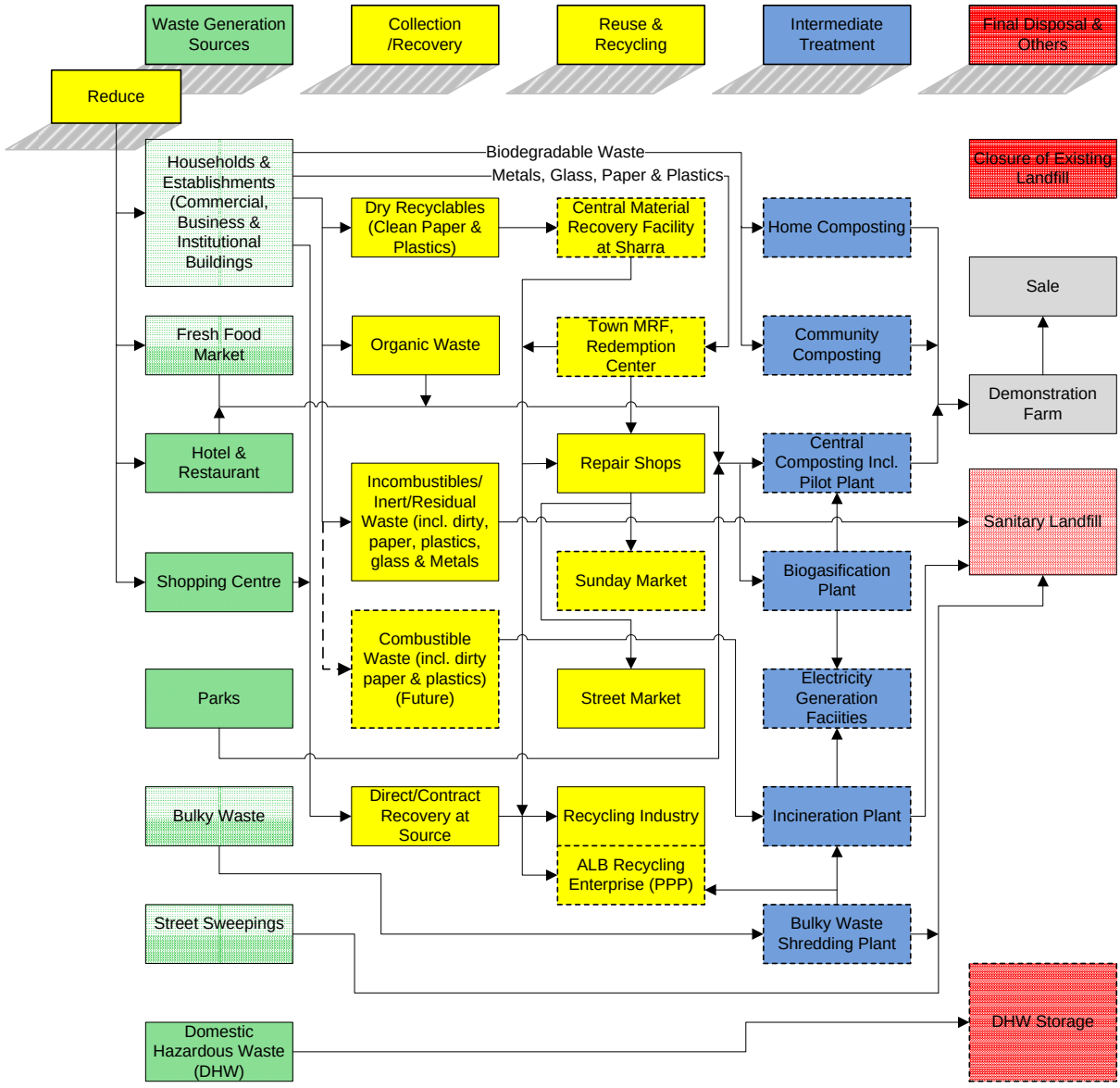
Waste collection will be conducted initially with 3 bins system comprised of 1) dry recyclables bins for clean paper, plastics, glass and metals 2) wet recyclables bins for organic waste or biodegradable waste, and 3) residues bins for incombustible waste including sandandinert materials. The fourth waste bins will be placed in future for collecting combustible waste including dirty paper and plastics.

Recovery of recyclable materials from large waste generation sources will be carried out directly by recycling industry and/or the ALB Resource Recovery and Recycling Enterprise, the recovery and recycling operator, to be proposed in the ISWM Plan. The central material recovery facilities will be proposed at Sharra for conducting secondary sorting of the dry recyclable waste bins to recover clean paper and plastics. In the town area, waste generators will

bring recyclable materials and/or reusable things to the recovery places, otherwise known as waste bank, redemption center or town material recovery facilities (Town MRF) in return for money or goods. Those recyclable materials and/or reusable things will be transferred, if any through the repair shops, to the Sunday Markets or Street Markets or to the recycling factories based on the respective characteristic of recyclable materials.

Intermediate treatment system will be comprised of: 1) home composting, 2) community composting, 3) central composting plant, 4) bio-gasification plant, 5) electricity generation facilities, 6) incineration plant, and 7) bulky waste shredding plant for the purposes of recovering energy, reducing volume and stabilizing waste.

Finally for waste disposal, the plans for: 1) closure work after the end-of-life of existing Sharra landfill, 2) sanitary landfill, and 3) domestic hazardous waste storage shall be provided for comprising the system.



Source: JICA Study Team

Figure 5.6.1 Basic Waste Flow of Tirana Municipality ISWM Plan

5.6.3 Components of ISWM Plan

The master plan of SWM, otherwise called the Tirana Municipality ISWM Plan, is composed of the following seven components:

Technical Approach

- Waste Collection and Transportation Plan
- Waste Minimization Plan (3R Plan)
- Intermediate Treatment Plan
- Waste Disposal Plan

Institutional and Financial Approach

- Institutional Capacity Development Plan
- Financial Strengthening Plan
- Raising Public Awareness Plan

Those components of the master plan are subdivided further into the plans, projects and programs described in the following sections.

5.7 Waste Collection and Transportation Plan

From the section hereafter, the plans and programs composing the Tirana Municipality ISWM Plan will be delineated for the basic conditions to formulate the plan and the phased development of the plan for the period from 2013 to 2027 starting with waste collection and transportation plan.

5.7.1 Basic Conditions for Waste Collection and Transportation Plan

(1) Planned Waste Collection and Transportation Amount

The total waste amount indicated in the preceding section in "Total Municipal Waste" is estimated for the potential waste amount required for waste collection in each waste collection service area as shown in Table 5.7.1. The waste collection amount in each collection area ranges from 90t/day to 153t/day in 2012. The population will increase in each collection service area in the future and the waste collection amount will correspondingly increase in the range of 109-185t/day in 2017, 130 - 219t/day in 2022, and 151-253t/day in 2027. The actual waste collection amount will be less than the estimated waste collection amount depending on the activities of 3R. Considering the recovery of recyclable materials in town, the current actual waste collection amount is estimated approximately 10% less than the aforementioned amount. In addition, the waste minimization program under the ISWM plan to reduce the waste generation amount will bring about further reduction of waste collection amounts in future.

Table 5.7.1 Potential Waste Collection and Transportation Amount (t/day)

Collection Area	Total Waste Amount (t/day)															
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
East-1	90	94	97	101	105	109	113	117	121	126	130	134	138	142	146	151
East-2	99	103	107	112	116	120	125	129	134	138	143	147	152	156	161	166
East-3	115	120	125	130	135	140	146	151	156	161	167	172	177	182	188	193
West-1	119	124	130	135	141	147	152	158	164	170	176	182	187	193	199	205
West-2	107	111	116	121	126	130	135	140	145	150	155	160	165	170	175	180
West-3	153	159	165	172	178	185	192	198	205	212	219	226	232	239	246	253
Total	683	712	741	771	801	832	863	894	925	957	990	1,020	1,051	1,083	1,115	1,148

Source: JICA Study Team

(2) Required Waste Collection and Transportation Capacity

1) Present Waste Collection and Transportation Capacity

Waste collection and transportation capacity is estimated based on the number of existing vehicles operated in each collection service area assuming that each vehicle is operating two trips per day as summarized in Table 5.7.2.

Table 5.7.2 Present Waste Collection and Transportation Capacity in Each Service Area

Collection Service Area	Vehicle type	Loading capacity (t)	Number of Vehicle	Total Number of Trips	Collection Capacity (t/day)	Required Number of Drivers	Required Number of Collection Staff
East-1	Compactor & Open Truck	3.5 - 14	7	14	130	14	42
East-2	Compactor & Open Truck	3.5 - 17.8	7	14	142	14	42
East-3	Compactor & Open Truck	3.5 - 14	9	18	138	18	54
West-1	Compactor & Open Truck	3.5 - 16	10	20	167	20	60
West-2	Compactor & Open Truck	3.5 - 17.8	8	16	202	16	48
West-3	Compactor & Open Truck	3.5 - 14	10	20	176	20	60
Total			51	102	955	102	306

Source: Directorate of SWM, MOT, JICA Study Team, March 2012

The lowest collection capacity is estimated at 130t per day in East-1 service area and the highest collection capacity is estimated at 202t per day in West-2 service area. As a result, the waste collection capacity estimated in each service area is sufficient enough to the potential waste collection amount. The total waste collection capacity of all the service area is estimated at 955t/day at present. Table 5.7.3 shows the details of estimation of collection capacity of each service area.

Table 5.7.3 Present Waste Collection and Transportation Capacity in Service Areas

East-1				
Vehicles Type	Loading capacity (t)	Number of Vehicle	Number of Trips Per	Collection Capacity
Compactor	14	1	2	28
Compactor	12	3	6	72
Compactor	6.5	1	2	13
Open Truck	3.5	1	2	7
Open Truck	5	1	2	10
Total East-1		7	14	130
East-2				
Vehicles Type	Loading capacity (t)	Number of Vehicle	Number of Trip per Day	Collection Capacity
Compactor	17.8	2	4	71
Compactor	14	1	2	28
Compactor	6.5	2	4	26
Open Truck	3.5	1	2	7
Open Truck	5	1	2	10
Total East-2		7	14	143
East-3				
Vehicles Type	Loading capacity (t)	Number of Vehicle	Number of Trip per Day	Collection Capacity
Compactor	14	1	2	28
Compactor	12	1	2	24
Compactor	10	1	2	20
Compactor	6.5	4	8	52
Open Truck	3.5	2	4	14
Total East-3		9	18	138
West-1				
Vehicles Type	Loading capacity (t)	Number of Vehicle	Number of Trip per Day	Collection Capacity

Compactor	16	1	2	32
Compactor	12	2	4	48
Compactor	10	2	4	40
Compactor	6.5	1	2	13
Open Truck	3.5	2	4	14
Open Truck	5	2	4	20
Total West-1		10	20	167
West-2				
Vehicles Type	Loading capacity (t)	Number of Vehicle	Number of Trip per Day	Collection Capacity
Compactor	17.8	1	2	36
Compactor	16	3	6	96
Compactor	14	2	4	56
Open Truck	3.5	2	4	14
Total West-2		8	16	202
West-3				
Vehicles Type	Loading capacity (t)	Number of Vehicle	Number of Trip per Day	Collection Capacity
Compactor	14	1	2	28
Compactor	12	2	4	48
Compactor	10	3	6	60
Compactor	6.5	1	2	13
Open Truck	3.5	1	2	7
Open Truck	5	2	4	20
Total West-3		10	20	176

Source: JICA Study Team based on information from Directorate of SWM, MOT, March 2012

2) Required Waste Collection Capacity in Future

Present waste collection capacity and the required waste collection amount in future are tabulated as shown in Table 5.7.4. The collection capacity is sufficient in each service area for the required wastes collection amount in 2017. The collection capacities of 138t/day in East-3 and of 176t/day in West-3 run short of the required waste collection capacity of 150t/day and 199t/day, respectively in 2017. In 2022 and 2027, the waste collection capacities of all the service areas except for West-2 run short of the required waste collection amount.

Table 5.7.4 Required Waste Collection and Transportation Capacity in Future

Collection Service Area	Present Collection Capacity (t/day)	Required Waste Collection Capacity (t/day)			
		2012	2017	2022	2027
East-1	130	90	109	130	151
East-2	142	99	120	143	166
East-3	138	115	140	167	193
West-1	167	119	147	176	205
West-2	202	107	130	155	180
West-3	176	153	185	219	253
Total	955	683	831	990	1,148

Source: JICA Study Team

(3) Storage Capacity of Waste Bins

1) Present Storage Capacity of Waste Bins

Waste storage capacity is estimated based on the number of existing waste bins in each collection service area assuming the bulk density of waste for converting the volume into weight of waste. The storage capacity waste bins placed in each service area is estimated as shown in Table 5.7.5. The storage capacity of East-2 is the lowest judging from the storage ration of 76% computed from the division of storage capacity by the waste amount of the service area in 2012. New waste bins are replaced with old waste bins in East-3 since February 1, 2012. However, the estimated total storage capacity is not sufficient for the waste amount in the service area. Meanwhile, the storage capacity in West-2 shows the highest storage ratio at 97%. As a result, the waste storage capacity in each service area is not sufficient although approximately 10% of municipal waste is collected directly by private collection operators, which is not discharged into the waste bins. Waste collection is carried out twice in a day in the area where the storage capacity is insufficient to cope with the waste spill problem.

Table 5.7.5 Present Waste Storage Capacity of Waste Bins in Each Service Area

Service Area	Number of Container	Container Volume (m^3)	Storage Capacity per Container (t)	Storage Capacity (t)	Waste Amount in 2012 (t/day)	Storage Ratio to Waste Amount (%)
East-1	468	1.7	0.149	70	90	78%
East-2	506	1.7	0.149	75	99	76%
East-3	650	1.7	0.149	97	115	84%
West-1	707	1.7	0.149	105	119	88%
West-2	696	1.7	0.149	104	107	97%
West-3	825	1.7	0.149	123	153	80%
Total	3852			573	683	84%

Source: JICA Study Team

2) Required Storage Capacity of Waste Bins in Future

Present waste storage capacity and the required waste storage capacity in future are tabulated as shown in Table 5.7.6. The waste storage capacity is not sufficient in each service area to the required wastes collection amount in 2012. There are difficulties to install waste bins especially in the down town area or in busy streets and the collection services in those areas are carried out twice in a day to cover the insufficiency of storage capacity of the waste bins. Installation and/or replacement of waste bins are required to meet the potential waste collection amount.

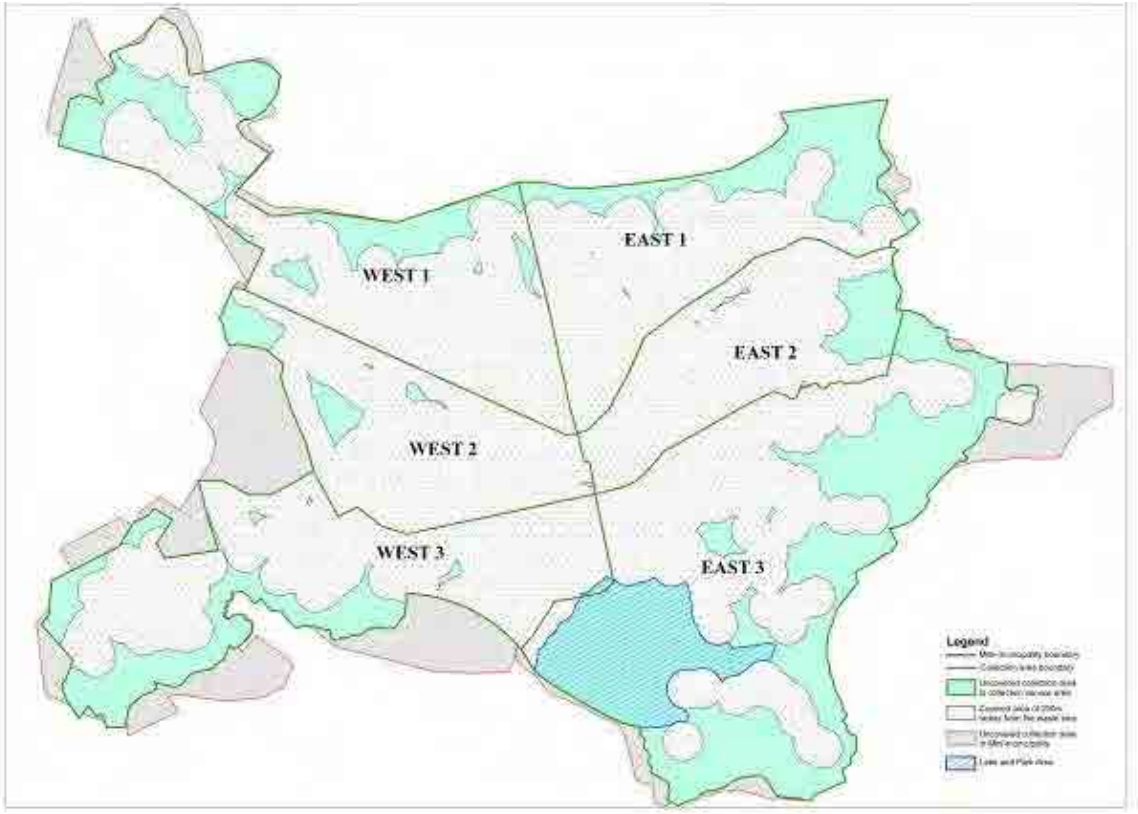
Table 5.7.6 Required Waste Storage Capacity of Waste Bins in Future

Service Area	Storage Capacity (t)	Potential Waste Collection Amount (t/day)			
		2012	2017	2022	2027
East-1	70	90	109	130	151
East-2	75	99	120	143	166
East-3	97	115	140	167	193
West-1	105	119	147	176	205
West-2	104	107	130	155	180
West-3	123	153	185	219	253
Total	573	683	832	990	1,148

Source: JICA Study Team

(4) Uncovered Waste Collection Service Areas

The Tirana Municipality ISWM Plan is formulated to cover the entire municipality area for waste collection services. Currently, some of the areas are not covered by the daily waste collection services and residents of those areas complained about the situation and environmental degradation. The unserviced areas are obtained by superimposing several layers of the GIS data from the Directorate of Territorial Planning, MOT and shown in Figure 5.7.1. The data was processed to show the areas without any collection service by 200m radius from the location of each waste bin, boundaries of six waste collection service areas and 11 mini-municipalities. According to the processed GIS map, it is observed that the waste collection service area does not cover the administration area of the municipality. However, most of the town area is covered within the waste collection service area except for the peripheral areas and newly developed areas. The data was also processed to show the size of the uncovered or unserviced collection service areas and tabulated in Tables 5.7.7 to 5.7.10. Table 5.7.7 shows that the waste collection service area is measured to cover about 39km^2 while the estimated actual service areas covered within the 200m radius from the waste bins covers 27km^2. This means a gap area of 12km^2. On the other hand, Table 5.7.9 shows the administration area of MOT to be approximately 43km^2 and, as such, the total uncovered areas of MOT would then be 16km^2 calculated from the covered area of waste bins estimated at 27km^2 as mentioned above. These uncovered areas will be the target areas in the formulation of the ISWM plan for expanding and improving the waste collection services in MOT.



Source: JICA Study Team based on information from Directorate of Territorial Planning, MOT

Figure 5.7.1 Uncovered Waste Collection Service Area in MOT

Table 5.7.7 Summary of Uncovered Collection Area by Collection Service Area

Collection Area	Total Collection Service Area (km2)	Mini-municipality in the Collection Area	Total Mini-municipality Area in the Collection Service Area (km2)	Total Non-covered Mini-municipality Area in the Collection Service Area (km2)	Total Covered Area of Buffer_200m from the Waste Bins (km2)	Total Non-covered Area of Buffer_200m from the Waste Bins (km2)	Lake & Park (km2)
East 1	5.41	Mini-municipality-3,4,8,9	5.03	0.38	3.90	1.51	
East 2	4.04	Mini-municipality-1,2,3,4,8,9	4.03	0.01	3.51	0.53	
East 3	11.74	Mini-municipality-1,2,3,5	11.28	0.46	5.73	6.01	1.92
West 1	7.04	Mini-municipality-7,9,10,11	6.90	0.14	5.25	1.79	
West 2	4.33	Mini-municipality-2,5,6,7,9,10	4.30	0.03	3.91	0.42	
West 3	6.87	Mini-municipality-2,5,6,7	6.73	0.14	5.17	1.70	0.02
Total	39.43	-	38.26	1.17	27.47	11.96	

Source: JICA Study Team

Table 5.7.8 Details of Uncovered Collection Area in Mini-municipality by Collection Service Area

Collec-tion Area	Total Collec-tion Service Area (km^2)	Mini-municipality in the Collection Area	Mini-municipa-lity Area in the Collection Service Area (km^2)	Total Mini-munici-pality Area in the Collection Service Area (km^2)	Total Non-covered Mini-munici-pality Area in the Collection Service Area (km^2)	Covered Area of Buffer_ 200m from the Waste Bins (km^2)	Total Covered Area of Buffer_ 200m from the Waste Bins (km^2)	Total Non-covered Area of Buffer_ 200m from the Waste Bins (km^2)	Lake & Park (km^2)
East 1		Mini-municipality-3	0.01			0.01			
		Mini-municipality-4	2.95			2.00			
		Mini-municipality-8	1.45			1.28			
	5.41	Mini-municipality-9	0.62	5.03	0.38	0.61	3.90	1.51	
East 2		Mini-municipality-1	0.23			0.17			
		Mini-municipality-2	0.76			0.76			
		Mini-municipality-3	1.98			1.53			
		Mini-municipality-4	0.61			0.60			
		Mini-municipality-8	0.45			0.45			
	4.04	Mini-municipality-9	0.00	4.03	0.01	0.00	3.51	0.53	
East 3		Mini-municipality-1	2.90			1.62			
		Mini-municipality-2	8.35			4.09			1.92
		Mini-municipality-3	0.02			0.01			
	11.74	Mini-municipality-5	0.02	11.28	0.46	0.02	5.73	6.01	
West 1		Mini-municipality-7	0.06			0.06			
		Mini-municipality-9	2.10			1.82			
		Mini-municipality-10	0.09			0.09			
	7.04	Mini-municipality-11	4.64	6.90	0.14	3.28	5.25	1.79	
West 2		Mini-municipality-2	0.02			0.02			
		Mini-municipality-5	0.09			0.09			
		Mini-municipality-6	0.52			0.40			
		Mini-municipality-7	2.99			2.71			
		Mini-municipality-9	0.01			0.01			
	4.33	Mini-municipality-10	0.68	4.30	0.03	0.68	3.91	0.4.3	
West 3		Mini-municipality-2	0.13			0.11			0.02
		Mini-municipality-5	2.65			2.31			
		Mini-municipality-6	3.95			2.75			
	6.87	Mini-municipality-7	0.00	6.73	0.14	0.00	5.17	1.70	
Total	39.43		38.26	38.26	1.17	27.47	27.47	11.96	

Source: JICA Study Team

Table 5.7.9 Summary of Uncovered Collection Area by Mini-municipality

Mini-municipality	Mini-municipality Area (km^2)	Collection Area	Total Collection Service Area in the Mini-municipality Area (km^2)	Total Non-covered Collection Service Area in the Mini-municipality Area (km^2)	Total Covered Area of Buffer_200m from the Waste Bins (km^2)	Total Non-covered Area of Buffer_200m from the Waste Bins (km^2)	Lake & Park (km^2)
Mini-municipality-1	4.00	East 2,3	3.12	0.87	1.79	2.20	
Mini-municipality-2	9.56	East 1,2,3, West 2,3	9.25	0.31	4.97	4.59	1.94
Mini-municipality-3	2.01	East 1,2,3	2.00	0.01	1.54	0.46	
Mini-municipality-4	3.64	East 1,2	3.56	0.08	2.60	1.04	
Mini-municipality-5	3.64	East 3, West 2,3	2.76	0.88	2.4.3	1.22	
Mini-municipality-6	6.90	West 2,3	4.47	2.43	3.16	3.74	
Mini-municipality-7	3.05	West 1, 2,3	3.05	0.01	2.77	0.28	
Mini-municipality-8	1.90	East 1,2	1.90	0.00	1.73	0.17	
Mini-municipality-9	2.73	East 1,2 West1,2	2.73	0.00	2.43	0.30	
Mini-municipality-10	0.77	East 2, West 1,2	0.77	0.00	0.77	0.00	
Mini-municipality-11	5.37	West 1,2	4.64	0.73	3.28	2.09	
Total	43.57	-	38.26	5.31	27.47	16.10	

Source: JICA Study Team

Table 5.7.10 Details of Uncovered Collection Area by Mini-municipality

Mini- municipality	Mini-municipality Area (km^2)	Collection Area	Collection Service Area in the Mini-municipality Area (km^2)	Total Collection Service Area in the Mini-municipality Area (km^2)	Total Non-covered Collection Service Area in the Mini-municipality Area (km^2)	Covered Area of Buffer_200m from the Waste Bins (km^2)	Total Covered Area of Buffer_200m from the Waste Bins (km^2)	Total Non-covered Area of Buffer_200m from the Waste Bins (km^2)	Lake & Park (km^2)
Mini-municipality-1		East 2	0.23			0.17			
	4.00	East 3	2.90	3.12	0.87	1.62	1.79	2.20	
Mini-municipality-2		East 1	0.00			0.00			
		East 2	0.76			0.75			
		East 3	8.35			4.09			1.92
		West 2	0.02			0.02			
	9.56	West 3	0.13	9.25	0.31	0.11	4.97	4.59	0.02
Mini-municipality-3		East 1	0.01			0.01			
		East 2	1.98			1.53			
	2.01	East 3	0.02	2.00	0.01	0.01	1.54	0.46	
Mini-municipality-4		East 1	2.95			2.00			
	3.64	East 2	0.61	3.56	0.08	0.60	2.60	1.04	
Mini-municipality-5		East 3	0.02			0.02			
		West 2	0.09			0.09			
	3.64	West 3	2.65	2.76	0.88	2.31	2.4.3	1.22	
Mini-municipality-6		West 2	0.52			0.40			
	6.90	West 3	3.95	4.47	2.43	2.75	3.16	3.74	
Mini-municipality-7		West 1	0.06			0.06			
		West 2	2.99			2.71			
	3.05	West 3	0.00	3.05	0.01	0.00	2.77	0.28	
Mini-municipality-8		East 1	1.45			1.28			
	1.90	East 2	0.45	1.90	0.00	0.45	1.73	0.17	
Mini-municipality-9		East 1	0.62			0.61			
		East 2	0.00			0.00			
		West 1	2.10			1.82			
	2.73	West 2	0.01	2.73	0.00	0.01	2.43	0.30	
Mini-municipality-10		East 2	0.00			0.00			
		West 1	0.09			0.09			
	0.77	West 2	0.68	0.77	0.00	0.68	0.77	0.00	
Mini-municipality-11		West 1	4.64			3.28			
	5.37	West 2	0.00	4.64	0.73	0.00	3.28	2.09	
Total	43.57		38.26	38.26	5.31	27.47	27.47	16.10	

Source: JICA Study Team

(5) Waste Collection and Transportation Options

There are two options in formulation of waste collection and transportation plan. The first option is regarding the division of waste collection area and the second option is for recovery of recyclable through separate collection as discussed in the following subsections.

1) Option for Division of Collection Area

The following two options are practical for the division of waste collection area for providing the waste collection area with private service providers on contract base.

Option No.	Option Title	Outline of Option
Option-CT1	6 Waste Collection Areas	Divide the entire municipality area into 6 waste collection areas following to the existing collection service areas
Option-CT2	1-2 Waste Collection Areas	Merge the 6 waste collection areas into 1 to 2 collection service areas.

Division of waste collection area of Option-CT1 follows the current service boundary of six waste collection areas, which can be contracted out to the service providers through the public or appointed tendering process. Each waste collection area has more or less 100,000 resident populations and the service area size ranges from five to 10km^2, which are good sizes in terms of the capability of the service providers available in Tirana.

Option-CT2 service area is formed by merging the current six collection areas into one or two service areas expecting to have better cost performance in service by the benefits from large scale business activities. In case of one service area for the entire MOT, the service provider shall mobilize about 50 collection vehicles to the waste amount as of today.

Option-CT1 collection service area of six areas is recommendable considering the availability of the service providers and to maintain the competitiveness for better quality of service among the service providers.

2) Option for Recovery of Recyclable Materials

Shifting to separate waste collection is a must for implementing the Tirana Municipality ISWM Plan. 3-bin system is introduced initially, which will be shifted to four 4-bin system as the waste to energy plant is operational. In addition, recyclable materials are collected not only from three kinds of waste bins but also from the large waste generators and town material recovery facilities or the similar collection stations where recyclable materials are sorted and stored for recovery service. Three options are conceived for implementing the service for recovery of recyclable materials as shown in the following and summarized in Table 5.7.11:

Option No.	Option Title	Outline of the Option
Option-RR1	Six service providers	Six service providers collect 3-bins separately in addition to recover recyclable materials from the source of large waste generators and from Town MRF.
Option-RR2	Recovery and recycling operator	Six service providers collect only 3-bins separately. Recovery and recycling operator recover recyclable materials from the source of large waste generators and from town material recovery facilities.

Option-RR3	Private sector by free market economy	Six service providers collect only 3-bins separately. Private sector or the waste pickers recover recyclable materials by the free market economy principle.
Option-RR4	Private sector by one service provider	One service provider collect 3-bins separately, recover recyclable materials from the source of large waste generators and from town material recovery facilities.

Table 5.7.11 Options of Recovery of Recyclable Materials

Option No.	Operator	3-bins	Large Waste Generators	Town MRFs
Option-RR1	Six service providers	○	○	○
Option-RR2	Six service providers	○	-	-
	Recyclables by Recovery and Recycling operator	-	○	○
Option-RR3	Six service providers	○	-	-
	Recyclables by private sector by free market economy	-	○	○
Option-RR4	One service provider	○	○	○

Source: JICA Study Team

Option-RR1 is operated only by the six waste collection service providers. Each service providers shall carry out separate collection of 3-bin system and recovery of recyclable materials and biodegradable waste from the places of large waste generators, Town MRF, etc. within own waste collection service area. Then, the collected waste and recyclable materials shall be transported to the designated places for treatment, disposal and recycling. This Option-RR1 requires additional vehicles for the waste collection service providers to recover sorted recyclable materials and biodegradable wastes directly from the places of large waste generator and the Town MRF, etc.

Option-RR-2 is also operated by the six waste collection service providers only for separate collection of 3 bin system. Recyclable materials and biodegradable waste shall be recovered by the recovery and recycling operator (hereinafter called ALB Resource Recovery and Recycling Enterprise) from places of large waste generators, Town MRF, etc. in the entire waste collection area of MOT. The transporting of recyclable materials and biodegradable waste for treatment and/or recycling is the responsibility of the ALB Resource Recovery and Recycling Enterprise. This Option-RR2 requires the establishment of ALB Resource Recovery and Recycling Enterprise under the legal framework and the participation of the stakeholders on SWM to create SRRS in Albania. Establishment of SRRS is discussed again under the section of waste minimization plan.

Option-RR3 is also operated by the six waste collection service providers only for the separate waste collection of 3-bin system. Recovery of recyclable materials is carried out by the actors of private sector and waste pickers following the current activities under the principle of free market economy with the linkage and support provided by MOT for some improvement of the current activities for recovery of more recyclables. In this Option-RR3, biodegradable waste from the places of large waste generators may be collected by the MOT Waste Management Enterprise.

Option-RR4 is operated by only one service provider for separate collection of three bins, recyclable materials from the sources of large waste generator and from the Town MRF. This option is the integration of six waste service providers proposed in Option-RR1 to carry out the uniform waste collection services for the entire area of MOT. Recyclable materials recovered by the service provider may be sold directly to the recycling industry or to the ALB Resource Recovery and Recycling Enterprise, if established. Similar to Option-RR3, biodegradable waste from the large waste generators may be collected by the MOT Waste Management Enterprise.

Option-RR3 is recommendable to implement in the initial stage and shift to Option-RR2 in near future as the legal framework is ready to have the waste generators responsible for the waste generated in the processes of manufacturing, distribution, retailing and consumption. The actors of recovery of recyclable materials under Option-RR3 may be integrated also with the actors of Option-RR2 by way of a systematic improvement.

5.7.2 Outline of Waste Collection and Transportation Plan

The master plan of waste collection and transportation plan consists of the plans, projects and programs summarized in Table 5.7.12.

Table 5.7.12 Outline of Waste Collection and Transportation Plan

Plans, Actions and Projects			Description of Works
SWM-1 Waste Collection and Transportation Plan			Formulation of waste collection plan and implementation of the programs and the projects for upgrading the waste collection services.
	SWM-1-1	Formulation of Implementation Plan for Waste Collection and Transportation	Formulate the implementation plan and feasibility study for waste collection based on the proposed conditions including 3-bins system, separate collection, placing additional waste bins, etc. based on the proposals of JICA Study.
	SWM-1-2	Survey of Illegal Dump Site and Preparation of Clean-up project	Survey and estimate the cost for urgent clean-up of the illegal dump sites and prepare the tender document for implementing the work by contract or the MOT Waste Management Enterprise to carry out the Clean-up Project of illegal dumpsite. .
	SWM-1-3	Implementation of Illegal Dump Site Clean-up Project through Contract	Implement the urgent clean-up work by the contractor under the supervision of MOT. The contract shall be made annually for the period of three years. During/After cleaning the area, the waste bins shall be placed in the regular collection service area.
	SWM-1-4	Implementation of Pilot Study for Improvement of Waste Collection Service	Survey and study the collection service area for the methods to improve the quality of waste collection services through expansion of service area, installation of sufficient Number of waste bins, introduction of primary collection, etc. Effectiveness of the plan shall be verified in the pilot study area and expanded to the entire service area of the municipality.
	SWM-1-4-1	Study for Expansion of Service Area by Separate Collection	Study the methods for expansion of service area through installation of sufficient Number of 3-bins system in relation with segregation at waste generation sources for recovery of recyclable materials in municipal waste
	SWM-1-4-2	Study of Separate Waste Collection for Special Wastes	Study the method for implementation of separate waste collection services for bulky waste and domestic hazardous waste to setup the services for special wastes.
	SWM-1-4-3	Implementation of Separate Collection at the Pilot Study Areas	Select the pilot study areas at: 1) detached house area, 2) apartment building area, and 3) commercial area. The pilot study for shifting to the separate waste collection shall be implemented with 3-bins system and replicated in the neighboring areas.
	SWM-1-5	Operation of Separate Collection by 3-bins system	Start operation of separate waste collection through introduction of 3-bins system and source segregation systems based on the results of the pilot study.
	SWM-1-6	Monitoring/Inspection of Waste Collection Activities	Conduct periodic inspection and monitoring to guide the waste collection service providers to follow the procedures standardized for separate waste collection system.
	SWM-1-7	Evaluation of Performance and Target Level of Waste Collection Plan	Review and evaluate the separate waste collection system and the performance of separate waste collection carried out by the waste collection service providers. Study the timing to shift to 4-bin system for combustible waste in line with the introduction composting, bio-gasification and waste to energy facilities.

Source: JICA Study Team

5.8 Waste Minimization '3R" Plan

5.8.1 Basic Conditions for Waste Minimization Plan

(1) Government Policy on Waste Minimization Target Level

The target level of waste minimization plan shall be determined in compliance with the time-wise target level in the superannuated plans including the National Waste Management Plan and EU Directives. The following target levels are stipulated in the National Plan and EU Directives, which shall be taken into consideration for the planning of the waste minimization plan.

Target Level of National Waste Management Plan		2015	2020	2025
- Recovery and Recycling, Chap. 2.1	:	25 %	55 %	75 %
- Separate Collection	:	Start by 2015		
- Recovery of Energy, Chap. 2.1	:	15 %, target year is not stated		
- Landfill of Municipal Waste, Chap. 2.1	:	30 %, target year is not stated		
- Zero Waste Growth, Chap. 2.1	:	By 2020		

Target Level of EU Directives		2015	2020
- 2008/98/EC-Reuse and Recycling Art.11	:	50 %	70 %
- 1999/31/EC- Biodegradable waste to landfill, Art 5.2	:	35 %by 2016	

(2) Proposed Target Level for Waste Minimization

The actual target level of waste minimization shall be determined in relation with planning of waste collection, intermediate treatment and waste disposal in addition to the consideration of participation of the stakeholders including especially the residents, communities and the establishments. Reduction of waste generation rate is very hard for a developing economy like Tirana. Therefore, the target level of waste generation rate is proposed at a challenging rate of 1% per annum and an accomplishment of 10% waste generation reduction by 2021.

The target recyclable materials for recovery and recycling are determined in consideration of the state of current recycling activities and the requirements for compliance with the rules and regulation of the country. The following are the target waste proposed for recovery and recycling in the Tirana Municipality ISWM Plan:

- Paper,
- Plastics,
- Glass,
- Metals, and
- Organic/Biodegradable/Combustible Wastes.

Recovery and recycling of organic waste or biodegradable waste shall be determined based on the facility development plan taking into consideration the aforementioned national target level. Paper, plastics, glass and metals are chosen for the objective recyclable materials to comply with the requirements of the superannuated plans and the law. The target recovery level of

recyclable materials is determined with reference to the data of recycling activities obtained from ARA and processed by JICA Study Team for analysis of current recovery ratio of each recyclable material as shown in Table 5.8.1. The recycling amounts of paper and plastics are 30t/day and 37t/day and the recovery ratio to each component is estimated at 18% and 26%, respectively in 2011. Reliable data was not obtained for glass and metals and the minimum recovery amount was determined at 10t/day. Based on the analysis, the recovery ratio of each recyclable material in 2011 are determined to be 20% for paper, 30% for plastics, 40% for glass and 60% for metals.

Table 5.8.1 Estimated Recovery Ratio of Major Recyclable Materials (2011)

Recyclable Materials	Mixture Ratio in Waste (%)	Recyclable Material Amount in Waste (t/day)	Estimated Recovery Amount (t/day)	Recovery Ratio to Each Component (%)	Determined Recovery Ratio (%)
Paper	23.20%	169	30	18%	20%
Plastics	19.40%	141	37	26%	30%
Glass	3.60%	26	10	38%	40%
Metals	2.40%	17	10	57%	60%
Other Waste	51.40%	374	-	-	-
Total	100.00%	728	-	-	-

Source: Analyzed by JICA Study Team based on information from Albania Recycling Association

The target recovery and recycling ratio to each component is determined in consistency with the stage-wise overall planning for procurement and construction plans for modernizing the SWM system in MOT. Table 5.8.2 shows the target level for waste minimization plan for the period of 2012-2027. The final target level in 2027 for the recovery and recycling target levels are proposed at 10% for waste reduction, 100% for organic waste, 60% for paper, 60% for plastics, 70% for glass and 70% for metals.

Table 5.8.2 Proposed Target Recovery & Recycling Ration to Each Component

Recyclable Materials	Proposed Target Ratio to Each Component			
	2012	2017	2022	2027
Waste Reduction	0%	5%	10%	10%
Organic Waste	0%	25%	117%	101%
Paper	20%	35%	50%	60%
Plastics	30%	40%	50%	60%
Glass	40%	50%	60%	70%
Metals	60%	65%	70%	70%

Source: JICA Study Team

(3) Planned Waste Minimization Amount

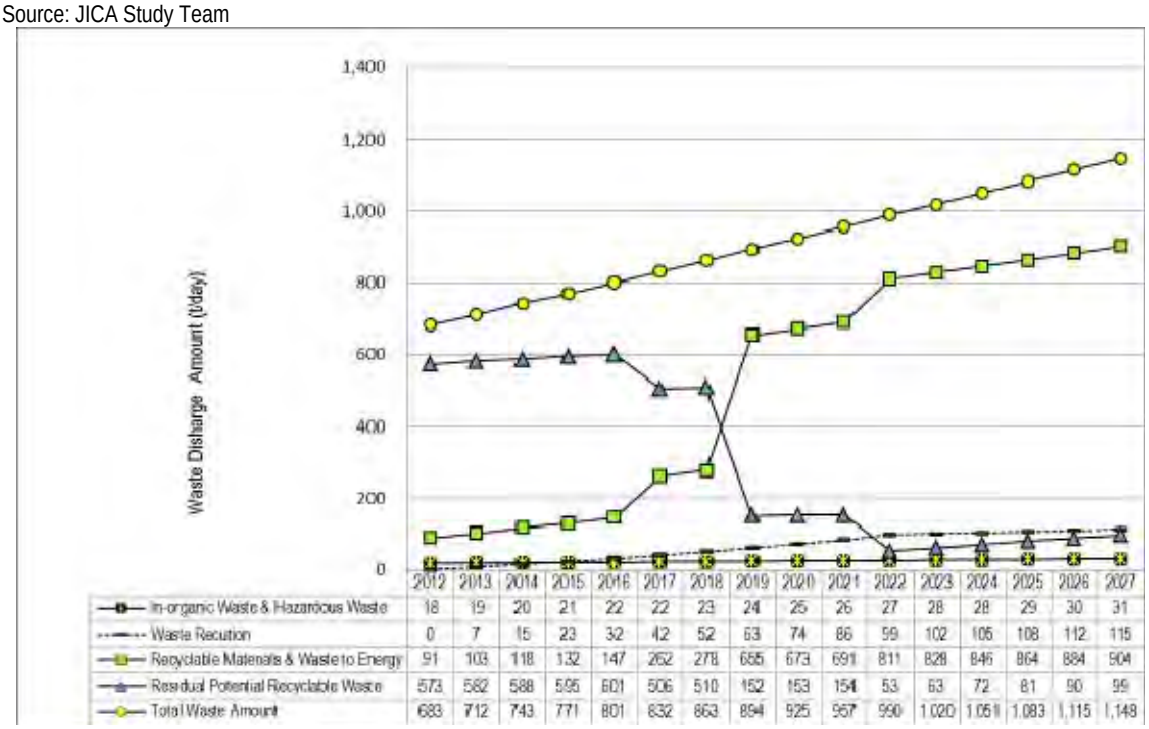
Waste reduction amount and recovery and recycling amount of resources in municipal wastes are estimated in relation to the total municipal waste amount, mixture ratio of each resource materials in municipal waste and the proposed target recovery ratio. The result of the calculation is shown in Table 5.8.3 and Figure 5.8.1. The total amount of waste generation reduction and recycling, and waste minimization increases from 91t/day in 2012 to 1,018t/day in 2027, which is equivalent to the increase of waste minimization ratio from 13% in 2012 to 89% in 2027. As shown in Figure 5.8.1, the increase in the amount of waste minimization appears in 2019 when

recovery of combustible waste is started for treatment at the waste to energy plant. On the other hand, a decrease of residual waste amount for final disposal is expected in the same year. The percentage in Figure 5.8.2 shows clearly the transition of increase of waste generation reduction and recycling and a decrease of waste disposal as an effect of waste minimization plan.

Table 5.8.3 Planned Target Recovery and Recycling Amount and Ratio to Each Component

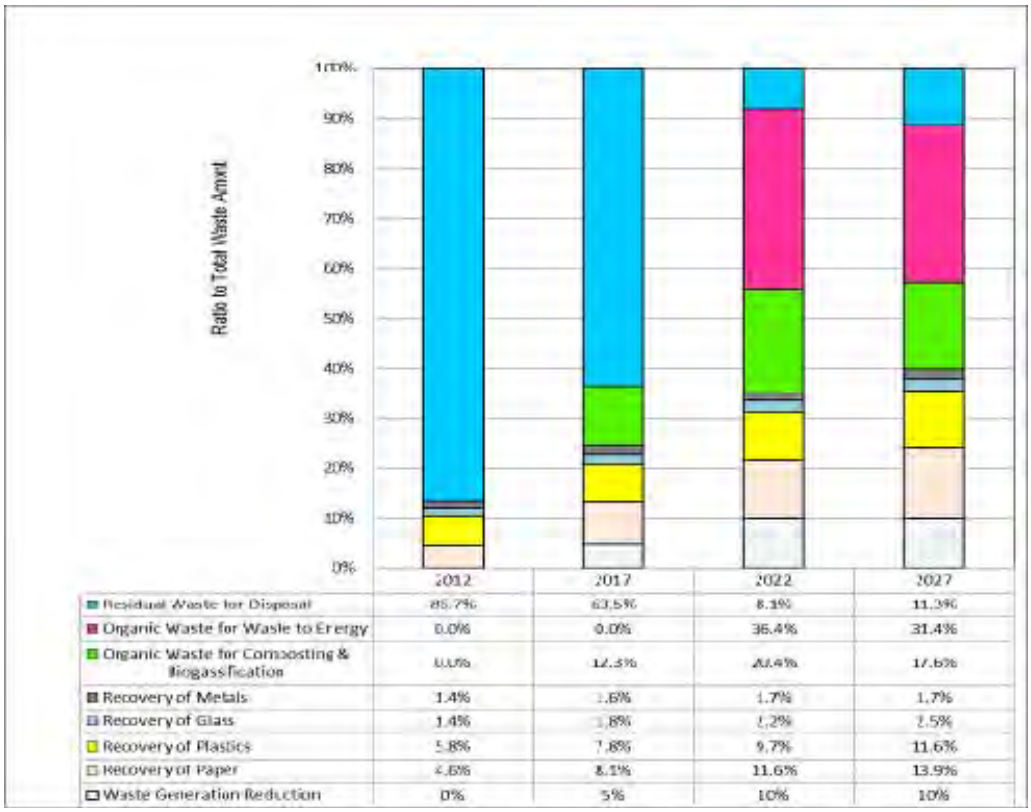
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Waste Reduction	0	7	15	23	32	42	52	63	74	86	99	102	105	108	112	115
Recyclable Materials	91	103	116	130	145	160	176	193	211	229	249	266	284	302	322	342
Waste to Energy	0	0	2	2	2	102	102	462	462	462	562	562	562	562	562	562
Residual Potential Recyclable Waste	573	582	588	595	601	506	510	152	153	154	53	63	72	81	90	99
In-organic Waste & Hazardous Waste	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31
Total Waste Amount	683	712	743	771	801	832	863	894	925	957	990	1,020	1,051	1,083	1,115	1,148
Total of Waste Minimization Amount	91	111	133	155	179	304	330	718	747	777	910	930	951	973	995	1,018
Waste Reduction Ratio	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	10%	10%	10%	10%	10%
Recovery Ratio of Recyclable Materials	13%	15%	16%	17%	18%	19%	20%	22%	23%	24%	25%	26%	27%	28%	29%	30%
Recovery Ratio of Compost & Biogas	0%	0%	0%	0%	0%	12%	12%	11%	11%	11%	20%	20%	19%	19%	18%	18%
Recovery Ratio by Waste to Energy	0%	0%	0%	0%	0%	0%	0%	40%	39%	38%	36%	35%	34%	33%	32%	31%
Waste Minimization Ratio to Total Waste Amount	13%	16%	18%	20%	22%	36%	38%	80%	81%	81%	92%	91%	90%	90%	89%	89%

Source: JICA Study Team



Source: JICA Study Team

Figure 5.8.1 Planned Recovery Amount of Recyclable Materials and Organic Waste



	2012	2017	2022	2027
Residual Waste for Disposal	85.7%	63.5%	8.1%	11.3%
Organic Waste for Waste to Energy	0.0%	0.0%	36.4%	31.4%
Organic Waste for Composting & Biogassification	0.0%	12.3%	20.4%	17.6%
Recovery of Metals	1.4%	1.6%	1.7%	1.7%
Recovery of Glass	1.4%	1.8%	2.2%	2.5%
Recovery of Plastics	5.8%	7.8%	9.7%	11.6%
Recovery of Paper	4.6%	8.1%	11.6%	13.9%
Waste Generation Reduction	0%	5%	10%	10%

Source: JICA Study Team

Figure 5.8.2 Transition of Planned Waste Minimization Ratio of Each Resource Material

(4) Planned Recovery and Recycling Amount

Recovery and recycling amount of the objective recyclable materials including paper, plastics, glass and metals are estimated based on the target recovery level determined in the preceding subsection. In addition, the recovery amount of organic waste is also estimated in relation with the time schedule for the development of composting, bio-gasification and waste to energy facilities. The results are summarized in Tables 5.8.4 and 5.8.5. The recovery ratio of recyclable materials to the total waste amount for paper, plastics, glass and metals increase from 13.3% in 2012 to 29.8% in 2027, which is equivalent to 91t/day in 2012 and 342t/day in 2027 in recovery quantity of total recyclable materials. Meanwhile, recycling of organic waste is nil at present and the recovery ratio of organic waste to the total waste amount will increase up to 49% or 562t/day in 2027 with the operation of composting, bio-gasification and waste to energy facilities. As a whole, the waste quantity of 904t/day can be diverted from the landfill in 2027 through recovery, intermediate treatment and recycling operation.

(5) Concept of Waste Minimization Plan

Waste minimization plan or 3R plan shall be carried out through waste generation control, waste discharge control and resource recovery at waste generation sources in accordance with the proposed programs presented hereinafter. The proposed programs include fulfillment of the roles and the responsibilities of the central government agencies, MOT, residents, enterprises and all other stakeholders through legislative measures, public campaign, raising awareness appealing to change the previous habit of the handling method of waste. In addition, the role of new organization named by ALB Resource Recovery and Recycling Enterprise will become a

key factor for establishing a sustainable recycling society or the sound resource recycling society in Albania. Following subsection summarizes the main activities comprising the waste minimization plan.

Table 5.8.4 Planned Recovery Ratio and Amount of Recyclable Materials

Calculated Recovery Ratio to Total Waste Amount (%)				
Item	2012	2017	2022	2027
Recovery of Paper	4.6%	8.1%	11.6%	13.9%
Recovery of Plastics	5.8%	7.8%	9.7%	11.6%
Recovery of Glass	1.4%	1.8%	2.2%	2.5%
Recovery of Metals	1.4%	1.6%	1.7%	1.7%
Total Recovery Ratio of Recyclable Materials	13.3%	19.2%	25.1%	29.8%
Planned Recovery Amount of Recyclable Materials (t/day)				
Item	2012	2017	2022	2027
Recovery of Paper	32	68	115	160
Recovery of Plastics	40	65	96	134
Recovery of Glass	10	15	21	29
Recovery of Metals	10	13	17	19
Total Recovery Amount of Recyclable Materials	91	160	249	342

Source: JICA Study Team

Table 5.8.5 Planned Recovery Ratio and Amount of Organic Waste

Calculated Back Planned Recovery Ratio to Organic Waste Component (%)				
Item	2012	2017	2022	2027
Organic Waste for Composting & Biogasification	0.0%	25.2%	41.9%	36.1%
Organic Waste for Waste to Energy	0.0%	0.0%	74.7%	64.4%
Total Recovery Ratio of Organic Waste	0.0%	25.2%	116.6%	100.5%
Calculated Recovery Ratio to Total Waste Amount (%)				
Item	2012	2017	2022	2027
Organic Waste for Composting & Biogasification	0.0%	12.3%	20.4%	17.6%
Organic Waste for Waste to Energy	0.0%	0.0%	36.4%	31.4%
Total Recovery Ratio of Organic Waste	0.0%	12.3%	56.8%	49.0%
Planned Recovery Amount of Organic Waste for Composting, Biogasification and Waste to Energy				
Intermediate Facilities	2012	2017	2022	2027
Pilot Composting	0	2	2	2
Central Composting Stage-1	0	50	50	50
Central Composting Stage-2	0	0	50	50
Biogasification Stage-1	0	50	50	50
Biogasification Stage-2	0	0	50	50
Waste to Energy Stage-1	0	0	360	360
Total Intermediate Treatment Amount	0	102	562	562

Source: JICA Study Team

Table 5.8.6 Planned Recovery Ratio and Amount of Recyclable Materials by Year

Planned Recovery Ratio to Each Component (%)																
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Recovery of Paper	20.0%	23.0%	26.0%	29.0%	32.0%	35.0%	38.0%	41.0%	44.0%	47.0%	50.0%	52.0%	54.0%	56.0%	58.0%	60.0%
Recovery of Plastics	30.0%	32.0%	34.0%	36.0%	38.0%	40.0%	42.0%	44.0%	46.0%	48.0%	50.0%	52.0%	54.0%	56.0%	58.0%	60.0%
Recovery of Glass	40.0%	42.0%	44.0%	46.0%	48.0%	50.0%	52.0%	54.0%	56.0%	58.0%	60.0%	62.0%	64.0%	66.0%	68.0%	70.0%
Recovery of Metals	60.0%	61.0%	62.0%	63.0%	64.0%	65.0%	66.0%	67.0%	68.0%	69.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
Calculated Recovery Ratio to Total Waste Amount (%)																
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Recovery of Paper	4.6%	5.3%	6.0%	6.7%	7.4%	8.1%	8.8%	9.5%	10.2%	10.9%	11.6%	12.1%	12.5%	13.0%	13.5%	13.9%
Recovery of Plastics	5.8%	6.2%	6.6%	7.0%	7.4%	7.8%	8.1%	8.5%	8.9%	9.3%	9.7%	10.1%	10.5%	10.9%	11.3%	11.6%
Recovery of Glass	1.4%	1.5%	1.6%	1.7%	1.7%	1.8%	1.9%	1.9%	2.0%	2.1%	2.2%	2.2%	2.3%	2.4%	2.4%	2.5%
Recovery of Metals	1.4%	1.5%	1.5%	1.5%	1.5%	1.6%	1.6%	1.6%	1.6%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Total Recovery Ratio of Recyclable Materials	13.3%	14.5%	15.7%	16.9%	18.1%	19.2%	20.4%	21.6%	22.8%	24.0%	25.1%	26.1%	27.0%	27.9%	28.8%	29.8%
Planned Recovery Amount of Recyclable Materials (t/dfay)																
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Recovery of Paper	32	38	45	52	59	68	76	85	94	104	115	123	132	141	150	160
Recovery of Plastics	40	44	49	54	59	65	70	76	83	89	96	103	110	118	125	134
Recovery of Glass	10	11	12	13	14	15	16	17	19	20	21	23	24	26	27	29
Recovery of Metals	10	10	11	12	12	13	14	14	15	16	17	17	18	18	19	19
Total Recovery Amount of Recyclable Materials	91	103	116	130	145	160	176	193	211	229	249	266	284	302	322	342

Source: JICA Study Team

Table 5.8.7 Planned Recovery Ratio and Amount of Organic Waste by Year

Calculated Back Planned Recovery Ratio to Organic Waste Component (%)																
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Organic Waste for Composting & Biogas	0.0%	0.0%	0.0%	0.5%	0.5%	25.2%	24.3%	23%	22.6%	21.9%	41.9%	40.7%	39.5%	38.3%	37.2%	36.1%
Organic Waste for Waste to Energy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	82.7%	79.9%	77.2%	74.7%	72.5%	70.3%	68.3%	66.3%	64.4%
Total Recovery & Recycling Organic Wa	0.0%	0.0%	0.0%	0.5%	0.5%	25.2%	24.3%	106%	103%	99.1%	117%	113%	110%	107%	103%	101%
Calculated Recovery Ratio to Total Waste Amount (%)																
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Organic Waste for Composting & Biogas	0.0%	0.0%	0.0%	0.3%	0.2%	12.3%	11.8%	11.4%	11.0%	10.7%	20.4%	19.8%	19.2%	18.7%	18.1%	17.6%
Organic Waste for Waste to Energy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.3%	38.9%	37.6%	36.4%	35.3%	34.3%	33.2%	32.3%	31.4%
Total Recovery Ratio of Organic Waste	0.0%	0.0%	0.0%	0.3%	0.2%	12.3%	11.8%	51.7%	49.9%	48.3%	56.8%	55.1%	53.5%	51.9%	50.4%	49.0%
Planned Recovery Amount of Organic Waste for Composting, Biogassification and Waste to Energy																
Intermediate Facilities	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Pilot Composting	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Central Composting Stage-1	0	0	0	0	0	50	50	50	50	50	50	50	50	50	50	50
Central Composting Stage-2	0	0	0	0	0	0	0	0	0	0	50	50	50	50	50	50
Biogasification Stage-1	0	0	0	0	0	50	50	50	50	50	50	50	50	50	50	50
Biogasification Stage-2	0	0	0	0	0	0	0	0	0	0	50	50	50	50	50	50
Waste to Energy Stage-1	0	0	0	0	0	0	0	360	360	360	360	360	360	360	360	360
Total Intermedeate Treatment Amount	0	0	2	2	2	102	102	462	462	462	562	562	562	562	562	562

Source: JICA Study Team

1) Generation Source Control

Waste generation control shall be focused on the flow of consumable goods from production, distribution, sale and consumption activities to restrict and reduce the waste generation potential in each process. The Generation Source Control consists of the following programs:

- Production Control,
- Distribution and Sale Control,

- Consumer Control,
- Waste Charge (Environmental Fee) Control, and
- Commercial Waste Control.

2) Waste Discharge Control

Waste discharge control consists of the programs to encourage self-disposal and/or composting at backyard, promotion of repair shop, exchange or sale of second hand goods to recover reusable materials at the waste generation sources to reduce the solid waste amount to be collected and disposed. The Waste Discharge Control is formulated for the programs of:

- Promotion of Self-disposal, and
- Promotion of "Mottainai Mind" to save whatever usable things.

3) Material Recovery and Recycling Control

Basic program for recovery of recyclable materials shall be conducted to segregate the recyclable materials at waste generation source and discharge it to the nearby waste bins of dry recyclable materials or the waste bins of wet recyclable materials, organic waste, to discharge by separate collection service. Waste generators may bring recyclable materials to the Town MRF, etc. in exchange for money or goods for an option to recover recyclable materials by the residents and small waste generators. The other option for recovery of recyclable materials from the large waste generators will be the establishment of the Resource Recovery and Recycling Enterprise under the legal framework aiming at forming a sound resource recovery society in Albania. Other programs for raising awareness of residents, establishments, waste pickers, dealers of recyclable materials, and recycling industries will be also the keys for success. Cooperation of the existing organization(s) such as ARA is important for recycling of recovered recyclable materials. Recycling of biodegradable waste through composting and bio-gasification will be an effective process to enrich fertility of arable land and waste to energy as well as reduction of waste disposal amount. The key for success will be the collaboration with the agriculture sector for securing the stable sales routes. Material recovery and recycling control consists of:

- Recovery of Resource Materials by Waste Generators and Stakeholders, and
- Recycling of Resource Materials.
-

5.8.2 Outline of Waste Minimization "3R" Plan

The master plan of waste minimization "3R" plan consists of the plans, projects and programs summarized in Table 5.8.8.

Table 5.8.8 Outline of Waste Minimization "3R"Plan

Plans, Actions and Projects			Description of Works
SWM-2 Waste Minimization Plan (3R Plan)			Formulation of 3R implementation plan and implement the programs and the projects to reduce waste generation amount, recovery of resource materials, reuse and recycle resource materials in municipal waste
	SWM-2-1	Formulation of Implementation Plan for 3R Activities	Formulate the implementation plan of 3R activities and implement the reduce, reuse and recycling activities through recovery of resource materials in waste toward establishment of SRRS in MOT and replicate this to other LGUs in the country based on the proposals of JICA Study.
	SWM-2-1-1	Formulation of Implementation Plan of Waste Reduction	Formulate the implementation plan for reducing waste generation amount through the programs of production control, consumer control, commercial and institutional control, etc., by means of public campaign, school education, workplace education, etc. in the pilot study area(s) and disseminate to the society.
	SWM-2-1-2	Formulation of Implementation Plan of Waste Recovery, Reuse and Recycling	Formulate the implementation plan for recovery of recyclable materials, reuse and recycling with involvement of the residents, community groups, recycling industries in the pilot study area(s) and disseminate to the society.
	SWM-2-2	Implementation of 3R Activities	Implement the programs and projects for realizing the 3R plan through participation of the stakeholders based on the time frame and the contents/target level to be set in the implementation plan
	SWM-2-2-1	Promotion of Waste Generation Source Control	Promote and Implement the programs for reducing waste generation amount in the pilot study areas and disseminate to the society
	SWM-2-2-2	Promotion of Waste Discharge Control	Promote and implement the programs for production control, consumer control, workplace control, etc. in the pilot study areas and disseminate to the society
	SWM-2-2-3	Promotion of Recovery of Recyclable Materials	Promote and implement the programs for recovery of recyclable materials at the waste generation sources and 3-bins system in the pilot study area(s) and disseminate to the society
	SWM-2-2-4	Promotion of Reuse and Recycling of Recyclable Materials	Promote and implement the programs for reuse, waste conversion, recycling of resource materials in the pilot study area(s) and disseminate to the society.
	SWM-2-2-5	Construction of Central Material Recovery Facilities at Sharra	Conduct the engineering design, tender, contract and construction work to develop the central material recovery facilities at Sharra by MOT or by PPP. The facilities shall be operated for secondary sorting and recovery of resource materials from the 3-bins system and transfer the residual waste to the final disposal site
	SWM-2-2-6	Operation of Central Material Recovery Facilities at Sharra	Operate and maintain the central material recovery facilities to be proposed at Sharra by PPP or by the MOT SWM enterprise.
	SWM-2-3	Monitoring for Implementation of 3R Activities	Implement regular monitoring and/or inspection for the activities of 3R and guide the groups participating to 3R activities
	SWM-2-4	Evaluation of Performance and Target Level of Waste Minimization Plan	Review and/or evaluate the pilot study and 3R activities to consider the achievement level and adjustment for the target level

Source: JICA Study Team

5.9 Intermediate Treatment Plan

5.9.1 Basic Conditions for Intermediate Treatment Plan

(1) Planned Intermediate Treatment Waste Amount

Intermediate treatment is planned for organic/combustible waste for transforming for recycling, reducing volume and stabilizing for final disposal. Intermediate treatment plan is formulated based on the target level of stage-wise waste minimization in consideration of the characteristic of waste composition. According to the waste minimization plan, transformation of organic/combustible waste is proposed for implementation by the following development schedule of the intermediate treatment facilities:

Intermediate Treatment Facilities		**Plant Capacity (t/day)**	**Operation start in**
Pilot Composting	:	2	2014
Central Composting-Stage-1	:	50	2017
Central Composting Stage-2	:	50	2022
Biogasification Stage-1	:	50	2017
Biogasification Stage-2	:	50	2022
Waste to Energy Stage-1	:	360	2019

Following the said time schedule, the waste amount of intermediate treatment amount is calculate back as shown in 5.9.1 and the details given in Table 5.9.2. Figure 5.9.1 also show the waste amount treated by respective intermediate treatment facility in each year. Intermediate treatment amount increases in four wastes. Firstly, bio-degradable waste of 2t/day is treated by the pilot compost plants in 2014. The second increase of intermediate treatment amount is also made by biodegradable waste of 50t/day compost plant and 50t/day bio-gasification plant in 2017. The third increase is made by the waste to energy plant of 360t/day to start operation in 2019. Finally, the second stage development of 50t/day each for the compost plant and bio-gasification plant will start operation in 2022. Then the total intermediate treatment waste amount will increase up to 570t/day in 2022. In addition, some more treatment of biodegradable waste is expected by home composing and community composting as a result of waste minimization plan.

Table 5.9.1 Planned Intermediate Treatment Waste Amount

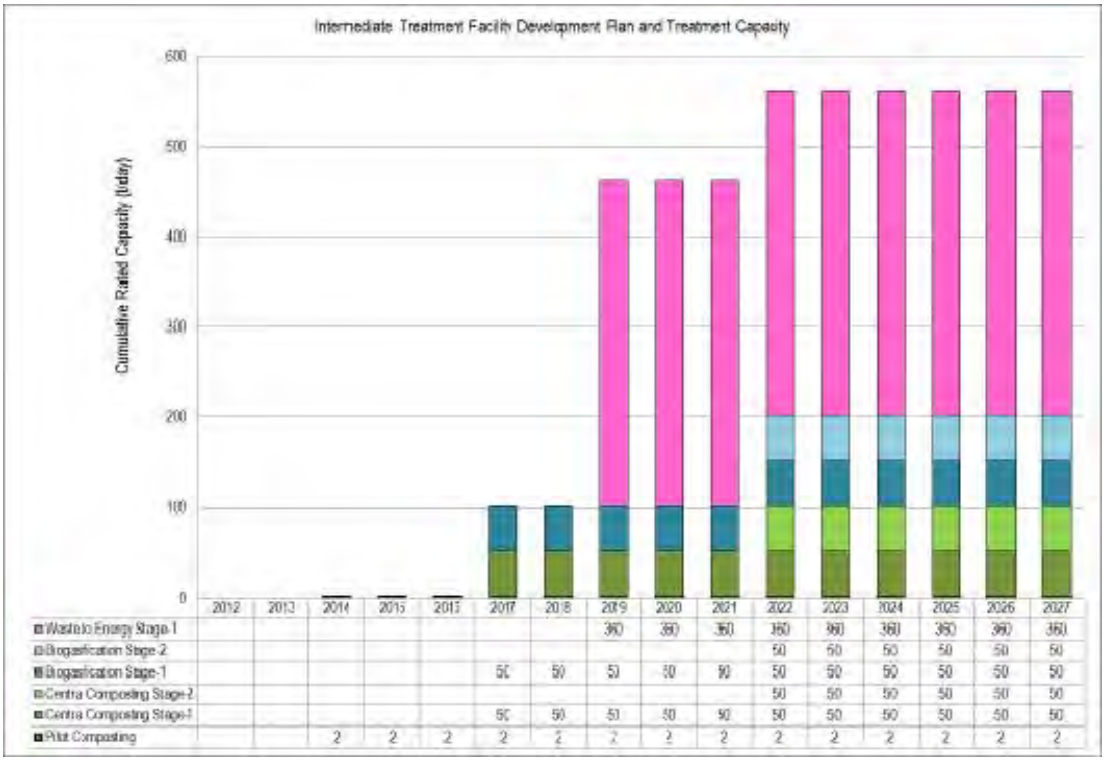
Item	2012	2017	2022	2027
Waste Reduction	0	42	99	115
Recovered Recyclable Waste	91	160	249	342
Remaining Waste for Intermediate Treatment	573	506	53	99
In-organic Waste & DHW	18	22	27	31
Total Intermediate Treatment Amount	0	102	562	562
Total Waste Amount (t/day)	683	832	990	1,148

Source: JICA Study Team

Table 5.9.2 Planned Intermediate Treatment Waste Amount by Year

Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Waste Reduction	0	7	15	23	32	42	52	63	74	86	99	102	105	108	112	115
Recovered Recyclable Waste	91	103	116	130	145	160	176	193	211	229	249	266	284	302	322	342
Remaining Waste for Intermediate Treatm	573	582	590	595	601	506	510	152	153	154	53	63	72	81	90	99
In-organic Waste & DHW	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31
Total Intermedeate Treatment Amount	0	0	2	2	2	102	102	462	462	462	562	562	562	562	562	562
Total Waste Amount (t/day)	683	712	741	771	801	832	863	894	925	957	990	1,020	1,051	1,083	1,115	1,148

Source: JICA Study Team



Source: JICA Study Team

Figure 5.9.1 Capacity of Intermediate Treatment Facilities by Year

(2) Waste Composition and Calorific Value of Domestic Waste

Planning of the intermediate treatment facilities largely depend on the characteristics of municipal wastes, especially the calorific value for waste to energy plant. As shown in Table 5.9.3 for the planned waste composition of domestic waste, the total combustible/organic waste is estimated at 91.3% and biodegradable waste including food waste and other organic waste is also determined at 48.7%, which are favorable ratios for considering intermediate treatment. Tale 5.9.4 show the moisture content test result for 60 samples from the incoming waste at Sharra conducted by the local consultant hired by JICA Study Team in September 2011. Average moisture content obtained is at 62.5%. By the relation between the moisture content and the waste composition shown in Table 5.9.3, the ratio of three contents of municipal waste, combustibles, inorganic waste and ashes, and moisture content, is obtained as shown in Table 5.9.5. Low calorific value of municipal waste is estimated by the following experimental equation:

Equation of Low Calorific Value (kcal/kg-waste): 45 x V - 6W

Where, V: Ratio of Combustibles in %

W: Moisture Content in %,

The low calorific value of municipal waste of Tirana is estimated at 1,166kcal/kg or 4,882kJoule/kg as shown in Table 2.7.5. The lower limit of calorific value for incineration is regarded to be 800Kcal/kg or 3,400kJoule/kg, the low calorific value of municipal waste in Tirana is higher than the lower limit of self-combustion level. From the estimated low calorific value, municipal waste in Tirana is acceptable level for considering incineration treatment. This low calorific vale varies depending on the recovery amount of recyclable such as paper, plastics and biodegradable waste. Municipal waste in Tirana is acceptable for considering incineration treatment. Less mixing amount of washy waste representing food waste in combustible waste will increase the low calorific value or more mixing amount of plastics and paper will also increase the low calorific value. Accordingly, introduction of waste to energy system is prospective under the challenging implementation of 3R plans and separate waste collection in Tirana.

Table 5.9.3 Planned Waste Composition for Tirana Municipality ISWM Plan

Waste Categories	Domestic Waste
Food Waste	40.00%
Paper (Recyclable: Clean Paper)	11.00%
Paper (Non-recyclable dirty paper)	12.20%
Plastics(Recyclable clean plastics)	9.20%
Plastics (Non-recyclable dirty plastics)	10.20%
Other organic waste	8.70%
Organic/Combustible Waste Total	91.30%
Glass	3.60%
Metals	2.40%
Other inorganic waste	2.20%
Domestic hazardous waste	0.50%
Inorganic/ Incombustible Waste Total	8.70%
Total	100.00%

Source: JICA Study Team

Table 5.9.4 Moisture Content of Incoming Waste (2011)

Collection Area	Minimum (%)	Mean (%)	Maximum (%)
East-1	53.2	64.8	72.2
East-2	55.6	62.9	67.7
East-3	50.3	61.5	71.2
West-1	57.2	62.1	68.9
West-2	55.2	61.3	69.1
West-3	50.8	62.4	68.8
Average	50.3	62.5	72.2

Source: JICA Study Team

Table 5.9.5 Ratio of Three Contents and Estimated Low Calorific Value (2011)

Moisture Content	62.5%
Combustible Waste	34.2%
Inorganic Waste & Ash	3.3%
Calorific Value (Kcal/kg)	1,166
Calorific Value (KJoule/kg)	4,882

Source: JICA Study Team

(3) Good Practices of Composting Projects in the Word

The following subsections introduce the good practices of composting activities for home composting, community composting and central composting summarized from the Final Report of Preparatory Survey for ISWM in Nairobi in the Republic of Kenya, October 2010, JICA. These examples are effective methods for composting and it shall be studied further for the possibility for application in MOT in consideration of the local conditions.

1) Home Composting in Indonesia

In Surabaya, Indonesia, home composting is carried out by the breathing type container, such as the plastic basket lined with geo-textile, to store raw wastes discharged from kitchens, etc., together with seeding material for composting. One of the seeding materials called “composting kit” made from Lacto-base bacteria solution composed of fermented soy beans, yoghurt, yeast, etc., which are effective for fermentation, decompose organic wastes into compost without rotting and reduce offensive odor generated under the anaerobic conditions. After a couple of months, the input waste is discharged from the container and buried in the ground or piled up for final maturation. The matured organic waste, compost, is used by residents for their gardens or parks in the region.

The NGO, PUSDAKOTA, established by the Surabaya University is planning to collect home-made compost in exchange for money. The NGO also plans to guide the people, depending on the compost quality, on how to input organic waste, maintain the compost container, etc., for the purpose of improving the compost quality. The price of compost brought by the residents depends on the compost quality and this pricing system gives incentive to the people for producing a better quality compost at home. This method will be studied for the possibility of its introduction in the area especially in the high income group houses with gardens wide enough for home composting.

2) Community Composting in Indonesia

PUSDAKOTA, as the counterpart of Kitakyushu International Techno-Cooperative Association in Japan (KITA), has been implementing the community level composting since 2006 in relation with the activities of the waste bank system. The community level composting called “Susun Method” also uses the breathing type plastic basket. Raw organic waste together with native microorganisms are put into the plastic basket lined with geo-textile and then pile up the plastic baskets to appropriate heights and widths for easy manual handling the containers. Pre-fermented compost is taken out from the plastic basket, then shredded and piled up to 1-1.5m compost pile for maturation. Tuning of the compost pile, measurement of temperature and adjustment of moisture is carried out every two days

depending on the conditions. Control of composting processes by the efforts of the staff of the community group results in a better quality of compost produced and the system to return the profit derived from the recyclable waste is being established.

3) Central Composting in Bangladesh

Waste Concerns, the registered NGO, constructed a middle-scale compost plant with the capacity of 130t per day and, upon approval from DCC, started operations beginning of 2009 to produce compost from biodegradable wastes collected from markets. This plant was approved by the Government of Bangladesh and by the CDM Executive Board of the UN for the CDM Project. This example is a good case to develop the central compost project through linkage with the activities of the private sector regardless of the financial weakness of the local government. Composting by the central method could be started firstly with composting of organic wastes from public markets and the second step could make use of kitchen waste or food waste from the households, restaurants and hotels through establishment of waste segregation and separate collection systems.

(4) Operation Status of Waste to Energy Plants in Japan

Table 5.9.6 shows the total number of 1,126 incineration plants operated in Japan in the fiscal year 2009. Specific features of incineration plants operated in Japan are summarized as follows:

- 299 plants with power generation are in operation with the maximum plant capacity at 1,800t/day and the average plant capacity at 366t/day;
- 827 plants without power generation are in operation with the maximum capacity at 900t/day and the average plant capacity at 85t/day;
- Maximum power generation efficiency is 44% and the average efficiency was 11%;
- Among 299 incineration plants with power generators, the maximum generated electricity is 0.98MWh and the average was 0.28MWh per ton-waste;
- Installed average generator capacity is 15kW per ton incinerator capacity; and
- Average generated electricity is 63MWh per ton incinerator capacity.

Table 5.9.7 indicates the average value of three contents, i.e., water content, combustibles and inert/ashes and calorific value of waste for the 1,075 incineration plant with/without power generation. The average moisture content, combustibles and inert/ashes of incineration plant with power generation is 46%, ,45% and 9%, respectively and the average values for the plants without power generation are a little high in moisture content, less in combustibles and high in inert/ashes, which reflect clearly the distinctive feature of the plants with and without power generation. With regard to the average calorific value computed from the three contents indicates more than 8,200kJ/kg-waste for the incineration plants with power generation although the incineration plants without power generation indicate approximately at 7,200kJ/kg-waste.

Table 5.9.6 State of Incineration Plants Operated in Japan in 2009 Fiscal Year

Item	Unit	Waste to Energy Plant (Incinerator with Power Generation)	Incinerator without Power Generation
Number of Plant	(plant)	299	827
Incineration Plant Capacity-Total	(t/day)	109,513	70,477
Incineration Plant Capacity-Max	(t/day)	1,800	900
Incineration Plant Capacity-Mean	(t/day)	366	85
Incineration Plant Capacity-Min	(t/day)	25	0.25
Treated (Combusted) Waste Amount	(t/year)	22,719,093	12,804,091
Generator Capacity-Total	(kW)	1,625,268	
Generator Capacity-Max	(kW)	50,000	
Generator Capacity-Mean	(kW)	5,436	
Generator Capacity-Min	(kW)	100	
Generated Electricity-Total	(MWh)	6,909,286	
Generated Electricity-Max	(MWh)	139,004	
Generated Electricity-Mean	(MWh)	23,264	
Generated Electricity-Min	(MWh)	62	
Power Generation Efficiency-Max	(%)	44	
Power Generation Efficiency-Mean	(%)	11	
Power Generation Efficiency-Min	(%)	2	
Generated Electricity per Treated Waste Amount-Max	(MWh/t)	0.98	
Generated Electricity per Treated Waste Amount-Mean	(MWh/t)	0.28	
Generated Electricity per Treated Waste Amount-Min	(MWh/t)	0.02	
Average Generator Capacity per Incinerator Capacity	(kW/t)	15	
Average Generated Electricity per Incinerator Capacity	(MWh/year/t)	63	

Source: Analysis by JICA Study Team based on www.env.go.jp/recycle/waste_tech/ippan/h19/index.html

Table 5.9.7 Municipal Waste Calorific Value of Incineration Plants in Japan 2009 Fiscal Year

Items	Incineration with Power Generation			Incinceration without Power Generation		
No. of Samples		296			779	
Three Component	Moisture Content (%)	Combustibles (%)	Inerts & Ashes (%)	Moisture Content (%)	Combustibles (%)	Inerts & Ashes (%)
Mean Value	45.5	45.1	9.3	48.9	41.3	9.8
Low Calorific Value	Computed	Measured Actually	-	Computed	Measured Actually	-
Mean Value	8,164	9,107	-	7,204	7,999	-

Source: Analysis by JICA Study Team based on www.env.go.jp/recycle/waste_tech/ippan/h19/index.html

(5) Potential Demand of Compost

Compost is applied for soil conditioning effects contributed by the increase of humus in the soil. Effects of humus in the compost are well known to improve characteristics of soil making it easier to till, increasing moisture holding capacity, reducing the application amount of chemical fertilizer, increasing healthy biological activities in soil, etc., and increasing productivity of crops. Fluctuation of compost demand and storage, marketing system, attitudes of farmers for use of compost, etc., are the key elements to consider in constructing a compost plant. However, the most important factor in estimating the potential demand for compost is the cultivation area. With regard to this factor, the statistical data of agricultural area in 2009 and potential compost demand is presented in Table 5.9.8. From the total agriculture area in the table and assumption of application rate of compost at 20t per hectare per year in average, the total potential demand of compost organic fertilizer in the agriculture area of the Tirana Prefecture is estimated at approximately 1.1 million tons per year or equivalent to 3,100t per day in terms of the amount of

final compost products. Furthermore, the total potential demand for compost for the country reaches at 14 million tons per year or 38,000t per day. The estimated compost demand does not include the consumption amount at parks, nurseries and reforestation. So, the potential compost demand will be large enough for production of good quality compost form biodegradable waste. However, collaboration with the agricultural sector is required for establishing the market and distribution of compost as well as awareness of farmers for the benefits to use compost in cultivation.

Table 5.9.8 Agriculture Area and Estimated Compost Demand in Albania

Qark/Prefecture	Total Land (ha)	Agriculture Land (ha)	Forest, Pasture & Other Land (ha)	Assumed Compost Application Rate (t/ha)	Potential Compost Demand (t/year)
Berat	179,793	52,995	126,798	20	1,059,900
Diber	248,503	41,059	207,444	20	821,180
Durres	76,442	40,593	35,849	20	811,860
Elbasan	329,994	72,875	257,119	20	1,457,500
Fier	189,069	121,910	67,159	20	2,438,200
Gjirokaster	288,426	45,110	243,316	20	902,200
Korce	371,032	90,920	280,112	20	1,818,400
Kukes	237,348	25,292	212,056	20	505,840
Lezhe	161,910	34,783	127,127	20	695,660
Shkoder	356,199	50,640	305,559	20	1,012,800
Tirana	165,463	56,609	108,854	20	1,132,180
Vlore	270,621	62,984	207,637	20	1,259,680
Albania Total	2,874,800	695,770	2,179,270	-	13,915,400

Source: Estimation analysis by JICA Study Team based on information from Directorate of Management of Land and Waters, MOEFWA

(6) Intermediate Treatment Options

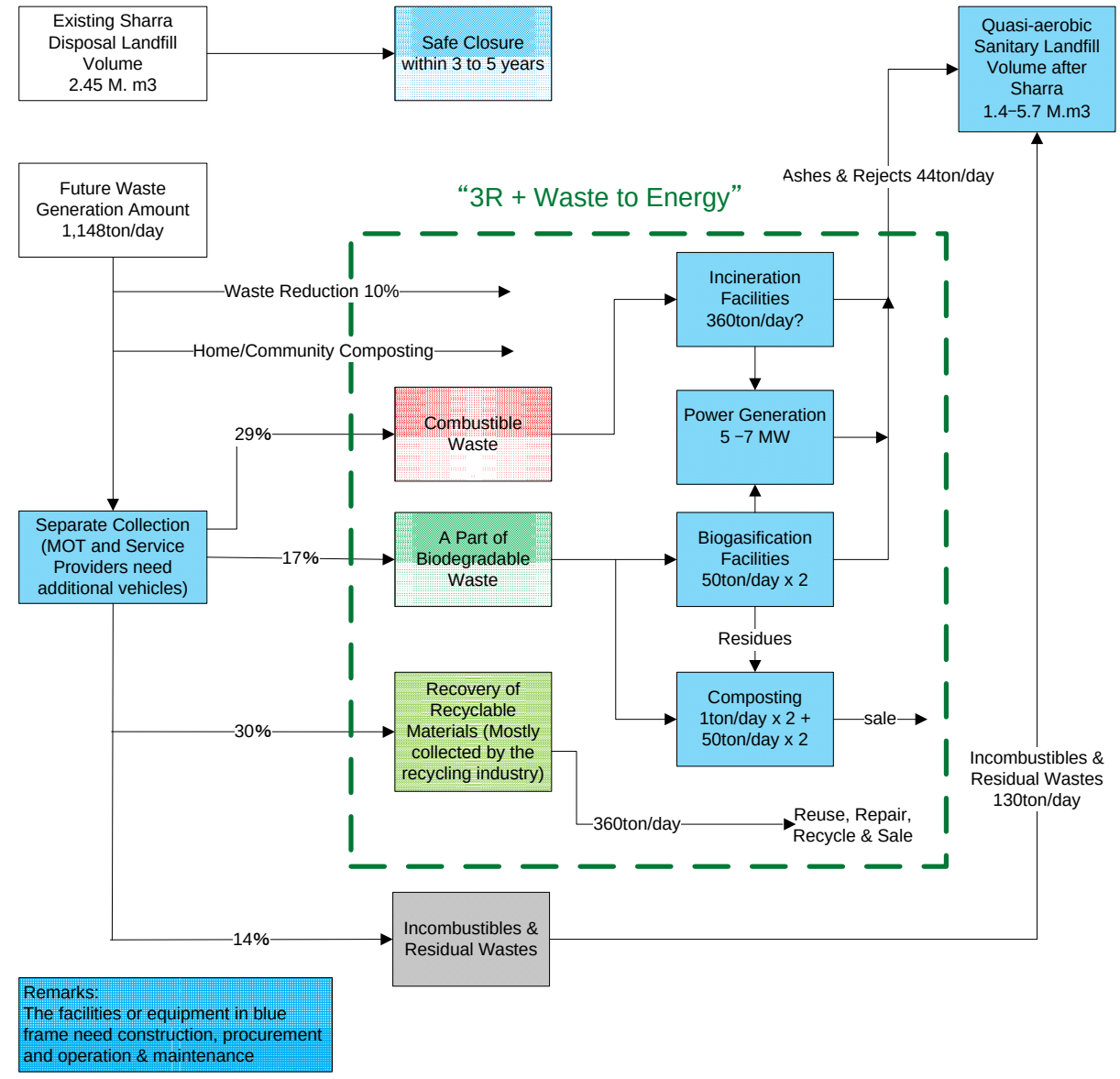
There are plenty of options for the intermediate treatment of municipal waste. Amongst the many options, the methods of intermediate treatment for the Tirana Municipality ISWM Plan have selected the options taking into consideration the characteristic of municipal waste and the strategies to comply with the recycling target of Albania. The selected options are: i) incinerator, ii) waste to energy, iii) bio-gasification with power generation, and iv) composting, which are tabulated in Table 2.7.9 for comparison. The most important key factor for selection is the total cost performance to treat wastes efficiently meeting with the waste characteristic. However the given condition of the characteristic of current mixed waste will change through the activities of recovery of recyclable materials and separate collection separate collection, which are proposed for the major ISWM activities from now on. Accordingly, the four options need not be studied searching for the best option for all the waste. Rather, selection of the option to most fit with the segregated waste may be considered. Wet waste or food waste is not suitable for combustion but this type of waste is a good material for composting and/or bio-gasification. The waste combustion efficiency becomes well by reducing the mixing ratio of wet waste from the combustible waste and the plant capacity also can be reduced. With regard to biodegradable waste, the washy food waste need mixing with the dry material for the composting process but

the bio-gasification process do not require mixing of dry material for the methanization process. Implementing these three options together supplements the weak point of the respective treatment process. Selecting a single option is not an effective overall intermediate process to cope with the different types of waste characteristics. A total system solution is necessary. Accordingly, the three options, Option-IT2 (waste to energy), Option-IT3 (bio-gasification with power generation) and Option-IT4 (composting) are recommendable for the intermediate treatment facilities for MOT. The proposed intermediate treatment options are illustrated with other activities composing the overall SWM system as shown in Figure 5.9.2. The options of each treatment process shall be studied further in the course of implementing the project.

Table 5.9.9 Intermediate Treatment Options

Evaluation Items	Option-IT1: Incineration	Option-IT2: Waste to Energy	Option-IT3: Bio-gasification with Power Generation	Option-IT4: Composting
Objective Waste	Combustible waste	Combustible waste	Biodegradable Waste	Biodegradable waste
Technical Reliability	Reliable	Reliable but complex in operation	Biological digestion become low in winter season	Biological digestion become low in winter season
Investment Cost	Less expensive	Expensive	Less expensive	Cheap if the system is less mechanized
O&M Cost	Less expensive	Expensive	Cheap	Cheap if the system is less mechanized
By-products/Recovery	Heat	Electricity	Fuel and/or electricity	Compost
Environmental Aspect	Need removal of air pollutants from combustion gasses	Need removal of air pollutants from combustion gasses	Need wastewater treatment and generation of offensive odour	Generation of odour
Applicability	Small to large scale plant	Middle to large scale plant	Small to middle scale plant	Small to middle scale plant
Benefits	Hot water supply	Electricity for consumption in the plant and/or sale	Electricity for consumption in the plant and/or sale	Sale of compost
Recommendations	Future, wait for increase of calorific value of waste	Future, wait for increase of calorific value of waste and development/investment partner	Future, wait for the O&M information of large scale plants.	Implement home and community scale composting. Implement the pilot central compost plant for studying future development of practical scale central compost plant

Source: JICA Study Team



Source: JICA Study Team

Figure 5.9.2 Proposed Intermediate Treatment Options for 2027

5.9.2 Outline of Intermediate Treatment Plan

The master plan of intermediate treatment plan consists of the plans, projects and programs summarized in Table 5.9.10.

Table 5.9.10 Outline of Intermediate Treatment Plan

Plans, Actions and Projects			Description of Works
SWM-3 Intermediate Treatment Plan			Formulate the intermediate treatment plan and implement the plans and projects for stabilization of organic/combustible, reduction of waste volume and recovery of energy/resources before final disposal.
	SWM-3-1	Formulation of Implementation Plan for Intermediate Treatment Plan	To conduct feasibility study and formulate the implementation plan for intermediate treatment for organic/combustible wastes to convert waste to compost, biogas, and generate electricity to save operation cost of SWM facilities and reduction of waste volume and stabilization of residual waste based on the proposal of JICA Study.
	SWM-3-1-1	Formulation of Implementation Plan for Organic Waste Treatment	To conduct feasibility study and formulate the implementation plan for organic waste to convert organic waste into biogas and compost including the plans for home, community, pilot scale & central compost plant in addition to the cost estimate, financial & economic analysis, financial source(s), time frame, monitoring, etc.
	SWM-3-1-2	Formulation of Implementation Plan for Waste to Energy	To conduct feasibility study and formulate the implementation plan of combustible waste for incineration and power generation in relation with the implementation plan of Compost and/or Biogasification plan in addition to the cost estimate, financial & economic analysis, financial source(s), implementation time schedule, monitoring, etc.
	SWM-3-2	Implementation of Organic Waste Treatment Plan	Construct, operate and maintain the Compost and/or Biogasification plant by PPP or by MOTbased on the time frame and the contents set in the implementation plan.
	SWM-3-2-1	Organizing Home Composting and Community Composting Groups	Organize the composting groups for home composting and community composting and guide them the composting procedures.
	SWM-3-2-2	Implementation of Pilot Project of Home and Community Composting	Implement home composting and community composting in the pilot study area(s).
	SWM-3-2-3	Expansion of Home Composting and Community Composting	Expand the activity area of home composting and community composting to the entire area of MOT.
	SWM-3-2-4	Selection of Large Waste Generation Source of Biodegradable Waste	Select large scale waste generation places to ask for cooperation to sort and recover organic/biodegradable wastes for raw material of composting and biogasification purposes
	SWM-3-2-5	Construction of Pilot Scale Compost and/or Biogasification Plant	To conduct engineering design, tender, construction work contract and construct pilot scale compost and/or biogasification plant of 1t/day each by MOT.
	SWM-3-2-6	Operation and Maintenance of Pilot Scale Compost and/or Biogasification Plant	Operate, maintain and study the composting and/or biogasification processes for future expansion of the appropriate processes for MOT.
	SWM-3-2-7	Construction of Central Composting and Biogasification Plant	To conduct engineering design, tender, construction work contract and construct the large scale central compost and/or biogasification plant of 50t/day each (2 plants) by PPP or by MOT based on the results of pilot study.
	SWM-3-2-8	Operation and Maintenance of Central Compost and/or Biogasification Plant	Operate and maintain the central compost and/or biogasification plant by PPP or by MOT.
	SWM-3-3	Evaluation of Performance and Target Level of Organic Waste Treatment Plan	Review and/or evaluate the performance of the plant to consider the achievement for improvement of the plant and operation.
	SWM-3-4	Implementation of Waste to Energy Plan	Construct, operate and maintain the waste to energy plant by PPP or by MOTbased on the time frame and the contents set in the implementation plan.
	SWM-3-4-1	Selection of Construction Site and Procurement	To conduct siting survey/study for more than two alternative sites and procure the construction site.
	SWM-3-4-2	Construction of Waste to Energy Plant	To conduct engineering design, tender, construction work contract and construct the waste incineration and power generation plant by PPP or by MOT.
	SWM-3-4-3	Operation and Maintenance of Waste to Energy Plant	Operate and maintain the waste incineration and power generation plant by PPP or by MOT.
	SWM-3-5	Evaluation of Performance and Target Level of Waste to Energy Plan	Review and/or evaluate the performance of the waste energy plant to consider the achievement for improvement of the plant and operation.

Source: JICA Study Team

5.10 Final Disposal and Facility Development Plan

5.10.1 Basic Conditions for Waste Disposal Plan

(1) Waste Disposal Amount

Final waste disposal amount changes depending on the extent of the activities of waste minimization and intermediate treatment plans. Final waste disposal amounts with and without those plans are estimated in Table 5.10.1 and summarized in Table 5.10.2. The disposal amount is basically counted by all the waste amount minus estimated waste generation reduction amount and recovery amount for recycling. In case of with project, inert/ashes from waste to energy plants shall be added in addition to the unsuitable biodegradable wastes to be rejected from the composting and biodegradable processes. The results of the calculation in the table show that final waste disposal amount without project varies from 591t/day in 2012 to 993t/day in 2027. Meanwhile, the final disposal amount with project reduces the quantity from 591t/day to 174t/day by the effects of waste minimization and intermediate treatment plans.

Table 5.10.1 Planned Waste Disposal Amount

Waste Disposal Amount without Project				(t/day)
Item	2012	2017	2022	2027
In-organic Waste &Domestic Hazardous Waste	18	22	27	31
Waste Reduction Amount	0	0	0	0
Recovery of Recyclable Materials by Private Sector	92	112	133	155
Potential Recyclable Resources & Residual Waste	573	698	830	962
Waste Disposal Amount	591	720	857	993
Total Potential Waste Amount	683	832	990	1,148
Waste Disposal Ration to the Total Waste Amount (%)	87%	87%	87%	87%
Waste Disposal Amount with Project				(t/day)
Item	2012	2017	2022	2027
In-organic Waste & Domestic Hazardous Waste	18	22	27	31
Waste Reduction	0	42	99	115
Recyclable Materials & Waste to Energy	92	212	811	904
Residual Potential Recyclable Waste	573	556	53	99
Rejects from Composting & Biogasification Plant	0	20	40	40
Ash from Waste to Energy Plant	0	0	4	4
Total Waste Disposal Amount including Ash & Rejects	592	599	124	174
Total Waste Amount	683	832	990	1,148
Waste Disposal Ration to the Total Waste Amount (%)	87%	72%	13%	15%

Source: JICA Study Team

Table 5.10.2 Planned Waste Disposal Amount by Year

Waste Disposal Amount without Project																	(t/day)
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
In-organic Waste & Hazardous Waste	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31
Waste Reduction Amount	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recovery of Recyclable Materials by Private Sector	92	96	100	104	108	112	116	120	125	129	133	137	141	146	150	155
Potential Recyclable Resources & Residual Waste	573	597	621	646	672	698	724	750	776	802	830	855	881	908	935	962
Waste Disposal Amount	591	616	641	667	693	720	747	774	800	828	857	883	910	937	965	993
Total Potential Waste Amount	683	712	741	771	801	832	863	894	925	957	990	1,020	1,051	1,083	1,115	1,148
Waste Disposal Ration to the Total Waste Amount (%)	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%
Waste Disposal Amount with Project																(t/day)
Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
In-organic Waste & Hazardous Waste	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31
Waste Reduction	0	7	15	23	32	42	52	63	74	86	99	102	105	108	112	115
Recyclable Materials & Waste to Energy	92	103	118	132	147	212	278	655	673	691	811	828	846	864	884	904
Residual Potential Recyclable Waste	573	582	588	595	601	556	510	152	153	154	53	63	72	81	90	99
Rejects from Composting & Biogasification Plant	0	0	0	0.4	0.4	20.4	20.4	20.4	20.4	20.4	40.4	40.4	40.4	40.4	40.4	40.4
Ash from Waste to Energy Plant	0	0	0	0	0	0	0	0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Total Waste Disposal Amount including Ash & Rejects	592	601	608	616	623	599	553	197	202	204	124	134	144	154	164	174
Total Waste Amount	683	712	743	771	801	832	863	894	925	957	990	1,020	1,051	1,083	1,115	1,148
Waste Disposal Ration to the Total Waste Amount (%)	87%	84%	82%	80%	78%	72%	64%	22%	22%	21%	13%	13%	14%	14%	15%	15%

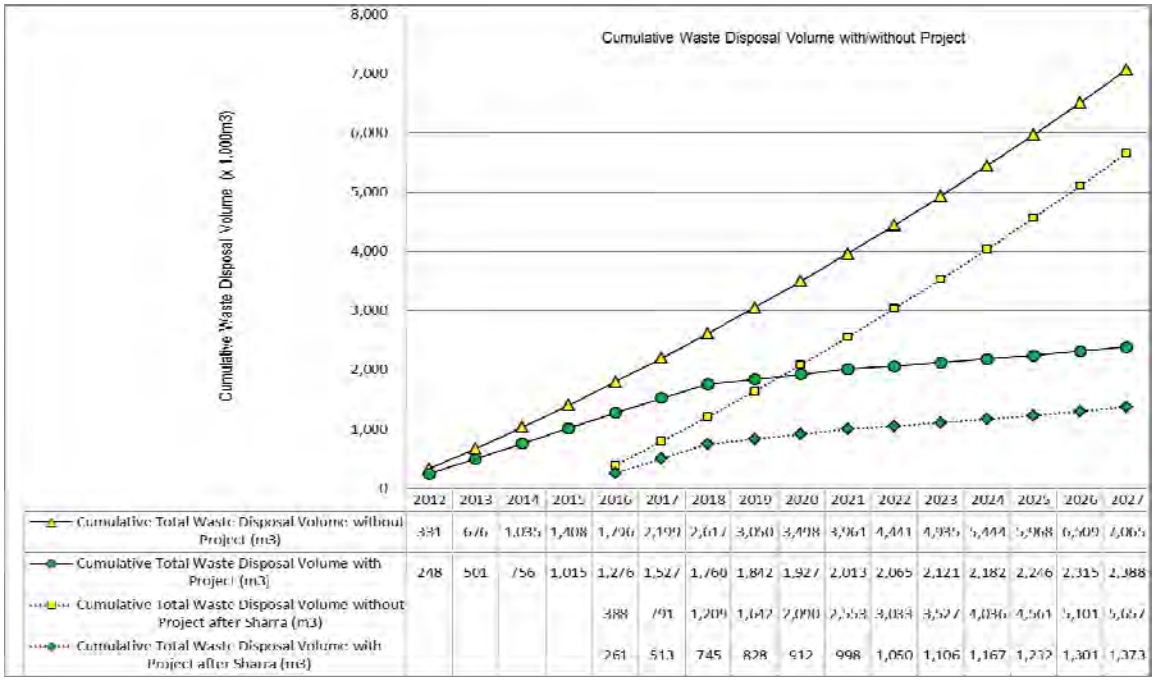
Source: JICA Study Team

The final waste disposal amount was converted to waste volume and annual cumulated waste volume to estimate the required landfill volume. In conversion of the waste amount to the waste volume, bulk density of filled waste is assumed at 0.75t/m^3. In addition, the volume of covering earth is added in 15% to the filled waste volume. The results of calculation show that the total landfill volume reaches at 2.4 million m^3 and 7.0 million m^3 for with and without projects in the period from 2011 to 2026. The existing Sharra disposal site is assumed full in 2015 and a new landfill site is required from 2015. The landfill volume after Sharra disposal site is estimated at 1.4 million m^3 and 5.7 million m^3 for with and without projects in the period of 2016-2027. The difference of the required landfill volume between with and without projects is estimated to be four times approximately. This means that the life of the landfill site with projects will be prolonged by four times.

Table 5.10.3 Planned Cumulative Waste Disposal Volume by Year

Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Annual Waste Disposal Amount without Project (t)	216	225	234	244	253	263	273	282	292	302	313	322	332	342	352	363
Cumulative Waste Disposal Amount without Project (t)	216	441	675	918	1,171	1,434	1,707	1,989	2,281	2,584	2,896	3,218	3,550	3,892	4,245	4,607
Cumulative Waste Disposal Volume without Project (m3)	288	588	900	1,224	1,562	1,912	2,276	2,652	3,042	3,445	3,862	4,291	4,734	5,190	5,660	6,143
Cumulative Cover Soil Volume without Project (m3)	43	88	135	184	234	287	341	398	456	517	579	644	710	778	849	921
Cumulative Total Waste Disposal Volume without Project (m3)	331	676	1,035	1,408	1,796	2,199	2,617	3,050	3,498	3,961	4,441	4,935	5,444	5,968	6,509	7,065
Cumulative Total Waste Disposal Volume without Project after Sharra (m3)					388	791	1,209	1,642	2,090	2,553	3,033	3,527	4,036	4,561	5,101	5,657
Annual Waste Disposal Amount with Project (t)	216	220	222	225	227	219	202	72	74	74	45	49	53	56	60	63
Cumulative Waste Disposal Amount with Project (t)	216	436	657	882	1,110	1,328	1,530	1,602	1,676	1,750	1,795	1,844	1,897	1,953	2,013	2,077
Cumulative Waste Disposal Volume with Project (m3)	216	436	657	882	1,110	1,328	1,530	1,602	1,676	1,750	1,795	1,844	1,897	1,953	2,013	2,077
Cumulative Cover Soil Volume with Project (m3)	32	65	99	132	166	199	230	240	251	263	269	277	285	293	302	311
Cumulative Total Waste Disposal Volume with Project (m3)	248	501	756	1,015	1,276	1,527	1,760	1,842	1,927	2,013	2,065	2,121	2,182	2,246	2,315	2,388
Cumulative Total Waste Disposal Volume with Project after Sharra (m3)					261	513	745	828	912	998	1,050	1,106	1,167	1,232	1,301	1,373

Source: JICA Study Team



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Cumulative Total Waste Disposal Volume without Project (m3)	331	676	1,035	1,408	1,796	2,199	2,617	3,050	3,498	3,961	4,441	4,935	5,444	5,968	6,509	7,065
Cumulative Total Waste Disposal Volume with Project (m3)	248	501	756	1,015	1,276	1,527	1,760	1,842	1,927	2,013	2,065	2,121	2,182	2,246	2,315	2,388
Cumulative Total Waste Disposal Volume without Project after Sharra (m3)					488	791	1,209	1,642	2,090	2,553	3,033	3,527	4,036	4,561	5,101	5,657
Cumulative Total Waste Disposal Volume with Project after Sharra (m3)					261	513	745	828	912	998	1,050	1,106	1,167	1,232	1,301	1,373

Source: JICA Study Team

Figure 5.10.1 Planned Cumulative Waste Disposal Volume by Year

(2) Landfill Design and Operation

In the overall context of SWM, the landfill is the final disposal point. Although there are various issues concerning selection of the site, selection of the type of landfill is not a problem since there are provisions for the types of landfill under the Law on Integrated Waste Management. Under the law, the types of landfills are categorized into three types: a) landfill for hazardous waste, b) landfill for non-hazardous waste, and c) landfill for inert waste. According to the law, only waste subjected to treatment can be landfilled and the landfill type for non-hazardous waste can only be used for municipal waste. The law also prescribes the wastes that cannot be accepted for landfill are liquid waste, explosives, chemicals, tires, automobile batteries, etc.

In view of the requirements of the law, the types of waste to be disposed of and the requirement for modernization of disposal facilities for the Tirana Municipality ISWWM Plan, the type of disposal facilities that shall be developed is the so called sanitary landfill with the associated facilities for functional operation and maintenance of the disposal facilities. There are several levels of sanitary landfill in terms of the structural design and the methods of operations. The quasi-aerobic type of sanitary landfill, which has been developed in Japan more than 30 years ago, will be the appropriate environment-friendly type to accelerate decomposition of organic matter in waste and reduce generation of methane gas.

Waste picking has functioned as a key to resource recovery at the existing disposal site. It can be recognized as an integral part of SWM system in the developing countries to offer significant economic benefit for the waste pickers and environmental benefits through the recovery of recycling materials. However, waste picking shall be banned at the new disposal site. Daily picking of recyclable materials provides the waste pickers with decent livelihood so the waste pickers may be considered as a potential work force for a more efficient materials recovery in the resource recovery program to be implemented under the Tirana Municipality ISWM Plan. It

is, therefore imperative for MOT to implement special programs for the waste pickers that would make them indispensable partners in SWM activities especially in the pursuit of waste segregation, waste recovery, composting of biodegradable waste, etc.

(3) Regional Landfill Plan

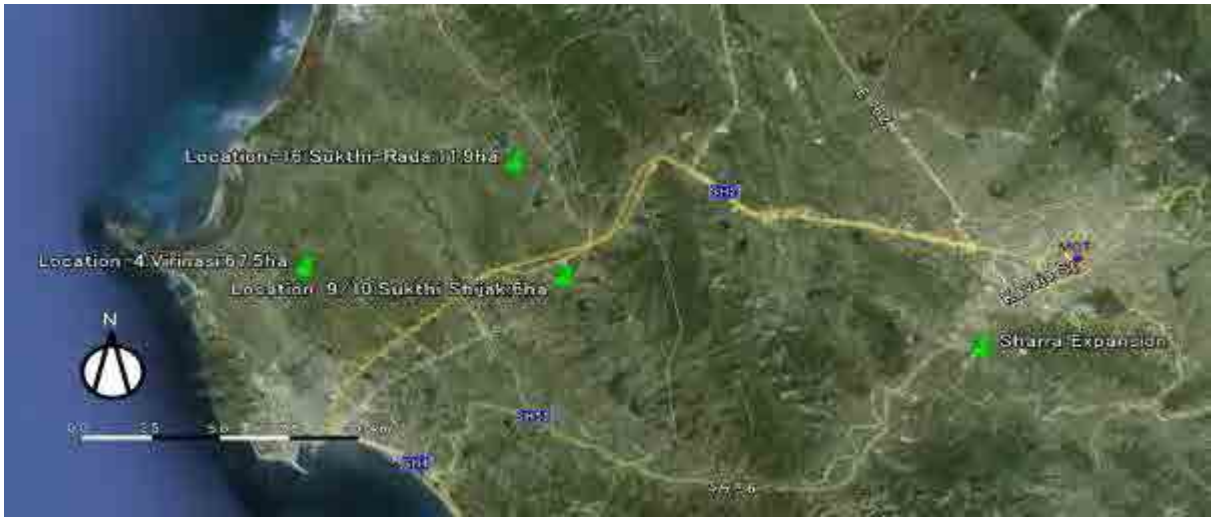
Siting Study for Solid Waste Disposal (Sanitary Landfill) in Durres, Albania (IFC)

In 2011, IFC has financed the siting study for Solid Waste Disposal (Sanitary Landfill) in Durres, aiming to evaluate and then propose the most suitable location for a new sanitary landfill, for the Durres region. The evaluation process started with 18 sites and after further application of various technical, geological, socio-political and other criteria, the number of the sites was reduced to three candidate sites. All the three "candidate sites" contain reasonable possibilities for a future landfill with advantages and disadvantages. Table 5.10.4 shown below gives the basic information for each of the candidate sites.

Table 5.10.4 Basic Information of the Candidate Waste Disposal Sites

Items	Site 16	Site 9+10	Site 4
Location	Sukthi-Rada	Sukthi-Shijak	Vrinasi
Distance from MoD	10.8km northeast	8.1km east	4.5km northeast
Site Area	11.9ha	6.5ha + 6.1ha	67.5ha
Elevation	9 – 19 MSWL	32 – 37 MSWL	Sea level/slightly below
Slope Grade	Approx. 2%	Approx. 2%	Approx. 2%
Site Condition	Good, well arranged, a little rugged to flat.	Good, well arranged, a little rugged to flat.	Average, well arranged, flat valley
Land Owner	Private owners, as the land is actually used for agriculture purposes.	Private owners, as the land is actually used for agriculture purposes.	Private owners, as the land is actually used for agriculture and livestock purposes.
Observations	The site is formed by a wide valley with practically level bottom, gradually rises westwards and eastwards to the slopes of gentle hills. The site is accessible along a tertiary road (field path), or along the road across the dam of Rubjekas water reservoir.	The sites are formed on a flat terrain, gradually rising to the slope of a gentle hill at the southern edge. They are accessible along the road from Maminas commune as well as from Shijak municipality, lying close to the road.	The site lies east of an industrial area. Terrain is flat and access close to the vicinity of the site is along the existing road. No road leads directly to the site.
Preliminary Evaluation	The site is approached from both directions along poor field paths. It will be necessary to build a paved access road several km long. The topography of the site is favorable for landfill construction and it has a short distance from the largest source of waste, the City of Durres. The main disadvantage is the difficult approach to the site, necessity to build an access road. The capacity is sufficient for regional landfill siting.	They are in a short distance from the largest source of waste, City of Durres. A very good access to the site along a new road from two sides. The topography of both sites is favorable for landfill construction and there's a sufficient amount of suitable material for structural layers of the landfill. The main disadvantage is the proximity to residential buildings. The site 9 is at the limit of capacity for regional landfill siting, but sufficient if combined with site No.10.	It will be necessary to construct the landfill as piled on the ground surface. As the terrain at the site is mostly below sea level it will have to be raised due to occasional flooding. Complicated collection and drainage of leachates and surface water precipitation. The main disadvantage is the permanent water logging areas and lack of material for installing structural elements at the site and in its vicinity. In terms of space, the site is sufficient for regional landfill siting.

Source: Siting Study for Solid Waste Disposal (Sanitary Landfill) in Durres, Albania, 18.05.2011, .A.S.A. international Environmental Services GmbH and GEOtest, a.s,, IFC



Source: JICA Study Team

Figure 5.10.2 Location of Candidate Regional Waste Disposal Sites

(4) Selection of Construction Site for Tirana Municipality ISWM Plan

The JICA Study Team and the Directorate of Waste Management, MOT carried out the preliminary selection of the future landfill site through the satellite image map. There was no proper site found within the jurisdictional area of MOT and four candidate sites were selected at the neighboring area of MOT as shown in Figure 5.10.3.

Source: JICA Study Team

Figure 5.10.3 Location of Candidate Waste Disposal Sites

Field reconnaissance was carried out for the four candidate sites and he survey results are summarized as shown in Table 5.10.5. Three sites, Mullet, Lalm and Sharra Expansion are private lands while the other site of Brar is a public land. The site areas of Brar and Mullet are

too small for development of a comprehensive SWM facility including waste disposal facilities. Meanwhile, the site of Sharra Expansion and Lalm are large enough to construct all the SWM facilities. Lalm is s privately owned land and there is need to construct a 1,000m long access road to reach the site. The site of Sharra Expansion has several advantages against the other three sites in terms of the hauling distance of waste from the collection area, adjacent area of the existing landfill area, environmental aspects, etc.

Table 5.10.5 Basic Information of Candidate Waste Disposal Sites

Items	Brar	Mullet	Sharra Expansion	Lalm
Location	Dajti Commune	Mullet Commune	Vaqarr Commune	Vaqarr Commune
Distance from MOT	8km	8.5km	6km	9km
Site Area	4.5 ha	15ha	33ha	40ha
Elevation	+190m ~ +290m	+160m ~ +230m	+115m ~ +155m	+100m ~ +270m
Slope Grade	33%	14%	6%	19%
Site Condition	Valley Walls	Hill Slope	Valley Walls & Hill Slope	Valley Walls & Hill Slope
Land Owner	Commune	Private	Private	Private
Observations	Site is small and steep. Need access road crossing the river.	Need procurement of land and construction of about 600m long access road.	Several houses exist in the adjacent area. Need agreement with Vaqarr Commune.	Need construction of about 850m long access road along the river bank of the Erzenit River.
Preliminary Evaluation	Site is too steep to construct the approach road lead to the landfill area and fear for sliding of landfill layer caused of inappropriate landfill work. The area is too small for the waste volume for MOT.	The private land is allocated to many landowners and it takes time for procurement. The site is not large enough for the development of comprehensive SWM facilities	The site locate at adjacent area of existing Sharra disposal site and not suitable for development for other purpose. The site is large enough for development of intermediate facilities and for landfill	The private land belongs to one owner and easier for negotiation. The site is wide enough for development of intermediate facilities and landfill. The access road along the river bank has a fear for flooding or erosion.

Source: JICA Study Team

The Sharra Expansion site is large and possibly enough to allocate a construction site for the material recovery facilities, compost plant, biogasification plant, waste to energy plant in addition to expansion of the landfill site. A map shown in Figure 5.10.4 tentatively shows the allocated site for the construction of the comprehensive SWL facilities at Sharra Expansion site.

Allocation of Sharra Expansion Site for Development of Comprehensive SWM Facilities

Landfill Expansion Site Phase-1 : 10.6ha (2015-2026)

Landfill Expansion Site Phase-2 : 11.4ha (after 2026)

Material Recovery Facilities : 2.1ha

Composting, Biogasification and Waste to Energy Plant : 3.4ha

Waste to Energy Plant Alternative Site : 6.3ha

Total Area : 30.4ha

Source: JICA Study Team

Figure 5.10.4 Allocation of Sites for Development of SWM Facilities at Sharra Expansion

5.10.2 Outline of Waste Disposal Plan

The waste disposal master plan consists of the plans, projects and programs summarized in Table 5.10.6.

Table 5.10.6 Outline of Waste Collection and Transportation Plan

Plans, Actions and Projects			Description of Works
SWM-4 Waste Disposal Plan			Formulation of the waste disposal plan and implement the programs and the projects for waste disposal of residual waste in an environmental-friendly manner in the sanitary landfill facilities.
	SWM-4-1	Formulation of Implementation Plan for Waste Disposal	To conduct feasibility study and formulate the implementation plan of waste disposal plan in consideration of the regional waste disposal plan
	SWM-4-2	Coordination with Regional Waste Disposal Plan	Coordinate with the authorities concerned to formulate the final waste disposal facilities for MOT or for regional facilities
	SWM-4-3	Selection of Construction Site and Procurement	Select the construction site of sanitary landfill from the candidate site to be proposed through the siting study of disposal site.
	SWM-4-4	Implementation of Waste Disposal Plan	Construct, operate and maintain the sanitary landfill by PPP or by MOT or by regional government based on the time frame and the contents set in the implementation plan
	SWM-4-4-1	Construction of Sanitary Landfill	To conduct engineering design, tender, construction work contract and construct the large scale central biogasification and/or Compost plant by PPP or by MOT or by Regional Government
	SWM-4-4-2	Operation of Sanitary Landfill	Operate and maintain the waste incineration and power generation plant by PPP or by MOT or by Regional Government
	SWM-4-4-3	Closure of Existing Landfill	To conduct safe closure work of the existing Sharra landfill after commencement of new landfill
	SWM-4-5	Evaluation of Performance and Target Level of Waste Disposal Plan	Review and/or evaluate the performance of waste disposal to consider the achievement for improvement of the facilities and operation

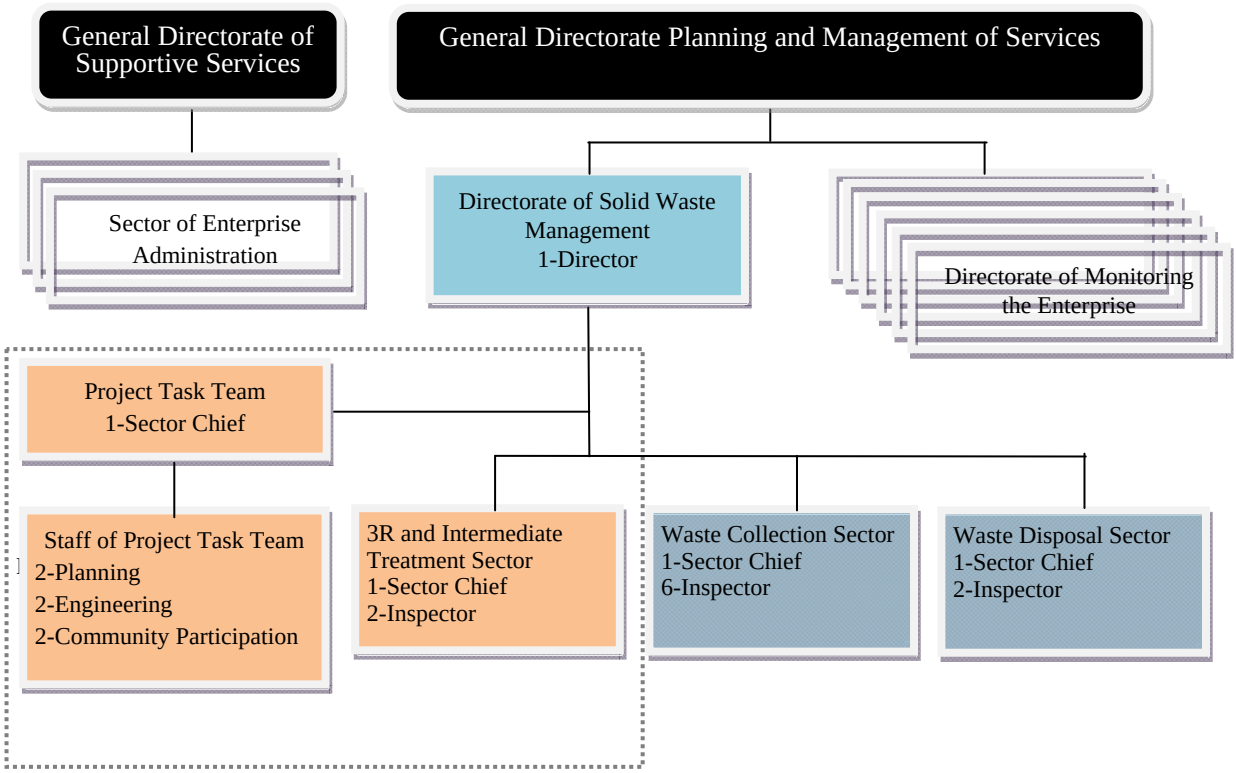
Source: JICA Study Team

5.11 Institutional Capacity Development Plan

5.11.1 Basic Conditions for Institutional Capacity Development Plan

(1) Establishment of Effective Implementation Organizational Structure

The objective of the capacity development is to establish the most suitable institutional and organizational arrangement to enable the MOT administration to implement the programs and projects defined under the ISWM Plan. The main subject for the institutional capacity building and development shall commence with organization of the implementing agency to undertake the primary roles and responsibilities to prepare and implement the proposed action plans in accordance with the purpose and the timeframe. Present SWM organization of MOT is comprised of the sectors for the services of waste collection and waste disposal but the ISWM requires additional functions in the Directorate of SWM for the activities of waste minimization, recovery of recyclable waste, intermediate treatment, financial strengthening, etc. to upgrade the current SWM system to a modern, international level SWM system. The additional sectors, Project Task Team and 3R and Intermediate Sector, are proposed to be established as shown in the Figure 5.11.1.



Source : JICA Study Team

Figure 5.11.1 Proposed Organization for Implementing SWM Plan

The Project Task Team shall undertake the primary role to prepare all the implementation plan of the projects and programs and promote the implementation of ISWM Plan. All the coordination and linkage with other agencies and sectors concerned shall be made by the Project Task Team. 3R and Intermediate Treatment Sector shall undertake the action plans of

intermediate treatment plan to promote initially the feasibility studies, engineering design, and construction supervision, setup the 3R activities, etc. through outsourcing some of the tasks to the engineering consultant firm(s). Later on, the Sector supervises, monitors and inspects the activities of the operation for evaluating the activities regularly. Other existing sectors of Waste Collection and the Waste Disposal shall undertake the activities related with the current fields to modify/upgrade the services according to the proposed action plans and programs. There are two alternatives to acquire the operation and maintenance staff. The first alternative is recruitment of the staff from the existing setup including the staff from other Directorates of MOT. The second alternative will be made through several types of contract. Wherever the sources of the staff, the assigned staff must be trained adequately to implement the plans and operate and maintain the system smoothly to realize the intended functions of the ISWM Plan.

Specific and periodic training shall be made for all the staff involved in the SWM activities for the purpose for upgrading the quality services of the plans and programs under the Tirana Municipality ISWM Plan. The following are the main training courses necessary to develop human resources capable to perform the better SWM services:

- Managerial standards for SWM services,
- Technical standards and criteria for planning and operation and maintenance, and
- Individual performance for accomplishing tasks.

Operational, organizational and management capabilities must be developed and established in an effective and efficient manner. These operational and managerial practices shall be established based on the following issues:

- An efficient organizational structure having rational organizational structures, clear reporting lines, reasonable spans for control, appropriate senior management structure and number and levels of directors, managers, engineers and inspectors,
- A clear assignment and mandate of responsibilities and adequate authority to managers and inspectors for individual performance,
- Procedures to clearly set and monitor objectives from the strategic level down to middle management and inspectors,
- Effective planning and policy formulation for preparation of medium/long term strategic plans as well as daily, weekly, monthly and annual operational plans,
- Effective financial management for integration of financial planning into the planning process, implementing budgetary planning and control and appropriate accounting systems for SWM services,
- Effective and early decision making by the managers,
- Effective and appropriate management information systems and other procedures, e.g., work flows and communication patterns for appropriate and regular information to enable the managers to make effective decisions and to efficiently carry out their responsibilities, and
- Periodic assessment of the performance of the staff against agreed performance targets and criteria to maintain well trained and committed staff.

An advisory committee for SWM may be organized mainly by the managerial staff of MOT and the members called from other agencies concerned, e.g., the government sectors, academic

sector, enterprise sector, community groups and the SWM committee is chaired by MOT. The committee reviews the proposed plans of MOT to advise, suggest and give concurrence to the action plans, programs and projects for implementation. The SWM committee will be called quarterly and as required.

(2) Japanese Legal System for Establishment of Sound Material Recycle Society

One of the most important activities in SWM nowadays is the 3R activities being carried out with the involvement of the stakeholders in society including waste generators, commercial and business establishments, schools, government offices, etc. In order to obtain the support from the society, raising public awareness is one of the key measures for the successful implementation of the 3R activities of SWM towards contributing to the establishment of SRRS in MOT and Albania. For the creation of SRRS, a comprehensive legal system is essentially required to formulate the rules, regulations, criteria, guidelines, standards, etc. to regulate overall 3R activities or the SRRS activities. In Japan, the legal measures for approaching the establishment of a Sound Material Recycle Society (SMRS) was setup more than 10 years ago through the enforcement of the relevant laws as follows.

The Basic Environment Law (Act No. 91 of 1993)

The purpose of this law is to comprehensively and systematically promote policies for environmental conservation to ensure healthy and cultured living for both the present and future generations of the nation as well as to contribute to the welfare of mankind, through articulating the basic principles, clarifying the responsibilities of the state, local governments, corporations and citizens, and prescribing the basic policy considerations for environmental conservation.

Basic Act for Establishing a Sound Material Recycle Society (Act No.110 of 2000)

The purpose of this Act is to promote comprehensively and systematically the policies for the establishment of SMRS and thereby help ensure healthy and cultured living for both the present and future generations of the nation. The Act articulates the basic principles on the establishment of SMRS, in conformity with the basic philosophy of the Basic Environment Law (Act No. 91 of 1993). It also clarifies the responsibilities of the State, local governments, business operators and citizens.

Waste Management and Public Cleansing Law

The purpose of this law is to preserve the living environment and to improve public health through the restriction of waste discharge, appropriate sorting, storage, collection, transportation, recycling, disposal, or the like of waste and conservation of a clean living environment.

Law for the Promotion of Effective Utilization of Resources

The purpose of this law is to provide the basic mechanism required for promoting the reduction of the generation of used goods and by-products and the utilization of recyclable resources and reusable parts, and thereby contribute to the promotion of a sound development of the national economy.

Container and Packaging Recycling Law

The purpose of this law is to promote reduction of waste containers and packaging waste discharge. It provides for a separate collection of recyclable waste containers and packaging waste that conform to the sorting standards. The law ensures proper management of waste and effective use of resources through reduction of municipal solid waste and adequate use of recyclable resources, thereby contributing to the preservation of the living environment and the sound development of the national economy.

Home Appliance Recycling Law

The purpose of this law is to provide a collection and recycling system in which home appliance retailers take charge of collecting used home appliances with charges to the users and home appliance manufacturers take charge of recycling collected appliances.

Construction Material Recycling Law

The purpose of this law is to reduce disposal of construction waste through material recovery by the contractors. It promotes activities such as the sorting out and recycling of wastes generated in the demolition work and construction work of buildings of specified construction materials, such as concrete including pre-cast plates, asphalt/concrete and wooden materials.

Food Waste Recycling Law

The purpose of this law is to reduce the amount of disposed dead stock and leftover food waste by the business entities, producers, processors and retailers by means of recycling. It is also to accelerate the efforts on recycling by food related businesses. The registered recycling business entities are given preferential measures within the scope of the Waste Management and Public Cleansing Law and the Fertilizer Control Law.

End-of Life Vehicle Recycling Law

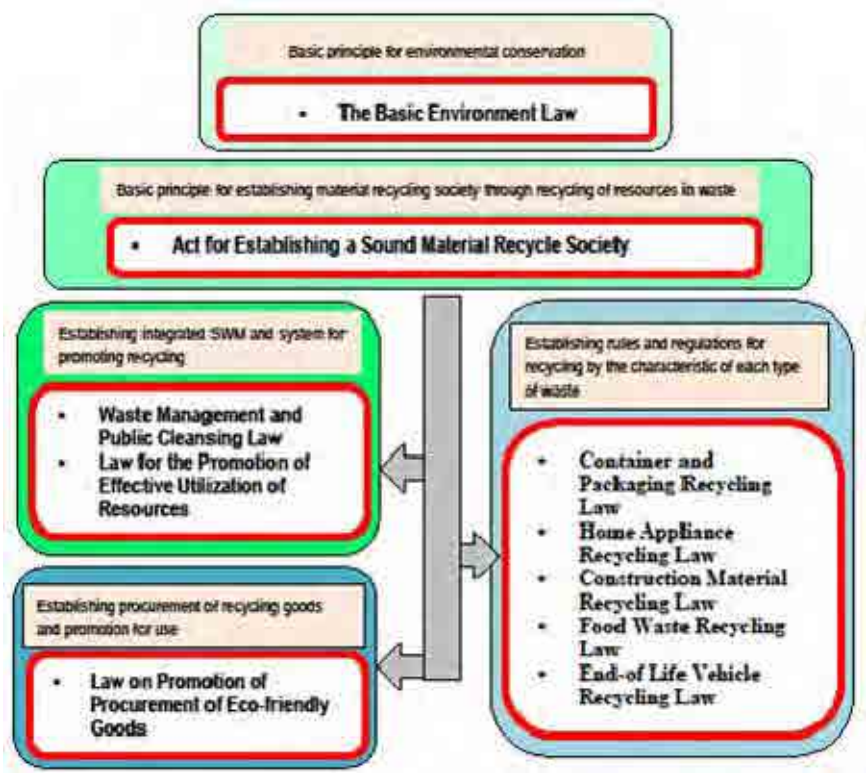
The purpose of this law is to ensure that waste from end-of life vehicles is properly disposed of and that resources are used effectively through reduction of the amount of waste from end-of life vehicles, and recycling and sufficiently using the recycled parts of such end-of life vehicles. This is to be accomplished by having vehicle manufacturers, etc. and operators of related businesses collect and deliver the end-of life vehicles, and by devising the means of recycling, etc., thereby contributing to the conservation of the environment and the development of a sound national economy.

Procurement of Eco-friendly Goods

The purpose of this law is to establish the necessary provisions to, a) encourage the State, independent administrative institutions, etc. and local governments to procure eco-friendly goods, etc., b) provide information on eco-friendly goods, etc. and c) encourage a shift in demand towards eco-friendly goods, etc. for utilization of more recycled goods, thereby contributing to the recycling activities. This is for establishment of a society which can enjoy sustainable development harmonized with environmental conservation and also contribute to a sound and cultural lifestyle for citizens today and in the future.

The relationships of the relevant laws are as illustrated in Figure 5.11.2. In order to fulfill the

ISWM Plan in compliance with the Laws and the EU Directives, the similar legal system is also required in Albania and the relevant by-laws in MOT.



Source: JICA Study Team

Figure 5.11.2 Legal System in Japan for Establishing SMRS

(3) Establishment of ALB Resource Recovery and Recycling Enterprise

In Tirana, packaging waste accounts for a large volume especially in the commercial area. Packaging waste consists of paper and plastics, which become typical recycling materials if a functional recovery and recycling systems is established in Albania. Cases in Germany and France cited below are the good practices to cope with the recycling of packaging waste.

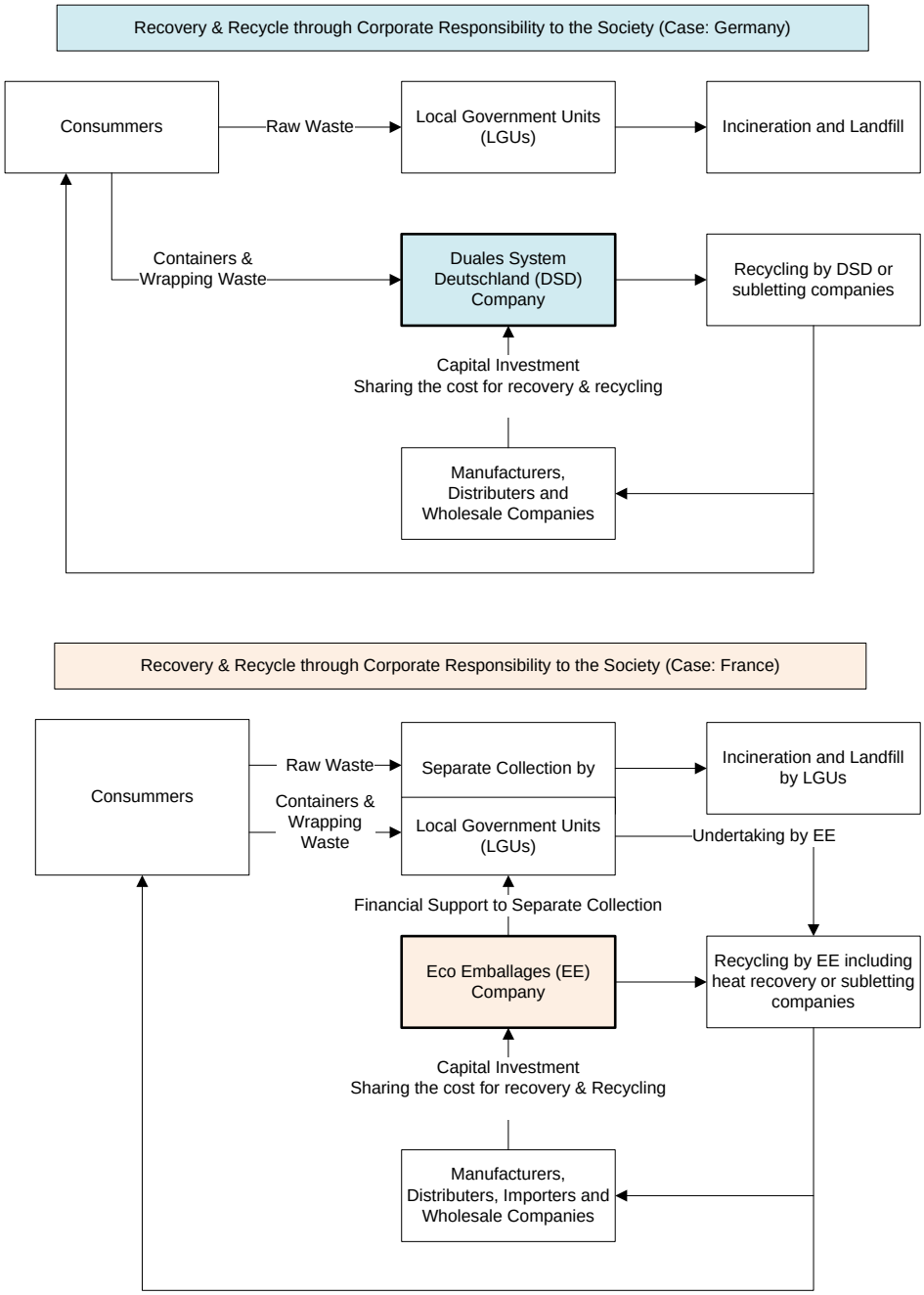
In Germany, a non-profit organization, Duales System Deutschland AG (DSD), was founded in 1990 responding to the Packaging Ordinance under the Waste Act. The organization of DSD is founded with the investment from more than 600 member companies including the consumer goods and packaging industries, wholesale companies, distributors, retailers, material suppliers, etc. who bear the producers' responsibilities in accordance with the stipulations of the Packaging Ordinance. DDS undertakes the producers' responsibilities on behalf of the member companies. In other words, if the companies that generate packaging waste do not participate in the DDS system, those companies shall take full responsibility for the end-of-life waste by themselves. DDS carry out recovery of recyclable materials through curbside collection or drop-off system to bring-in the recyclable materials at the designated collection stations in addition to recycling of the recovered materials. In practice, DDS sublet the recycling process to the recycling companies or the manufacturers.

In France, a similar system is founded for recovery and recycling of packaging waste. Eco-

Emballages (Packaging) was established in 1992. Similar to the case of Germany, the members take the producers' responsibilities on behalf of the member companies. However, Eco-Emballages do not collect recyclables directly but the recovery of recyclable materials is carried out by the municipalities and ECO-Emballages provides financial support to the municipalities for a separate collection.

Both of the organizations are managed by the investment of the member companies and the income from the activities. Figure 5.11.3 shows the outlines of the activities of DDS and Eco-Emballages.

In the case of Albania, the producers' responsibilities are stipulated under the Law on Integrated Waste Management 2011. In connection with the formulation of the Tirana Municipality ISWM Plan, the non-profit organization called ALB Resource Recovery and Recycling Enterprise is proposed to take on the producers' responsibilities on behalf of the member companies who invest in the Enterprise for undertaking the recovery and recycling of packaging wastes. Establishment of ALB Resource Recovery and Recycling Enterprise shall be supported with strict rules and regulations for the producers' responsibilities. Therefore, enactment and enforcement of the relevant rules and regulations similar to the aforementioned case in Japan for legal frame work for establishment of the sound resource recycling society is essentially the base for founding the ALB Resource Recovery and Recycling Enterprise.



Note: In Japan, the country wide recycling system does not exist. The individual company or the groups of the companies set-up their own recovery system and recycle to fulfill the company responsibility.

Source: JICA Study Team

Figure 5.11.3 Recovery and Recycling System of Packaging Waste in Germany and France

5.11.2 Outline of Institutional Capacity Development Plan

The master plan for institutional capacity development consists of the plans, projects and programs summarized in Table 5.11.1.

Table 5.11.1 Outline of Institutional Capacity Development Plan

Plans, Actions and Projects			Description of Works
SWM-5 Institutional Capacity Development Plan			Improvement and strengthen the institutional setup regarding organizational structure, reporting system, operation rules, etc. for implementing the proposed action plans, programs and projects smoothly
	SWM-5-1	Establishment of Project Task Team and Implementation of Priority Projects	Organize a Project Task Team having a primary role for preparation of the implementation plans and budgeting for the scheduled implementation of action plans and/or the priority projects. Start with a temporary staff, develop for the permanent staff of future Planning Sector under the Directorate of Waste Management
	SWM-5-1-1	Recruiting the Task Team Staff	The staff member of the Task Team shall be appointed in early stage of 2013
	SWM-5-1-2	Orientation of Action Plans of ISWM Plan, Modification and Finalization	Conduct an orientation program to the staff member of the Project Task Team for the contents of action plans and priority projects and modify as required and finalize the configurations of the priority projects toward implementation.
	SWM-5-1-3	Preparation of Implementation Plan of the Priority Projects	Prepare a phased implementation plan for the priority projects covering the entire periods of urgent/short-term, mid-term and long-term plans for seven project components.
	SWM-5-1-4	Budgeting for Implementation of the Priority Projects	Estimate the costs for the five year implementation of the priority projects and update the cost before the turn of the fiscal year for budgeting the project cost for the next fiscal year.
	SWM-5-2	Formulation of Implementation Plan for Institutional Capacity Development	The Project Task Team formulate the implementation plan of institutional capacity development to upgrade the SWM services through the activities for recruiting the staff, capacity development training, enactment of by-laws, rules, regulations on SWM, preparation and approval of master plan, surveys, etc.
	SWM-5-3	Upgrading of Institutional System	Enact and enforce the by-law(s), rules, regulations, standards, etc. and study the PPP scheme for establishing a corporation to handle specific recyclable materials for recovery and recycling
	SWM-5-3-1	Enactment of by-laws to comply with the ISWM Law	Enact and enforce the rules and regulations in the By-law of MOT to comply with the requirements stipulated in the ISWM Law
	SWM-5-3-2	Preparation of rules, regulations, criteria, standards, etc.,	Prepare and enforce the rules, regulations, criteria, standards, guidelines, etc. for implementing the SWM projects involving the participation of the stakeholders
	SWM-5-3-3	Study and Establishment of ALB Resource Recovery and Recycling Enterprise	Study the possibilities to establish a resource recovery and recycling corporation to handle exclusively recyclable materials in solid wastes through public-private partnership (PPP) scheme
	SWM-5-4	Formulation and Approval of ISWM Plan	Finalize the proposed SWM master plan and take the process for official approval of the master plan for MOT. The master shall be reviewed and updated periodically.
	SWM-5-4-1	Review, Modification and Revision of ISWM Plan	Review the master plan prepared by the JICA Study Team and modify as required to finalize the Integrated SWM Master Plan (ISWMP) of MOT. Review and/or update the ISWMP of MOT in every five years to reflect the change of the situation taking place in the past years and prospects in the future
	SWM-5-4-2	Official Approval of ISWM Plan	Submit the ISWMP of MOT to the MOT Council for resolution and approval by the Mayor.
	SWM-5-5	Surveys of Baseline Data for Performance Indicators and Reporting	To set up a reporting system for the SWM activities and conduct surveys for obtaining the evaluation indicators
	SWM-5-5-1	Preparation of Monthly and Annual Report	Standardizing the activity records for preparation of monthly report in addition to the preparation of annual activity report including the description of the state and evaluation of the activities.
	SWM-5-5-2	Public Awareness/Opinion Survey on SWM Activities	Conduct public awareness and opinion survey for SWM services of MOT in every 3 years to collect the information of income, willingness to pay, complains, opinion, etc. of the beneficiaries
	SWM-5-5-3	Domestic Waste Amount and Composition Survey	Conduct domestic waste amount and composition survey for analysis of waste generation rate per capita, change of waste composition, recyclable waste ratio for use as the several indicators to evaluate the target level of

			respective activities and waste tariff
	SWM-5-5-4	Commercial/Business Waste Amount and Composition Survey	Conduct commercial, business and institutional waste amount and composition survey for analysis of unit waste generation rate per type of workplace, change of waste composition, recyclable waste ratio for use as the several indicators to evaluate the target level of respective activities and waste tariff
	SWM-5-6	Evaluation of Performance of Target Level of Institutional Capacity Development Plan	Review and/or evaluate the performance of implementation of institutional capacity development

Source: JICA Study Team

5.12 Financial Strengthening Plan

5.12.1 Basic Conditions for Financial Strengthening Plan

(1) Separate Accounting System

Analysis of a separate account of SWM services is required for implementing the financial strengthening plan under the Tirana Municipality ISWM Plan. All the revenue and expenditure on SWM services shall be separated from the general accounting system of MOT to identify the actual financial status of the SWM services. The separated accounting system shall be the basic data for establishing a fair waste tariff system for MOT. Transparency will be required for the separated SWM account and the financial statement by disclosure to the public through MOT home page. An accountant(s) in the financial sector of MOT shall be appointed or deployed newly to conduct the financial analysis of SWM services under the direction of the Project Task Team and the administrator in charge of MOT financial management.

(2) Cash Flow Analysis and Financial Statements

Based on separation of the SWM accounting system, annual cash flow analysis and financial statement shall be prepared. These analyses must be studied together with the waste tariff system to secure firstly the financing required for the operation and maintenance of the SWM services towards improvement of financial viability and independent financing for establishment of cost recoverable SWM services. MOT shall study the method of analysis and review the current revenue, cost, and collected waste fee to recognize the financial status of the SWM services. Implementation of the master plan requires additional investment cost, operation and maintenance costs, MOT shall secure the financial sources for implementing the action plans and programs from its own annual budget, subsidy from the central government, project loan from the external source(s), private sector involvement and/or the combination of the aforementioned financial sources.

(3) Establishment of Optimum and Fair Waste Tariff

Optimum and fair waste tariff system shall be established in the course of the implementation of the Tirana Municipality ISWM Plan. Accordingly, the task related with waste tariff shall commence with the review of the current waste tariff imposed to the household and the business establishment. Considering the beneficiaries pay principle (BPP), the waste charging rate can be set to the level of full cost recovery. However, the timing and introduction of the full rate tariff shall be determined in consideration to the economic situation and the affordability of the waste generators or the beneficiaries. As the tariff is too high for the affordability of the waste

generators, MOT shall take measures to find financial sources to supplement the revenue to lower the charging rate. The waste tariff in the initial stage may be determined at the rate at least covering the operation and maintenance cost. The following stage-wise charging system is applied for recovery SWM service cost as discussed earlier in the preceding section.

- First Stage : Recovery of actual operation and maintenance costs;
- Second Stage : Recovery of salaries of the staff in addition to the above costs; and
- Third Stage : Recovery of depreciation cost in addition to the above costs. (Full cost recovery)

The proposed waste charging rate and the tariff will be made on appropriate assumption of the collection ratio of waste fee and the waste discharge amount, and the actual amount of investment capital cost, replacement cost, operation and maintenance cost. The tariff shall be optimized as it requires making a balance between the revenue and costs at the final stage to impose the full cost recovery rate. As the adjustment of waste tariff is discussed, the public awareness/opinion survey and the survey of commercial/business waste generators shall be carried out for the income level, willingness to pay, affordability to pay, type of business, floor area of business activities, number of staff, type and amount of waste, etc. for accumulation of the data and information to determine the waste tariff. Also, the estimation of investment cost, operation and maintenance costs, waste generation amount, collection coverage ratio, etc. shall be conducted for adjustment of the waste tariff.

5.12.2 Outline of Financial Strengthening Plan

The master plan on financial strengthening consists of the plans, projects and programs summarized in Table 5.12.1.

Table 5.12.1 Outline of Financial Strengthening Plan

Plans, Actions and Projects			Description of Works
SWM-6 Financial Strengthening Plan			Formulation and implementation of financial plan for establishing a stable and perspective financial system through setting the fair waste tariff to the beneficiaries
	SWM-6-1	Formulation of Implementation Plan for Financial Strengthening	Formulate the implementation plan for establishing a SWM accounting system in MOT including the study on unit costs, waste tariff, other financial sources, etc.
	SWM-6-2	Study on SWM Unit Cost and Review of Waste Tariff System	Study and estimate the unit cost per ton for waste collection, intermediate treatment and final disposal with/without depreciation cost and review the waste tariff of each type of beneficiary
	SWM-6-3	Implementation of Financial Strengthening Plan	Implement the financial strengthening plan based on the time frame and the contents set in the implementation plan
	SWM-6-3-1	Preparation of Separate SWM Account	Study and prepare for subdividing the revenue and expenditure for verifying the unit cost and waste tariff
	SWM-6-3-2	Implementation and Establishment of Sound Waste Tariff System	Survey the awareness/opinion of the beneficiaries including the willingness to pay, income level, affordability to pay, etc. and study the appropriateness of waste fee, collection coverage ratio of waste fees of different types of beneficiaries. Then implement a sound waste tariff system obtained from the study.
	SWM-6-3-3	Implementation and Establishment of Separate SWM Account	Implement the independent accounting system for SWM activities of MOT
	SWM-6-4	Evaluation of Performance and Target Level of Financial Strengthening Plan	Review and/or evaluate the performance of implementation of financial plan for consideration to improve the system

Source: JICA Study Team

5.13 Raising Public Awareness Plan

5.13.1 Basic Conditions for Raising Public Awareness Plan

(1) Raising Awareness within the Implementing Agency of MOT

The plan shall start with the raising awareness of the MOT staff concerned to provide quality SWM service to the beneficiaries. The objective groups are the members of the proposed Project Task Team, all the staff of the Directorate of Waste Management, the staff and managers of other Directorates and the administrative managers of MOT. Raising their awareness shall be made for the full understanding of the mission, purpose, strategies, outline of the proposed action plans and the timeframe of implementation, etc. Periodical internal meetings and training programs will be effective to raise their own awareness for fulfilling the primary responsibilities and the roles for SWM services.

(2) Raising Public Awareness

Raising public awareness shall be carried out through public relation programs and the materials prepared by the Project Task Team in collaboration with the parties concerned. The programs may be comprised of the following:

- Public campaigns through mass media, i.e., television and radio programs, newspaper, leaf lets, public debates, etc.,
- Activities of NGOs, CBOs, NPOs, etc. for non-formal education on SWM,
- Community involvement pilot projects, and
- Stakeholder involvement programs.

These raising of public awareness programs are addressed mainly to the residents and the programs for children and students shall be carried out through the school education. The programs for raising awareness of the stakeholders shall be prepared for fulfilling the producer responsibilities to carryout segregation, recovery and storage of recyclable materials at each workplace in addition to the programs for the reduction of waste generation amount.

The raising of public awareness will be successful as more numbers of residents participate in the 3R programs for waste reduction, reuse, segregation and resource recovery at waste generation source through the activities of the Town MRF proposed to be located at a considerably large number of places in the town. The Town MRF programs shall be promoted at first with the community groups made to understand that participation in public services is essentially required to keep the community clean. Prior to implementation of the plan, the Project Task Team shall review all the related activities, i.e., recovery of recyclable by waste pickers, possibilities for home and community composting activities, the sites for construction or rental of existing buildings or provision of an open space for the Town MRF, marketing system of recyclables, involvement of recycling industries, available support and assistance of MOT, etc. and linking with the current activities in the areas.

The Project Task Team in coordination with the mini-municipality office shall prepare the programs for community involvement starting within the typical pilot study area and expanded to the adjacent areas and to the entire area of MOT. The programs shall be formulated with the

involvement of all the stakeholders including the residents, community groups, shops, restaurants, hotels, business offices, schools, institutions, mini-municipalities and the central government under the initiative of MOT.

(3) School Education

Raising awareness of school children and students shall be made as one of the curriculum for school education. The Project Task Team assisted by the related Directorates of MOT and the Ministries will prepare the texts for primary school education and for secondary school education. The texts shall be prepared visually for easy understanding of the contents with the key issues for discussion in the homeroom. Also, the video programs shall be considered as one of the effective tools for school education. In addition, the school curriculum includes the site visit programs for waste collection, intermediate treatment, waste disposal and recycling industries for observation of the actual operations and to think about their contribution to the SWM activities. Furthermore, the outcome of school education shall provide a chance for involvement of the parents and all family members with the SWM activities. School education programs shall be carried out continuously every year in accordance with the curriculum and the schooling schedule prepared by the Project Task Team assisted by the education authorities concerned.

5.13.2 Outline of Raising Public Awareness Plan

The master plan for raising public awareness consists of the plans, projects and programs summarized in Table 5.13.1.

Table 5.13.1 Outline of Raising Public Awareness Plan

Plans, Actions and Projects			Description of Works
SWM-7 Raising Public Awareness Plan			Formulation of raising public awareness plan on the responsibilities of stakeholders regarding the waste they discharge and encourage cooperation for the SWM action plans to be carried out with involvement of the society
	SWM-7-1	Formulation of Implementation Plan for Raising Public Awareness	Formulate the implementation plan to organize the community groups for participation at 3R activities by means of public relation, formal and informal educations, etc.
	SWM-7-2	Implementation of Raising Public Awareness Plan	To inform the public about the concept of 3R, saving resource mind, support for establishing SRRS. The implementation shall start in the pilot study areas and the activities disseminated to the entire area of MOT.
	SWM-7-2-1	Implementation of Public Information Plan	To implement public information of SWM through mass media for raising awareness of the residents
	SWM-7-2-2	Implementation of School Education Plan	To include the curriculum for environmental conservation and SWM responsibility
	SWM-7-2-3	Implementation of Non-formal Education Plan	To implement public meetings as well as discussions/presentations at the workplaces on environmental conservation and SWM responsibility
	SWM-7-2-4	Implementation of Community Involvement Plan	To organize several community groups for the model area groups to implement segregation at source, recovery, home / community composting
	SWM-7-3	Evaluation of Performance and Target Level of Raising Public Awareness Plan	Review and/or evaluate the performance and the target level for consideration to improve the system

Source: JICA Study Team

5.14 Phasing/Roadmap to Establish the ISWM System

The plans, programs and projects formulated under the master plan, for the Tirana Municipality ISWM Plan, are divided into seven components as proposed in the precedent sections. In order to fulfill the target levels of the activities in compliance with the timeframe of the National Waste Management Plan, the law and the EU Directives, MOT shall carry out the development of the facilities and the systems based on the following three phase implementation periods:

Urgent and Short-term Plan : 2013-2017

Mid-term Plan : 2018-2022

Long-term Plan : 2023-2027

Implementation time schedule of the plans, programs and project of each component are as shown in Figure 5.14.1.

Table 5.14.1 Implementation Time Schedule of Tirana Municipality ISWM Plan (2/1)

Action Plans	Urgent and Short-term Period					Mid-term Period					Long-term Period				
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
SWM-1 Waste Collection and Transportation Plan															
SWM-1-1 Formulation of Implementation Plan for Waste Collection and Transportation															
SWM-1-2 Survey of Illegal Dump Site and Preparation of Clean-up project															
SWM-1-3 Implementation of Illegal Dump Site Clean-up Project through Contract															
SWM-1-4 Implementation of Pilot Study for Improvement of Waste Collection Service															
SWM-1-4-1 Study for Expansion of Service area by 3-bins System															
SWM-1-4-2 Study of Separate Waste Collection for Special Wastes															
SWM-1-4-3 Implementation of Separate Collection at the Pilot Study Areas															
SWM-1-5 Operation of Separate Collection by 3-bins System															
SWM-1-6 Monitoring/Inspection of Waste Collection Activities															
SWM-1-7 Evaluation of Performance and Target Level of Waste Collection Plan															
SWM-2 Waste Minimization Plan (3R Plan)															
SWM-2-1 Formulation of Implementation Plan for 3R Activities															
SWM-2-1-1 Formulation of Waste Reduction Implementation Plan															
SWM-2-1-2 Formulation of Waste Recovery, Reuse and Recycling Implementation Plan															
SWM-2-2 Implementation of 3R Activities															
SWM-2-2-1 Promotion of Waste Generation Source Control															
SWM-2-2-2 Promotion of Waste Discharge Control															
SWM-2-2-3 Promotion of Recovery of Recyclable Materials															
SWM-2-2-4 Promotion of Reuse and Recycling of Recyclable Materials															
SWM-2-2-5 Construction of Central Material Recovery Facilities at Sharra															
Civil Work															
Building Work															
Mechanical & Electrical Works															
Engineering Design and Construction Supervision															
SWM-2-2-6 Operation of Central Material Recovery Facilities at Sharra															
SWM-2-3 Monitoring for Implementation of 3R Activities															
SWM-2-4 Evaluation of Performance and Target Level of Waste Minimization Plan															
SWM-3 Intermediate Treatment Plan															
SWM-3-1 Formulation of Implementation Plan for Intermediate Treatment Plan															
SWM-3-1-1 Formulation of Implementation Plan for Organic Waste Treatment															
SWM-3-1-2 Formulation of Implementation Plan for Waste to Energy															
SWM-3-2 Implementation of Organic Waste Treatment Plan															
SWM-3-2-1 Organizing Home Composting and Community Composting Groups															
SWM-3-2-2 Implementation of Pilot Project of Home and Community Composting															
SWM-3-2-3 Expansion of Home Composting and Community Composting															
SWM-3-2-4 Selection of Large Waste Generation Source of Biodegradable Waste															
SWM-3-2-5 Construction of Pilot Scale Compost Plant															
Civil Work															
Building Work															
Mechanical & Electrical Works															
Engineering Design and Construction Supervision															
SWM-3-2-6 Operation and Maintenance of Pilot Scale Compost Plant															
SWM-3-2-7 Construction of Central Compost and/or Biogasification Plant															
Civil Work															
Building Work															
Mechanical & Electrical Works															
Engineering Design and Construction Supervision															
SWM-3-2-8 Operation and Maintenance of Central Compost and/or Biogasification Plant															
SWM-3-3 Evaluation of Performance and Target Level of Organic Waste Treatment Plan															
SWM-3-4 Implementation of Waste to Energy Plan															
SWM-3-4-1 Selection of Construction Site and Procurement															
SWM-3-4-2 Construction of Waste to Energy Plant															
Civil Work															
Building Work															
Mechanical & Electrical Works															
Engineering Design and Construction Supervision															
SWM-3-4-3 Operation and Maintenance of Waste to Energy Plant															
SWM-3-5 Evaluation of Performance and Target Level of Waste to Energy Plan															
SWM-4 Waste Disposal Plan															
SWM-4-1 Formulation of Implementation Plan for Waste Disposal															
SWM-4-2 Coordination with Regional Waste Disposal Plan															
SWM-4-3 Selection of Construction Site and Procurement															
SWM-4-4 Implementation of Waste Disposal Project															
SWM-4-4-1 Construction of Sanitary Landfill															
Civil Work															
Building Work															
Mechanical & Electrical Works															
Engineering Design and Construction Supervision															
SWM-4-4-2 Operation and Maintenance of Sanitary Landfill															
SWM-4-4-3 Closure of Existing Landfill															
Civil Work															
SWM-4-5 Evaluation of Performance and Target Level of Waste Disposal Plan															

Source: JICA Study Team

Table 5.14.2 Implementation Time Schedule of Tirana Municipality ISWM Plan (2/2)

Action Plans	Urgent and Short-term Period					Mid-term Period					Long-term Period				
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
SWM-5 Institutional Capacity Development Plan															
SWM-5-1 Establishment of Project Task Team and Implementation of Priority Projects															
SWM-5-1-1 Recruiting the Task Team Staff	■		■		■										
SWM-5-1-2 Orientation of Action Plans of ISWM Plan, Modification and Finalization	■	■													
SWM-5-1-3 Preparation of Implementation Plan of the Priority Projects		■	■												■
SWM-5-1-4 Budgeting for Implementation of the Priority Projects		■		■		■		■		■		■		■	
SWM-5-2 Formulation of Implementation Plan for Institutional Capacity Development	■	■													■
SWM-5-3 Setup Additional Institutional System															
SWM-5-3-1 Enactment of by-laws to comply with the Integrated SWM Law		■	■												
SWM-5-3-2 Preparation of rules, regulations, criteria, standards, etc.,			■	■											
SWM-5-3-3 Study and Establishment of ALB Resource Recovery and Recycling Enterprise			■	■	■	■	■	■	■	■					
SWM-5-4 Formulation and Approval of ISWM Plan															
SWM-5-4-1 Review, Modification and Revision of ISWM Plan	■	■								■					■
SWM-5-4-2 Official Approval of ISWM Master Plan		■													■
SWM-5-5 Survey of Baseline Data for Performance Indicators and Reporting															
SWM-5-5-1 Preparation of Monthly and Annual Report	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-5-5-2 Public Awareness/Opinion Survey on SWM Activities		■													■
SWM-5-5-3 Domestic Waste Amount and Composition Survey		■													■
SWM-5-5-4 Commercial/Business Waste Amount and Composition Survey		■													■
SWM-5-6 Evaluation of Performance and Target Level of Institutional Cap. Develop. Plan															■
SWM-6 Financial Strengthening Plan															
SWM-6-1 Formulation of Implementation Plan for Financial Strengthening	■	■													■
SWM-6-2 Study on SWM Unit Cost and Review of Waste Tariff		■													■
SWM-6-3 Implementation of Financial Strengthening Plan															
SWM-6-3-1 Preparation of Separate SWM Account	■	■													
SWM-6-3-2 Preparation and Establishment of Sound Waste Tariff System			■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-6-3-3 Implementation and Establishment of Sound SWM Account			■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-6-4 Evaluation of Performance and Target Level of Financial Strengthening Plan			■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-7 Raising Public Awareness Plan															
SWM-7-1 Formulation of Implementation Plan for Raising Public Awareness	■	■													■
SWM-7-2 Implementation of Raising Public Awareness Plan															
SWM-7-2-1 Implementation of Public Relation Plan		■	■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-7-2-2 Implementation of School Education Plan			■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-7-2-3 Implementation of Non-formal Education Plan			■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-7-2-4 Implementation of Community Involvement Plan			■	■	■	■	■	■	■	■	■	■	■	■	■
SWM-7-3 Evaluation of Performance and Target Level of Raising Public Awareness Plan					■					■					■

Source: JICA Study Team

5.15 Listing of Priority Actions/Projects

The priority projects or immediate action plans are provisionally selected in consideration of the urgent necessity, expected effects of the project, required compliance to the targets in the law, the national strategies and plans, EU directives, and the interrelation of the plans, programs and the projects among the seven components proposed in the ISWM Plan. Those Priority Actions/Projects of each components listed up below will be examined again in the succeeding section for the components of each package project.

Action Plan of Waste collection and Transportation

- Implementation of the clean-up project for the illegal dump site
- Implementation of separate collection at the pilot study areas and expansion to the neighbouring areas

Action Plans of Waste Minimization (3R Plan)

- Implementation of 3R activities at the pilot study areas

Action Plans of Intermediate Treatment

- Construction of pilot scale compost plant and/or bio-gasification plant and operation
- Construction of central compost plant and/or bio-gasification plant and operation
- Construction of a waste to energy plant and operation

Action Plans of Waste Disposal

- Construction of sanitary landfill at the Sharra Expansion Site-1 and operation

Action Plans of Institutional Capacity Development

- Establishment of Project Task Team, orientation, training, formulation of SWM master plan, official approval of the SWM master plan, and appropriation of project budget
- Implementation of public awareness/opinion survey for SWM activities

Action Plans of Financial Strengthening

- Establishment of sound waste tariff system and implementation/establishment of sound SWM account

Action Plans of Raising Public Awareness

- Implementation of community involvement plan at the pilot study areas for 3R activities, expansion of service area and separate waste collection

6. Water Supply System

6.1 Current Status and Salient Feature in Water Supply

6.1.1 National Policy and Strategy on Waterworks and Sewerage Sector

Water supply and sewerage (WSS) goes hand in hand. This section therefore deals with national policy and strategy on not only waterworks but also sewerage sector. An outline of the National Water Supply and Sewerage Services Sector Strategy 2011-2017, the latest national sector strategy plan, released in May 2011, is summarized below.

(1) Sector Strategy and Objectives

This national strategy is based on the assumption that the 3.4 million population in 2010, base year, will continue to increase with a moderate annual growth rate of 0.4% and considering internal migration from rural to urban area. A social program for the poor will be introduced in the sector.

In order to comply with the European Union (EU) Directives, the River Basin Management shall be executed by revising the relevant laws. The General Directorate of Water Supply and Sewerage, under the Ministry of Public Works and Transport, has started a monitoring and benchmarking program (M&B Unit) since 2002, applying mainly six performance indicators, shown below, for 58 domestic water supply utilities.

1. Water Supply Service Coverage
2. Sewerage Service Coverage
3. Water Supply Demand Ratio (Non-Revenue Ratio)
4. Continuity of Water Supply Service
5. Safety of Water Supply (Water Quality)
6. Sewage Treatment Ratio

Improvement of operating efficiency of the utilities transferred to the local government units (LGUs) by appropriate assets management and cost recovery policy is necessary. Consolidation of the utilities shall be promoted to strengthen operating efficiency and Private Sector Participation (PSP) shall be promoted under the guidance of the central government.

(2) Vision, Mission Objectives and Priority Actions

The vision, mission objectives, and priority actions of the water supply and sewerage sector are summarized in Figure 6.1.1. Strategic goal of performance indicators for each year is also described in Tables 6.1.1 and 6.1.2

(3) Policies

The sector also adheres to the following nine policy statements:

- Jurisdiction of Tariff Policies;
- Tariff Differentiation and Structure;
- Cross-subsidy between Customer Category;
- Cost Recovery for Service Providers;

- Introduction of Targeted Subsidy;
- Asset Inventory and Valuation of Water Supply and Sewerage Systems;
- Consider and Draft a Special Water Supply and Sewerage Service Law;
- Licensing of Water Supply and Sewerage Service Providers; and
- Authorization to Replace a Failing Operator.

(4) Resources Implication

The total capital investment needed to support the strategic objectives for deferred investments in asset management and for technical assistance during planning period is summarized in Table 6.1.3

(5) Accountability, Monitoring and Evaluation

The responsible institution is required to develop a more detailed implementation plan for each of its assigned priority action plan. Monitoring and evaluation of the progress in implementing sector strategy is assigned to the General Directorate of Policy for Water Supply, Sewerage and Solid Waste.

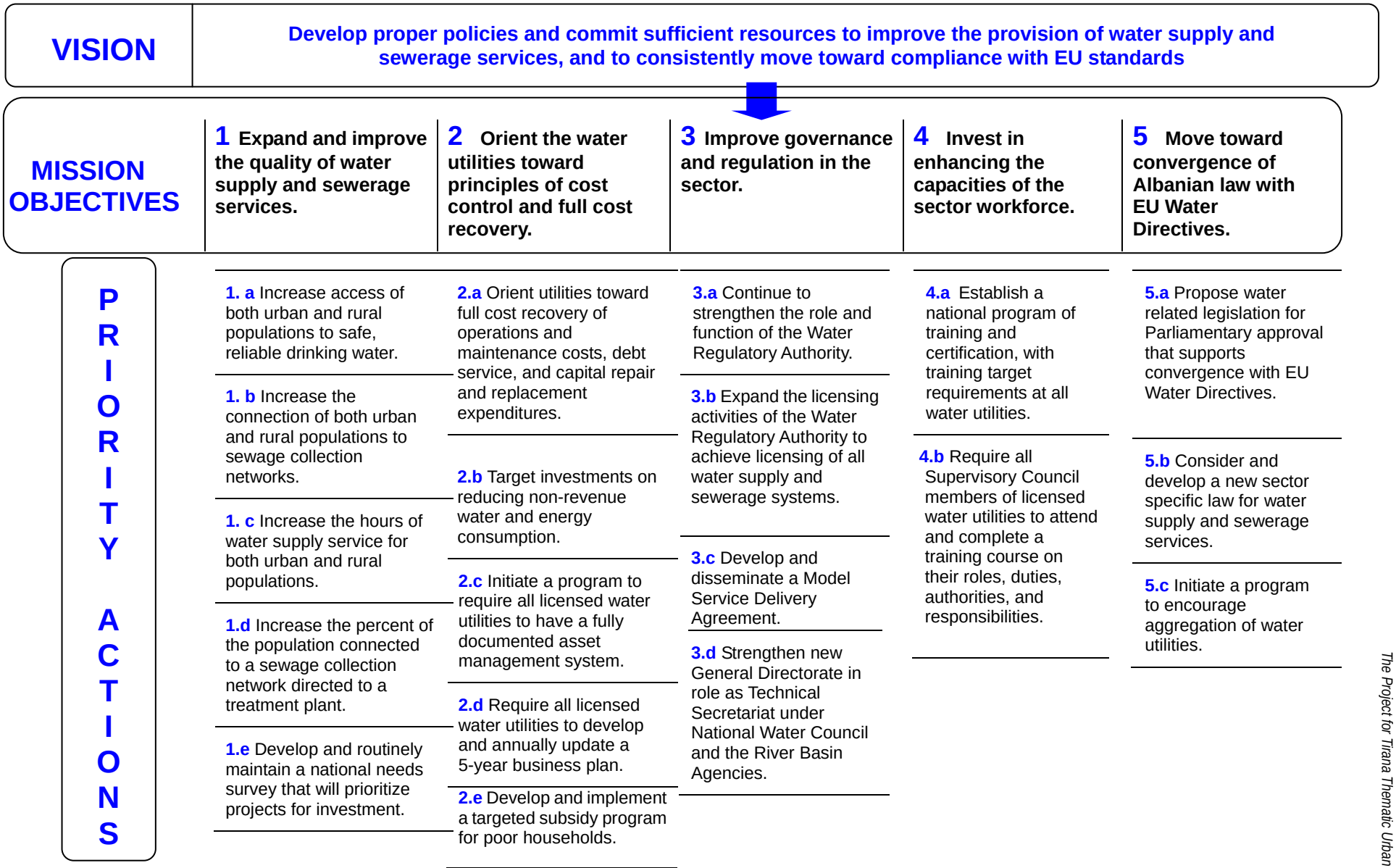


Figure 6.1.1 Vision, Mission Objectives, and Priority Action Chart of Water Supply and Sewerage Sector

Table 6.1.1 Strategic Goals and Performance Indicators (1/2)

No.	Performance Indicators	2010	Strategic Goals for Year-End						
			2011	2012	2013	2014	2015	2016	2017
1	Expand and improve the quality of water supply and sewerage services.								
1.a.1	Water Coverage for the urban area.	90.7%	91%	92%	93%	94%	95%	96%	98%
1.a.2	Water Coverage for the rural area.	57.0%	60%	64%	70%	76%	79%	82%	85%
1.b.1	Sewerage Coverage for the urban area.	83.0%	83%	84%	85%	85%	86%	87%	87%
1.b.2	Sewerage Coverage for the rural area.	10.9%	11%	13%	15%	20%	25%	35%	45%
1.c.1	Continuity of Service for Water Supply.	11.1hrs	12hrs	13hrs	14hrs	15hrs	16hrs	18hrs	20hrs
1.d.1	Sewer Treatment Coverage from treatment plants.	4.0%	7%	15%	20%	25%	30%	35%	40%
1.e.1	Develop and routinely maintain a national needs survey that will prioritize projects for investment					100%	100%	100%	100%
2	Orient the water utilities toward principles of cost control and full cost recovery.								
2.a.1	Direct Operational Costs (DOC) Coverage with Revenue.	93.4%	95%	95%	100%	100%	100%	100%	100%
2.a.2	Direct Operational Costs (DOC) Coverage with Collections.	78.6%	80%	85%	90%	100%	100%	100%	100%
2.a.3	Total Operational Costs (TOC) Coverage with Revenues.	66.6%	68%	70%	72%	74%	76%	78%	80%
2.a.4	Total Operational Costs (TOC) Coverage with Collections.	56.1%	58.5%	61.6%	64.8%	68.1%	71.4%	74.9%	78.4%
2.a.5	Coverage of capital reserve funds (repair/ replacement and new capital) with revenues.	0%	0%	0%	10%	20%	30%	40%	50%
2.a.6	Overall Collection Rate.	84.2%	86%	88%	90%	92%	94%	96%	98%
2.b.1	Reduction of Non-Revenue Water.	63.2%	60%	57%	54%	51%	48%	45%	40%
2.b.2	Metering Level for water consumption expressed in number of connections.	44.6%	48%	52%	60%	65%	72%	80%	85%
2.b.3	Metering Level for water production expressed in number of meters.	16.0%	30%	60%	90%	100%	100%	100%	100%
2.b.4	Metering Level for water distribution expressed in number of meters.	12.0%	13%	30%	60%	90%	100%	100%	100%
2.c.1	Initiate a program to require all licensed water utilities to have a fully documented asset management system.				100%	100%	100%	100%	100%
2.d.1	Require all licensed water utilities to develop and annually update a 5-year business plan.				100%	100%	100%	100%	100%
2.e.1	Develop and implement a targeted subsidy program for poor households.				100%	100%	100%	100%	100%

Table 6.1.2 Strategic Goals and Performance Indicators (2/2)

No.	Performance Indicators	2010	Strategic Goals for Year-End						
			2011	2012	2013	2014	2015	2016	2017
3	Improve governance and regulation in the sector.								
3.a.1	Continue to strengthen the role and function of the water regulatory entity.		50%	75%	100%	100%	100%	100%	100%
3.b.1	Expand the licensing activities of the water regulatory entity to achieve licensing of all water systems.			50%	100%	100%	100%	100%	100%
3.c.1	Develop and disseminate a Model Service Delivery Agreement.		50%	100%	100%	100%	100$	100%	100%
3.d.1	Strengthen new General Directorate in role of Technical Secretariat of National Water Council and the River Basin Agencies.			50%	75%	100%	100%	100%	100%
4	Invest in enhancing the capacities of the sector workforce.								
4.a.1	Hours of staff training per year (hours/year/person).		1	4	8	16	24	32	40
4.a.2	Number of Trained and Certified Managerial Staff for their working positions.		0	0	25	75	150	150	150
4.b.1	Require all Supervisory Council members of licensed water utilities to attend and complete a training course on their roles, duties, authorities and responsibilities.			100%	100%	100%	100%	100%	100%
5	Move toward convergence of Albanian law with EU Water Directives.								
5.a.1	Propose water related legislation for Parliamentary approval that supports convergence with EU Water Directives.			50%	100%	100%	100%	100%	100%
5.b.1	Consider and develop a new sector-specific law for water supply and sewerage services.		50%	100%	100%	100%	100%	100%	100%
5.c.1	Regional Water Supply and Wastewater Utilities.	57	57	50	45	40	35	30	26

Source: National water supply and sewerage service sector strategy 2011-2017

Table 6.1.3 Total Investment Capital Needed in Planning Period (in Lek)

Technical Assistance	2011	2012	2013	2014	2015	2016	2017	Total
New Capital Investment	32,777,877	76,146,321	69,149,936	63,501,382	64,970,718	71,564,910	69,999,837	448,110,981
Capital Repair and Replacement Investment	42,052,000	42,052,000	42,052,000	42,052,000	42,052,000	42,052,000	42,052,000	294,364,000
Technical Assistance Capital	-	3,750,000	5,750,000	3,000,000	3,000,000	2,000,000	4,000,000	21,500,000
Total	74,829,877	121,948,321	116,951,936	108,553,382	110,022,718	115,616,910	116,051,837	763,974,981

Source: National water supply and sewerage service sector strategy 2011-2017

6.1.2 Implementing Agency of Water Supply and Sewerage Sector

(1) Organization

The existing implementing agency of the WSS sector is Tirana Water Supply and Sewerage Company (UKT). As of end 2011, the total number of people working at UKT is 1,154 including 116 full-time outsourced contract employees. The Engineering department has three divisions, namely, Distribution Division, Technical Division and Sewerage Division.

The Technical Division deals with the study and design of projects needed for expansion and improvement of the transmission pipe and distribution networks. The Distribution Division manages maintenance and control of the distribution networks now limited within Municipality od Tirana (MOT) through 4 regional units. The Sewerage Division manages and maintains all the sewer networks through 4 units same as waterworks.

The Production Division is in charge of the water source, treatment plant and transmission line up to the distribution reservoir which is overseen by a vice general director since its water source spreads outside of MOT and coordination between LGUs is required. The organizational chart with staff number is shown in Figure 6.1.2 and Figure 6.1.3

(2) Performance Record

In 2011, UKT's total production volume was 105,029,200 m^3 of which 84% is produced from gravity-based source, which means Bovilla Lake and other springs, while the remaining 16% comes from an underground well using pump facilities. As to the billed water, 45,917,800 m^3 was consumed as revenue water of which 43% was consumed for residential use, 7% for private entity, 6% for institutional use, and the rest, amounting to 44%, for wholesale to the municipality/commune other than MOT. Main performance indicators and outcome of UKT in 2011 are shown in Table 6.1.4.

Table 6.1.4 Outcome of UKT Main Indicators in 2011

Item		Performance	Remarks
Coverage	Water supply (%)	91.74 %	Urban area 100% Rural Area 59.90%
	Sewerage (%)	79.40 %	
Non-Revenue Rate (%)		56.28 %	Production per capita per day 342.78 litter Water Sale per capita per day 145.87 liter
Service Hour per day		11.13 hrs.	
Water Quality Compliance Rate	Residual Chlorine (%)	100 %	
	Coliform (%)	99.44%	
Sewage Treatment Ratio		-	On-going JICA Project will contribute.
Staff Number per Connection		3.72	

Source: DPUK

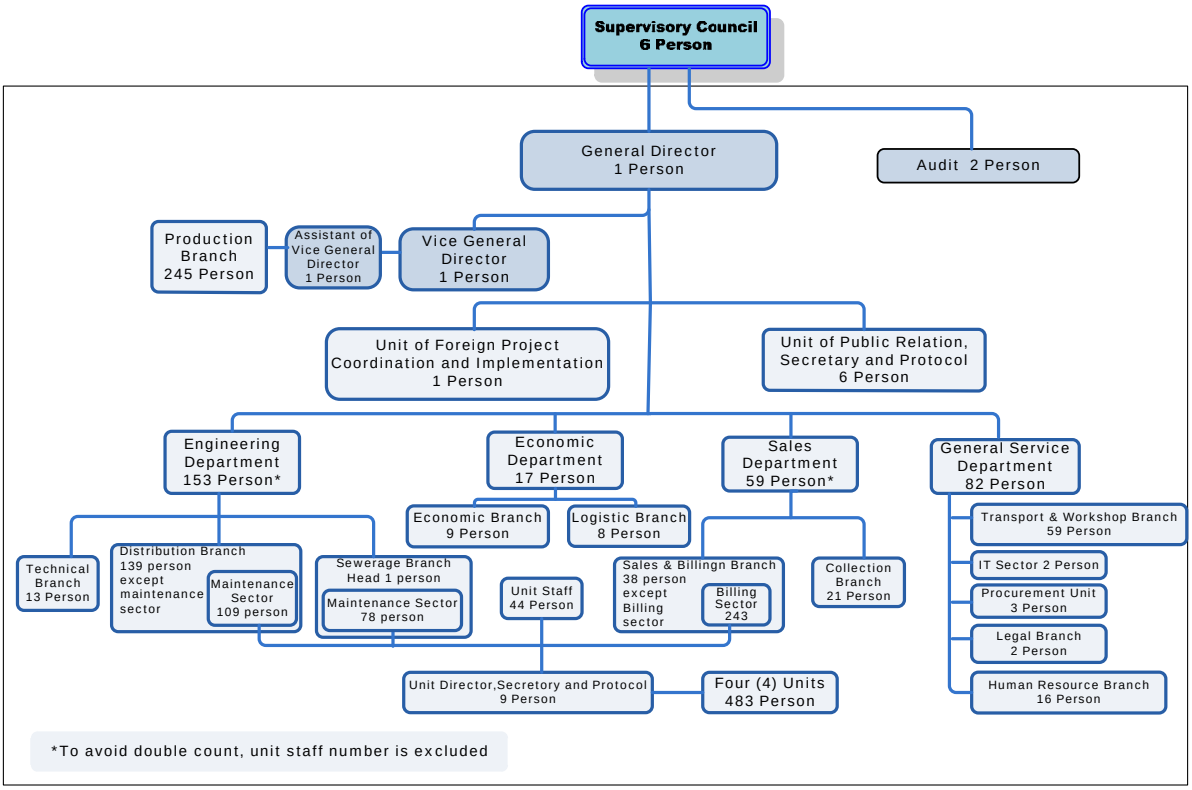
(3) Financial conditions of UKT

From the revenue-expenditure sheet, the net income of 2010 has remarkably increased from that of 2009, due to the tariff hike, increase of metered collections and removal of illegal connections. Existing tariff rate is shown in Table 6.1.5.

Table 6.1.5 Water Tariff Table

Item	For drinking water		For wastewater	
Household	45	Lek/m^3	11	Lek/m^3
Budget Institution	120	Lek/m^3	30	Lek/m^3
Private entity	135	Lek/ m^3	35	Lek/ m^3
Particular client *(Production of alcoholic drinks, drinks, pool)*	170	Lek/m^3	40	Lek/m^3
Bakery	95	Lek/m^3	13	Lek/m^3
Wholesale water sales (Municipality, Commune)	12	Lek/m^3		Lek/m^3
HEC Lanabregas	5	Lek/m^3		Lek/m^3
Fixed monthly service fee	100 Lek / Client			

Source: UKT



Source: UKT

Figure 6.1.2 Organizational Chart of UKT (Simplified Version)

6.1.3 Existing Conditions of Water Supply System

Findings on the water supply system of UKT, MOT and surrounding area which acquired through date collection, discussion and site survey in Tirana are summarized below.

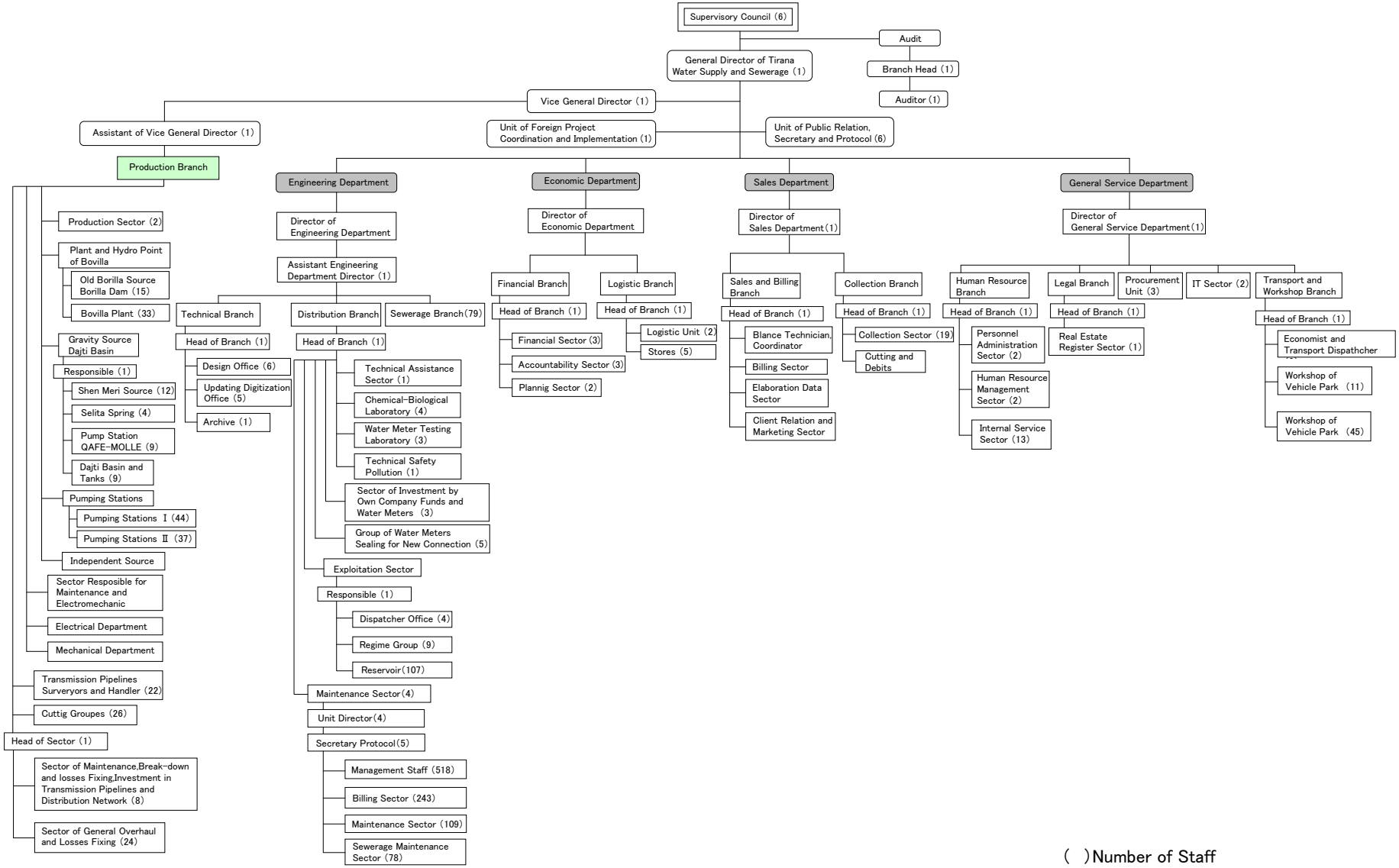
(1) Water Demand Projection

Based on URPTM projection, UKT will serve 1,290,000 water consumers, supplying a daily maximum 363,740 m^3 to 472,600 m^3 (4,210L/sec to 5,479 L/sec) in the year 2020.

(2) Current Water Supply System

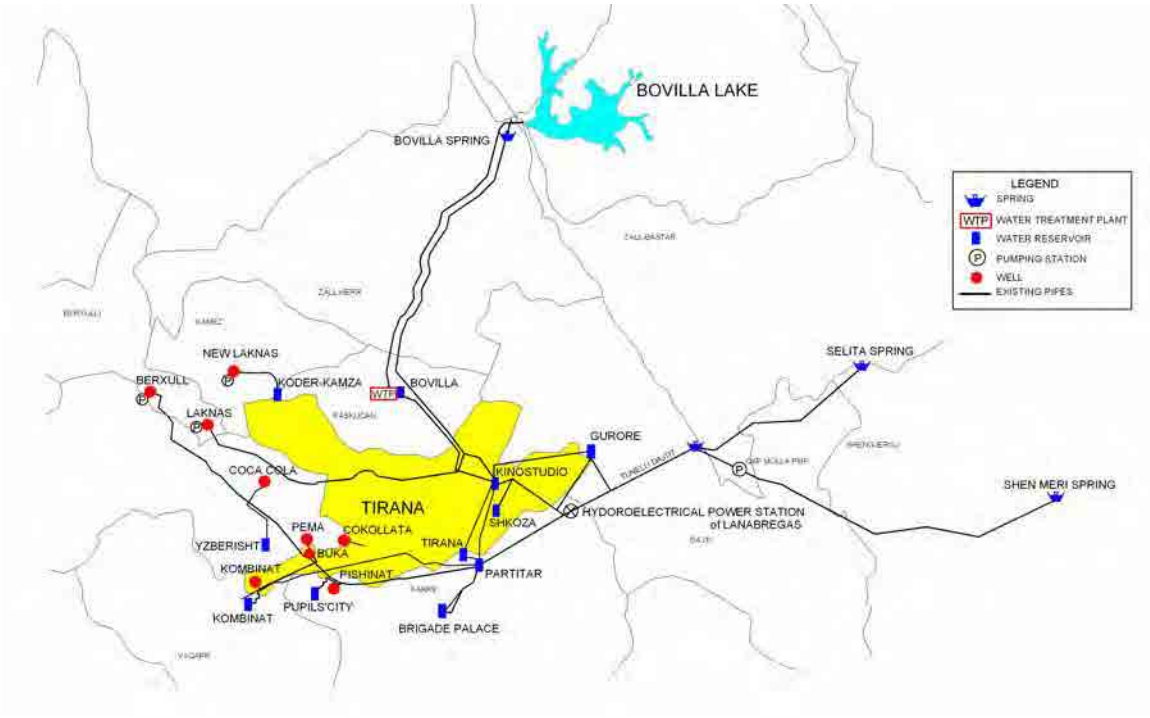
Outline of the Current System

As of 2011, MOT sources its water from 1) Surface water from Bovilla Lake, 2) 3 springs, and 3) Groundwater from 9 well fields. Surface water is treated at Bovilla Water Treatment Plant and then conveyed to the distribution network and distribution reservoirs. Spring water and ground water are also conveyed directly to the network or to the reservoirs after chlorination. Location of each source is shown in Figure 6.1.4 together with main reservoirs. Note that there are many reservoirs outside of MOT for water supply to surrounding area.



Source: UKT

Figure 6.1.3 Organizational Chart of UKT (Detailed Version)



Source: UKT

Figure 6.1.4 Water Source and Reservoir Location

Water Resources

Total intake capacity from various kinds of water sources (Bovilla Lake, three springs and nine well fields) is 3.450 m^3/sec (≒ 298,000 m^3/day), which is enough to cover the service area of UKT. Especially, Bovilla Lake is reserving abundant water for the future demand.

Bovilla Lake has good water quality and is categorized in Class A in the environmental water quality standard, while some of the well fields are exposed to the risk of pollution and eventual closure due to the lack of appropriate wastewater treatment system in the area of well fields.

Water Treatment Plant (WTP)

Bovilla WTP is the only treatment plant operated by UKT. Water from the two other sources, spring and underground, is supplied to the distribution network only after chlorination.

The treatment capacity of Bovilla WTP is 6,500 m^3/hr. (=156,000 m^3/day). Rapid sand filtration method after coagulation/sedimentation is applied for the water treatment, and powdered activated carbon is injected into the filter system to eliminate the stagnant smell of the Lake water during October to January.

Once water is treated, it is stored in the purified water reservoir located within the plant site and distributed to the network or other distribution reservoirs by gravity after post chlorination. Residual chlorine concentration at the outlet point is kept at 0.8~1.0 mg/L as of December 2011. Sludge from the sedimentation tanks and backwashed water flow into the sludge storage tanks. Overflow from the tanks is returned to the inlet receiving well, while sludge is discharged to the Tirana River.

A total of thirty plant personnel divided into four teams and three teams with one standby team operate the plant every eight hours by three shifts. Influent and effluent water quality is analyzed for seventeen parameters twice a day, at 8 a.m. and 2 p.m.

Transmission Pipe

One of the urgent issues for UKT is the illegal connection, specifically the illegal abstraction from the transmission pipe. Work is now underway to install large transmission pipes of 700 mm diameter together with the removal work since the large pipe is difficult to connect to the branch pipe.

Reservoirs

Eighteen reservoirs are located in and around MOT as of 2011, and a total capacity of 86,300 m^3, equivalent to 9.1 hours volume of the 228,700 m^3/d daily maximum supply volume in 2011.

Table 6.1.6 List of Reservoirs

No	Name of tank	Year of Construction	Volume m3	Level in m	Furnishing Source	Name of Service Area (ha)	Area served
1	New Partitar	1989	4,000	180	Shen Meri, Selite	Ali Demi Area	Ali Demi, Dhimiter Kamrda, Mihal Grameno
2	Old Partitar	1975	4,000	218	Shen Meri, Selite	Tirana e Re Area	Sauk, Sanatorium, Tre Vellezerit Kondi
3	Old Tirana	1941	4,000	179	Kinostudio	Komuna e Parisit, Tirana e Re Area	2 linja Tirane Qender, Ali Demi, PST
4	Tirana	1964	4,000	179	Kinostudio	Komuna e Parisit, Tirana e Re Area	Tirane e Re, Rr.Budi, Bajram Allaraj
5	New Tirana	2010	6,500	179	Kinostudio	Komuna e Parisit, Tirana e Re Area	Tirane Qender
6	Kinostudio 1	1972	6,000	186	Bovilla	Kinostudio Area	Kinostudio, Tirane Qytete, Linja Dajt
7	Kinostudio 2	1972	2,000	186	Bovilla	Kinostudio Area	Kodra e Priftit
8	Kinostudio	1972	2,000	205	Bovilla	Kinostudio Area	Tirane Qender
9	Kombinat 1	1951	1,000	119	PST. Pema	Kombinat, Fusha Misto Mame Area	Kombinatin
10	Kombinat 2	1983	4,000	98	PST. Pema	Kombinat, Fusha Misto Mame Area	Kombinatin
11	Qyteti Nxenesve	1987	4,000	170	PST. Pishinat	Kombinat, Fusha Misto Mame Area	Komua e parisit ,Koder e Dielli, Selite
12	Yzberisht 1	1985	1,000	118	PST. Coca-Cola	Rural Area	Unaze e Re,Yzberisht
13	Yzberisht 2	1986	400	128	PST. Coca-Cola	Rural Area	Unaze e Re, Yzberisht
14	Koder-Kamez	1990	2,000	125	Kinostudio	Rural Area	Kamez, Institutin
15	Shkoze	1979	1,000	100	Kinostudio	Rural Area	Shkoze
16	Gurore - Dajt	2011	10,000	146.5	Shen Meri, Selite	Kinostudio Area	Kinostudio, Tirane Qender
17	Pallati i Brigadave	1941	400	196	Partitar	Rural Area	Pall. Brigadave
Sum			56,300				
Bovilla Reservoir			30,000		Bovilla Dam	Tirana	
Total			86,300				

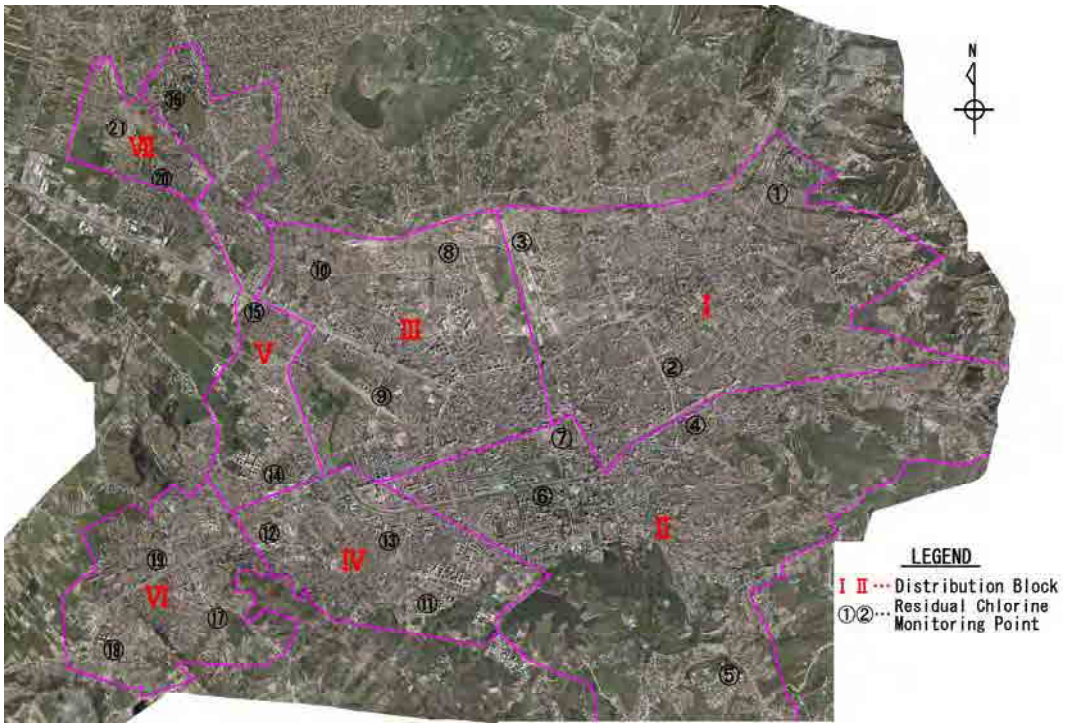
Source: JICA Study Team

Distribution Network

There exist areas where water pressure is under 2.0 MPa in the eastern hilly and southwestern area. Residual chlorine concentration measurements at 21 points in the water supply areas shown in Figure 6.1.5 was conducted by the Team in July 2012, indicated values ranging from 0.0 mg/L and 1.8 mg/L. The point with a 0.0 mg/L value is the result of being directly tapped from the raw water main without chlorination. There were 10 points recording more than 1.0 mg/L of concentration. The high concentration of chlorine injection by UKT explains this fact, especially in summer season as the higher water temperature rise, the more rapidly water consumes chlorine. UKT injects more chlorine considering that majority of the consumers use water reserved in private storage tanks while UKT water is cut off. Although this level of concentration does not pose danger to human health, a lower concentration of chlorine injection is better for the taste of water. At least 0.3 mg/L of residual chlorine concentration is necessary based on the drinkable water quality standard in Albania.

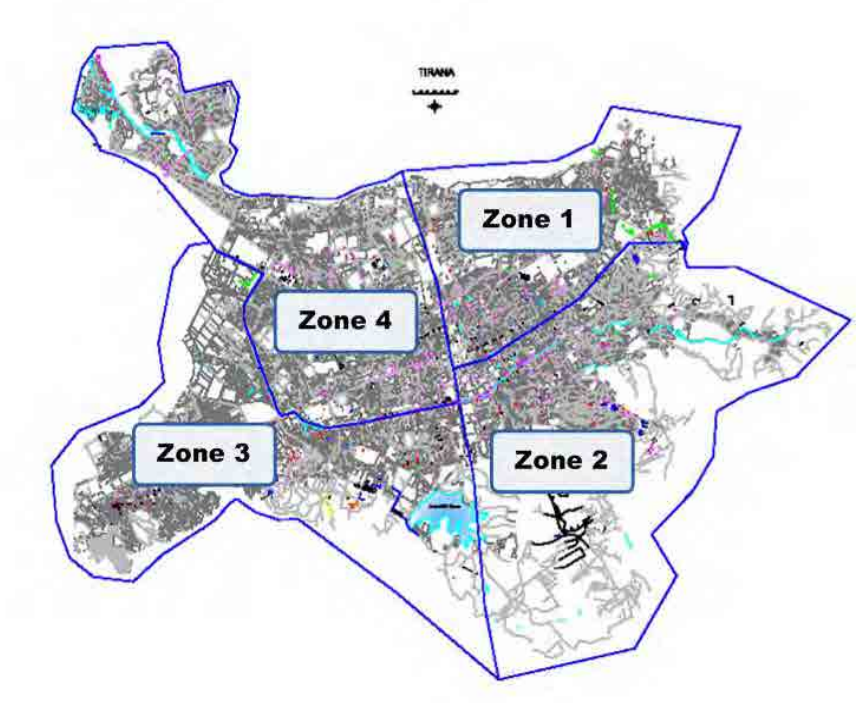
(3) Area-wise O&M Works and Billing Works

MOT is divided into 4 areas for O&M works and for billing works as shown in Figure 6.1.6. The number of connections in each area (zone) is summarized in Table 6.1.7.



Source: JICA Study Team

Figure 6.1.5 Monitoring Points of Residual Chlorine for Drinking Water



Source: UKT

Figure 6.1.6 O&M Zone

Table 6.1.7 Number of Water Connections at Each Area

No	Name of Area	Number of Connection/Consumers in the Years		
		2009	2010	2011
1	Area 1	33,585	34,111	35,229
2	Area 2	28,839	30,029	31,921
3	Area 3	46,883	48,861	53,506
4	Area 4	35,215	35,904	37,756
Total		144,522	148,905	158,412
Increase rate(%)		-	3.0	6.4

Source: UKT

(4) Activities of Other Donors on WSS Sector

Many donors have provided technical or institutional support toward the WSS sector in Albania. Recently, the German consultants, with funding from the German development bank KfW (Kreditanstalt für Wiederaufbau), have started the "Water Supply and Sewerage Master Plan for Albania." They have just submitted a draft inception report screening and verifying existing documentation, defining voids and proposing remedies. The target year of the Master Plan is set for 2040. The plan can be a big driving force for the development of WSS sector in Albania. As to Tirana-related information, no project except JICA's Sewerage Project is on-going.

6.2 Identified Problems and Planning Issues

(1) Low Revenue Water Ratio

Billed volume recorded a 21% increase in 2010, while that of 2011 remained on almost the same level (it actually decreased 0.5%). Revenue water ratio also indicated an increase to 43.7% in 2011, a marginal 1.1 points up from the previous year, compared with the 15% increase recorded in 2010. More than half of production volume has been wasted due to water leakage and/or illegal connections.

Billing of water charge is based on the meter reading, while a constant tariff is charged regardless of actual usage, whether or not there is a water meter or the meter is out of order. According to the date of General Directorate of Water Supply and Sewerage, Ministry of Public Works and Transport (DPUK), nearly 40% of household have non-metered water connections as of 2011. Since 24-hour water service is not available within all the service areas, the actual water consumption is deemed different from the potential water demand in case of full-time supply service. Repair and new installation of the water meters are also the urgent issues.

As to the flow control of the water supply system, UKT had already installed flow meters at the outlet point of each reservoir in 2011 to record the effluent water volume from each reservoir. Data from these meters enables UKT to manage the distribution of water, meeting the required demand of each distribution block. The difference between distribution volume and metered consumption volume presents clear figures of unaccounted water volume as a result of leakage or water theft in the network and it can be dealt with by efficient pipeline repair works. Introduction of network management system using hydraulic analysis software like Water Cad or a similar mapping system

helps reconstruct an efficient network system and sustainable Operation and Maintenance (O&M) works.

For the financial sustainability of UKT, further reduction of maintenance cost shall be promoted together with reduction of non-revenue water and increase of collection rate. For example, power cost, which covered almost a quarter of total maintenance cost in 2011, shall be investigated more in detail.

(2) Unstable Water Supply System in Tirana

Based on the UKT data, daily average consumption volume per capita in billed water basis was 82,354 m^3 in 2011. Daily maximum volume, the basis for configuring the water supply facilities, is estimated to be 228,700 m^3 assuming 43.7% of revenue water ratio and 82.4% of peak factor of daily average volume against the daily maximum volume. The ratio of 82.4% was applied to the daily average flow based on the records in the past 3 years.

Daily Maximum Supply Volume = Daily average supply volume ÷ Revenue water ratio ÷ Peak factor

$$= 82,354 \div 0.437 \div 0.824$$

$$= 228,700 \text{ m}^3/\text{day}$$

On the other hand, total capacity of main reservoirs within UKT service area is 86,300 m^3, equivalent to 9.1 hours of daily maximum flow (9.1=86,300/228,700 x 24). More than 12 hour-equivalent volume of daily maximum flow is required for the reservoir capacity to correspond to the hourly fluctuation, thus expansion of the reservoir capacity is desirable.

While non-revenue water ratio can be improved by reducing leakage and eliminating illegal connections, water demand per capita is likely to increase due to the increase of service populations and upgrading of life style. For this reason, production capacity of water source shall be reviewed.

Some of the water source wells located in the non-sewered areas are contaminated by ammonia or coliform attributed to sewage, and those wells are exposed to the risk of future closure.

Low water pressure area and low residual chlorine area are others issues to be tackled by UKT to improve the water supply service.

6.3 Review of Existing Policies, Strategies and Previous Studies

6.3.1 National Policy and Strategy on Water Supply and Sewerage Sector

(1) Outline of National Policy and Strategy Document released so far

This section discusses national policy and strategy on not only waterworks but also sewerage. After 2000, the following documents were released regarding Albania's national policy and strategy for the WSS sector, describing existing issues on the sector and future policy and strategy for a set target year:

- Albania – Water Supply and Sanitation Sector Strategy 2003;
- Rural Water Supply and Sanitation Strategy for the Republic of Albania 2003;

- National Strategy for Development and Integration 2007 – 2013;
- National Strategy of Water Supply and Sewerage Service Sector, Draft 2007;
- Policy and Strategy – Water Supply and Sewerage Sector 2010 – 2013; and
- National Water Supply and Sewerage Service Strategy 2011 – 2017.

In addition, the following two documents were published on institutional reform:

- Reform on Water Supply and Sewerage Sector After the Transfer Process of Water Supply and Sewerage Companies to Local Government Authorities, Two Year Plan 2007 – 2009, and
- Policy Paper – Regionalization, a new Philosophy in Water Supply and Sewerage Utility Sector, January 2010.

Major policies discussed so far in the above-mentioned documents are (1) expansion of the service area and improvement of service level; (2) financially sustainable operation of the service utilities; and (3) compliance with EU Directives. Regionally consolidated utilities are proposed after the transfer of their ownership to the LGUs; also, cross-subsidy to the poor groups shall be adopted by the government to enforce the financial conditions of the service utilities and to keep the equilibrium to the customer. Aiming at compliance with EU Directives, the River Basin Management Plan has been in effect since 2002 to protect valuable water source and to keep the water environment through periodic checks and regulation not only for the water production but also for wastewater discharge by concerned inter-ministerial agency.

6.3.2 Findings from Previous Studies

The following 4 studies, among others, have a big impact on the water supply for MOT and surrounding LGUs.

(1) Urban Regulatory Plan in MOT (URPTM: 2009)

This World Bank funded plan was prepared in 2009 to cope with the future urbanization of MOT caused by the rapid increase of population; a review of the plan is in progress. Waterworks master plan and action plan shall be in compliance with the urban planning and land use planning described in this URPTM report.

(2) Master Plan –Technical and Financial Assistance to the Greater Tirana Water Supply & Sewage Enterprise (TWS&SE) (December 2002)

This plan was prepared by Consortium Tirana Acque with financial aid of the Italian Government. It is aimed at improving operational conditions, restructuring of the organization, capacity building, and sustainability of UKT.

(3) Master Plan –Technical and Financial Assistance to the Greater TWS&SE First Update (September 2003)

The 2002 Report was updated in 2003, expanding the study area up to the surrounding communes connected to UKT's water supply and to independent water supply systems outside of UKT jurisdiction. A detailed survey of the existing facilities was done, and an improvement plan including expansion of reservoir capacity, renovation of pumping facilities, and enforcement of pipe network was proposed.

(4) Water Supply and Sewerage Master Plan for Albania

The study has just started this year with funding from KfW and covers 58 water supply and sewerage companies nationwide. In accordance with the National Policy and Strategy, released this year by MOPWT, this plan is aimed at elaborating the master plan and action plan of the 58 companies. A consolidated regional company may be introduced to stabilize their operational and financial conditions.

6.4 Overall Planning Concept and Directions of Water Supply Master Plan

6.4.1 Objectives and Strategies

(1) Objectives

Overall planning objectives are as follows:

- To balance the supply and demand volume up to the target year 2027 within UKT's jurisdiction area;
- To supply safe water without allocation; and
- To construct the framework for the sustainable water supply system.

(2) Strategy

Strategies for accomplishing the above-mentioned objectives are as follows:

- Set up an efficient and practical plan for the solution of existing problems and achievement of the goal;
- To comply with the staged goal described in "National Water Supply and Sewerage Services Sector Strategy 2011-2017"; and
- To follow the short and middle-term action plan prepared by UKT based on the national policy.

(3) Target Area

The existing service area of UKT covers not only MOT but also the surrounding municipalities and communes. Therefore, in discussing and investigating the water supply system in MOT, the total area should always be taken into consideration. Although effective and practical action plans are focused on the "yellow line area," some proposals related to the water sources, treatment plant, reservoirs, raw water pipeline and water transmission pipeline cover areas beyond the yellow line.

(4) Target year

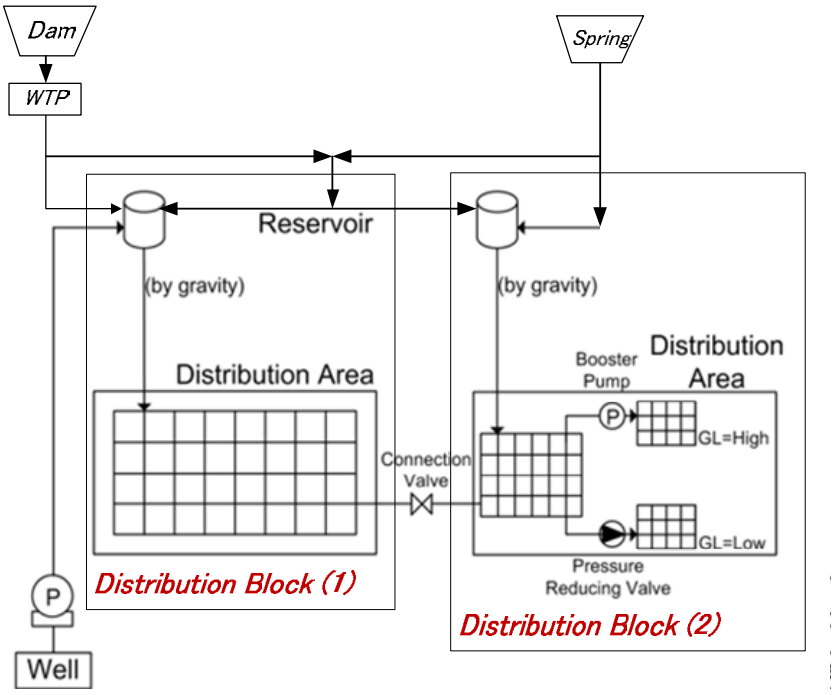
As a staged plan with target year up to 2027, the short-term target year is set at 2017, while the mid-term target year is 2022. The goal at each stage is clearly figured in this study.

(5) Methodology of the Study

The first step of the work is future demand projection based on future population by distribution blocks under which flow control shall be conducted. One distribution block is the area covered and supplied by one reservoir or several reservoirs located nearby as shown in Figure 6.4.1. Next comes the balancing of the gap between total water supply and total demand.

Based on the balanced figure, the following improvement plan shall be elaborated.

- Additional water source development;
- Water flow/quality control;
- Peak demand control;
- Inter distribution block volume control;
- Energy saving plan; and
- Capacity building.



Source: JICA Study Team

Figure 6.4.1 Separate Distribution Block

6.4.2 Overall Concept of Sustainable Water Supply System

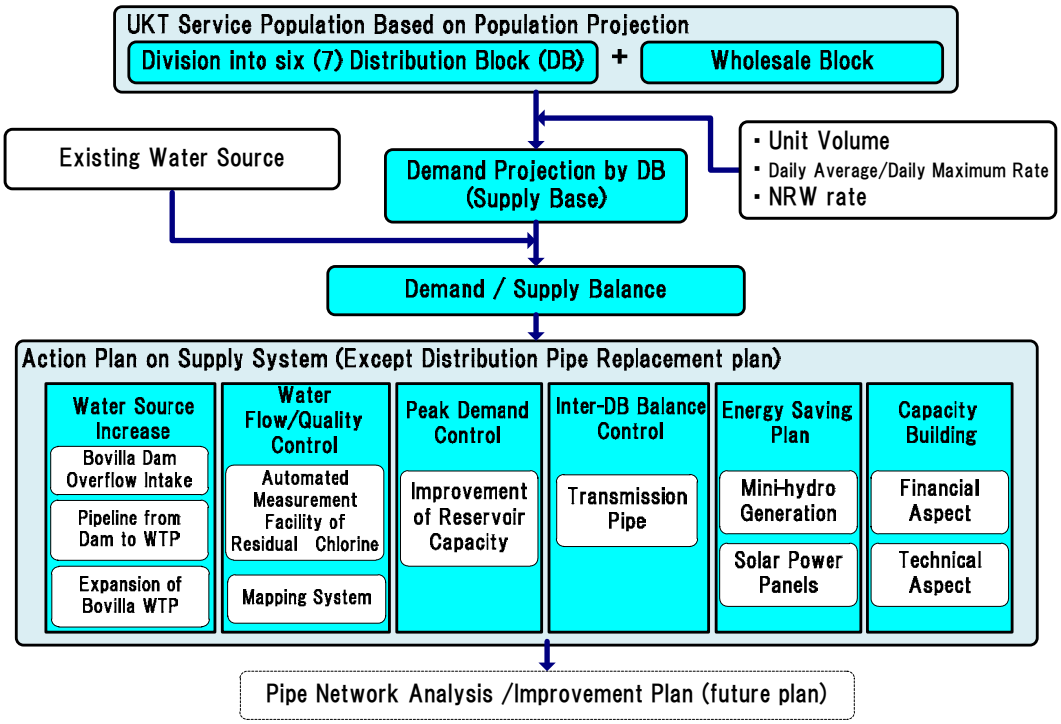
For a sustainable water supply system, additional water sources should be developed to meet future water demand. Since the use of Bovilla dam overflow water for drinking water is promising, this surface water is subject to water treatment process before it is distributed to the network. Expansion of the capacity of Bovilla WTP is required. To solve the existing intermittent water distribution problem, volume expansion of the water distribution reservoir to correspond to the hourly peak flow is required. The storage volume equivalent to the volume of 12 hours daily maximum flow is desirable. Overall concept is summarized as follows.

- Balanced water supply and demand volume
- Appropriate water transmission pipeline from the water source(s) to the distribution reservoir(s)
- Adequate capacity of reservoirs to absorb the fluctuation of the peak flow.
- Flow control based on the separate water distribution block system.

- Introduction of District Metering Area (DMA) for the detection of leakage point in the network

6.4.3 Study Flow

Figure 6.4.2 shows the study flow.



Source: JICA Study Team

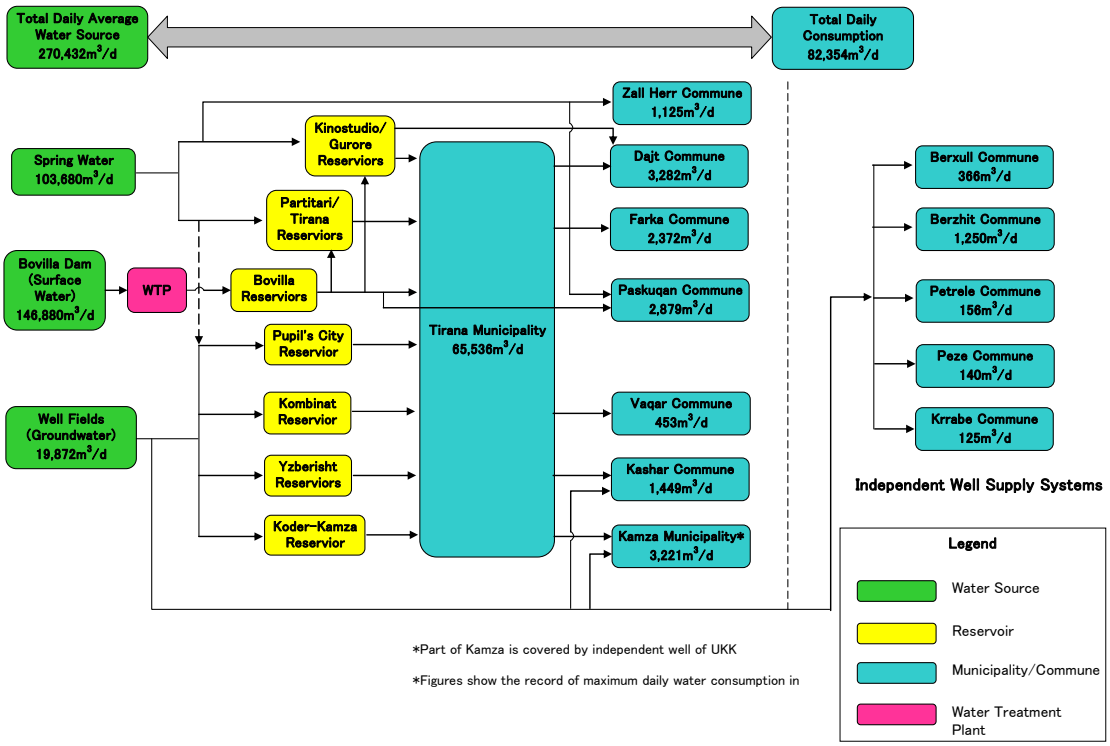
Figure 6.4.2 Study Flow

Detailed water pressure analysis in the water distribution network shall be done after adequate program or software is introduced to UKT.

6.5 Quantitative Analysis of Water Demand and Capacity Gap

(1) Water Demand Projection

Before water demand projection overall supply conditions are first briefly discussed here. Existing balance flow between water source and local consumption is summarized in Figure 6.5.1 based on the data provided by UKT.



Source: JICA Study Team

Figure 6.5.1 Water Balance between Source and Consumption

Numbers in Figure 6.5.1 are based on the water consumption volume in 2011 in Table 6.5.1 and the water source volume in Table 6.5.2

At present, 13 municipalities/communes, shown in Table 6.5.1, receive water supply from UKT. Other than MOT, most of the areas are supplied by wholesale basis, which means the water volume is measured by bulk meter and sold. These areas are the target area of UKT.

Table 6.5.1 Water Supply Area and Volume Sold

No	Commune/ Municipality	Water Sold (m3/year)					
		2009		2010		2011	
		Volume	ratio(%)	Volume	ratio(%)	Volume	ratio(%)
1	Tirane Municipality	23,511,980	94.2	25,601,111	84.8	23,920,817	79.6
2	Berxull Commune	5,424	0.0	95,824	0.3	133,567	0.4
3	Dajti Commune	91,873	0.4	877,732	2.9	1,197,808	4.0
4	Kamez Municipality	127,602	0.5	1,020,714	3.4	1,175,504	3.9
5	Kashar Commune	290,952	1.2	422,578	1.4	528,972	1.8
6	Paskuqan Commune	562,510	2.3	591,093	2.0	1,050,815	3.5
7	Farke Commune	13,776	0.1	678,055	2.2	865,791	2.9
8	Vaqar Commune	33,750	0.1	37,852	0.1	164,751	0.5
9	Zall Herr Commune	172,470	0.7	350,242	1.2	410,566	1.4
10	Berzhite Commune	41,468	0.2	408,849	1.4	456,427	1.5
11	Petrele Commune	36,980	0.1	37,598	0.1	57,201	0.2
12	Peze Commune	49,597	0.2	50,185	0.2	50,937	0.2
13	Krrabe Commune	27,438	0.1	24,595	0.1	45,924	0.2
Total	(m3/Year)	24,965,820		30,196,428		30,059,080	
	(m3/day)	68,400		82,730		82,354	
Increase rate		-	100	21.0	100	-0.5	100

Source : UKT

Table 6.5.2 Water Source Volume

Name of Source	Flow (L/sec)			Remarks
	Average	Max	Min	
Well Field	450	450	450	
Spring	1,200	1,850	800	
Surface Water	1,800	1,800	1,800	Bovilla Lake
Total (L/sec)	3,450	4,100	3,050	
Total (m³/day)	298,100	354,200	263,500	

Source: UKT

On the other hand, the daily maximum volume in 2011, the base figure for configuring the water supply facilities, is estimated to be 228,700 m^3 assuming 43.7% of revenue water ratio, the reverse ratio of NRW in 2011, and 82.4% of peak factor of daily average volume against daily maximum volume. The 82.4% was applied based on the minimum figure in past 3 years' performance shown in Table 6.5.3.

Daily Maximum Volume = 82,354 / 0.437 / 0.824 = 228,700 m^3/day.

Table 6.5.3 Daily Distribution Record in Past 3 years

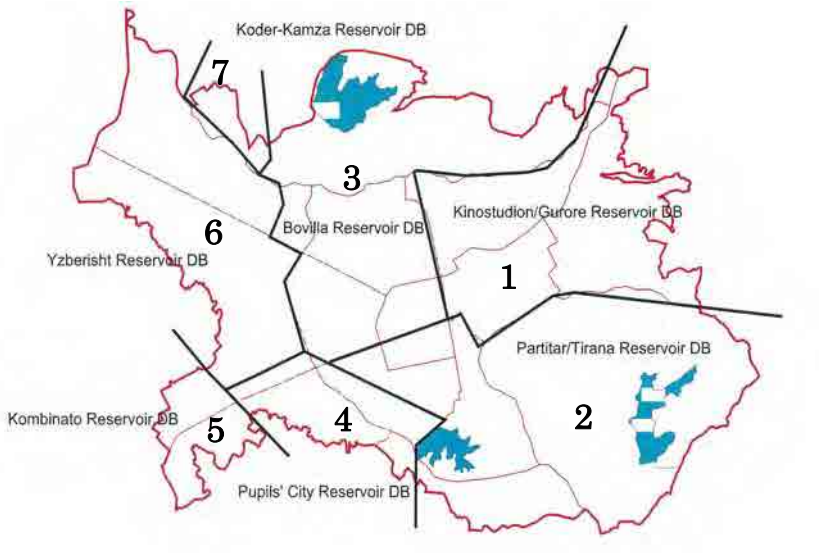
No	Name of Reservoir	Daily Flow in m3					
		2009		2010		2011	
		Max daily	Average daily	Max daily	Average daily	Max daily	Average daily
1	New Partitar	10,000	8,000	16,000	15,000	17,000	16,000
2	Old Partitar	12,000	10,000	16,000	14,000	17,000	15,000
3	Kinostudio 1	14,000	12,000	20,000	18,000	21,000	19,000
4	Kinostudio 2	6,000	5,000	8,000	6,000	9,000	7,000
5	Kinostudio		0	4,000	3,000	5,000	4,000
6	Qyteti i Nxenesve	7,000	6,000	12,000	10,000	13,000	11,000
7	Kombinat 1	10,000	8,000	12,000	12,000	13,000	13,000
8	Kombinat 2	6,000	5,000	8,000	6,000	9,000	7,000
9	Tirana 1	10,000	8,000	16,000	14,000	17,000	15,000
10	Tirana 2	10,000	8,000	16,000	14,000	17,000	15,000
11	Tirana 3		0	20,000	18,000	21,000	19,000
Total		85,000	70,000	148,000	130,000	159,000	141,000

Source: UKT

Water demand in 2027 is calculated by 13 Municipalities/Communes under the conditions described below.

- Unit volume per service population is 200 liters in 2027 on a daily average basis (200 lpcd).
- Demand volume is converted to daily maximum volume assuming the peak factor between daily average and daily maximum flow as 0.85 referring to past performances.
- Non-revenue water (NRW) rate will be reduced to 20% by 2027
- MOT is completely covered by UKT, while some municipalities/communes have other local water source, for example, Tirana Water Supply and Sewage Company UKK for Kamuza Municipality, though full coverage is not considered. There are some communes who are out of this study's scope and no population projection exists. For such communes, 1.5 times of 2011 supply volume is assumed as future consumption volume.

Water demand on a daily maximum supply basis in MOT is divided into 7 proposed distribution blocks, as shown in Figure 6.5.2. The population of each of the 11 mini-municipalities is distributed to each block as shown in Table 6.5.4.



Source: UKT

Figure 6.5.2 Distribution Block Area

Table 6.5.4 Service Population by Distribution Block

mini-municipality / Distribution Block	Tirana 1	Tirana 2	Tirana 3	Tirana 4	Tirana 5	Tirana 6	Tirana 7	Tirana 8	Tirana 9	Tirana 10	Tirana 11	Service Population
	54,464	122,181	54,540	65,489	100,403	92,987	97,503	54,935	84,461	31,320	83,078	
1. Gurore/Kinostudio	21,782	12,217	54,540	65,489				54,935	16,890			225,853
2. Partitar/Tirana	32,682	109,964			40,159		19,497			20,360		222,662
3. Bovilla Reservoir						4,648	68,250		67,571	10,960	37,390	188,819
4. Pupils' City					60,244	18,601						78,845
5. Kombinat						41,841						41,841
6. Yzberisht						27,897	9,756				24,918	62,571
7. Koder-Kamza											20,770	20,770
SUM	54,464	122,181	54,540	65,489	100,403	92,987	97,503	54,935	84,461	31,320	83,078	841,361

Source: JICA Study Team

Water demand in MOT is summarized in Table 6.5.5.

Table 6.5.5 Water Demand in MOT in 2027

mini-municipality / Distribution Block	Service Population	Daily Maximum Volume (m³/day)
1. Gurore/Kinostudio	225,853	66,430
2. Partitar/Tirana	222,662	65,490
3. Bovilla Reservoir	188,819	55,530
4. Pupils' City	78,845	23,190
5. Kombinat	41,841	12,310
6. Yzberisht	62,571	18,400
7. Koder-Kamza	20,770	6,100
SUM	841,361	247,450

Source: JICA Study Team

Water demand in the LGUs other than MOT is summarized in Table 6.5.6. The populations served in Zall Herr, Berzhit, Petrele, Peze and Krreabe Commune are not estimated in this study. The water service areas in Table 6.5.6 are mainly supplied by wholesale basis, that is, bulk volume contract basis.

Table 6.5.6 Water Demand in MOT in 2026

LGU	Service Population by UKT	Daily Maximum Volume (m3/d)	LGU	Service Population by UKT	Daily Maximum Volume (m3/d)
Kamza Municipality	32,580	9,580	Zall Herr Commune		2,480
Paskuqan Commune	45,620	13,420	Berzhit Commune		2,760
Kashar Commune	35,480	10,430	Petrele Commune		350
Farka Commune	25,340	7,450	Peze Commune		310
Dajt Commune	10,140	2,980	Krrabe Commune		280
Berxulle Commune	8,110	2,390			
Vaqarr Commune	10,640	3,130	Total		55,560

Source: JICA Study Team

Total water demand within UKT jurisdiction in 2027 on a daily maximum volume basis is calculated to be 303,010 (=247,450+55,560) ≒303,000 m^3/d.

Water demand on a daily maximum basis in 2027 within UKT jurisdiction is 303,000 m^3/d

Table 6.5.7 Water Demand Projection

Tirana Municipality

Mini-municipality / Distribution Block	Tirana 1	Tirana 2	Tirana 3	Tirana 4	Tirana 5	Tirana 6	Tirana 7	Tirana 8	Tirana 9	Tirana 10	Tirana 11	Total	Unit volume(lpcd)	Daily maximum volume
	54,464	122,181	54,540	65,489	100,403	92,987	97,503	54,935	84,461	31,320	83,078	841,361	200	
Gurore/Kinostudio	21,782	12,217	54,540	65,489				54,935	16,890			225,853	45,171	66,430
Partitar/Tirana	32,682	109,964			40,159		19,497			20,360		222,662	44,530	65,490
Bovilla Reservoir						4,648	68,250		67,571	10,960	37,390	188,819	37,760	55,530
Pupils' City					60,244	18,601						78,845	15,770	23,190
Kombinat						41,841						41,841	8,370	12,310
Yzberisht						27,897	9,756				24,918	62,571	12,510	18,400
Koder-Kamza											20,770	20,770	4,150	6,100
SUM	54,464	122,181	54,540	65,489	100,403	92,987	97,503	54,935	84,461	31,320	83,078	841,361	168,261	247,450

Other than Tirana municipality (1)

	2027 population	Total Demand (m3/d)	2011billed volume(m^3/d)	Daily maximum volume 2027 volume	Coverage at 2027	
Kamza Municipality	108,610	21,722	3,220	9,580	30%	(UKK 70%)
Paskuqan Commune	65,166	13,033	2,880	13,420	70%	
Kashar Commune	50,684	10,137	1,450	10,430	70%	
Farka Commune	36,203	7,241	2,372	7,450	70%	
Dajt Commune	14,481	2,896	3,280	2,980	70%	
Berxulle Commune	11,585	2,317	366	2,390	70%	
Vaqarr Commune	15,205	3,041	451	3,130	70%	
SUM	301,934	60,387	14,019	49,380		

Other than Tirana municipality (2)	2011 billed volume (m^3/d)	Daily maximum volume
Zall Herr Commune	1,125	2,480
Berzhit Commune	1,250	2,760
Petrele Commune	157	350
Peze Commune	140	310
Krrabe Commune	126	280
SUM		6,180

(*) Daily Maximum Volume = Daily Average Volume/0.8(Revenue water ratio)/ 0.85(peak factor)

Total Maximum Volume = 247,450 + 49,380 + 6,180 = 303,010 ⇒ 303,000m3/day

Source: JICA Study Team

(2) Water Supply Capacity

Although the water supply capacity varies by season, dry and wet seasons, and also by year, the existing total supply capacity is assumed to be 283,100 m^3/day (≒ Intake capacity 298,000 m^3/day

× 0.95) assuming 5% operational losses based on 2011 performance. Water sources are 1 dammed surface water source, 3 springs and 9 wellfields.

Existing water supply capacity is 283,100 m^3/d

(3) Water Demand and Supply Balance

It is requested that the daily maximum demand be satisfied by the constant water supply all year round. Corresponding to the water demand of 303,000 m^3/d in 2027, an additional water supply capacity of approximately 20,000 m^3/d is required according to the following calculations:

Demand-supply gap in 2027 is
303,000 - 283,100 m^3/d = 19,900 ≒20,000 m^3/d

6.6 Water Resource Management

(1) Water Resource

According to the URPTM 2009 report, the potential intake volume of existing water sources will not be able to cover the future water demand of the service area, while UKT staff believes the potential volume is enough for future demand as long as the produced water reaches the distribution reservoirs with minimum leakage and illegal connection losses.

From the projection of the Study Team, approximately 20,000 m^3/d additional water supply capacity is required and this volume can be covered by the overflow water of Bovilla dam now amounting to 20,000,000 m^3/year (= 54,800 m^3/d).

In case of closure of groundwater wells that are probably contaminated, sourcing of the 20,000 m^3/d of water elsewhere is necessary. In total, an additional 40,000 m^3/d has to be sourced and developed before the target year. The Study Team assumes groundwater will be used continuously up to the target year.

For the continuous use of the existing wells, installation of sewers in the area of well fields is recommended to prevent groundwater contamination.

(2) Raw Water Main

Water conveyance of additional 54,800 m^3/d of water from Bovilla dam to Bovilla WTP requires laying more pipelines with a diameter of 800 mm and length of 10.5 km.

6.7 Water Treatment Facilities

(1) Water Treatment Plant

The Bovilla WTP capacity is increased by 50,000 m^3/d, from the existing 156,000 m^3/d to 206,000 m^3/d, using the overflow water from the Bovilla dam.

Proposed daily maximum water demand in 2027 is estimated at 303,000 m^3/day. Meanwhile, the existing water supply capacity is 283,100 m^3/d. Although the balance explained earlier at the

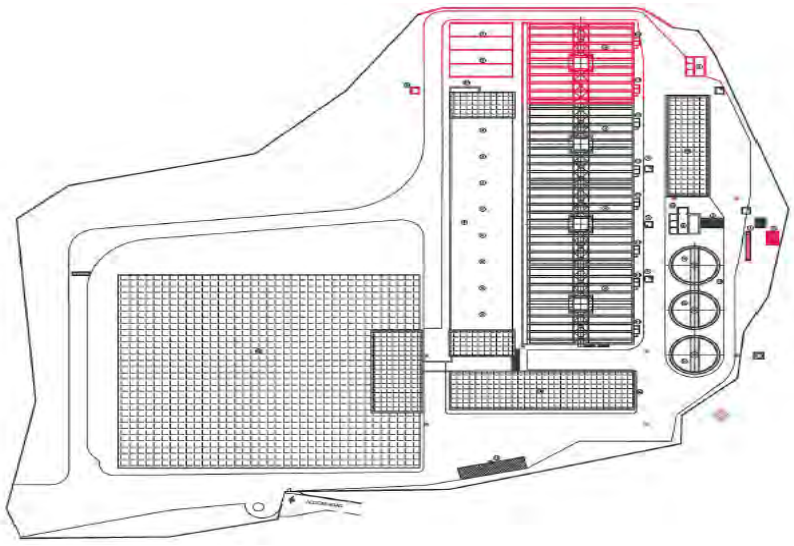
additional capacity of 20,000 m^3/d is enough to meet the daily maximum water demand in 2027, the total water supply capacity falls short against the demand in just five years considering the construction work of the expansion facilities of 20,000 m^3/d is scheduled to be completed in 2022.

It is necessary to decide the increase capacity of the Bovilla WTP considering the extension of water supply hours, in view of increased water demand in Tirana and the surrounding area through the improvement of the water supply system, and the possibility of closure of contaminated groundwater wells.

Furthermore, the amount of overflow volume of 20,000,000 m^3/year (54,800 m^3/d) from the Bovilla Dam may fluctuate owing to seasonal changes.

In conclusion, the increase capacity of the Bovilla WTP is decided at 50,000 m^3/d considering unpredictable factors and expansion of the existing capacity from 156,000 m^3/d to 206,000 m^3/d.

Treatment method of expansion facility is selected from two options. First option is to adopt the same treatment method as the existing facilities – flocculation/sedimentation and rapid sand filtration method. Second option is to adopt membrane filtration method, which has become a popular method in Japan. An advantage of membrane filtration method is its space saving characters, while its disadvantage is power cost and complex maintenance procedure. The membrane has to be cleaned with chemicals regularly, once or twice a year, at the manufacturer's designated plant. Since the latter is not convenient in Albania, the Study Team recommends the first option. Even in this case, the required area for the adopted method, flocculation/sedimentation and rapid sand filtration, can be secured within the existing plant site, as shown in Figure 6.7.1, without area expansion.



Source: UKT

Figure 6.7.1 Expansion Plan of Bovilla WTP

6.8 Rehabilitation and Expansion of Water Distribution System

(1) Transmission Pipe and Distribution Network

New water transmission pipes of ductile cast iron shall be installed between the WTP and the distribution reservoirs to establish a stable water transmission system and to prevent illegal connections.

Additional connection pipe(s) between the water distribution blocks shall be installed to mitigate the low water pressure problem in the eastern hilly area and the southwest area of MOT. Those service areas will be supplied by new reservoir(s).

To check the residual chlorine concentration within the water distribution network, an automatic measurement system shall be installed at the point where the low residual chlorine concentration is anticipated. Fifteen points or so shall be selected as the water sampling points.

A pipe mapping system having also the function to carry out hydraulic analysis shall be introduced to prepare the expansion, repair and replacement plan corresponding to the increase of the water demand and urbanization of the area. Assigned personnel have to master the know-how of the system through classroom or on-the-job training.

(2) Water Distribution Reservoirs

Water allocation to each water distribution reservoir is mainly caused by the shortage of water storage capacity of the reservoirs. Increasing reservoir capacity is an essential measure to enable 24-hour water supply.

The seven water distribution blocks cover water supply for the entire area of MOT. Some reservoirs are supplied from another reservoir to adjust the water balance for the service blocks. The required water storage capacity of each reservoir is decided considering the water demand of the service covering area and also the water transmission capacity. Basically, the required capacity is one hour volume equivalent to the daily maximum water demand. Table 6.8.1 shows the required volume of each water distribution reservoir. Many water distribution reservoirs need expansion of the water storage volume.

Table 6.8.1 Expansion Plan of Reservoirs

Nr.	Distribution block	Maximum daily demand(m^3/d) in 2027 Ⓐ	Volume required for 12hours of detension (m^3) Ⓑ=Ⓐ×12/24	Volume required for transmission adjustment (m^3) Ⓒ	Required volume of proposed reservoir (m^3) Ⓓ=Ⓑ+Ⓒ	Volume of existing reservoir (m^3) Ⓔ	Volume of reservoir planned or under construction (m^3) Ⓕ	Required volume of necessaary to increase (m^3) Ⓖ	Proposed
Ⅰ	Gurore／Kinostudio	Gurore 31,620 Kinostudio 34,810 66,430	33,215	1,728	34,943	21,000	8,000 (2013)	5,943 ⇒6,000	**15,000m3 of additional water reservoir (including 1,000m3 of Shkoze reservoir) is necessary to construct.**
Ⅱ	Partitar／Tirana	Partitar 24,030 Tirana 41,460 65,490	32,745	—	32,745	22,900	15,000 (start 2012)	—	**No increasing of reservoir is necessary after complition of 15,000m3 reservoir construction.**
Ⅲ	Bovilla	55,530	27,765	5,678(*)	33,443	30,000		3,443	**Transmission to Kombinat, Pupil's city, Yzberisht and Koder-Kamza block is considered in the future.**
Ⅳ	Pupil's City (Qyteti Nxenesve)	23,190	11,595	—	11,595	4,000	6,500 (2014)	1,095	**8,000m3 of additional water reservoir is proposed (planned volume + required volume)**
Ⅴ	Kombinat	12,310	6,155	—	6,155	5,000	5,000 (2015)	—	**3,000m3 of additional water reservoir is proposed instead of 5,000m3 construction planned**
Ⅵ	Yzberisht	18,400	9,200	—	9,200	1,400	6,500 (2015)	1,300	**8,000m3 of additional water reservoir is proposed (planned volume + required volume)**
Ⅶ	Koder-Kamza	6,100	3,050	—	3,050	2,000	—	1,050	**2,000m3 of additional water reservoir is proposed**
	計	247,450	123,725			86,300			

(*) Break down of required transmission adjustment volume of Bovilla block

- One hour volume of Kinostudio water supply
  $34,810m^3/d \times 1/24=1,450m^3$
- One hour volume of Tirana water supply
  $41,460m^3/d \times 1/24=1,728m^3$
- One hour volume of Kombnat water supply
  $12,310m^3/d \times 1/24=513m^3$
- One hour volume of Pupil's City water supply
  $23,190m^3/d \times 1/24=966m^3$
- One hour volume of Yzberisht water supply
  $18,400m^3/d \times 1/24=767m^3$
- One hour volume of Koder-Kamza water supply
  $6,100m^3/d \times 1/24=254m^3$

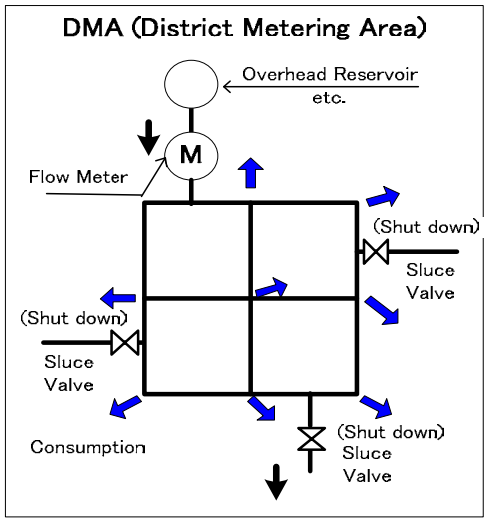
Total $5,678m^3$

Source: JICA Study Team

(3) Reduction of Non-Revenue Water

Reduction of non-revenue water is one of the urgent issues to stabilize the financial condition of UKT. UKT assumes that water losses due to illegal connections account for 30 to 35% of NRW and 20 to 25% of NRW volume is wasted from the deteriorated old pipeline mostly made of steel pipes. Although the replacement of water transmission pipe to prevent illegal connections is undertaken by UKT, non-revenue water rate still remains high. Planned water leakage surveys and repair work shall be scheduled setting up the special task force team with appropriate water leakage detection devices.

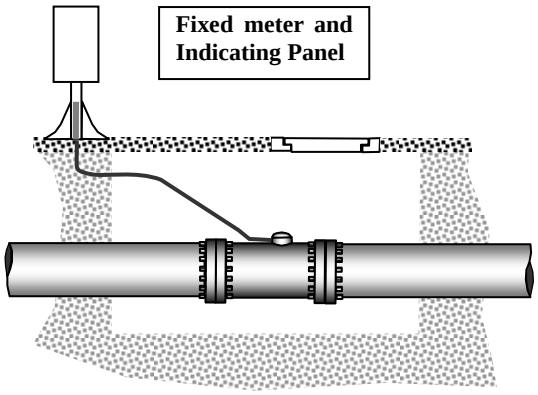
For the reduction of NRW, flow control or measurement based on the DMA is one of the useful methods. Block (shut) valve(s) and flow meter(s) shall be inserted to structure the DMA within the network to measure the daytime/night time water flow at the pending points to determine the leakage point（see Figure 6.8.1）.



Source: JICA Study Team

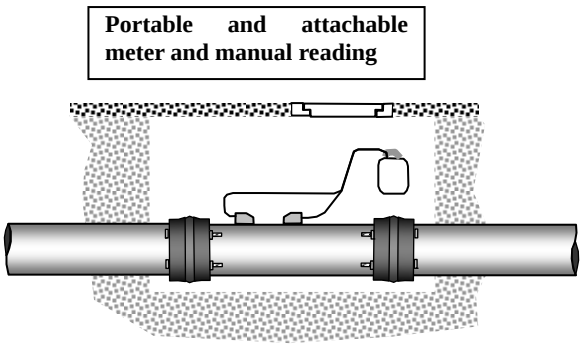
Figure 6.8.1 District Metering Area

The flow meter used for the formation of DMA can be a temporary portable meter instead of a permanently installed meter as shown in Figure 6.8.2 and Figure 6.8.3.



Source: JICA Study Team

Figure 6.8.2 Permanent Monitoring Meter(Electro-magnetic flow meter)



Source: JICA Study Team

Figure 6.8.3 Temporary Monitoring Meter(Portable type ultrasonic flow meter)

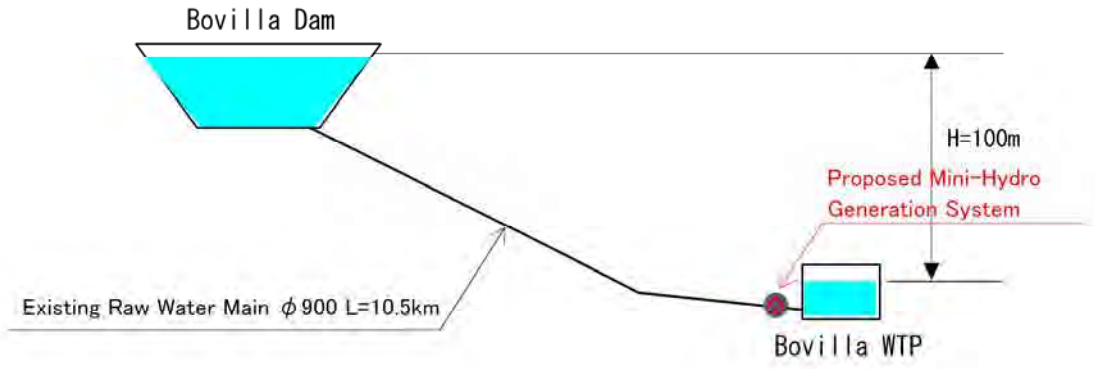
Another issue making the NRW reduction difficult is the removal of water meter at the house connection point. Unmetered house connections amount to 30% of all the connections. Not only new installation of water meter but also repair or replacement of broken meter shall be promoted. Since water meter accuracy drops as time goes by, replacement work shall be done regularly considering the lifetime of the meter.

6.9 Introduction of Environment-friendly and Energy-saving Technologies

Reduction of power cost, which accounts for nearly one-fourth of total O&M cost of UKT, is one big issue to ensure a stable management of the water supply system. Power cost reduction by utilization of renewable energy, hydro-power and solar power etc., can be appealing countermeasures.

(1) Mini-hydro Generation System

The raw water pipeline from Bovilla Dam to Bovilla WTP has a diameter of 900 mm and spans a length of 10.5 km. The WTP has approximately 100 m ground-height difference. Introduction of mini-hydro generation system utilizing this potential energy enables reduction of power cost for the maintenance of the WTP. The result of calculations is shown in Figure 6.9.1.



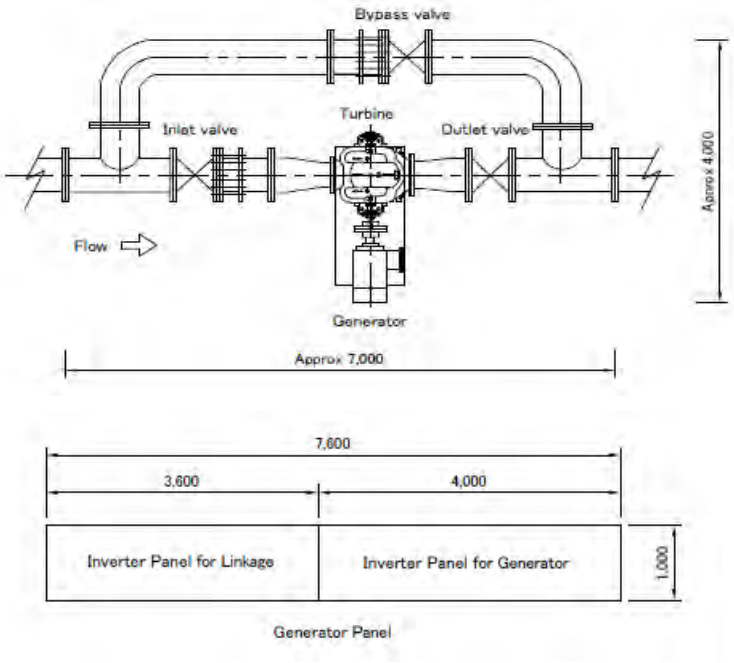
$$P_f = G \times Q_f \times H_{ef} \times \eta = 9.8 \times 1.81 \times 15 \times 0.75 = 200 \text{ (kW)}$$

Where P_f : constant output power (kw)
G : Acceleration of gravity (=9.8 m/sec^2)
Q_f : Constant flow rate (=1.81m^3/sec)
H_{ef} : Effective difference in height (=15m)
η : Efficiency rate (= 0.75)

Source: JICA Study Team

Figure 6.9.1 Proposed Mini-Hydro Generation System

A diagram of a mini-hydro power plant is shown in Figure 6.9.2.



Source: JICA Study Team

Figure 6.9.2 Required Space for Generator and Electrical Panel

(2) Solar Panel Generation System

Electricity produced by solar panel installed above the Bovilla clear water tank (Distribution Tank of 30,000 m^3) can reduce the power cost of the WTP.

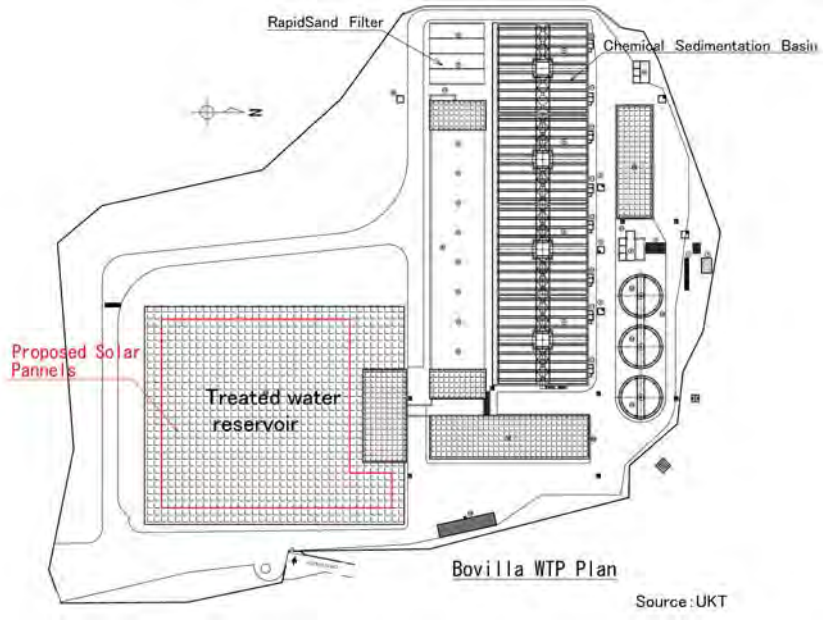


Figure 6.9.3 Solar Panel Generation System of WTP

6.10 Institutional, Organizational and Financial Reforms for Sustainable Water Administration

(1) Institutional Reform

Although the ownership of UKT was transferred to the local government units located in the area of service, including 3 municipalities and 16 communes in January 2007 and UKT became a Joint Stock Company, the autonomy of UKT is still limited. Water tariff is approved and licensed by the Water Regulatory Authority (WRA) and UKT activity is monitored by DPUK. UKT has to keep good relations with both agencies for providing stable water service to the customers and to try to assume more autonomy.

(2) Organizational Reform

a) Number of Personnel

As for the number of personnel overseeing one connection, UKT should try to reduce the number to aim for a more efficient management system. Some work which can be done by a contractor shall be outsourced.

b) Reshuffle of Production Branch

One remarkable feature is that the UKT Production Branch is under the control of vice director of UKT and not under the Engineering Division. That is because water sources are located in a wide range of area and the coordination among the multi-LGUs is required. However, data/information and also technical issues should be shared with Distribution Branch personnel now under the Engineering Division, and integration of the Production Branch into the Engineering Division providing more linkage with the Distribution Branch is desirable since both branches are closely related and total system efficiency is evaluated by the activity of both branches.

c) Enforcement of IT/GIS section

Although UKT has electronic data of existing water distribution network, the data and the system are not well structured. The more detailed network mapping shall be completed using GIS data of IT section.

d) Enforcement of Leakage Detection/Repair Section

Considering the high NRW rate, enforcement of leakage detection and repair is indispensable. Attendance in the JICA training course on NRW reduction is also recommended.

e) Capacity Building by Participating in JICA Training Course on Waterworks Management

Attendance to the JICA training course on waterworks management is also recommended. As a whole, UKT should aim for more slimmed down and efficient organization gradually reducing number of personnel and raising efficiency.

(3) Financial Reform and Consideration to the Poor

Water tariff is proposed by UKT and approved by WRA, so financial reform, that is financial stability, comes from, firstly, reduction of O&M cost and, secondly, reduction of NRW by

installation of accurate water meters.

a) Reduction of O&M cost

Power cost and chemical cost shall be reviewed by checking whether uneconomical operation is taking place or not.

b) Reduction of NRW by Installation of Accurate Water Meters

First step to reduce NRW is water tariff collection with accurate water meter reading. Not a small number of households are non-metered in spite of UKT's installation work. UKT should continue to patiently install accurate water meters.

As to the water tariff, new methodology under which consumers will be charged based on consumption thresholds in place of the existing constant unit cost system has been approved by the Water Regulatory Entity. According to information obtained, the new methodology divides water consumption into 4 blocks, with the first one having 4.5 m^3 as a threshold, the second 30 m^3, the third block 20 to 30 m^3 and the final block above 30 m^3 so that families facing financial difficulties are given relief and misuse or waste of water is prevented. Under this system a family with small consumption pays less, while excessive consumption is reduced due to higher tariff.

The new system is expected to be applied next year, 2013.

6.11 Integrated Overall Measures, Projects/Programs and Phasing

(1) Prioritization of the Waterworks Project

The following projects are prepared to establish a sustainable water supply system for UKT jurisdiction area and the timetable is shown in Table 6.11.1.

- WS-1 Water Resource Development
- WS-2 Construction of Treatment Facility
- WS-3 Construction of Reservoirs
- WS-4 Construction of Transmission Pipeline and Distribution System
- WS-5 Reduction of Non-revenue Water
- WS-6 Energy Saving Consideration
- WS-7 Capacity Enhancement of Sector Workforce and Finance

Table 6.11.1 Proposed Projects/Actions and Time Schedule

Proposed Projects/Programs		Short term period					Mid term period					Long term period				
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WS-1: Water Resource Development																
WS-1-1	Utilization of overflow water of Bovilla dam as new water resource						■	■								
WS-1-2	Construction of conduit pipeline between Bovilla dam and Bovilla WTP						■	■	■	■						
WS-2: Construction of Treatment Facility																
WS-2-1	Increasing of Bovilla WTP								■	■	■					
WS-3: Construction of Reservoirs																
WS-3-1	Construction of new tank of Gurore/Kinostudio(15,000m3)	■														
WS-3-2	Construction of new tank of Yzberishit(8,000m3)		■													
WS-3-3	Construction of new tank of Pupils' City(8,000m3)			■												
WS-3-4	Construction of new tank of Kombinat(3,000m3)				■											
WS-3-5	Construction of new tank of Kozer-Kamza(2,000m3)					■										
WS-4: Construction of Transmission Pipeline and Distribtuion System																
WS-4-1	Transmission pipeline from Bovilla WTP D=1000×3000m			■												
WS-4-2	Transmission pipeline between Yzberisht and Yrshek reservoirs D=700×3000m				■											
WS-4-3	Transmission pipeline between Yzberisht and Konbinat reservoirs D=500×3000m					■										
WS-4-4	Transmission pipeline between Nxenesve and Yzberishit reservoirs D=800×3500m						■									
WS-4-5	Construction of additional distribution mains D=300～500 L=20000m	■	■	■	■	■	■	■	■							
WS-4-6	Installation of automatic measurement facilities of portable water such as residual chlorine concentration										■	■				
WS-4-7	Introduction of pipe mapping system								■	■						
WS-5: Reduction of Non-Revenue Water																
WS-5-1	Reduction of Non-Revenue Water				■											
WS-5-2	Installation and replacement of water meters	■	■	■	■											
WS-6: Energy Saving Consideration																
WS-6-1	Installation of mini-hydro generating system	■	■													
WS-6-2	Installation of solar- panel generating system			■	■											
WS-7: Enhancing of capacities of sector work force and finance																
WS-7-1	Enhancing capacity building of UKT					■										

※ Porject that has already been planned and/or to be implimented by UKT

Project terms include one year of consulting and design

Source: JICA Study Team

6.12 Listing of Priority Actions/Projects

The list of priority actions and projects including their costs are shown in Table 6.12.1.

Table 6.12.1 Implementing Schedule and Cost of Priority Projects

Proposed Projects/Programs		Short term period					Mid term period					Long term period					Project Cost
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	(Million Lek)
WS-1: Water Resource Development																	
WS-1-1	Utilization of overflow water of Bovilla dam as new water resource						■	■									84
WS-1-2	Construction of conduit pipeline between Bovilla dam and Bovilla WTP						■	■	■	■							1,080
WS-2: Construction of Treatment Facility																	
WS-2-1	Increasing of Bovilla WTP								■	■	■						1,890
WS-3: Construction of Reservoirs																	
WS-3-1	Construction of new tank of Gurore/Kinostudio(15,000m3)	■															350
WS-3-2	Construction of new tank of Yzberishit(8,000m3)		■														200
WS-3-3	Construction of new tank of Pupils' City(8,000m3)			■													200
WS-3-4	Construction of new tank of Kombinat(3,000m3)				■												90
WS-3-5	Construction of new tank of Kozer-Kamza(2,000m3)					■											70
WS-4: Construction of Transmission Pipeline and Distribtuion System																	
WS-4-1	Transmission pipeline from Bovilla WTP D=1000×3000m			■													1,148
WS-4-2	Transmission pipeline between Yzberisht and Yrshek reservoirs D=700×3000m				■												303
WS-4-3	Transmission pipeline between Yzberisht and Konbinat reservoirs D=500×3000m					■											143
WS-4-4	Transmission pipeline between Nxenesve and Yzberishit reservoirs D=800×3500m						■										435
WS-4-5	Construction of additional distribution mains D=300～500 L=20000m	■	■	■	■	■	■	■	■								945
WS-4-6	Installation of automatic measurement facilities of portable water such as residual chlorine concentration										■	■					-
WS-4-7	Introduction of pipe mapping system								■	■							3
WS-5: Reduction of Non-Revenue Water																	
WS-5-1	Reduction of Non-Revenue Water				■												83
WS-5-2	Installation and replacement of water meters	■	■	■	■												250
WS-6: Energy Saving Consideration																	
WS-6-1	Installation of mini-hydro generating system	■	■														262
WS-6-2	Installation of solar- panel generating system			■	■												76
WS-7: Enhancing of capacities of sector work force and finance																	
WS-7-1	Enhancing capacity building of UKT					■											2
Total																	**7,614**

※ ■ Porject that has already been planned and/or to be implimented by UKT

Project terms include one year of consulting and design

Source: JICA Study Team

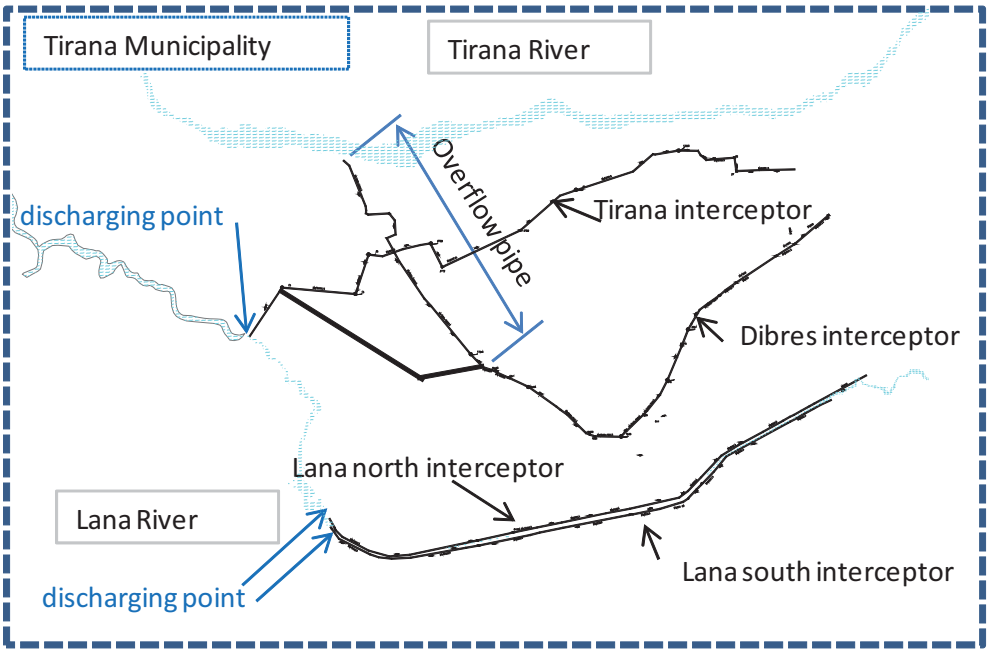
7. Sewerage and Drainage

7.1 Current Status and Salient Feature in Sewerage

(1) Sewer Network and Its Coverage

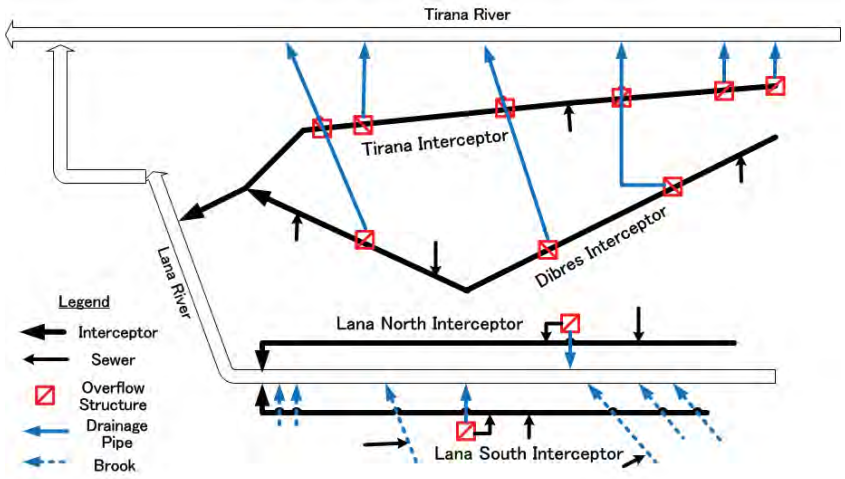
The existing sewerage system of Tirana municipality is a combined collection system without a treatment facility, and so, sewer and drainage (storm water) pipes are not clearly demarcated. Recently installed sewer pipes have a separate collection system although it is connected to the existing combined sewer network. Sewage collected through the combined sewer pipe is either conveyed directly to the river or flows into the interceptor sewer up to the discharge point located downstream of the river. An overflow structure on the way of the interceptor discharges overflowed storm water through drainage pipes to the river. Tirana River in the north and Lana River in the south of the town are the two main receiving rivers. The location of the main four interceptors is shown in Figures 7.1.1 and 7.1.2

Based on the Aggregated Data for Tirana Water Supply & Sewerage Company (UKT), released through the General Directorate of Water Supply and Sewerage (DPUK), the total length of the sewer lines is 559 km including interceptors, main sewers and branch sewers, and the estimated population of nearly 787,500 in the urban area is served by sewerage networks with 79.4% coverage, as of the end of 2011. The location of existing sewer mains is shown in Figure 7.1.3. As has been stated in a previous study by JICA, or by other donors, much of the existing sewer pipeline has not sufficient capacity to accommodate both the wastewater and storm water since the existing pipeline seems to be originally designed to accommodate 3 to 5 times of the peak dry weather wastewater. Critical areas were also pointed out in the 2002 study funded by the Italian Cooperation, as shown in Figure 7.1.3. Lack of capacity of the main/branch sewer pipe is aggravated by the theft of manhole covers and the dumping of waste into the sewers in some areas. As to the Operation and Maintenance (O&M) works of the network, UKT has been conducting reconstruction work of the existing sewer pipes and replacement of the stolen manholes in addition to the new installation of sewer pipe to the yet unsewered areas. Almost all the sewer pipes were installed during the 1930s to 1970s, but it is said that they are not so deteriorated owing to the periodic maintenance works by UKT. Capacity analysis of the interceptor sewer has been done in past studies. Especially, the Italian funded study in 2002-2003 had conducted a detailed hydraulic analysis on the interceptors and main sewers and concluded that these pipes have enough capacity to serve as the separate system collection pipe. The previous JICA study also proposed an additional trunk sewer collection system conveying sewage to the sewerage treatment plant (STP), effectively using existing interceptor sewer pipes.



Source: JICA Study Team

Figure 7.1.1 Interceptor Layout Plan



Source: JICA Study Team

Figure 7.1.2 Schematic Drawing of the Sewer System

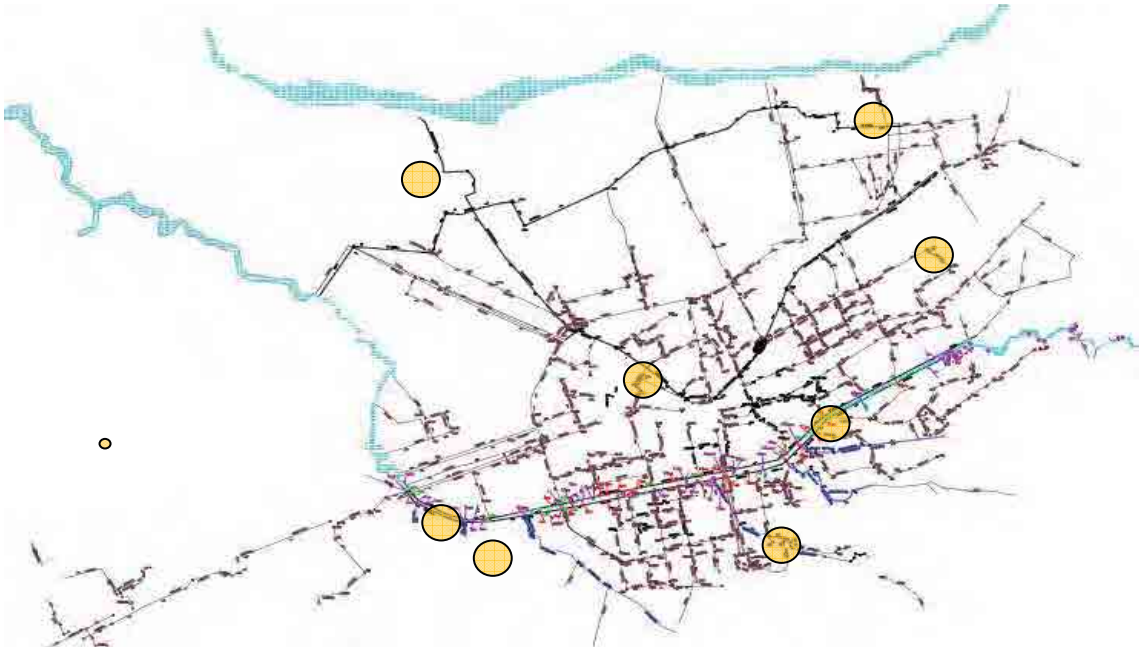
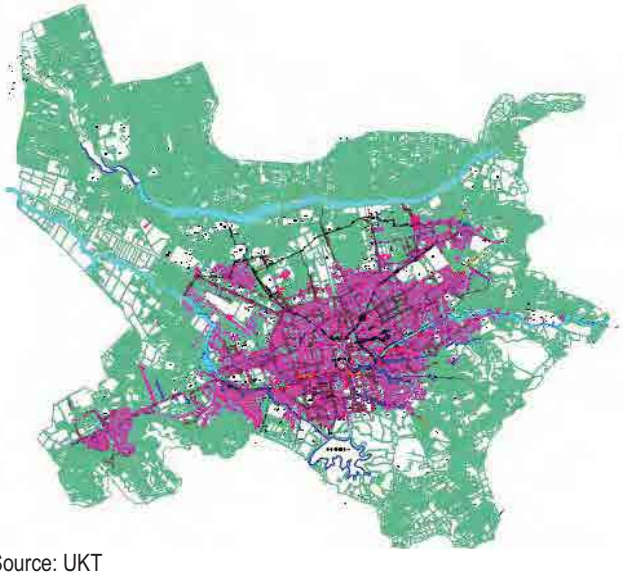


Figure 7.1.3 Existing Sewer Network of MOT (Main Pipe)

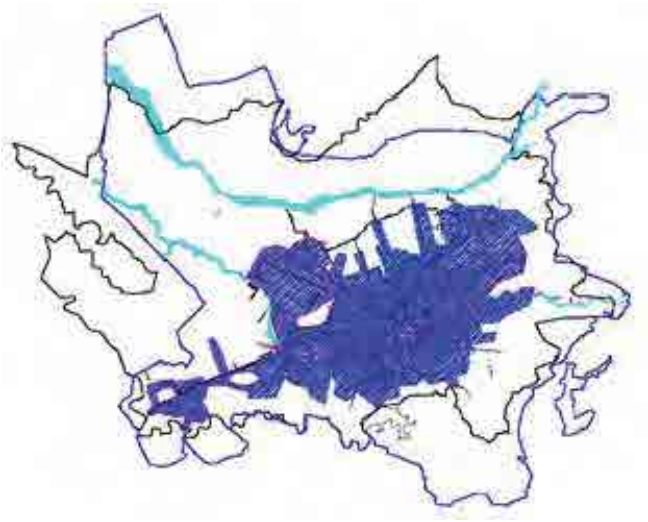
A network plan indicating all the branch sewers, main sewers and interceptors is shown in Figures 7.1.4 and 7.1.5.

As to the maintenance of the sewer network, sewerage branch personnel of UKT distributed to four units corresponding to four blocks within Municipality of Tirana (MOT), shown in Figure 7.1.6, are engaged mainly in the maintenance work of the sewer network based on the annually scheduled plan. The sewerage branch is also in charge of new construction of sewer pipe, replacement of deteriorated sewers and supervision of sewer pipe construction. Recently, on an average, 3 km of sewerage/drainage pipe has been installed or replaced annually by UKT.



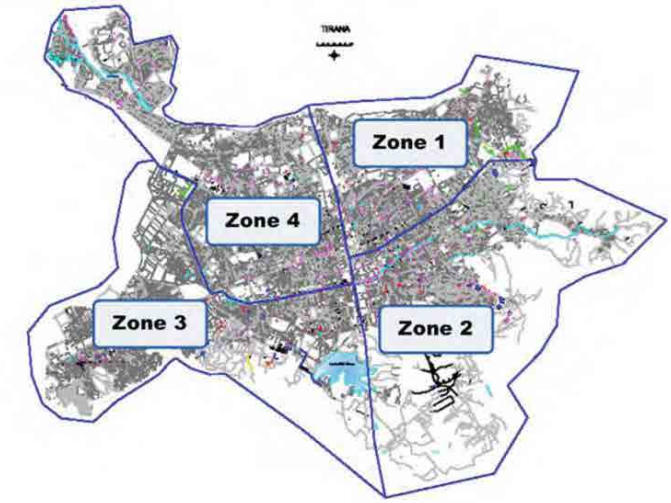
Source: UKT

Figure 7.1.4 Existing Sewer Network of MOT (Main and Branch Pipes)



Source: UKT

Figure 7.1.5 Sewer Coverage

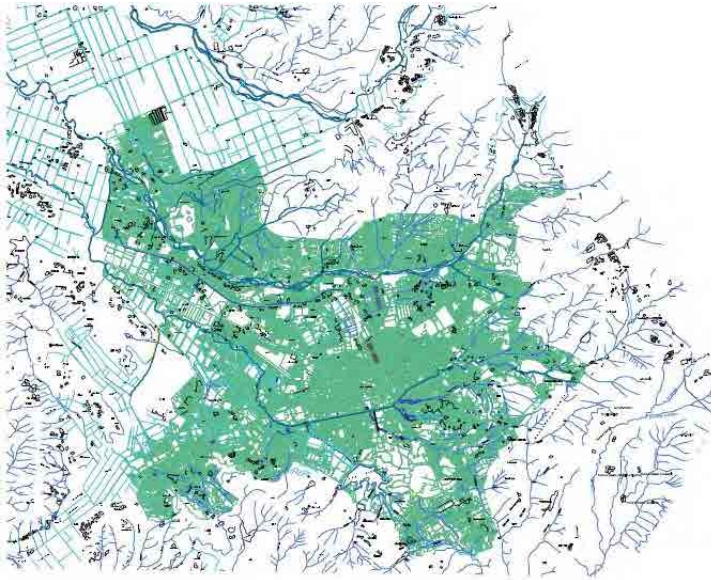


Source: UKT

Figure 7.1.6 Delineation of Maintenance Blocks

(2) Drainage Facilities

The stormwater system including the drainage of public roads is managed by the Workers Company No. 2 of the City under the Municipality of Tirana. Lack of joint management has invited some negative impact on the operation of the existing combined sewer system. In MOT, there are two types of drainage pipe: one is pipe laid in beds of natural watercourses and the other is pipe laid under roads and terrene. The former one is laid in brook, and there are six brooks along Lana River, although they play a big role for collection and transport of not only storm water but also waste water. Drainage pipes not in the natural watercourse have also the same function as the combined sewer; they also serve as the overflow pipe of the storm water from the overflow structure at the intercepting point, although they were originally constructed for storm water only. The separation of stormwater pipe from wastewater pipe is the important but troublesome task for UKT. Main drainage pipe/brooks are marked in blue lines in Figure 7.1.3. Waterways in and around MOT are shown in Figure 7.1.7.



Source: Master Plan -Technical and Financial Assistance to the Greater TWS & SE

Figure 7.1.7 Existing Waterways in and around MOT

7.2 Identified Problems and Planning Issues

(1) Collection Area

One of the issues on collection area is that Sauk area, the southeast gate of Greater Tirana, was not included in the 2007 JICA study and other revision works by Japanese Official Development Service (ODA) Loan consultants. It is probably because this area belongs to the Erzen River watershed, and a pumping facility is required for water treatment within the proposed collection area, Kashar Sewer District (SD). In any case, collection and treatment of sewage from Sauk area shall be discussed from the wider point beyond the river basin. A minor revision of collection area boundary line shall be considered. One issue is the incorporation of part of Dajt Commune, Farka Commune and Vaqarr Commune into the proposed collection area (Kashar SD), and another issue is the reduction of coverage at northern Paskuqan Commune near Bovilla Complex.

(2) Target year

While the 2007 JICA study set the target year, which is 2022 for the Master Plan and 2013 for the priority projects, the Japanese ODA loan consultants added another target year, 2030 – nearly twenty years from now. Although this project for Tirana Thematic Urban Planning indicated targets of 2017, 2022 and 2026 for the short, medium and long terms, respectively, it seems reasonable to adopt the plan made by the Japanese ODA Loan consultants.

(3) Sewage Treatment Method

The 2007 JICA study proposed the use of trickling filters for the treatment of sewage mainly aiming for the low operation cost. It seems reasonable judging from the fact that the existing two treatment plants, one in Kavaja and another in Pogradec, have adopted this treatment method and both plants have been working well although their capacities are smaller than Kashar STP and that enough area could be secured at the proposed site. As to the treated water quality, it is expected that this method can clear treatment water quality standard based on EU directives. In case this

method failed to clear water quality standard by some kind of conditions or request for higher level water quality in Phase I, it is one option to change the construction design in Phase II.

(4) Drainage Plan

Since the central area of MOT is covered by a combined sewer system, two types of drainage facility shall be surveyed: one is the overflow channel from the existing main interceptor to the Tirana River and the other is a brook where local sewage has already flowed. Improvement of these drainage channels is the main issue. From the viewpoint of water circulation, introduction of a stormwater infiltration facility can be helpful both for the groundwater recharge and for mitigation of impact brought about by increased stormwater run-off volume accelerated with rapid urbanization. Verification of recent rainfall patterns or tendencies is another issue to tackle in this study. Review of formulas used to estimate rainfall intensity, for drainage planning, investigation of run-off coefficient corresponding to the urbanization, and appropriate dimensioning of the drainage facilities is also a main issue.

7.3 Review of Existing Policies, Strategies and Previous Studies

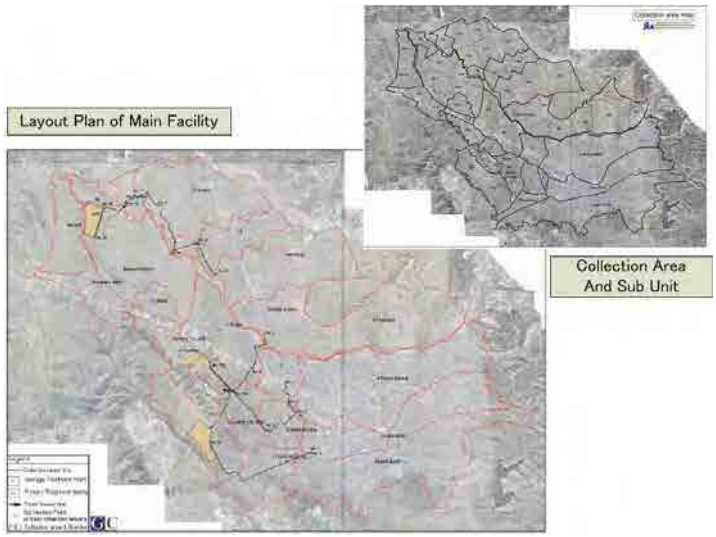
The national policy is in compliance with the National Water Supply and Sewerage Services Sector Strategy 2011-2017, as previously stated in the Water Supply Section.

Since 1998, the following studies have been conducted, and finally, sewerage projects composed of the construction of STP, trunk main, main and branch sewer pipe have started in 2009 funded by Japanese ODA Loan based on the feasibility study of the priority project planned in the fourth JICA study.

- The Study on the Sewerage System in Metropolitan Tirana in the Republic of Albania: JICA, 1998
- Strategic Plan for Greater Tirana (2001): funded by World Bank
- Water & Sewerage Plans (2002, 2003): funded by the Italian Government
- The Study on the Development Plan for Sewerage System and Sewage Treatment Plant for Greater Tirana in the Republic of Albania: JICA, 2007

In addition to the above stated reports, an infrastructure development plan, including a sewerage and drainage sector plan, was once prepared based on the urban development plan tentatively drawn up by municipality staff in 2009. But it was not officially approved because of some difference of opinion with the municipality administrator with regard to the urban development plan area, thus leaving the 2007 JICA plan as the most reliable plan.

The study area in the 2007 study was covered by two STPs, Kashar STP and Berxulle STP, each collecting and treating sewage from collection areas shown in Figure 7.3.1.



Source: 2007 JICA Report

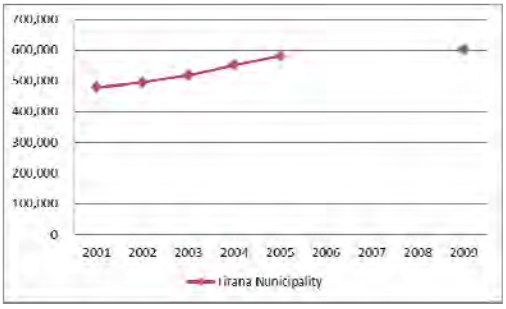
Figure 7.3.1 Main Facility Layout Plan in 2007 JICA Report

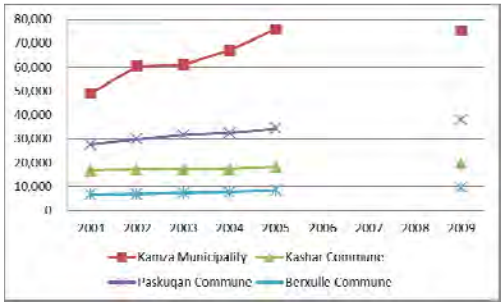
The feasibility study was reviewed for the detailed design of the project in 2010 by the Japanese ODA Loan consultants, and an outline of the revised plans is given below.

- Future population was projected considering the 2009 survey result by each municipality /commune up to new target year 2030 apart from the Urban Regulatory Plan for Tirana Municipality (URPTM).
- Due to the small population growth rate from 2005 to 2009, smaller than projected especially in MOT, estimated future population in 2022 was downwardly revised.
- For the Priority Project area (Phase 1 area), estimated population in newly targeted year 2030 does not so much exceed the previously projected population in 2022; therefore, facility dimension has no need of revision.
- On the contrary, since Phase II area includes rapidly growing Kashar Development Area, where 225,000 persons are expected to inhabit in target year 2030, facility dimension shall be increased.
- Since a new connection point for Kashar Development Area is arranged to be set between connection point 9 and 10-a in the 2009 Master Plan, flow direction was revised so that the sewage collected to connection point 5 flows down to connection point 6 and to 7 and finally to 9 as can be seen in the figure below.

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Figure 7.3.2 Trunk Main Route Review in 2010

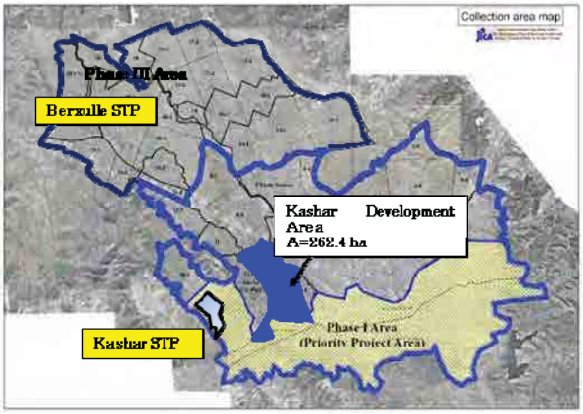




Source: Report on Basic Design review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

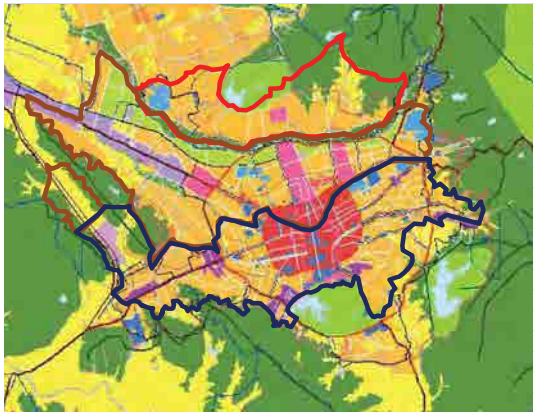
Figure 7.3.3 Population Projection (1) (MOT)

Figure 7.3.4 Population Projection (2) (Other Municipality/Commune)



Source: Report on Basic Design review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Figure 7.3.5 Review Plan of JICA 2007 MP



Source: 2009 URPTM

Figure 7.3.6 Land Use in Kashar Sewerage Area

The following Tables 7.3.1 to 7.3.10 compare the 2007 JICA study and the review results. (The latter is the Basic Design Review by the Japanese ODA Loan Consultants.)

Table 7.3.1 Sewer District (Sewage Treatment Plant-wise) (ha)

	JICA Study	Basic Design Review	Remarks
Kashar SD	6,228	6,228	No change
Berxulle SD	3,046	3,046	
Total	9,274	9,274	

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.2 Priority Project Area of Kashar Sewer District (ha)

	JICA Study	Basic Design Review	Remarks
Priority Project Area (Phase Ⅰ)	2,343	2,343	No change
Other Area (Phase Ⅱ)	3,885	3,885	
Total	6,228	6,228	

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.3 Population in Planned Area by Jurisdiction (person)

	2013		2022		2030	Remarks
	JICA Study	B/D Review	JICA Study	B/D Review	B/D Review	
MOT		661,263	700,000	700,000	700,000	Considering population survey in 2009, new development in Kashar, sewage of Dajti Commune
Kamza Municipality		111,300	150,000	125,142	137,447	
Kashar Commune		21,057	25,000	24,584	27,719	
Kashar Development Area		13,800	25,000	25,000	225,000	
Paskuqan Commune		40,810	84,000	51,289	60,603	
Berxulle Commune		10,893	16,000	14,238	17,211	
Dajti Commune		12,438	-	16,952	22,322	
Total	Not available	871,561	1,000,000	957,205	1,190,301	

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.4 Sewer-served Population in Kashar Sewer District (person)

	2013		2022		2030	Remarks
	JICA Study	B/D Review	JICA Study	B/D Review	B/D Review	
Kashar STP (Phase Ⅰ)	342,475	335,880	353,537	357,845	361,073	
Kashar STP (Phase Ⅱ)	0	0	475,961	458,927	673,311	
Total	342,475	335,880	829,498	816,772	1,034,384	

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.5 Sewage Flow of Kashar Sewer District (Maximum Daily) (m^3/d)

	2013		2022		2030	Remarks
	JICA Study	B/D Review	JICA Study	B/D Review	B/D Review	
Kashar STP (Phase I)	95,893	94,046	109,596	110,933	111,933	
Kashar STP (Phase II)	0	0	147,548	142,269	208,727	
Total	95,893	94,046	257,144	253,202	320,660	

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.6 Outline of Tirana Trunk Sewer (Phase I Trunk Sewer)

JICA Study	B/D Review	Remarks
Diameter: 900 to 1,500 mm	Diameter: 900 to 1,500 mm Sewer Alignment: No Change	Considering the 2030 flow

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.7 Outline of Kashar Trunk Sewer (Phase II Trunk Sewer)

JICA Study	B/D Review	Remarks
Diameter: 450 to 1,650 mm	Diameter: 250 to 2,000 mm	Sewer Alignment should be changed considering sewage flow in 2030 and Kashar Development Area

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.8 Outline of Kashar Pumping Station

JICA Study	B/D Review	Remarks
Required Capacity: 146 m^3/min (Maximum hourly)	Required Capacity: 141 m^3/min (Maximum hourly)	

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.9 Sewage Flow and Water Quality of Kashar Sewage Treatment Plant

		JICA Study	B/D Review	Remarks
Sewage Flow (Maximum Daily)	2013	95,893	94,046	Considering sewage flow in 2030 and Kashar Development Area
	2022	257,144	253,202	
	2030		320,660	
		JICA Study / B/D Review		Remarks
		Influent	Effluent	
Water Quality	BOD	200	25	
	SS	200	35	

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

Table 7.3.10 Outline of Facilities of Kashar Sewage Treatment Plant

(1) Facilities for Phase I (2013)

	JICA Study	B/D Review	Remarks
Pumping Facilities	Capacity:95 m^3/min	Pump for low inlet water level Capacity:94 m^3/min	
Wastewater Treatment	Primary settling tank: 12 tanks Trickling Filter: 24 tanks Secondary settling tank: 9 tanks	Primary settling tank: 6 tanks Trickling Filter: 24 tanks Secondary settling tank: 6 tanks	Tank configuration and size changed
Sludge Treatment	Sludge thickener: 2 tanks Digester: 8 tanks Sludge drying bed: 36,000 m^2 Dewatering machine: 3 units	Sludge thickener: 2 tanks Digester: 6 tanks Sludge drying bed: 50,000 m^2 Dewatering machine: 4 units	Tank configuration and size changed

(2) Facilities for Phase II (2022)

	JICA Study	B/D Review	Remarks
Pumping Facilities	Capacity:253 m^3/min	Pump for low inlet water level Capacity:110 m^3/min Pump for high inlet water level Capacity:141 m^3/min	
Wastewater Treatment	Primary settling tank: 32 tanks Trickling Filter: 64 tanks Secondary settling tank: 24 tanks	Primary settling tank: 16 tanks Trickling Filter: 64 tanks Secondary settling tank: 16 tanks	Tank configuration and size changed
Sludge Treatment	Sludge thickener: 4 tanks Digester: 16 tanks Sludge drying bed: 36,000 m^2 Dewatering machine: 11 units	Sludge thickener: 4 tanks Digester: 12 tanks Sludge drying bed: 50,000 m^2 Dewatering machine: 13 units	Tank configuration and size changed

Source: Report on Basic Design Review for Consulting Services for Greater Tirana Sewerage Improvement Project, March 10, 2010

As to the priority project framework funded by JICA, it was revised to correspond with 2030 sewage volume of the priority project area considering the sewage volume of target year 2013. Regarding the bill of quantities of the project, branch sewer length was much reduced since UKT has already installed the pipe in the road originally proposed in the 2007 JICA study in these past few years. Based on the pre-qualification invitation notice published in newspapers on 6 July 2011, latest framework of the project is illustrated in Table 7.3.11. The final framework is described in the Action Plan.

Table 7.3.11 Outline of the Priority Project

Item	First Stage Priority Project
Basic Information	
1.1 Service Area	2,343 ha
1.2 Service Population	342,500 persons
1.3 Sewage Flows	Average daily dry weather flow: 77,100 m^3/day Maximum daily dry weather flow: 94,000 m^3/day
Outline of Sewerage System	
2.1 Sewers	
2.1.1 Trunk Sewer	Pipes constructed with micro-tunneling: Concrete Pipe: DN 1,500 4,300m Concrete Pipe: DN 600 60m Concrete Pipe: DN 1000 60m
2.1.2 Main Sewer	Pipes constructed in trenches: HDPE SN8: OD 500 870 m HDPE SN8: OD 630 750 m HDPE SN8: OD 1000 30m
2.1.3 Branch Sewer	Pipes constructed in trenches: HDPE SN8: OD 250 6,500 m HDPE SN8: OD 315 1,800 m HDPE SN8: OD 400 550 m
2.1.4 Structures	24 no. Shafts for micro-tunneling 35 no. Overflow structures with side weir and throttle pipe* 450 no. manhole No house connection
2.2 Sewage Treatment Plant	Kashar STP
2.2.1 Capacity	94,000 m3/d maximum daily dry weather flow 77,100 m3/d average daily dry weather flow
2.2.2 Sewage Treatment Process	Screening + Grit Removal + Primary Settling + Conventional Trickling Filter + Final Settling + Chlorination
2.2.3 Influent	BOD_5 : 200 mg/l, SS: 200 mg/l
2.2.4 Effluent	BOD_5 : 25 mg/l, SS: 35 mg/l
2.2.5 Sludge Treatment Process	Thickener + Anaerobic Digester + De-watering (Belt Filter Press or Sludge Drying Bed)
2.2.6 Sludge Generation for disposal Wet (Dry) basis	22.6 ton/day (8.2 ton/day)

Source: PQ document by Japanese ODA Loan Consultants
*Interception volume is one time of maximum hourly dry weather flow

Construction of the sewerage facilities is supposed to be deferred two years from original completion year, from 2013 to 2015.

7.4 Quantitative Analysis for Required Sewerage Capacity in Future

Future population of the Study area was projected in this study, setting short-term, medium-term and long-term target years, respectively 2017, 2022 and 2027, while 2030 is the new target year set by the Japanese ODA Loan consultants. Both plans were compared and the Study Team confirmed 2030 as a reasonable final target year.

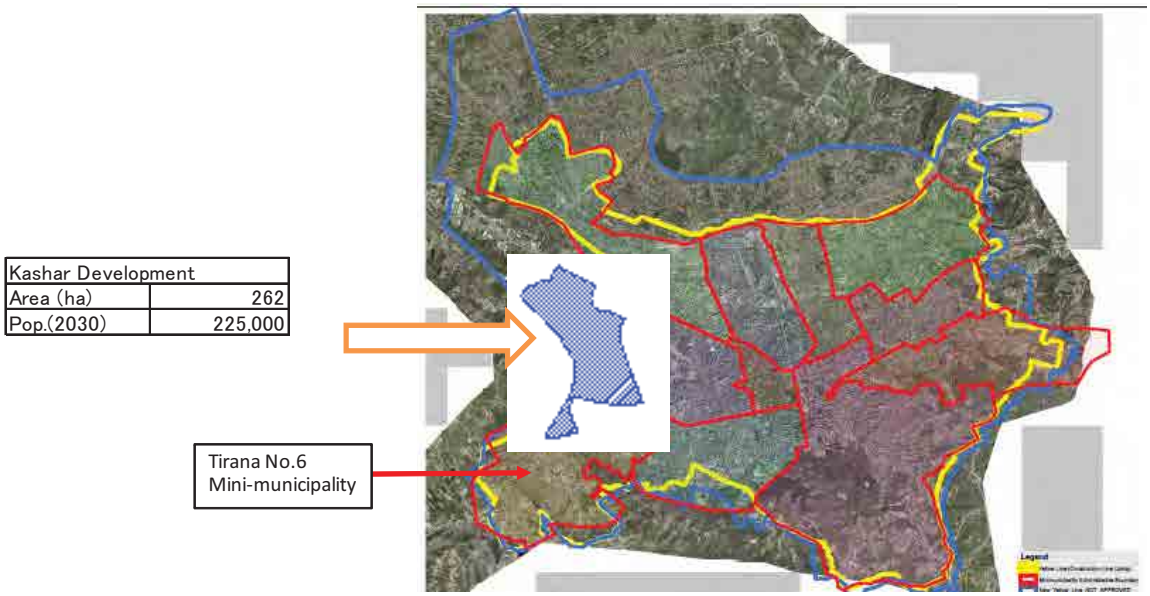
First, population is compared with the projection made by the Japanese ODA Loan consultants, as shown in Table 7.4.1.

Table 7.4.1 Comparison of Administrative Population Projection

	Projection Data from Municipality				Japanese ODA Loan Consultants projection			
Target year / Administration area	2012	2017	2022	2027	2013	2022 (in 2007 JICA Study)	2022 (revised)	2030
tirane	581,000	673,538	762,047	841,361	684,313	724,400	724,400	724,400
kamza	75,000	86,946	98,371	108,610	111,300	150,000	125,142	137,447
paskuqan	45,000	52,167	59,023	65,166	43,628	89,800	54,830	64,788
kashar	35,000	40,575	45,906	50,684	21,339	25,670	24,913	28,090
Kashar (Development)					13,800	25,000	25,000	225,000
dajt	10,000	11,593	13,116	14,481	12,438	-	16,952	22,322
Berxulle	8,000	9,274	10,493	11,585	11,233	16,500	14,683	17,749
sum	754,000	874,093	988,956	1,091,887	898,051	1,031,370	985,920	1,219,795
Vaqarr	10,500	12,172	13,772	15,205	-	-	-	-
farka	25,000	28,982	32,790	36,203	-	-	-	-
Plan area	789,500	915,247	1,035,518	1,143,295				

Source: JICA Study Team

Table 7.4.1 shows both projections resulted in almost same figures in the target year 2022. It is reasonable that the 2030 population by the ODA consultants is 11% larger than the 2027 population by the Study Team considering the difference in target year. The major discrepancy of the projection is the calculated population of MOT and Kashar Commune. That is mainly due to the allocation of population in Kashar Development Area, which straddles both Kashar commune and Tirana No. 6 mini-municipality area (see Figure 7.4.1). Nearly 60% of the area belongs to Tirana No. 6 mini-municipality, whose population is included in MOT in this study projection but is excluded from MOT by the Japanese ODA Loan consultants who viewed the yellow line as the existing administrative boundary line. As a result, total population of the two LGUs, MOT and Kashar Commune, showed a little difference between the two projections.



Source: JICA Study Team

Figure 7.4.1 Location of Kashar Development

A comparison of service population projections by the Study Team and the Japanese ODA Loan consultants is shown in Tables 7.4.2 and 7.4.3.

The Study Team's and the Japanese ODA loan consultants' service population projections for Berxulle SD are different mainly because their target years are different – 2027 for the former and 2030 for the latter.

The Study team recommends that future framework of the sewerage system comply with the projection by the Japanese ODA Loan consultants so that on-going projects can proceed well. Sewerage capacity is based on the sewage flow in Table 7.4.4.

Table 7.4.2 Comparison of Administrative Population Projection (1)

	Japanese ODA Loan Consultants (Reviewd in 2010)			This Project		
Target year / Administration area	2030			2027		
	Administrative Population	Coverage (-)	Service Population	Administrative Population	Coverage (-)	Service Population
tirane	724,400	0.966	700,000	841,361	0.966	812,800
kamza	137,447	1.000	137,447	108,610	1.000	108,600
paskuqan	64,788	0.935	60,603	65,166	0.935	60,900
kashar	28,090	0.987	27,719	50,684	0.987	50,000
Kashar (Development)	225,000	1.000	225,000			
dajt	22,322	1.000	22,322	14,481	1.000	14,500
Berxulle	17,749	0.970	17,211	11,585	0.970	11,200
Plan area	1,219,795	0.976	1,190,301	1,091,887	0.976	1,058,000

Source: JICA Study Team

Table 7.4.3 Comparison of Administrative Population Projection (2)

Study		2007 JICA Study Report	Japanese ODA Loan consultants review	This Study
Target Year		2022	2030	2027
Kashar STP	Phase Ⅰ (Priprity Area)	353,537	361,073	327000
	Phase Ⅱ	475,961	673,311	609,900
	Sub total	829,498	1,034,384	936,900
Berxulle STP		170,502	155,917	121,100
Total		1,000,000	1,190,301	1,058,000

Source: JICA Study Team

Table 7.4.4 Sewage Flow Projected in 2030

		Kashar SD	Berxulle SD
Service Area (ha)		6,228	3,046
Service Population		1,034,384	155,917
Unit Flow (lpcd)	Daily Average	250	
	Daily Maximum	310	
	Hourly Maximun	440	
Sewage Flow (m^3/d)	Daily Average	258,600	38,980
	Daily Maximum	320,660	48,330
	Hourly Maximun	455,130	68,600

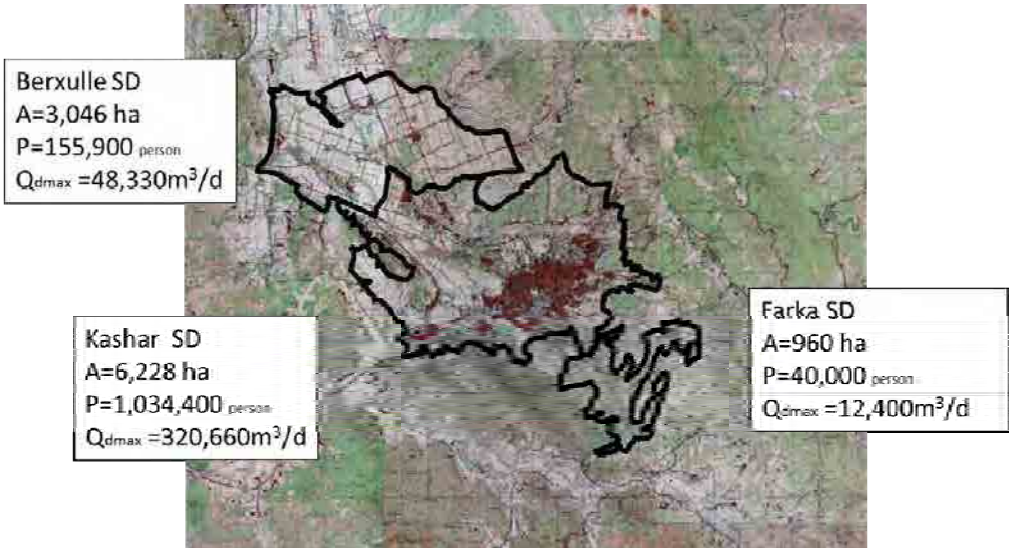
Source: Japanese ODA Loan consultants

7.5 Planning Concept and Main Framework of the Sewerage Master Plan

(1) General

The Master Plan focuses on the treatment of Sauk area, a strategic gateway of Tirana municipality, considering two SDs (SD), Kashar SD and Berxulle SD, as the given condition. One plan to integrate Sauk area into Kashar SD and another plan to convert this area to new Farka SD are compared, and finally, the latter plan is adopted as shown in Figure 7.5.1. Target year is basically set up to be 2030. The outline of the Master Plan framework is shown in Table 7.5.1. Project cost is estimated later by the phased project.

As to the treatment method of STP, trickling filter method is recommended for sewage treatment and thickener-digester-Sludge Drying Bed (De-watering machine) system is recommended for sludge treatment, referring to the 2007 JICA Report and on-going Japanese ODA loan project.



Source: JICA Study Team

Figure 7.5.1 Proposed Plan of Three Sewer Districts

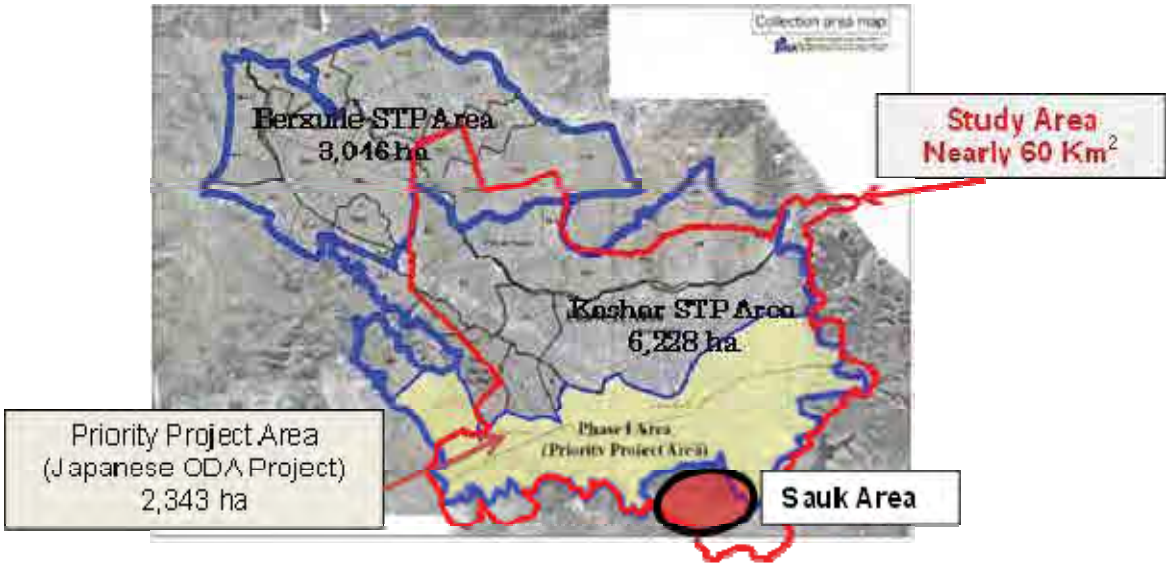
(2) Necessity of Investigations

As shown in Figure 7.5.2, Sauk area is not covered by the 2007 JICA Sewerage Master Plan since it does not belong to Lana River watershed, as does Tirana, but to the Erzen River watershed. But Sauk area is rapidly growing as the eastern entrance of MOT. So, at first, treatment of Sauk sewage is discussed.

Table 7.5.1 Outline of Proposed Sewer District

SD	Kashar SD	Berxulle SD	Farka SD
Target Year	2030		
Service Area	6,228 ha	3,046 ha	960 ha
Service Population	1,034,400 persons	155,900 persons	40,000 persons
Sewage Flow	320,660 m^3/d (Daily Maximum Flow)	48,330 m^3/d (Daily Maximum Flow)	12,400 m^3/d (Daily Maximum Flow)
Main Component	• Kashar STP Capacity 320,700 m^3/d (Daily Maximum Flow) Trickling Filter Method • Kashar PS Capacity 206 m^3/min (Hourly Maximum Flow) • Trunk Main Sewer Phase I 4.4 km Phase II & Expansion 10.3 km Total 14.7 km • Main & Branch Sewer Phase I 14.2 km Phase II & Expansion 79.6 km Total 93.8 km	• Berxulle STP Capacity 48,400 m^3/d (Daily Maximum Flow) Trickling Filter Method • Kamza PS Capacity 32.4 m^3/min (Hourly Maximum Flow) • Trunk Main Sewer Total 6.8 km • Main & Branch Sewer Total 74 km	• Farka STP Capacity 12,400 m^3/d (Daily Maximum Flow) Trickling filter method • Main & Branch Sewer Total 73.6 km

Source: JICA Study Team



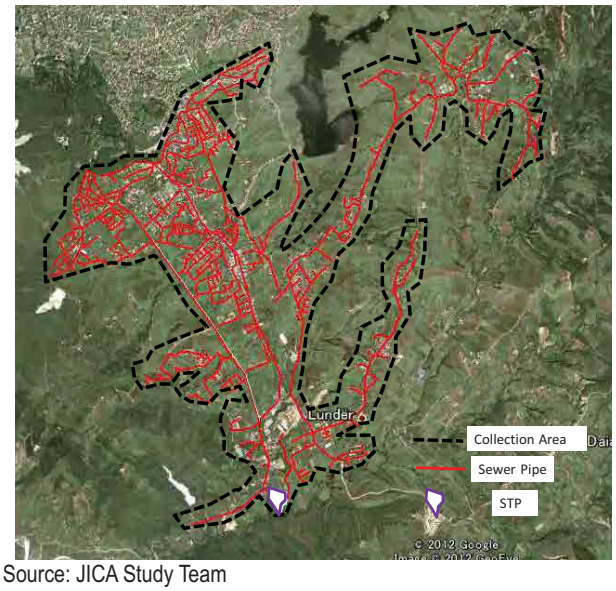
Source: JICA Study Team

Figure 7.5.2 Study Area vs. JICA Sewerage Master Plan Area

(3) Comparison of Sewerage Development Plan for Sauk Area

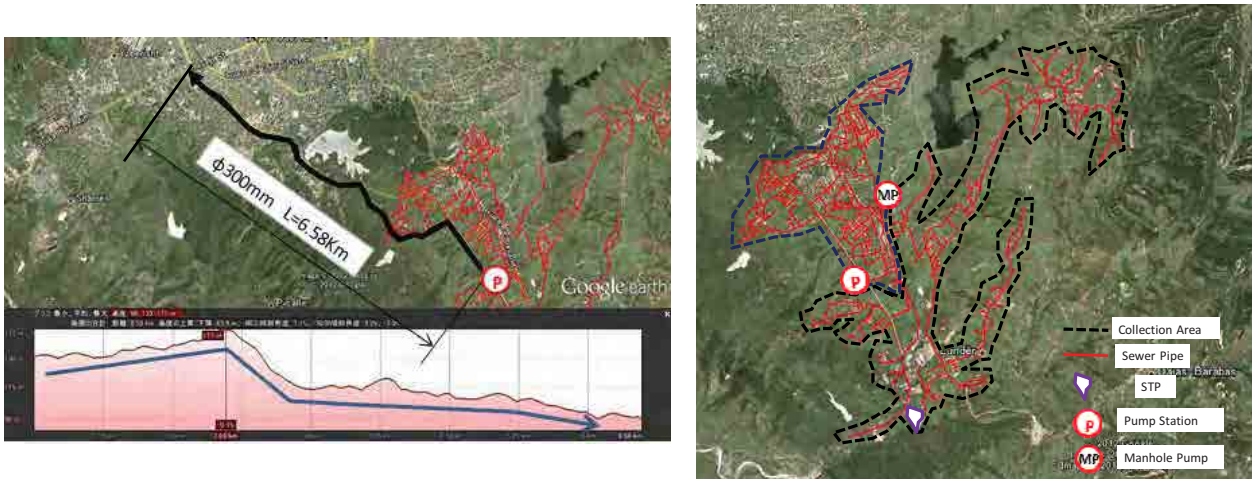
Two options are set up and compared. One option is a plan to collect and treat Sauk area sewage at the treatment plant near Erzen River in accordance with watershed protection measures. On the way, sewer pipe collects sewage from the nearby Farka Commune village including TEG wastewater.

Another option is to pump up Sauk sewage to Kashar STP, which has already been proposed and designed, to promote early sewerage development for Sauk area, since it takes a long time to plan and construct a totally new STP. In this case, the collection area for a new treatment plant (Farka SD) can be reduced. Figures 7.5.3 and 7.5.4 show Option 1 and Option 2, respectively.



Source: JICA Study Team

Figure 7.5.3 Option 1 Plan



Source; JICA Study Team

Figure 7.5.4 Option 2 Plan and Pressure Main Route

Plan outlines of Option 1 and Option 2 are shown in Table 7.5.2 and Table 7.5.3, respectively. A comparison of the two options is shown in Table 7.5.4. Although Option 1 is a better choice, from the point of spare capacity of the Kashar STP and also Trunk Sewer No. 3 pipe, and from the point of river basin-wise management of the water, construction of a new treatment plant will take a long time due to the need of an Environmental Impact Assessment and procurement of STP site, and so, Option 2 is a more suitable plan for early development for Sauk area.

Table 7.5.5 shows construction cost of each option and Table 7.5.6 presents O&M cost.

Table 7.5.7 indicates trunk sewer No. 3 has enough spare space even if Sauk's sewage is transferred to the sewer.

Figure 7.5.5 presents a sample diagram of a suitable pump station for Sauk with submersible type of pump facility and with the bucket for incoming solid waste. A grit chamber is omitted to save space and cost.

Table 7.5.2 Outline of Option 1 Plan

Farka SD		
Service Area (ha)	960 ha	
Service Population (person)	Sauk area 20,000*1 Farka Commune 20,000*2 Total 40,000	Projection by study team
Sewage Flow		
Daily average	40,000 × 0.25=10,000 m^3/d	Unit volume is same as 2007 JICA Report
Daily Maximum	40,000 × 0.31=12,400 m^3/d	
Hourly Maximum	40,000 × 0.44=17,600 m^3/d	
Main Facility		
Sewer Pipe	L=73.6 km	200 mm～600 mm
Farka STP	Q_{dave}=10,000 m^3/d Q_{dmax}=12,400 m^3/d Sewage Treatment Method: Trickling filter (Conventional activated sludge method, if enough area is not secured) Sludge Treatment Method; Drying Bed Treated Water Discharge Point: Erzen River branch	Site Area 3.2 ha

Source: JICA Study Team

*1In the 2009 JICA Report, it states that the MOT population not covered by the sewerage master plan service area is 24,400 in 2022. Assuming 80% of that population stays in Sauk area, 20,000 is assumed.

*2Although the existing population of Farka Commune in 2009 was nearly 10,000, the MOT Technical team predicts its population will increase to 41,700 in 2026 assuming a population of 28,800 in 2011. Future development within Farka SD is not projected clearly, but service population within the area is assumed based on this computation: 28,800×0.7≒20,000 persons.

Table 7.5.3 Outline of Option 2 Plan

Farka SD		
Service Area (ha)	635 ha	
Service Population (person)	Farka Commune 20,000	Projection by study team
Sewage Flow		
Daily average	20,000 × 0.25=5,000 m^3/d	Unit volume is same as 2007 JICA Report
Daily Maximum	20,000 × 0.31=6,200 m^3/d	
Hourly Maximum	20,000 × 0.44=8,800 m^3/d	
Main Facility		
Sewer Pipe	L=35.4 km	200 mm～450 mm
Farka STP	Q_{dave}=5,000 m^3/d Q_{dave}=6,200 m^3/d Sewage Treatment Method; Trickling filter Sludge Treatment Method; Drying Bed Treated Water Discharge Point; Erzen River branch	
Sauk Pump Station area (Additional Kashar SD)		
Service Area (ha)	325 ha	
Service Population (person)	Sauk area 20,000	
Sewage Flow		
Daily average	20,000 × 0.25=5,000 m^3/d	
Daily Maximum	20,000 × 0.31=6,200 m^3/d	
Hourly Maximum	20,000 × 0.44=8,800 m^3/d	
Main Facilities		
Sewer Pipe	Gravity Flow L=37.2 km Pressure Pipe 150mm L=0.5 km Pressure Pipe 300mm L=6.58 km	200 mm～450 mm
Pump Station	Manhole Pump 1 unit Sauk Pump Station Q_{hmax}=8,800 m^3/d =6.2 m^3/min Pump facility Q=3.1 m^3/min × H=40m × 2sets (plus standby: 1 set) Pump Discharge Point: Trunk Main No.3 Pipe	

Source: JICA Study Team

Table 7.5.4 Comparison of Alternative Plans for the Coverage of Sauk Area

Option	Outline	Advantage	Disadvantage	Construction/O&M cost	Evaluation	
1	Construction of a new STP in Farka Commune near the discharging point to Erzen River.	Basically, plan is in compliance with River basin water management. New treatment plant could cover not only Sauk area but also neighboring Farka village. This plan has no impact on the neighboring Kashar SD.	It takes a long time to start construction of the treatment plant as it requires an Environmental Impact Assessment and compliance certification, and land procurement is also long and troublesome. Sauk is the upper area of the SD and its development depends on the lower main sewer and construction of new treatment plant Planning framework is not yet fully surveyed since this commune is basically out of study area.	(Construction Cost) Farka STP 744x10^6 Lek Sewer Pipe 1,619x10^6 Lek 2,363x10^6 Lek (O&M Cost) Farka STP 5x10^6 Lek/yr	Development of Sauk area depends on the construction of Farka STP.	○
2	Transmission of Sauk sewage to the Proposed Trunk Main No.3. New STP treats sewage only from Farka village	Capcity of new STP can be reduced. Since sewage is conveyed and treated at already designed STP, Sauk area sewer system can be developed earlier than Option 1.	This plan is to transfers sewage from one watershed to another watershed and some environmental consideration can be required. Safety factor (free board ratio) of Trunk Main No.3 Sewer pipe decreases in comparison with original design, but has enough capacity even in case of accepting Sauk sewage. Transmission pressure pipe length reaches as much as 6.6 km. Long pressure pipe with many ups and downs requires troublesome O&M work, like H_2S, air valve and drainage of the pipe sediments.	(Construction Cost) Farka STP 372x10^6 Lek Sauk PS 93x10^6 Lek Sewer Pipe 1,772x10^6 Lek 2,237x10^6 Lek (O&M Cost) Farka STP 2.5x10^6 Lek/yr Sauk PS 0.5x10^6 Lek/yr 3.0x10^6Lek/yr	Development of Sauk area can be independent from Farka sewerage plan.	△

Source: JICA Study Team

Table 7.5.5 Construction Cost of Each Facility

Pipe					
	Type	Diameter (mm)	Length (m)	Unit Cost (Lek/m)	Cost (million Lek)
Option 1	Gravity Flow	200～600	73,606	22,000	1,619
					1,619
Option 2	Gravity Flow(Sauk)	200～450	37,191	22,000	818
	Gravity Flow(Farka)	200～450	35,409	22,000	779
	Pressure Flow	150mm	500	20,000	10
	Pressure Flow	300mm	6580	25,000	165
					1,772

P S					
	Type	Capacity (m^3/min)	Unit Cost (millionLek/m^3/min)	Cost (million Lek)	
Option 2	Manhole Pump	–			
	Submersible Pump	6.2	15	93	

STP					
		Capacity (m^3/day)	Unit Cost (millionLek/1000m^3/day)	Cost (million Lek)	
Option 1		12,400	60	744	
Option 2		6,200	60	372	

Source: JICA Study Team

Table 7.5.6 O&M Cost of Each Facility

P S					
	Type	Capacity (m^3/day)	Unit Cost (Lek/year/m^3/min)	O&M Cost (MillionLek/year)	(Powercost)
Option 2					
	Submersible Pump	5,000	100	0.5	100Lek/year/m3/day

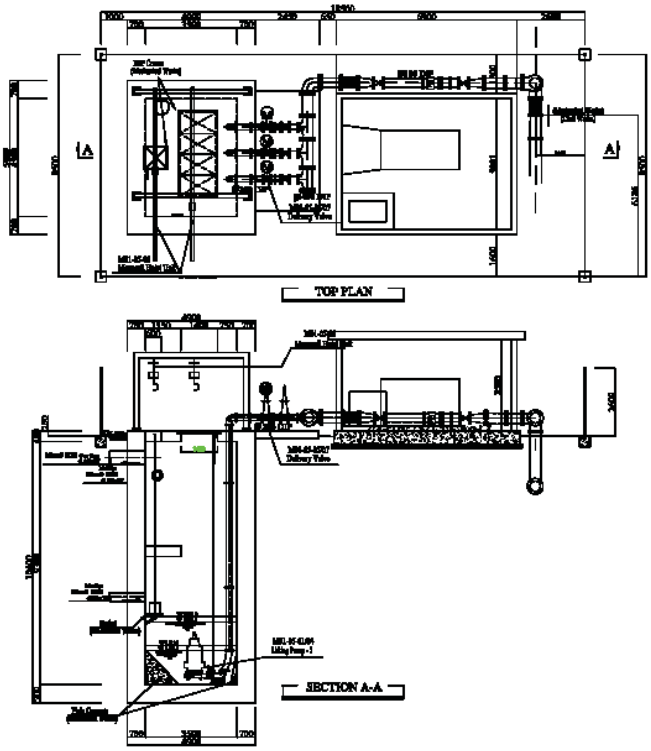
STP					
		Capacity (m^3/day)	Unit Cost (Lek/year/m^3/min)	O&M Cost (MillionLek/year)	(Power and Chemical)
Option 1		10,000	500	5.0	500Lek/year/m3/day
Option 2		5,000	500	2.5	

Source: JICA Study Team

Table 7.5.7 Capacity Check of Trunk Sewer No.3 Pipe

Trunk Main Capacity				
Proposed Flow for Trunk Main No.3		m^3/sec	1.76	
Specification of Trunk Main No.3				
	Diameter	mm	1,500	
	Slope	%	0.1	
	Velocity (Full Flow)	m/sec	1.37	Manning Formula n=0.012 V=1/0.012 × (1.5/4)^(2/3) × (0.01)^(1/2)
	Capacity (Full Flow)	m^3/sec	2.42	
Safety Factor (freeboard ratio)		-	1.38	=2.42/1.76
Capacity Check after Transfer				
Revised Flow		M3/sec	1.86	=1.76+0.10
Revised Safety Factor		-	1.30	=2.42/1.86

Source: JICA Study Team



Source: JICA Study Team

Figure 7.5.5 Pump Layout Plan

(4) Conclusion of the SD Plan

Option 1 is selected as optimum plan based on following reasons:

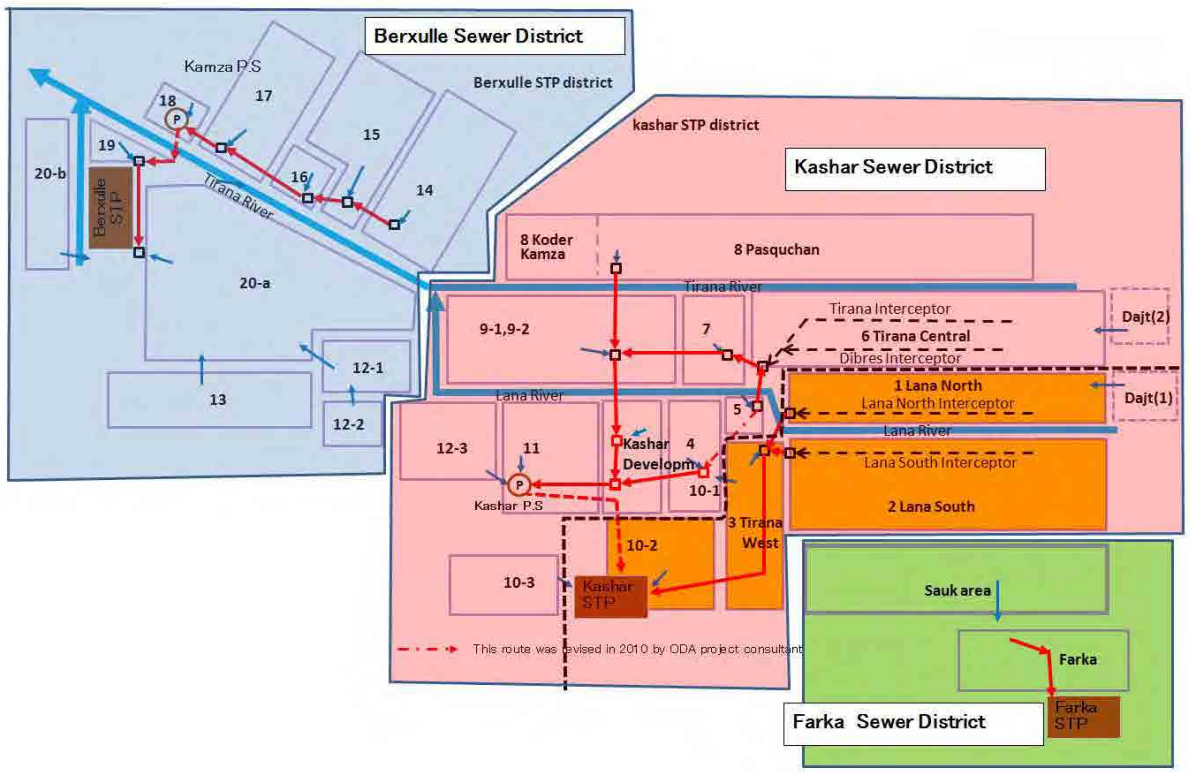
- Option 1 is in compliance with river basin management; and
- Sauk sewage plan put no impact on the Kashar SD development which has been reviewed by the Japanese ODA Loan consultants,

In the staged development plan, however, tentative pumping-up of the Sauk sewage is recommended since sewerage coverage of Sauk area has a very high priority.

As a conclusion, the Greater Tirana Sewerage System is composed of three SDs as shown in Figure 7.5.1.

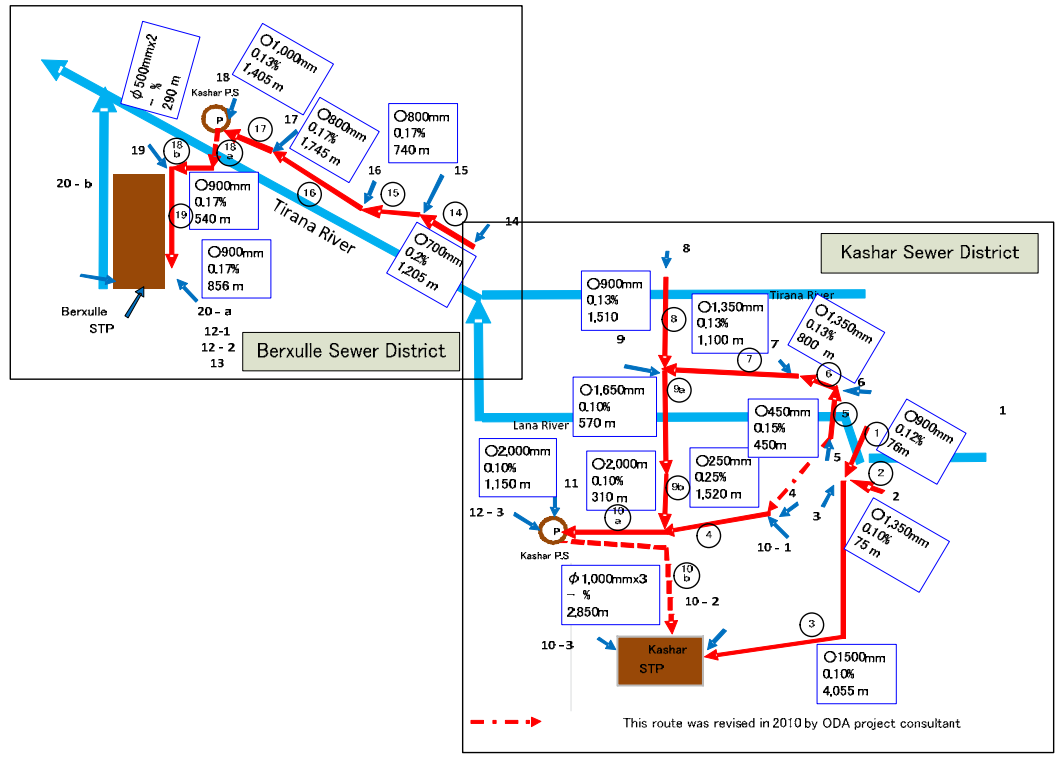
(5) Trunk Main Configurations in Master Plan

A schematic plan of the sewer trunk mains is shown in Figure 7.5.6 and their dimensions are calculated as shown in Figure 7.5.7. Table 7.5.8 shows the flow calculation sheet of the trunk mains. Almost all of the mains are deep, and pipe jacking installation method is adopted.



Source: JICA Study Team

Figure 7.5.6 Proposed Three-SD Plan



Source: JICA Study Team

Figure 7.5.7 Revised Trunk Main Sewer Plan

Table 7.5.8 Flow Calculation Sheet

Sewer		Catchent Area		Population		Pipe Length		Unit volume per capita	Wastewater		Pipe Design G.L=Ground Level, I.L=Invert Level, E.C=Earth Cover									
		Each Sewer	Cummulative	Each Sewer	Cummulative	Each Sewer	Cummulative				Diameter	Slope	Full-pipe Velocity	Full-pipe Flow	Upper G.L	Lower G.L	Upper I.L	Lower I.L	Upper E.C	Lower E.C
From	To	(ha)	(ha)	(person)	(person)	(m)	(m)	(lpcd)	(m^3/day)	(m^3/sec)	(mm)	(1/1000)	(m/sec)	(m^3/sec)	(m)	(m)	(m)	(m)	(m)	(m)
(Kashar Sewer District)																				
1	3	306	306	93,423	93,423	76	76	440	41,106	0.48	○900	1.2	1.068	0.68	92.30	93.50	88.17	87.91	3.20	4.60
2	3	1770.4	2076.4	257,654	257,654	75	75	440	113,368	1.31	○1350	1.0	1.340	1.92	92.70	93.50	88.01	87.80	3.30	4.30
3	STP	51.9	2128.3	5,192	356,269	4,055	4,131	440	156,758	1.81	○1500	1.0	1.370	2.42	93.50	90.00	87.78	83.62	4.10	4.80
5	6	3.72	3.72	11,694	11,694	450	450	440	5,145	0.06	○450	1.5	0.752	0.12	84.00	82.20	81.300	79.700	2.20	2.00
6	7	27.63	31.35	313,719	325,413	800	1,250	440	143,182	1.66	○1350	1.3	1.456	2.08	82.20	81.40	78.600	77.560	2.20	2.44
7	9a	0.00	31.35	11,306	336,719	1,100	2,350	440	148,156	1.71	○1350	1.3	1.456	2.08	81.40	74.00	77.400	70.600	2.60	2.00
8	9a	0.00	31.35	77,972	77,972	1,510	1,510	440	34,308	0.40	○900	1.3	1.112	0.71	70.90	74.00	67.970	64.439	2.00	8.61
9a	9b	32.57	63.92	24,205	438,896	570	2,920	440	193,114	2.24	○1650	0.9	1.385	2.96	74.00	71.78	64.419	63.906	8.00	6.17
9b	10a	0.00	63.92	225,000	663,896	310	3,230	440	292,114	3.38	○2000	0.9	1.575	4.95	71.78	74.69	63.886	63.607	5.82	8.98
4	10a	0.00	63.92	3,412	3,412	1,520	1,520	440	1,501	0.02	○250	2.5	0.656	0.03	89.23	74.69	86.000	72.390	2.93	2.00
10a	10b	0.00	63.92	0	667,308	1,150	4,380	440	293,616	3.40	○2000	0.9	1.575	4.95	74.69	66.06	63.587	62.850	8.98	3.00
10b	STP	182.75	182.75	6,003	673,311	2,850	7,230	440	296,257	3.43	φ1000 x 3	—	1.456	3.43	66.06	95.79	62.025	91.755	2.00	2.00
(Berxulle Sewer District)																				
14	15	652.7	652.7	44,502	44,502	1,205	1,205	440	19,581	0.23	○700	2	1.166	0.45	56.10	50.20	53.38	47.49	2.00	2.00
15	16	262.7	915.4	17,911	62,413	740	1,945	440	27,462	0.32	○800	1.7	1.175	0.59	50.20	51.00	47.37	46.08	2.00	4.10
16	17	39.3	954.7	2,680	65,093	1,745	3,690	440	28,641	0.33	○800	1.7	1.175	0.59	51.00	45.00	46.06	42.22	4.10	2.00
17	18a	650.9	1,605.6	44,379	109,472	1,405	5,095	440	48,168	0.56	○1000	1.3	1.192	0.94	45.00	43.60	41.90	39.07	2.10	3.50
18a	18b	82.9	1,688.5	5,652	115,124	290	5,385	440	50,655	0.59	φ500 x 2	—	1.503	0.59	43.60	43.70	38.98	38.98	4.10	4.20
18b	19	0.00	1,688.5	0	115,124	540	5,925	440	50,655	0.59	○900	1.7	1.271	0.81	43.70	41.00	38.96	38.02	3.80	2.10
19	STP	86.5	1,775.0	5,898	121,022	856	6,781	440	53,250	0.62	○900	1.7	1.271	0.81	41.00	41.00	38.00	36.54	2.10	3.50

Source: JICA Study Team