The legal powers of the akimate or a state enterprise owned by the akimate to collect fees for service and to control appropriation of these fees without interference from higher levels of Government are not clear-cut. It is not clear whether the recent changes to the tax code (in which the distinction between local and Republic taxes was abolished) will further reduce the ability of the akimate to manage an independent budget. Ideally overall reform of the budget system matching taxing powers with responsibilities should be carried through. In the meantime mechanisms to ensure that the collection of fees for the provision of local services is kept separate from national taxes need to be developed and tested. In due course some form of "Local Government Act" which codifies the powers of local levels of Government to collect charges and appropriate the revenues needs to be developed to cover not only SWM Services but the whole range of municipal functions.

2.6.4 Environmental Responsibilities

Kazakhstan along with other members of the Former Soviet Union has inherited a rather unusual administrative structure. The presidential Apparat directly appoints akimates in each oblast. Administrative units in the oblasts (and special cities with the status of oblasts) are sub-ordinated both to the akimate and to the Republican Ministry which reports through its minister to the Council of Ministers[2]. In many respects the presidential apparat and the akimates have taken over the role that the Communist party assumed before 1991. The result is still a highly centralized power structure albeit with two different routes to the top.

To this structure must be added the "mushroom" effect. The administration in Kazakhstan has a strong tendency to form a new committee whenever a new problem arises. While this effect can be observed in most administrations, it is particularly strong in Kazakhstan. Great care should be taken in interpreting the word "Committee" which when used in Kazakhstan or other parts of the FSU has a rather different meaning to that normally associated with it in the West. Committees in systems with a Soviet heritage often have significant executive powers which they exercise. How these committees are in turn controlled is not clear to an outside observer, but it would appear that the members of such committees loyalties tend to lie with the bodies from which they drawn, rather than to any statutory duties laid down in the documents creating these committees.

An associated development has been the creation of separate off-budget funds for specific purposes. This has made it very difficult for the Government to establish overall priorities. Further local levels of Government are not representative local Governments in the Western democratic tradition, but administrative arms of the central government, again making it less likely that these bodies will respond to local priorities.

A detailed review of these structures is well outside the scope of this project. For a fuller review the reader is referred to a World Bank Report.[3] These structures are quite different from public administrative practices followed in the developed World. There is need for urgent reform of these structures both to consolidate functions and reduce the overlaps of responsibilities, and to create a formal division of responsibilities between different levels of Government. Options are presented in the Supporting Report and in the Discussion Papers previously distributed during the Study course.

[2] In Russian the term Government is often used to mean the Council of Ministers, not the broader administrative structure. The reader should note the potential for confusion in documents translated between the two languages.

[3] **"Kazakstan: Transition of the State"** A World Bank Country Study, March 1997, ISSN 0253-2123

The legal section of the Supporting Report identifies the main entities which are operating in the Environmental sector and lists the documents establishing these entities. However given the double subordination arrangements, it is not possible to identify clearly the actual responsibilities of the different levels of Government. The first step towards reform is to clarify and specify in legislation the responsibilities, duties and powers of the oblast level and republican level Government. Even if there are no plans for introducing representative government at the oblast level, there would be benefits in clarifying the division of power using legal rather than administrative means. This would be a first step towards reducing the opportunity for shifting responsibility from one body to another in a game of perpetual "pass the parcel". The second step would be consolidation of bodies at each level:

At the Republican level within the Ministry of Ecology

At the oblast level into two departments,

Department of Housing and Communal services – which would have responsibilities for overall management of solid waste services and other projects for Public Health and Environment protection that need to be funded from the public purse.

Department of Environment and Public Health – which would be responsible for monitoring environmental and public health issues, and enforcement of republican legislation in this area as specified in the implementation arrangements of that legislation.

2.6.5 Management, Monitoring and Enforcement

SWM is a public responsibility. That is the state must ensure that the service is carried out and ensure that resources are mobilized for this purpose. This does not mean that the actual service must be provided by the government or a state owned enterprise, but that the Government accepts a responsibility to specify minimum levels of service and to ensure that resources are mobilized to provide that service.

The arguments showing that it is a public responsibility are presented in the Supporting Report and the earlier Discussion papers. At the start of the study it was unclear that these were accepted, but it now appears that the these arguments are now generally accepted, and the proposed Institutional arrangements are based on acceptance of this principle.

With the change from a command economy to a market economy the pendulum has swung from one extreme to the other. In the past all such services were under direct state control; now it is assumed that the old state institutions can simply be privatized, and that the sole role of Government is enforcement of laws and regulations which codify environmental standards. While this is true in many sectors, in those sectors where there are genuine public interests, the pendulum must be slowed and stopped part way as indeed has been done in privatization programs throughout the developed world. While most operations can be carried out by the private sector the Government must provide overall management, and this requires some institutional structures to provide this overall management.

There is also a need to assign responsibilities for management of these public interests to these institutions through new laws. These laws have to replace the previous system where responsibilities were assigned administratively, and provide a basis to hold some

level of Government liable if it fails to fulfil its public duties in this area. These issues are discussed in more detail in the Supporting Report..

2.6.6 Ownership of Current Services

While the lack of Government involvement in overall management of services poses significant problems, the current ownership structure of key assets poses no real problems except for the need to access new capital for investment.

Collection system. Operation of this by private companies poses no real problems and indeed this service is provided by private contractors in many other countries. Further it is common for the equipment to be financed wholly by the private sector. However as discussed above the contracts for services might be made between the companies and the city, and the collection of fees from households undertaken by the Waste Authority on behalf of the city. Financing of new trucks requires government involvement simply because the private sector is too weak to finance these itself. If these vehicles are financed using aid, the donors will require that the Government retains ownership of these trucks, which could be leased to the companies.

Transfer and Disposal facilities. The existing short term leases are in effect management contracts and should be converted into this legal form on their expiry. Major new investment will be needed and it appears likely that this will have to be made by the Government, as it is very unlikely that the private sector will be interested. The Government could contract out operation of these new publicly owned facilities. However it is crucial that these management contracts protect the Government's assets, and allow the city to control access to these sites to prevent the operators abusing a potential monopoly position.

Should this capital be provided through aid, then significant legal issues will arise in drawing up the aid agreement to ensure that the public interest in the assets that are constructed are properly protected. This for example might include conditions that any loan involved would be repayable immediately should title to the assets be transferred to a private owner.

The current modus operandi of the State Property Committee poses a significant barrier to any aid agreement. Unless there is a substantial change of attitude by this body and a willingness to make its operations more transparent, it will be difficult for any aid body to provide funds for the construction of new assets to be owned by the state. To date the State Property Committee has failed to answer reasonable questions on the ownership of various existing state assets, and the processes that it has used in leasing these assets or of controlling companies in which it holds shares.

Any aid donor will require water-tight guarantees that assets constructed using aid money will be properly protected, and that partial or total interests in these assets will not be disposed of through secret deals.

2.6.7 Anti Monopoly Committee

To date the actions of the Anti-Monopoly Commission (AMC) in this sector have been inappropriate. To date they have simply hastened the deterioration of most of the

companies operating in the Sector and have done little if anything to promote competition in the sector.

Certainly consumer protection is a significant issue in Almaty, and the whole of Kazakhstan. Communal services consume a very large part of the income of many pensioners and quite a large number of workers. Until wages and pensions can be raised to more realistic levels (in many cases they are currently below subsistence levels) holding down the tariffs for these services is one of the few ways the Government can assist the large numbers currently living in poverty.

However the priorities of the AMC appear to be misguided. Waste charges represent only 1% or 2% of the total charges; and the resources of the AMC would be far better employed addressing the major components of the overall budget for communal services faced by the poorer members of the community. This should involve not only regulation of tariffs where producers possess real monopoly powers, but forcing sellers to change their systems so that householders can control their consumption.

The control of collection tariffs in its current form based on out-moded Soviet style norms setting uniform tariffs across the city should cease. (An appendix to the Discussion Paper "Sample Sector Structure" which is attached discusses where these norms are inappropriate). In aggregate the tariffs set are too low. This is indisputable from the deterioration in the financial condition of the collection companies. Structurally the poor are being forced to subsidize the rich. Finally the inflexibility of the norm is preventing new arrangements between the community and the collection companies for replacement of containers.

Thus the attention of the AMC should be turned to ensuring that there is effective competition amongst the collection companies.

Similarly price control of the operation of the transfer station and disposal site should be abandoned in favor of ensuring that there is genuine competition for the management contracts for these facilities. The existing leases are effectively management contracts. In future if the state has to invest in new facilities, operation of these facilities should be contracted out via management contracts rather than leases. The attention of the AMC should be redirected to ensure that the tendering process is open and encourages competition for these management contracts.

Unfortunately the AMC has not answered any of our formal questions on its powers to identify beneficial owners, cross ownership or to control mergers and acquisitions. This should be the core of its activities in this and many other sectors. We are aware of many rumors of ownership through various proxies, cross ownership and other anti-competitive behavior within the sector. But without the help of the AMC and proper provisions within the company law to require the disclosure of anti-competitive ownership holdings, we are unable to judge whether these rumors are true or false. Laws regulating competition and ownership are discussed in the next section.

2.7 EXISTING LEGAL STRUCTURE

1) General

The change to the economic system of Kazakhstan has created the need for major changes as well in the legal system. The most obvious change is that suddenly many types of activities which previously had not been allowed have now become possible, and a whole range of new laws are needed to regulate these activities. A list of the existing laws may be found in the Supporting Report.

This expansion in the range of activities that the law must regulate has necessitated a massive volume of new legislation. The sheer volume of this new legislation makes it extremely difficult to be certain of what laws currently apply in any sector.

The changes in the economic system have not only increased the range of activities to be governed by the law, but also necessitated some more subtle but far reaching changes in the role of the legal system. Under the old order, the law was concerned mainly with specifying what actions were allowable and what actions were not allowable. With the change in economic system and the diversification of ownership and other rights, the legal system must become increasingly involved in defining the processes to enforce the law. It should become the most important tool for defining institutional structures. It must also become increasingly involved in defining the relationship between a more diverse range of entities.

So far there has been a lot of activity in rewriting laws to define what actions are and are not permitted in this new system. As yet very little has been done to enhance those aspects of the legal code which defines enforcement procedures and specifies legal entities or institutions responsible for enforcement. This problem is endemic in the environmental and solid waste management sphere, as well as in many other areas.

The lack of attention to enforcement procedures in drafting new laws to codify (and possibly upgrade) existing norms has been a contributing factor to the "mushroom effect" – or the uncontrolled creation of new institutions. Within the public health and environmental sector there are already too many institutions monitoring various laws and perhaps enforcing them.

For example it is widely agreed that there is a major problem with both small local and large illegal dump sites, though there are many environmental laws which make these "illegal" and several institutions already involved in enforcing these laws. This would appear to be a classic example of the old adage "where many are responsible no-one is responsible" The solution to this problem is twofold. First there must be consolidation of the institutions involved as already discussed in sections 2.6.4 and 2.6.5. Secondly the enforcement provisions of laws that set standards must be strengthened to specify that a particular institution is responsible for enforcement. If the institution does not take reasonable measures to enforce the standards and take other actions necessary to resolve the underlying problem, then it should be liable to prosecution.

Continuing this example it is clear that the existence of local "illegal" dumpsites in some areas is, at least in part, the result of a lack of waste management services in these areas. This is particularly the case in areas where individual houses predominate. Enforcement

provision for laws defining "illegal" dumpsites might include provisions requiring a designated institution to ensure that waste collection services are available in the region.[4]

For implementing more effective SWM services in Almaty, the priorities as far as legal reform appear to be:

- Development of a "Local Government Act" or at least that part which defines the powers and responsibilities of the city Administration for waste management and environmental protection.
- Amending the Housing Act to ensure that a legal entity must be created to take responsibility for all communal areas – i.e. make the formation of KSKs or some equivalent body compulsory
- Amending the Housing Act to ensure that the City Government has adequate powers to impose compulsory levies for services such as garbage collection, and to ensure that the proceeds of these levies must be spent on these services and are not transferred to the Republic budget.
- Amending existing environmental and Sanitary protection laws to ensure that specific institutions are responsible and accountable for the enforcement of these laws
- Abolishing the powers of the Anti-monopoly Committee to set tariffs for waste collection or else to change the basis for setting these maximum tariffs so that tariffs are based on long run rather than short run marginal costs (that is the tariff should allow for the gradual replacement of assets such as trucks)

To assist the implementation of possible foreign assistance programs for SWM services in Almaty, the priorities as far as legal reform appear to be:

- Introduction of laws requiring disclosure of all state assets
- Introduction of laws to require disclosure of any agreement to lease or sell state assets or to sell state held shares
- Introduction of laws to ensure equal access to leases of state assets (to ensure that equipment provided by aid is not "husbanded" for the use of favored companies)
- Introduction of laws requiring open tendering processes for the operation of any state services or assets (to ensure fair competition for operation of the transfer station and disposal site)
- Clarification of the laws on the granting of Guarantees by local levels of Government to ensure that there is a limit on the volume of guarantees that can be issued by local Government (so that the guarantee has some real value)
- Allow local government to issue guarantees by giving a lien over its revenues as well as granting liens over assets
- Modify budget laws so that local Governments have control over local tax revenues so that a lien offered by local Government over these revenue flows is indeed meaningful

[4] For example in Australia the "Local Government Act" and the "Public Health Act" inter alia identify the "Health Inspector" – a statutory post in local councils (a local level of Government) as the designated person to enforce anti-dumping regulations. These Acts also place a responsibility on the Health Inspector to ensure that garbage collection services are operational in urban areas within the Council area. Similar provisions will be found in the Laws of most developed countries.

2) Regulation/Norms for Services of solid waste management

In 1997, the regulations/norms prepared by various health organizations were approved by the Ministry of Health's Department of Sanitary Monitoring under the number of "Sanitary Rules #3.01.007.97 Maintenance of Populated Areas Territories". Some of the norms stipulated in that document and relevant to this report are described in section 2.2.

3) Environmental Protection

There are many laws pertaining to environmental protection. As the Government is trying to improve standards in this area there have been many new laws released over the past few years specifying new standards. In the absence of a modern registration and gazetting system for legislation it is difficult to identify all relevant legislation.

Of particular importance to SWM is legislation requiring the licensing of entities that generate, transport or dispose of solid waste. This legislation does identify enforcement procedures and could in theory be used to monitor and control waste generation and collection. In practice it seems to be used as a way of funding environmental protection bodies rather than to control waste generation.

4) Environmental Impact Assessment

The procedure and contents of EIA in Kazakhstan is stipulated in "Provisional Instruction on Assessment Procedure of Economic Activity Impact on Environment (OVOS/EIA) in Kazakhstan, #03.02.01.93, Almaty 1993.

According to the above instruction, environmental impact assessment is required for all projects in principle. Procedure of EIA is divided in following 4 steps.

(1) Review of environmental conditions
(2) Preliminary assessment
(3) Environmental assessment
(4) Comprehensive environmental mitigation measure

Firstly review and preliminary assessment will be conducted then necessity of following steps will be decided based on the result of preliminary assessment of each project.

5) Housing Relations and Tariffs

The most important legislation in this area concerning SWM is the Law on Housing Relations of 16 April, 1997. This law is intended to provide a framework for the relationship amongst the main bodies concerned with housing, and inter alia provides a legal basis for the formation of KSK's and KSD's to replace the co-operatives that had existed under earlier ownership arrangements.

Unfortunately this legislation does not compel households to belong to their local KSK or KSD, severely limiting the ability of these bodies to manage services such as SWM where householders are not co-operative.

The findings of the AMC are also given the status of Law, though the procedures to be followed by AMC are in many cases not specified in Laws. This makes challenging either the jurisdiction or findings of the Committee extremely difficult.

The Laws setting SWM charges specify actual charges rather than principles to be used to calculate charges or tests for whether the AMC should regulate charges. These principles, rather than specific findings need to be encoded in law. Current laws setting tariffs should be repealed, and reconstituted as regulations that can be challenged according to the general principles established in the main Anti-Monopoly legislation.

6) Budget Laws and Guarantees

There is a group of laws that regulate the budget and the granting of guarantees by various arms of Government. While at first sight the relevance of these to SWM is not obvious, these laws will determine whether it is possible to finance the Waste Authority.

The laws on the budget such as Law 318 of, Law 357 of ... and Law 359 of ... are actually implementing acts that appropriate funds annually. They are superseded ever year. While these laws actually specify funds to be spent on an annual basis, they do not set down any principles for the allocation of funds or delegate responsibilities to lower levels of Government. In fact budget allocations can vary widely from one year to the next. For example the proportion of the Environmental Protection Fund that is collected by Almaty city Environmental Protection Fund that it was allowed to retain changed from 50% to 21% in one year.

The laws currently referred to as Budget laws do not specify the powers of local Government to collect or retain taxes or to appropriate these for local purposes. Local Budgets indeed differ in structure from local budgets as normally understood in the West in that they are not program oriented, but provide largely for salaries of local staff that fulfil programs that are directed and largely funded by the central Government.

The failure of the budget laws to provide a stable revenue stream to local Government and to provide local Government with a reasonable degree of control over this revenue stream will be seen as a major weakness by lenders. It is likely to prevent them accepting a city guarantee.

Law 464-1.3 PK of 2 August 1999 is the key law governing the actual issue of a guarantee by the City Government on behalf of the Waste Authority. This law appears to prohibit the City Government from issuing a charge over the revenue of the city to the lender, which is likely to be the only form of Guarantee acceptable to a lender.

2.8 FINANCIAL AND ECONOMIC SITUATION

2.8.1 Present Conditions of Kazakhstan

1) Economic Structure

In Soviet times, the economies of the component Republics were highly integrated with the Soviet production system and planned by Moscow. In pursuit of economic efficiency for the Soviet Union, only a few kinds of industries were developed in each Republics. Kazakhstan specialized mainly in agriculture, metallurgy and mineral extraction. It had virtually no manufacturing industries and depended on the Soviet system.

Since the break-up of the Soviet Union followed by the turbulence of economic transition, Kazakhstan remains dependent on only a few industries and on the Russian economy.

In 1997, the top exporting commodities were as follows.

Table 2.8.1 Top Exporting Commodities

Commodity	Share
Fuel/oil products - mostly crude oil -	32.7%
Ferrous metals	14.8%
Copper and copper products	10.5%

Exports to Russia were 42.0% and to CIS 53.8%.

The top import commodities were as follows.

Table 2.8.2 Top Importing Commodities

Commodity	Share
Reactors/machinery	16.4%
Fuel/oil products - most of them is gasoline	14.3%
Electrical equipment	7.8%
Vehicles	6.1%

Imports from Russia 46.0% and from CIS 54.0%.

2) Recent Economic Situations

(1) Recent GDP Growth

According to Kazakhstan Economic Trends, the real GDP growth rate is as follows.

Table 2.8.3 GDP Growth Rate

Year	1996	1997	1998
Growth Rate	0.5%	2.0%	-2.5

This reverse in growth was caused mainly by the Russian Ruble crisis and the decline of agricultural production, as shown in Figure 2.8.1.

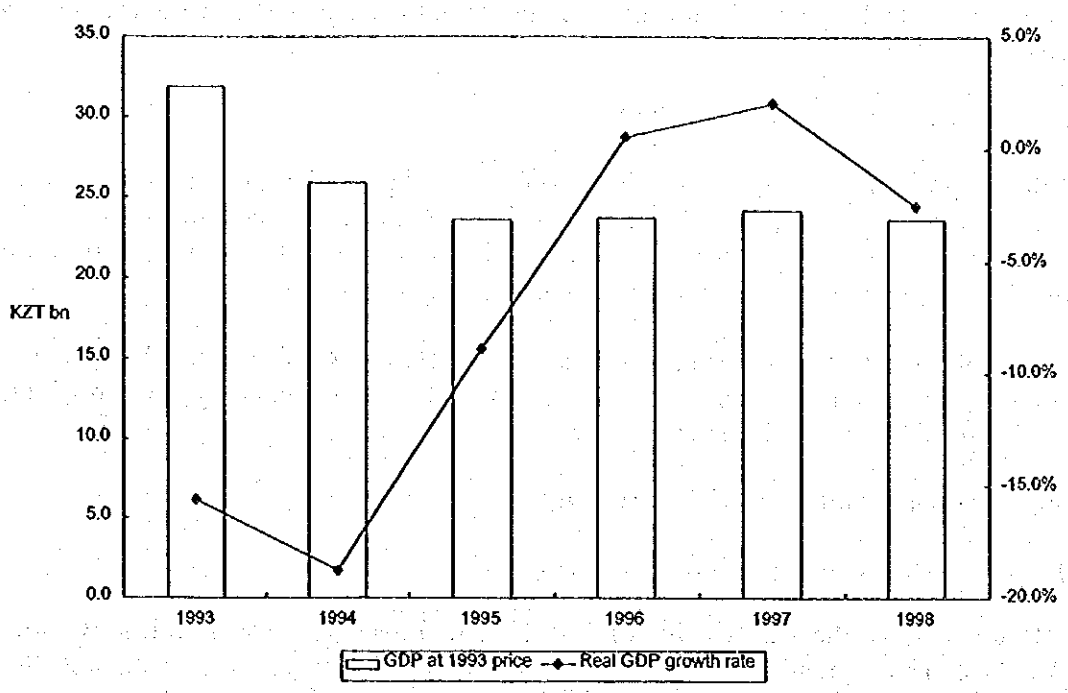


Figure 2.8.1 Real GDP Growth

Source: Economic Intelligence Unit, *"Country Report Kazakhstan, 4th quarter 1998"*and Kazakhstan Economic Trends, *"Monthly Update February 1999"*

(2) Balance of Payments

Current accounts have been showing deficits and it has been increasing, as follows.

Table 2.8.4 Current Account Deficit

Year	1995	1996	1997	1998*
Current Account Deficit (USD million)	518.3	749.9	912.3	689.0

*: 9 months

Those deficits had been covered by the surplus of capital accounts especially by Foreign Direct Investment (FDI). But the overall balance shows a deficit from the first quarter of 1998 as a result of FDI decline. This is because of the world-wide "flight to quality" trend in capital markets since the Asian financial crisis.

(3) State Budget

The state budge deficit resulted in about 3.7% of GDP, which is the same level in 1997 and well below the 5.5% target agreed with IMF for the 1998 budget. In order to attain the target, 1998 budget was a very tight one as the Education budget was reduced by 70%, Health care by 26.8%, Agriculture by 43.6% and Mining/manufacturing by 67.9% in nominal terms.

On the other hand, VAT and Customs revenue rose by 37.5% and 22.1% respectively due to improvements in tax administration while Corporate income tax and Personal income tax fell by 4.7% and 27.5% respectively due to economic deterioration. In addition, the

government sold the state stake for the exploitation of the Caspian shelf which amounts to USD 500 million.

(4) Russian Ruble Crisis in 1998

With foreign debt rising due to political instability and partly because of reduced export earnings due to foreign world oil prices after the East Asian recession, the Russian ruble collapsed in August 1998. Other CIS countries including Kazakhstan suffered from this crisis because they were closely related to the Russian economy.

The Kazakhstan economy was relatively steady before the Russian crisis. After August, however, the Kazakhstan economy collapse. In September the monthly real growth rate was down 11.5% on previous year.

2.8.2 Present Conditions of Almaty City

1) Impacts of New Capital City

In October 1997 the capital city of Kazakhstan moved to Astana (formerly called Akmola). The population of Astana was 271,000 as of January 1998 or about 26% of Almaty. The territory is 300 km^2 or about 1.28 times larger than Almaty .

It is very difficult to evaluate the impact of the change of the capital city on the economic and financial activity in Almaty since no quantitative data is officially available including the budget for the development of the new city, etc.

Presently almost all Ministries of the Republic have moved to the new capital city but the Central Bank is still located in Almaty as well as a number of private companies. It is expected that Almaty will remain the economic center and Astana with will be administrative/political center of Kazakhstan. Thus, the impact on Almaty will be limited from the viewpoint of economy or finance at least in the next decade.

2) Business Conditions of Waste Collection Companies

Presently tariffs for solid waste management are set by the Antimonopoly Committee of Almaty City as follows:

Table 2.8.5 Tariff on Solid Waste

(As of July 1, 1998)

Service Type	Tariff
Household waste collection	
Block houses with full utility	25.15 KZT/person/month
Block houses with partial utility	33.53 KZT/person/month
Individual houses	55.89 KZT/person/month
Industrial waste collection	335.34 KZT/m^3
City dump site	35.24 KZT/m^3
Transfer station	81.89 KZT/m^3
Waste recycling mill	170.49 KZT/m^3

Source: Antimonopoly Committee of Almaty City

In our interview survey a number of companies complained about the difficulties of a running waste collection business. Tariffs for household and industrial waste collection were set in 1997 and have not been revised. Costs such as fuel, electricity, etc. have since doubled. In addition, social tax (21% of salaries after pension fund payment), corporate income tax (30%) and VAT (20%) are levied.

Another problem is the tariff collection rate is roughly 70%. Around 30% of people receiving services do not or cannot pay the tariff.

But collection companies have virtually no legal mechanism to enforce payment. Legal procedure is time consuming and costly.

3) Business Conditions of KSK/KSD

In the case of KSKs (cooperatives for block house management), each family pays the fees to a savings bank. The computer center of the bank calculates and distributes money to the water supply company, electricity company, telephone company, waste collection company and KSKs for their building maintenance services. On the other hand, in the case of KSDs (cooperatives for individual house community management), people come to the office and pay the charges directly because KSDs are located in the suburbs. The KSDs pay the collected fees to a bank. In both cases, they get 1.5% commission from utility companies for billing and collection. But this revenue is very small. Their main revenues are those from building or community management services.

KSKs/KSDs have no liability for collecting charges. Thus, supplying companies sue people not paying.

Some KSKs or KSDs provide their solid waste collection services with leased trucks and hired drivers when they are dissatisfy with the services provided by the collection companies. In this case, they face the same problems as the collection companies do.

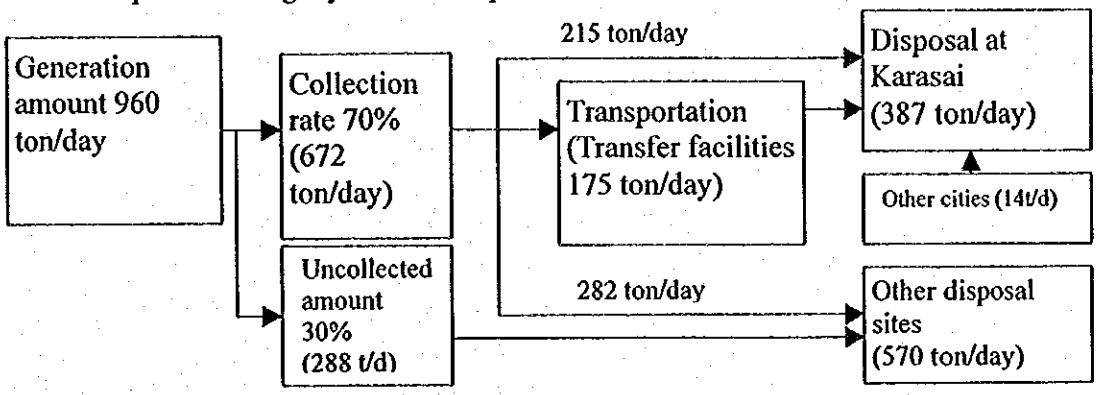
Chapter 3

SOLID WASTE MANAGEMENT ISSUES

CHAPTER 3 SOLID WASTE MANAGEMENT ISSUES

It must be very clearly stated that SWM in Almaty City is on the verge of collapse as described in the previous section. The following issues which have led to this situation are considered in the preparation of the master plan (hereinafter referred to as "M/P").

1. In outline, current solid waste flow is as follows. Although Karasai disposal site is the only approved disposal site for waste from Almaty city, it receives less than half the amount of solid waste collected in the city. The remaining waste is disposed of illegally at other disposal sites.



2. Although all responsible authorities, including the municipality, understand this situation, no effective measures have been taken or are planned.
3. None of the collection companies are able to replace their equipment. Therefore it is doubtful that they can continue their service for much longer.
4. Privatization of solid waste collection service started in 1996 but the financial condition of the companies is poor and the service provided is inadequate. The main causes are:
   a. Tariff for the service is set by the Anti-monopoly committee but the tariff is too low to meet the costs of the services required.
   b. Local government administration is basically responsible for the state of affairs within its territory, as outlined in the Constitution, Article 85. However Almaty City has passed the responsibility of public health, which is included the "state of affairs" to private companies.
   c. Collection of SWM related tariffs is much more difficult than collection of electricity or water tariffs because there is no effective sanction against non payment. The present system does not allow for this problem.

PART II

SOLID WASTE MANAGEMENT MASTER PLAN IN ALMATY CITY

Chapter 4

BASIC POLICY AND TARGET OF THE MASTER PLAN

PART II SOLID WASTE MANAGEMENT MASTER PLAN IN ALMATY CITY

CHAPTER 4 BASIC POLICY AND TARGET OF THE MASTER PLAN

4.1 POLICY OF THE MASTER PLAN

The system of SWM in Almaty city has been deteriorating year by year after privatization was introduced in 1996. It is quite urgent to convert this situation and to establish a base for a sustainable SWM system. Therefore, it is necessary not only to arrange the required equipment and facilities to provide SWM service but also to re-organize the legal and institutional set-up and to establish a concrete financial base for SWM.

Therefore, the master plan (M/P) to be formulated shall be realistic and feasible for implementation and concentrate on the three points of:

- Requirements in equipment and facilities
- Reorganization of institutional and legal set-up.
- Establishment of concrete financial base

The M/P shall take into consideration the very severe financial situation of Kazakhstan at present. Therefore, the financial resources shall be concentrated in the most important areas.

It should be noted that reduction of solid waste and promotion of recycling will be required in the long term. However, it will be difficult to establish these systems at present because SWM in Almaty city is on the verge of collapse and suffering severe financial constraints. Based on these considerations the M/P has recommended the introduction of a suitable system in the target year of 2010.

The basic policy to formulate the M/P is set for each of technical, financial and institutional aspects as shown in Figure 4.1.1.

Technical Aspects
1. Set up minimum requirements of the Services
2. Formulate alternatives to achieve minimum requirements
3. Select the minimum cost alternative

Financial Aspects
1. Formulate financial base to cover operation and maintenance costs through collection of service charge
2. Introduce cross subsidy system
3. Set tariff level between 1-2 % of income

Institutional Aspects
1. Review and reform SWM service system
2. Guarantee universal service to whole area of the city
3. Reform tariff system to ensure financial sustainability
4. Establish implementation organization for investment
5. Restructure the management system of facilities and equipment
6. Provide incentives for private sector development of service delivery

Figure 4.1.1 Basic Policy for the M/P

4.2 TARGET OF THE MASTER PLAN

The targets of SWM service are to provide speedy, efficient and economical service to collect solid waste from urban areas where it is generated and to dispose of it in a sanitary manner, in order to provide the citizens with a safe and healthy environment. The need for environmental conservation has pushed countries in the developed world to exert efforts reduce levels of waste generation. This shall be considered as a long target of the M/P. The reason for this is that in the case of Almaty city the important issues at present are to rebuild a sustainable system to provide collection service to the whole area of the city and to provide the much needed sanitary disposal of solid waste. These shall be the medium term targets of the M/P. The overall target of the M/P is to realize sustainable SWM.

a. Target year — Medium term 2005, Long term 2010

b. Target — Establishment of sustainable SWM system
- Arrangement of appropriate equipment and facilities
- Reform of institutional set up
- Establishment of financial base
- Provision of appropriate service to the whole city area
- Introduction of appropriate system to reduce and recycle solid waste once the economic conditions have improved sufficiently to sustain such a system

Chapter 5

SOCIOECONOMIC FRAMEWORK OF THE MASTER PLAN

CHAPTER 5 SOCIOECONOMIC FRAMEWORK OF THE MASTER PLAN

5.1 POPULATION FORECAST

The Architectural and Town Planning Department of Almaty City is now preparing a new development plan to supercede the 1989 plan. This plan will provide the conceptual development plan for the city for the year 2030 and general plan up to the year 2020.

Since the existing development plan was approved in 1992 the city is said to have undergone many changes such as a fall in expected investment, privatization, transfer of the capital to Astana, etc. Due to these changes the city authorities decided to prepare the new plan. Population forecasts have been lowered.

While the new development plan is still being prepared the Study Team was provided with population forecasts as shown in Table 5.1.1.

Table 5.1.1 Forecast Population in New Development Plan

District	1999	2005	2010
1) Almalinskii	188,500	184,900	183,200
- Dwellings with complete conveniences	(77.6%)	(77.6%)	(77.9%)
- Dwellings with partial conveniences	(8.9%)	(8.9%)	(8.8%)
- Dwellings with no conveniences	(13.5%)	(13.5%)	(13.3%)
2) Auezovskii	246,600	288,000	319,800
- Dwellings with complete conveniences	(83.4%)	(85.0%)	(77.7%)
- Dwellings with partial conveniences	(2.0%)	(2.6%)	(11.3%)
- Dwellings with no conveniences	(14.6%)	(12.4%)	(11.0%)
3) Bostandyskii	233,500	212,100	210,600
- Dwellings with complete conveniences	(87.0%)	(87.0%)	(87.2%)
- Dwellings with partial conveniences	(6.1%)	(6.1%)	(6.0%)
- Dwellings with no conveniences	(6.9%)	(6.9%)	(6.8%)
4) Zhetysuskii	130,700	132,400	129,400
- Dwellings with complete conveniences	(59.6%)	(55.8%)	(55.8%)
- Dwellings with partial conveniences	(6.9%)	(12.8%)	(12.8%)
- Dwellings with no conveniences	(33.5%)	(31.4%)	(31.4%)
5) Medeuskii	130,300	132,100	132,100
- Dwellings with complete conveniences	(61.4%)	(60.7%)	(55.8%)
- Dwellings with partial conveniences	(6.2%)	(7.2%)	(12.8%)
- Dwellings with no conveniences	(32.4%)	(32.1%)	(31.4%)
6) Turksibskii	145,000	150,500	174,900
- Dwellings with complete conveniences	(27.4%)	(24.2%)	(31.5%)
- Dwellings with partial conveniences	(28.1%)	(36.5%)	(35.4%)
- Dwellings with no conveniences	(44.5%)	(39.3%)	(33.1%)
Total Almaty City	1,076,600	1,100,000	1,150,000
- Dwellings with complete conveniences	(70.2%)	(69.4%)	(68.1%)
- Dwellings with partial conveniences	(8.6%)	(10.8%)	(13.3%)
- Dwellings with no conveniences	(21.2%)	(19.9%)	(18.6%)

These forecasts do not differ much from other forecasts provided by the Almaty City Economic Department. The population growth in the city will be absorbed mainly by the two border districts of Auezovskii (to the west) and Turksibskii (to the north). These forecasts were therefore adopted by the Study Team in formulating the M/P. However from the solid waste collection viewpoint the three dwelling types were combined in two categories as follows:

New City Development Plan	SWM Master Plan
1) Dwellings with complete conveniences	1) Block Housing areas (BH)
2) Dwellings with partial conveniences	2) Low rise block housing areas
3) Dwellings with no conveniences	3) Individual Housing areas (IH)

5.2 ECONOMIC FORECAST

5.2.1 Kazakhstan-2030

President Nursultan Nazarbayev published a long-term national program "Kazakhstan 2030" in 1997. It aims for Kazakhstan to become an Asian NIE (Newly Industrializing Economies) country such as Singapore, Malaysia, etc. in 2030. Confusion and declining production after economic transition required a long-term goal. As many examples of economic development in oil-rich developing countries that fail to diversify their economic structure show, knowledge and technology based competitiveness is fundamentally more important than any amount of natural resources. The paper says, "The government must set about launching an active industrial policy of diversification....".

As for the industrial policy for the medium-term, until the year of 2010 it concentrates on labor-intensive sectors which have potential from the viewpoint of their opportunities and competitiveness. Such sectors include agriculture, forestry and timber processing, light manufacturing and food processing, tourism, housing construction and the building of infrastructure. By developing these sectors they are solving not only the structural problems of the economy, but also issues of employment and poverty, which at present time is particularly important.

On the other hand, the development of energy and other natural resources will continue to attract more foreign investments. Its purpose is to earn export revenues which will assist not only the economic growth but the political stability of the country as well as providing for its national security.

5.2.2 Future Oil Price

Kazakhstan's economy is particularly vulnerable to fluctuating world commodity markets especially to oil prices. Thus, it is important to examine future oil price scenarios before making economic forecast for Kazakhstan. In 1998, international oil markets were characterized by a structural glut, or supply exceeding demand. Demand was falling due to the Asian financial crisis. And supply increased due to production in Iraq and many other countries. As a result, oil prices were at historically low levels in 1998. Since it is expected that in 2000, the world economy will recover from the recent sluggishness, oil prices will increase from the present level. But according to the forecasts made by

Petroleum Economics Ltd., oil prices should not be expected to rise significantly and should be stable over the medium-term (refer to Table 5.2.1).

Table 5.2.1 Long Term Oil Price Scenarios

(in 1996 USD/bbl)

Institution/Scenario	Date of forecast	2000	2005	2010	2020
Petroleum Economics Ltd.	Feb. 98	15.31	13.97	13.14	n.a.
EIA Reference Case	Dec. 97	19.11	20,20	20.81	22.32
EIA Low-price Case	Idem	14.47	14.59	14.44	14.43
DRI	Apr. 97	17.29	19.27	21.07	26.16
EIA Capacity-Constraint Case	1996	18.18	26.73	26.73	n.a.
EIA Energy-Saving Case	1996	18.18	18.18	18.18	n.a.

5.2.3 Global Economic Prospects

According to the IBRD report, "Global Economic Prospects, 1998/99", despite the gloomy near-term outlook, world economic growth in the medium-term part of the forecast (2001-07) is projected at 3.2% a year. But some downward revisions have been made from the previous issue reflecting the recent economic situations. First, among the industrial countries, projections for Japan have been reduced to 2-2.4% in 2001-07, which is in the range of other industrial countries. Second, growth projections for the countries in the CIS and in South Asia have also been reduced. Third, the biggest reductions have been made for the crisis-affected countries in East Asia (Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand).

The prospects for Russia and the other CIS countries, is now much more unclear. Financial crisis and a new government of uncertain policy intentions have blown up expectations for a near-term recovery in Russia. Russia's economy showed a decline of 4-6% in 1998, followed by a similar reduction in 1999. Attaining long-term growth depends on how successfully they achieve institutional reforms, economic stabilization, and tax and financial reforms that supply public resources as well as support the development of the private sector. Recent economic turbulence has emphasized the institutional vulnerability of CIS countries. The IBRD report presented, "With growth in Russia falling or severely constrained, and Central Asia hurt by developments in commodity markets, **10-year growth projections for the region as a whole have been lowered to 2.6%**, a major 2.4 percentage point revision." This is shown in Table 5.2.2.

Table 5.2.2 Global Economic Prospects

(annual percentage change in real GDP)

	Present			Forecasts				
				World Economic Prospects 1998/90				1997/1998
	1981-1990	1991-1997	1997	1998	1999	2000	2001-2007	2001-2006
World total	3.1	2.3	3.2	1.8	1.9	2.7	3.2	3.4
High-income countries	3.1	2.1	2.8	1.7	1.6	2.3	2.6	2.8
Developing countries	3.0	3.1	4.8	2.0	2.7	4.3	5.2	5.5
East Asian crisis countries	6.9	7.2	4.5	-8	0.1	3.2	5.2	6.8
Transition countries of Europe and Central Asia	2.4	-5.5	1.7	-0.4	-0.6	3	4.8	5.3

Source: IBRD, "World Economic Prospects 1998/99"

5.2.4 Future Growth of Kazakhstan Economy

According to a UK economic information service company, the Economic Intelligence Unit (EIU), real GDP growth rate is forecast as -3.0% in 1999 and 2.0% in 2000 "Real GDP growth in the first nine months of 1999 was zero. The recession will be severe because of the lack of vigorous enterprise restructuring. In 2000 the recovery in oil and other raw materials exports should lead to 2.0% real GDP growth rebound." This is shown in Table 5.2.3.

Table 5.2.3 Forecast Summary by EIU

	1999 Forecast	2000 Forecast
Real GDP	-4.0	2.0
Industrial production	-4.5	4.0
Consumer prices		
Average	6.0	9.0
Year-end	13.0	7.0
Exchange rate (av; KZT, US$)	94.0	104.0
Oil price ($/b)		
IEA import price	8.6	10.0
Kazakh export price	8.5	10.9
Exports (US$ m)	5,382.0	5,957.0
Imports (US$ m)	-6,528.0	-6,848.0
Trade balance (US$ m)	-1,146.0	-891.0
% of GDP	-6.0	-4.7
Current-account balance (US$ m)	-1,636.4	-1,480.0
% of GDP	-8.6	-7.7

Source: Economist Intelligence Unit, "Country Report Kazakhstan, 1st quarter 1999"

Considering the analyses of the World Bank and EIU, it may be possible to expect that Kazakhstan's economy will grow at around 2.0% level from 2000 to 2010 if

a. The recovery of the world economy and oil prices are realized in 2000;
b. Kazakhstan's institutional reforms progress fundamentally; and
c. The fiscal deficit is well controlled by the Government.

5.3 INSTITUTIONAL AND LEGAL FRAMEWORK

5.3.1 Background

Over the past eight years Kazakhstan has changed rapidly with the introduction of market oriented reforms to replace the previous centrally planned command economy. Major changes to date have included the transfer of ownership of many assets and enterprises from the state to the private sector.

These changes to the economy have created considerable confusion on the role of government in the management of the economy and the provision of social services. This confusion has been exacerbated by the high costs of transition: the economy in general and the Government's finances in particular are still in crisis. The public finance crisis has severely complicated the process of changing the role of government, and may have forced the Government to take decisions based purely on financial necessity rather than on social or economic needs. The privatization program for SWM Services in Almaty City which commenced in 1996 should be viewed against this backdrop.

It is now agreed that the Government[1] should take a limited role in the provision of this essential public service to ensure that coverage is universal and to ensure that it is provided even in circumstances where individual consumers are unable to pay for the service. Given that the Government is committed to privatization wherever possible, it has also been agreed that the most effective approach is for the Government to "contract out" service provision. That is the Government assumes an overall management role, but the actual service is provided by private companies under contracts let by the Government.

The arguments for the Government to accept such a role are presented in some detail in the Supporting Report. The Main Report identifies the most effective approach to implementing this role in the current environment.

At the start of the economic reform program, there were massive gaps in the institutional structure and legal framework needed for managing a modern market economy. While considerable progress has been made in filling these gaps, there remains a lot of work to be done, and it is perhaps unrealistic to imagine that this process can be completed in less than another decade. In looking at the institutional and legal reforms that may be of particular benefit to the SWM Sector, the constraints of the broader reform program must be kept in mind. There are both resource and absorption constraints on the overall reform program, and these may limit the priority that can be given to reforms required in any particular sector. Two specific areas where reform would certainly be beneficial for management of Solid Waste but where reform will have to be fitted into a far broader reform agenda are:

- Assignment of powers, (including budgeting and taxation) between national and local levels of Government;
- Amending the legal framework governing ownership of private housing.

5.3.2 Government Structure

The fundamental pyramidal structure inherited from the Soviet period remains largely unchanged, though there have been many reassignments of tasks amongst Government Departments. Delegation of powers to lower levels of Government where it occurs is almost always effected by administrative order rather than codified by law. Control over the budget has if anything become even more centralized.

There are strong arguments for delegation of responsibility for local services (such as SWM) to local levels of Government. Such reform would need to include reform of budgetary and tax systems, so that these local levels were responsible for their own budgets and for collecting taxes to cover their expenditures. Such changes however need to be undertaken as part of an overall reform of national-local government relationships and will take some time. This M/P for SWM must be developed within the constraints of existing national-local Government relations and associated budget laws. The implications are discussed at more length in Chapter 8.

1 The term Government is used to cover all levels of public administration, not the more narrow meaning of the Council of Ministers sometimes given to this term in Russian.

5.3.3 Regulation of Private Housing

Early in the economic reform process ownership of much of the housing stock including many "block houses" was transferred to the private sector. (Before the economic reforms started private ownership was restricted to individual houses). Prior to privatization of houses, management of communal services even in block housing was comparatively simple. The state owned all of the housing blocks and adjacent spaces, and could manage all services to these blocks via administrative means.

Now with many different owners involved, demarcation of responsibilities, even identification of the entities responsible for specific items has become far more complex, and needs to be controlled by appropriate legal procedures. A start has been made to develop such procedures with the introduction of the "Housing Act" in April 1997. Inter alia this act recreates the old communal collectives as "KSK's" and "KSD's" to manage communal property and services. However membership is effectively voluntary.

Considerable development of housing and land titling laws[2] is still needed before there is a clear legal assignment of responsibility which will allow Government to enforce public health and similar measures effectively.

Again the M/P has been developed on the basis that the KSK's and KSD's will be the main bodies representing owners of apartments and houses. It is hoped that legislation to clarify responsibilities and to ensure that individual owners cannot avoid their responsibilities is introduced[3]. However it is recognised that the M/P will operate initially under existing legal arrangements working with the existing co-operative structures.

2 Upgrading of the land titling and cadastral system is also urgently needed to minimize civil disputes over property ownership, though this is unlikely to a significant issue for SWM.

3 This could be done by strengthening the powers of the existing "co-operatives" and amending the process whereby they are formed to prevent owners opting out. Alternatively the land title registration system could be amended so that it automatically creates a new "body corporate" whenever a plan for a multi-owner building is registered. (A common approach in many jurisdictions)

Chapter 6

PLANNING CONDITIONS

CHAPTER 6 PLANNING CONDITIONS

6.1 AMOUNT AND COMPOSITION OF SOLID WASTE

6.1.1 Amount

1) Unit generation rate

Two field surveys were conducted once during winter and once during summer. Unit generation rates obtained through the surveys are shown in Table 6.1.1.

Table 6.1.1 Unit Generation Rate

	Unit generation rate		
	Winter	Summer	Average
Domestic waste (kg/day/capita)			
Block house	0.30	0.45	0.38
Two story house	0.31	0.60	0.45
Individual house	0.87	0.42	0.65
Commercial waste			
Restaurant (kg/day/entity)	11.1	8.8	10.0
Shops (kg/day/entity)	2.5	2.9	2.7
Office (kg/day/entity)	5.5	5.0	5.2
Market (kg/day/stall)	2.0	4.3	3.2
Street waste (kg/km)	57.1	93.2	75.2

The average unit generation rates for both seasons were used in the M/P. The unit generation rate of commercial waste is difficult to expand because of insufficient statistical data. Therefore, the amount of commercial waste was estimated using the ratio between domestic waste and commercial waste as provided by the Kazakh side.

2) Present Waste Amount

For the purpose of preparing the M/P estimates of the present waste amounts generated are as follows:

- Domestic waste 474.1 t/d
- Commercial waste 316.1 t/d
- Street sweeping waste 76.9 t/d (based on estimated road length swept)
- Medical waste 21.5 t/d (of which 6.0 t/d is infectious waste)
- Non hazardous industrial waste 70.0 t/d

Figure 6.1.1 shows the present flow of solid waste. Roughly 30% of the total generated waste is either self treated or disposed of by open dumping.

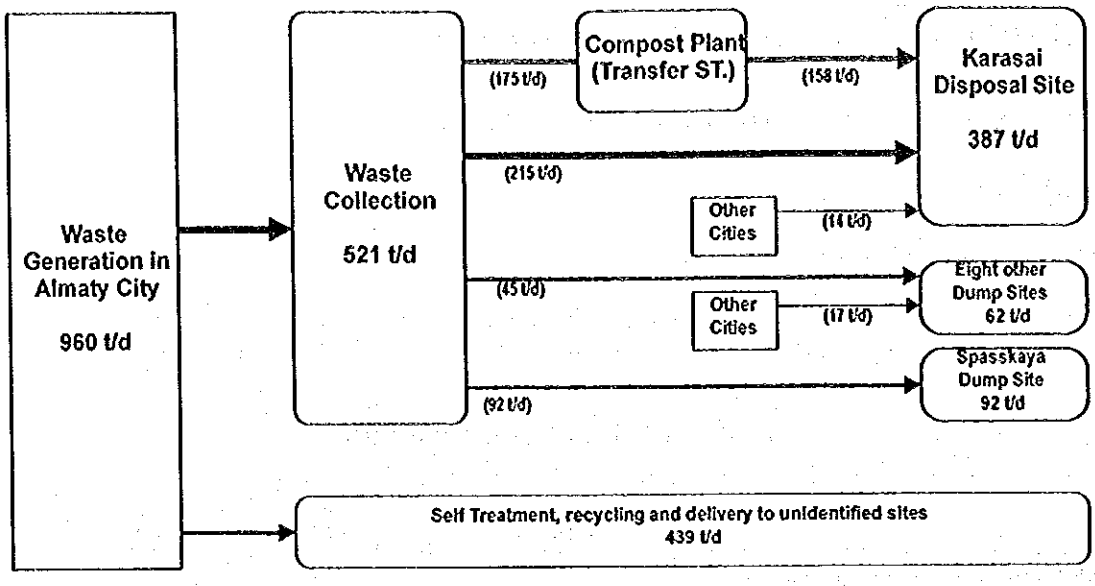


Figure 6.1.1 Present Waste Flow in Almaty

3) Forecast Total Waste

As the citizens grow more affluent and lifestyles change the total waste generated per citizen has a tendency to increase. Despite the present unfavorable economic conditions in Almaty, prospects for economic improvement are favorable as discussed elsewhere in this report. In Japanese cities annual growth rates of the waste unit generation rate range between 2 – 3%. However in the case of Almaty city a modest annual growth rate of 1% was adopted to forecast the future solid waste totals.

The following Table 6.1.2 shows the forecast unit generation rates by waste type.

Table 6.1.2 Forecast Growth in Waste Unit Generation Rate

Waste Type	Unit	1999	2005	2010
(1) Domestic				
- Full conveniences	Kg/cap/d	0.38	0.35	0.37
- Partial conveniences	Kg/cap/d	0.45	0.35	0.37
- No conveniences	Kg/cap/d	0.65	1.01	1.06
(2) Commercial	Kg/cap/d	0.31	0.32	0.33
Total Domestic and Commercial	Kg/cap/d	0.77	0.80	0.83
(3) Street sweeping	Kg/km/d	75.2	61.1	64.2
(4) Medical waste	Kg/bed/d	1.61	1.81	1.97
(5) Non hazardous industrial	T/year	70.0	70.0	70.0

Taking into consideration the forecast population growth as outlined in section 5.1 of this report, the total length of streets swept and the number of hospital beds, the total waste amounts generated by type in the city are shown in Table 6.1.3. The M/P has been prepared based on these waste amounts.

Table 6.1.3 Forecast Generated Waste Amounts

(unit = ton/year)

Waste Type	1999	2005	2010
(1) Domestic			
- Block housing	103,852	111,790	119,426
- Low rise housing	15,509	20,759	29,567
- Individual housing	53,698	54,588	56,173
(2) Commercial	115,372	124,758	136,778
Sub total (1) + (2)	288,431	311,896	341,944
(3) Street sweeping	28,062	29,789	31,308
(4) Medical waste	7,835	8,808	9,586
(5) Non hazardous industrial	25,225	25,225	25,226
Total Waste Amount	349,553	375,717	408,064

6.1.2 Solid Waste Composition

1) Present Waste Composition

The solid waste composition was surveyed for both winter and summer seasons and the results are shown in Table 6.1.4

Table 6.1.4 Solid Waste Composition

Waste composition	Domestic waste			Commercial waste			Market waste		
	Win.	Sum.	Ave.	Win.	Sum.	Ave.	Win.	Sum.	Ave.
Combustible									
Paper	17.6	18.0	17.8	37.8	33.4	35.6	23.7	18.3	21.0
Textile	1.8	2.5	2.2	3.4	1.7	2.6	0.9	0.6	0.8
Plastic	12.0	9.9	10.9	5.7	11.1	8.4	7.8	7.9	7.8
Leather	0.3	1.4	0.9	1.5	0.3	0.9	0.2	0.0	0.1
Leaves	1.2	3.5	2.3	0.2	2.0	1.1	0.8	11.0	5.9
Food	50.8	57.2	54.0	38.7	42.9	40.8	56.5	49.3	52.9
Sub total	83.7	92.4	88.1	87.2	91.4	89.3	89.9	87.1	88.5
Non combustible									
Metal	3.0	2.2	2.6	3.6	1.9	2.7	3.0	1.8	2.4
Glass	6.6	4.5	5.6	7.9	2.9	5.4	5.5	2.7	4.1
Ceramic	1.1	0.3	0.7	0.4	1.1	0.7	0.3	0.0	0.2
Sand	5.6	0.5	3.1	0.9	2.8	1.8	1.3	8.4	4.9
Sub total	16.3	7.5	11.9	12.8	8.6	10.7	10.1	12.9	11.5
Total	100	100	100	100	100	100	100	100	100
Density	0.31	0.34	0.32	0.22	0.22	0.22	0.24	0.45	0.34
Moisture content	40.7	45.6	43.1	34.2	37.3	35.7	44.9	41.2	43.0
Lower calorific value	1,695	1,768	1,731	2,028	2,032	2,030	1,703	1,740	1,722

2) Forecast Waste Composition

The composition of solid waste reflects changes in life style. Experience gained in many countries indicates the following:

a. Paper, plastic and metal content will increase
b. Food, and sand will decrease.
c. Moisture content will decrease and organic content increase
d. Lower calorific value will increase
e. Bulk density will decrease

The future composition of solid waste will change in line with the above mentioned tendencies.

6.2 MINIMUM REQUIREMENTS OF SWM SERVICE

The M/P shall be formulated to achieve the minimum requirement of the SWM services in Almaty city. The minimum requirements have been set considering the results of the field surveys, public awareness survey and discussions with the Kazakh side and are shown in Table 6.2.1.

Table 6.2.1 Minimum Service Level Requirements for M/P Formulation

	Year 2005	Year 2010
a. Waste collection (Domestic and commercial waste)		
(1) BH - Block housing (defined as dwellings with complete or partial conveniences)	• Waste (including kitchen waste) will be collected 3 times/week. • Collection will be from collection stations with containers. • Collection coverage will be 95%.	• Waste (including kitchen waste) will be collected 3 times/week. • Collection will be from collection stations with containers. • Collection coverage will be 100%.
(2) IH - Individual housing (defined as dwellings with no conveniences)	• Waste (including kitchen waste) will be collected 2 times/week. • Collection will be from collection stations and door-to-door. • For collection stations plastic bag discharge shall be required. • Collection coverage will be 95% (remainde will be by self disposal).	• Waste (including kitchen waste) will be collected 2 times/week. • Collection will be from collection stations and door-to-door. • For collection stations plastic bag discharge shall be required. • Collection coverage will be 100%.
(3) Commercial waste	• In principle minimum 2 times/week collection. • Central area will have daily collection.	• In principle minimum 2 times/week collection. • Central area will have daily collection.
(4) Materials resources		• Source separation will be introduced for at least two of these three waste items; Glass, plastic, and paper. • Separated items will be collected separately. • Collection will be 2 - 4 times per month. • Amenity centers will be introduced for separated items.
(5) Harmful waste discharged from households		• Harmful wastes will be collected separately. • Manifest system for harmful wastes shall be introduced.
b. Waste treatment and disposal		
	• Sanitary landfill site operation. • Harmful waste will be disposed (buried) separately or stored.	• Sanitary landfill site operation. • Harmful waste will be disposed of (buried) separately or stored.
c. Waste reduction, processing and resource utilization		
		• Introduction of system for waste volume reduction (collection of recyclable materials). • Separate collection of recyclable materials and their recycling. • Introduction of economically feasible treatment system.
d. Medical waste		
	• Separate collection and disposal of infectious wastes.	• Separate collection, treatment and disposal of infectious wastes.
e. Industrial waste		
	• Generators will be responsible for their waste disposal. Industrial waste cadasta will be established. • System for educating and registering companies responsible for collection and treatment.	• Generators will be responsible for their waste disposal. • System for educating and registering companies responsible for collection and treatment.
f. Street sweeping		
	• Minimum once/week, and daily in city center.	• Minimum once/week, and daily in city center.
g. Illegal dump sites		
	• System for abolition and control of illegal dumping. • Phased rehabilitation of illegal dump sites.	• System for abolition and control of illegal dumping. • Rehabilitation of all illegal dump sites.
h. Waste collection tariff		
	• Maximum 1-2% of household income.	• Maximum 1-2% of household income.

6.3 FINANCIAL CONSTRAINTS

6.3.1 Gross Regional Domestic Product (GRDP) of Almaty City

Gross Regional Domestic Product (GRDP) of Almaty City is the total value produced in the city, which is frequently referred to for a base of the economical limitation (the final base of financial limitation) of the SWM. The ratio of GRDP of Almaty City to GDP is 13.8% in average of the last three years. Gross Domestic Product (GDP) is forecast to grow at 2% from year 2000 as mentioned in Section 5.2 Economic Forecast. Thus, the GRDP can be calculated as shown in Table 6.3.1.

Table 6.3.1 GDP and GRDP of Almaty City (forecast)

	1999	2000	2005	2010
GDP (KZT bn; at 1999 price)	1,812.0	1,848.3	2,040.6	2,253.0
GDP Growth Rate	-4.0%	2.0%	2.0%	2.0%
GRDP (KZT bn; at 1999 price)	250.2	255.2	281.7	311.1

Sources: (1) Economist Intelligence Unit: GDP and GDP growth rates in 1999 and 2000
(2) Ministry of Economic Planning: GRDP data from 1994 to 1999
(3) JICA Study Team: Remaining figures based on JICA Study Team estimates

6.3.2 Governmental Budget

1) Waste Collection

Presently all SWM services are privatized. Waste collection for households and industries is carried out by private companies without control. The city government does not allocate any budget for such services.

2) Management of Transfer Stations and the Final Disposal Site

A single company runs the business of transfer stations and the final disposal site and the city government allocates no budget for their operation.

A budgetary source comes from the Almaty Environmental Protection Fund, which is under the supervision of the Ministry of Natural Resources and Environment Protection. Its main revenues are charges related to environmental pollution. Tariff rates are set by the Ministry and City Akim. The proportion sent to the Central Government varies from year to year. This year 50% of collected money was sent to the central government and the remaining 50% to the city. Such money is spent on an environmental action plan but none has been allocated for the construction of a new transfer station, rehabilitation of existing transfer stations or the disposal site. The action plan should be approved by the Ministry and the City Akim. KZT 4 million or 11% of all the revenues to the fund is earmarked for SWM in 1999.

3) Street Sweeping

Street sweeping services are supplied by a Joint Stock Company "Road Exploitation Department", formerly an organization of the City Government but privatized as a whole department. In addition to street sweeping, they clean the bus stops and terminals. The structure of the shareholders is 71.5% central government owned and employee owned.

Their revenue comes from only the City Financial Department through a JSC; "Landscape Department", which is like a parent company. It was 240 million KZT/year

by 1995 but has been reduced to 130 million KZT/year from 1996 due to financial difficulties of the Government. 80% of the business profit goes to the Republic.

6.3.3 Household Income

1) Income Growth

Household monetary income in Almaty City was KZT 5,368.9 in 1997 per person per month and KZT 5,656.8 in 1998 at current prices. When reviewed in real terms, it increased by 10.7% in 1997 but decreased by 4.8% in 1998. This income decline is larger than those in 1995 (-1.6%) and 1996 (-3.1%). The major reason is the influence of the Russian crisis. Considering that the GDP fell 2.5% in 1998, the economic turbulence hit the household economy much harder than the national economy. Statistics on household income however should be treated with some caution. According to these official figures, household incomes as a proportion of GDP are some of the lowest worldwide.

According to "Households of Almaty City in 1998", average monthly household income per person is KZT 5,656.8 in 1998. In 1999 that is estimated at KZT 5,827.0 considering the inflation rate (7.3%) and forecast GDP growth rate (-4.0%). The highest income category is Physical Workers, whose income is KZT 6,249.3 and the lowest is Pensioners' KZT 4,492.2.

2) Breakdown of Household Income and Expenditure

Pensioners' income is KZT 4,361 per month per person in 1998 which is about 23% lower than the average. In addition, pensions account for 79.3% of their income resource, which means that their lives are highly affected by the deferment of pension payment.

In terms of expenditure, pensioners spend KZT 4,354.2 per person per month. Their balance between income and expenditure is only KZT 6.8 or 2.4% of the average. Payment for the services including utility supply and solid waste collection accounts for 44.1%, which is remarkable because those for other job categories are less than 30%. It is not surprising that pensioners are very sensitive to increases in service charges.

3) Household Income Distribution

Almaty City Statistical Department performed a household survey in February 1999. Income distribution is presented as follows:

Table 6.3.2 Income Distribution (as of Feb 1999)

Monthly income per person (KZT)	Frequency	Relative Frequency	Accumulated Relative Frequency
0 - 1,320		1.0%	1.0%
1,320 - 2,640	40	10.3%	11.3%
2,640 - 3,960	76	19.5%	30.8%
3,960 - 5,280	93	23.8%	54.6%
5,280 - 6,600	66	16.9%	71.5%
6,600 - 7,920	34	8.7%	80.3%
7,920 - 9,240	21	5.4%	85.6%
9,240 - 10,560	17	4.4%	90.0%
10,560 - 11,880	10	2.6%	92.6%

11,880 - 13,200	6	1.5%	94.1%
13,200 -	23	5.9%	100.0%
Total	390	100.0%	-

Source: Almaty City Statistical Department

According to the data, 30.8% of the samples earn less than KZT 4,000. Median is calculated at KZT 5,025, or 50% of the samples earn less than KZT 5,025.

Statistical Data	Income: KZT, per person per month
Mean	5,726
Median	5,025
Mode	4,620
25% point	3,569
75% point	7,124
Quartile Range	3,557

As shown in the above data, the order of the three data is Mode < Median < Mean. This means that the distribution curve is not symmetrical and is skewed to the right, which is frequently seen in social phenomena.

4) Forecast Household Disposable Income in 2000-2010

Household disposable income per person in the project years 2000-2010 is estimated with the assumption that it grows in accordance with the real GDP growth rate.

Table 6.3.3 Household Income

(per person, monthly; KZT)

	1999	2000	2005	2010
Average	5,547.1	5,658.0	6,246.9	6,897.1
Physical Workers	5,927.0	6,045.5	6,674.7	7,369.5
Office Workers	5,725.6	5,840.1	6,448.0	7,119.1
Non-Governmental	4,886.9	4,984.6	5,503.4	6,076.3
Pensioners	4,492.2	4,582.0	5,058.9	5,585.5

Source: (1) Almaty City Statistical Department source of 1999 figures
(2) Projections prepared by JICA Study Team

Chapter 7

TECHNICAL ALTERNATIVES

CHAPTER 7 TECHNICAL ALTERNATIVES

7.1 DOMESTIC AND COMMERCIAL WASTES

7.1.1 Technical Alternatives Formulated

Four technical alternatives were studied and the most suitable was adopted as the M/P. Figure 7.1.1 shows the waste flow within each alternative in the year 2010, the M/P target year. The 1,119 tons generated daily in the city include domestic, commercial, street sweeping, medical and non-hazardous industrial wastes. An amount of 94 t/d (10% of the domestic and commercial wastes) is estimated to be recycled, and the remainder collected. As Karasai disposal site at present receives wastes from surrounding cities this practice is expected to continue in the future. The following Figure 7.1.2 shows the locations of the proposed SWM facilities.

The four alternatives were formulated taking into consideration providing various options for the technical activities that form the SWM practice. These are shown in Table 7.1.1.

Table 7.1.1 Formulation of the Technical Alternatives

Alternative / Activity	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1) Collection	The same technical system is applied in all four alternatives			
2) Transport	One transfer station west of the city.	Two transfer stations west and north of the city.	One transfer station west of the city.	One transfer station north of the city.
3) Intermediate Processing	None	None	None	An incineration plant north of the city.
4) Final disposal	One disposal site; Karasai	One disposal site; Karasai	Two disposal sites; Karasai and Enbek	One disposal site; Karasai

The background for the formulation of each alternative shall be explained in the following sections.

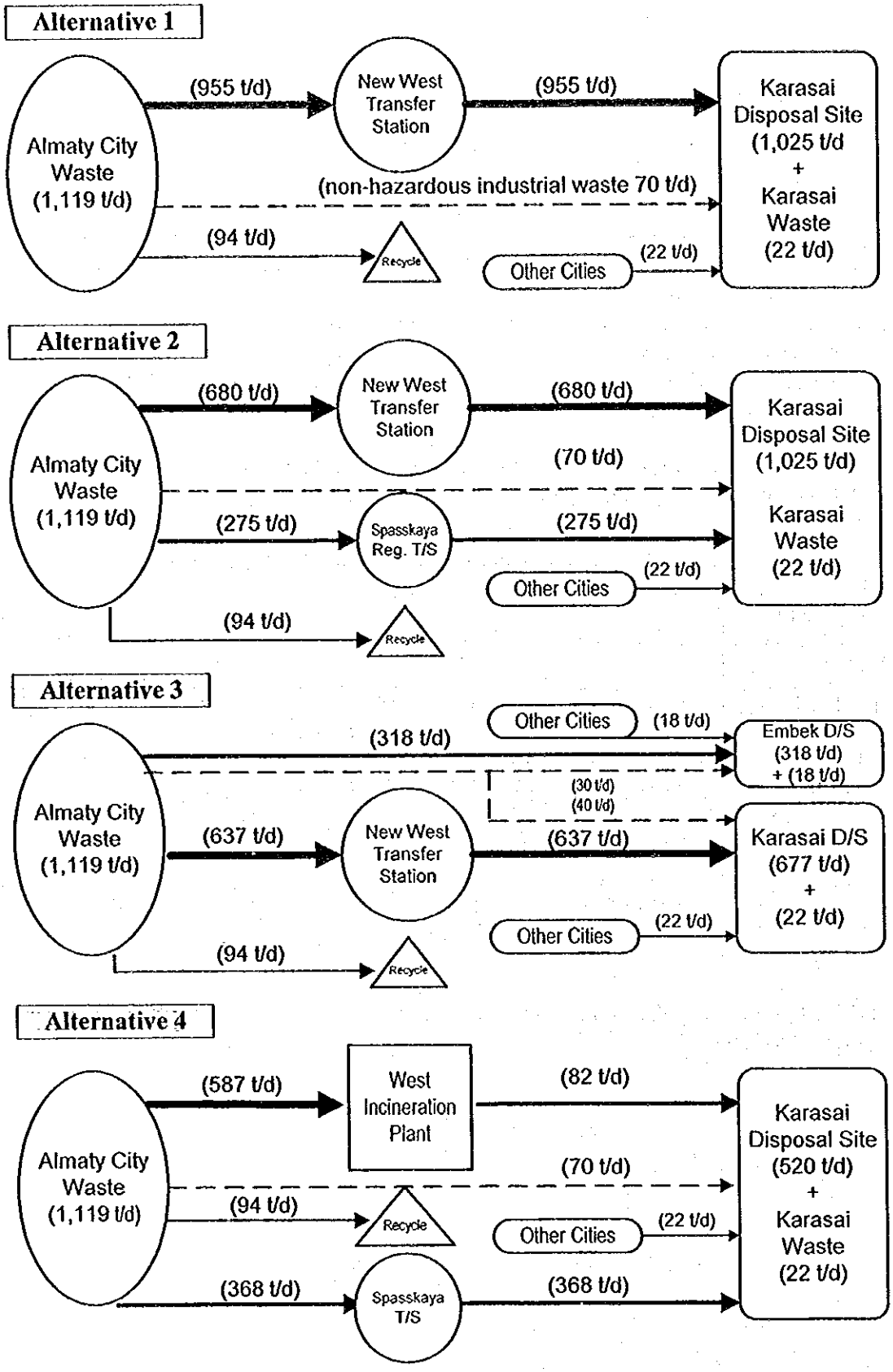


Figure 7.1.1 Solid Waste Flows in 2010 for each Technical Alternative

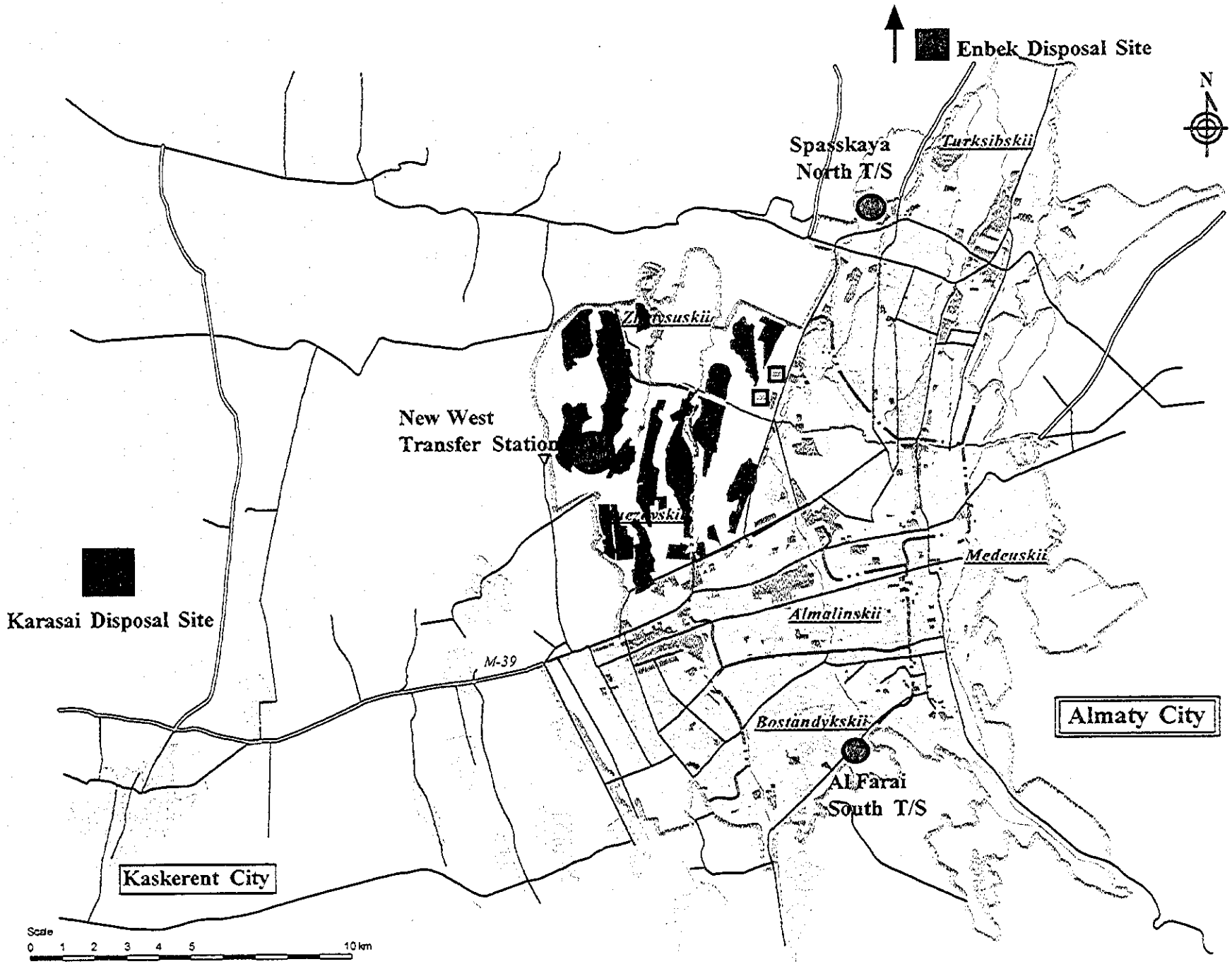


Figure 7.1.2 Location of the Proposed SWM Facilities

7.1.2 Background for Alternatives Formulation

1) Collection System

(1) General

The city extends for about 35 km in the north south direction and 20 km at its widest part in the east west direction. City development has mainly extended from the southern part of the city towards the north and west. Development in the other directions is hampered by mountain ranges, especially to the south.

Housing can be classified into two categories; low to middle density housing and high density housing. The first comprises individual housing, with little or no communal services (will be referred to hereafter as "IH") and low rise buildings of 1-2 stories. The second classification includes dominant block housing and some multi story buildings (and will be referred to hereafter as "BH").

Major development in the north is in the form of IH while to the south and city center area BH is dominant. Commercial activity is presently concentrated in the city's south and west parts but is expected to develop to the north direction. These conditions were considered in preparing the collection system.

(2) Alternatives for the Collection System

The alternatives are mainly formulated with the objective of studying the need for one or more transfer station, an additional disposal site nearer to northern part of the city and the suitability of intermediate treatment system to the city's waste. However in the case of collection activity the most suitable system is first studied independently in this section and then applied to all the four alternatives. The reason for this is that the selection of suitable equipment depends to a large degree on the land use conditions such as high, mid and low density residential areas, commercial areas, street network, etc. The study on the collection system is presented in this section.

The effect of each alternative on the collection system in terms of operation is then considered in the following section 7.1.3.

(3) Collection Service Coverage

In order to specify the collection service coverage it is necessary to understand the difference between the following three actions:

a. Generated solid waste amount
   This amount refers to the solid materials that arise from various activities and are discarded as useless or unwanted, but have not yet been removed from the premises where they were generated. For example they are still remaining within the residence, office, shop, etc. Waste is generated all the time, but for practical purposes the amount is considered as a unit of one day, i.e. t/day.

b. Discharged solid waste amount
   Obviously the generated waste is not kept at the generation premises indefinitely. Certain waste types are removed from the premises more frequently than others.

People tend to remove food wastes daily or every two days, while other types such as paper, plastic and glass bottles may be removed at longer frequencies. So roughly speaking if the waste is removed, or discharged from a certain premises every two days than the discharge amount on a certain day will be equal to twice the generated amount for the premises on that same day. Also one day's generated waste amount should be stored within the premises.

c. Collected solid waste amount
This amount refers to the amount of the discharged waste that is collected and transported to the disposal site or transfer station. In order to preserve the sanitary conditions in the city it is necessary to collect all the discharged waste on a specific day. However all discharged waste may not be collected if some is discharged at unauthorized locations or the collection system fails.

The aim of the collection plan is threefold:

- To collect all the waste amount discharged on a given day on that same day, i.e. Discharged waste amount = Collected waste amount.
- To operate the collection equipment more efficiently and with less cost by introducing collection frequencies of 3 and 2 days/week. The city will be divided into zones and collection every 2 or 3 days will be designated for each zone. However the collection system should be planned in such a manner that the waste discharged on a given day in specified collection zones of the city shall be equal to the waste generated on that day in all the city.
- To plan the collection system in such a way that citizens will not be asked to keep more than two days amount of generated waste within their premises. Therefore 3 and 2 day/week waste discharge system shall be adopted in the city.

More discussion will be made on the collection frequencies and discharge frequencies in the following section. At this point it is important to note that the M/P target for the year 2010 is to provide every citizen with collection service at least once every three days in the city of Almaty. In that sense the collection service ratio is considered to be 100%.

At present approximately 75-80% of the waste is collected. By the year 2010 it is planned to collect 100% of the waste discharged. As reported in the waste recycling plan it is planned to recycle 10% of the generated waste, therefore actually 90% of the generated waste shall be collected.

The collection plan is accordingly prepared as follows:

Table 7.1.2 Collection Service Coverage

Collection service coverage rate (domestic and commercial wastes)	1999	2005	2010
a. Uncollected wastes (self treatment, illegal dumping)	25%	5%	0%
b. Collected but taken to unauthorized dump sites	20%	0%	0%
c. Collected and taken to authorized waste facility (transfer station or dump site)	55%	95%	100%
d. Recycling (share of domestic and commercial wastes)	1%	1%	10%

(4) Collection Frequency

Collection frequency means the number of times the collection truck will come and collect the waste from a collection point during a week. Presently in Almaty city daily collection is provided for BH areas and about 1 or 2 days per week for IH areas.

In developed countries the collection of waste on a daily basis has been changed in favor of 2 to 3 days per week collection. This will allow the collection truck to make more trips in one shift by reducing the time it spends on the collection route through decreasing the number of stops it has to make by concentrating a larger amount of waste at the collection points. Such a system allows for saving in time and costs by about 20 to 25%.

The introduction of lower collection frequencies is also recommended for Almaty city. The collection frequencies proposed in the master plan in the year 2010 for all the four alternatives can be described as follows;

- IH type housing: 2 days/week
- BH type housing: 3 days/week
- Mixed commercial residential waste and small commercial waste generators: 3 days/week
- Commercial waste from large generators, special types such as market waste: Daily

(5) Discharge System

The discharge system shall be regulated in line with the collection system. Citizens cooperation shall be obtained through explaining that their cooperation will lead to a more efficient collection system in terms of operation and cost. The following table shows the options considered and those selected for the discharge system.

Table 7.1.3 Discharge System

System	Options
1) Discharge Frequency	a. At any time b. In accordance with the collection service schedule *Obviously option a. is not acceptable because it will mean that the waste may remain at the collection point for a day or two until the collection truck comes. Citizens will be instructed to discharge their waste based on the collection service schedule, option b.*
2) Discharge location	c. In front of the house d. At designated collection points *Option c. is widely practiced in IH areas but is not recommended because it forces the collection truck to make numerous stops and increases the time at the collection route. Option d. is already in practice in the BH areas and shall be extended to IH areas. Two types shall be considered, Container Station where 1.1m³ and 6m³ containers are placed and Open Station where packed waste is discharged. The former shall be used in BH areas and the latter in IH areas.*
3) Waste discharge form	e. Loose waste discharge f. Packed waste g. Source separation and separate discharge *Option e is acceptable only in case of discharge at Container Station, while Option f is necessary at Open Station. Option g is closely related to the intermediate treatment system applied or recycling plan being promoted. Based on the recycling plan in this M/P Option g shall be recommended to start by the year 2007.*

The proposed discharge system will require the understanding and support of the citizens. Therefore effective public education campaigns will have to be implemented.

(6) Truck Types

In order to ensure a sanitary collection system that is both cost effective and provides better work conditions mechanized collection system is recommended. The components of that system are the compactor truck and mechanical emptying of containers.

The compactor truck can make larger hauls per trip and the containers can be mechanically emptied into the collection truck. Three sizes of compactor trucks were compared as shown in Table 7.1.4.

Table 7.1.4 Compactor Trucks Considered

Compactor	Advantages	Disadvantages
a) 16 m^3	• Large haul capacity • Cost effective over long distances, in the range of 20 km. • Suitable for Container Station in BH areas	• Difficult to maneuver inside old BH areas • Unsuitable for Open Station in IH areas
b) 12 m^3	• Medium to large haul capacity • Cost effective for the distances in Almaty from the collection zone to the SWM facility within 10 to 15 km • Suitable for Container Station in BH areas • Suitable for most BH areas in the city	• Unsuitable for Open Station in IH areas
c) 8 m^3	• Cost effective for the distances in Almaty from the collection zone to the SWM facility within 5 – 10 km • Suitable for both Container Stations and Open Stations	• Comparatively low haul capacity

Based on the analysis described in the table and cost estimates, the large compactor is effective in Almaty at distances over 25 km (refer to Table 7.1.5). Because transfer stations are necessary in the city, as shall be discussed in the following section and therefore such long running distances will not be necessary this truck size has not been included in the collection system.

Table 7.1.5 Cost Comparison between Large and Medium Compactors

(Unit = KZT/ton)

Distance (OW – KM)	Medium compactor	Large compactor	L/M
5	881	1,141	1.29
10	1,127	1,334	1.18
15	1,342	1,570	1.17
20	1,557	1,764	1.13
25	1,772	1,958	1.11

Arm roll trucks equipped with 6 m^3 containers are also employed for use mainly in commercial waste because of the large number of trips that can be made by them and their ease of operation.

Accordingly the truck types selected for the collection system are shown in Table 7.1.6.

Table 7.1.6 Truck Types for the Collection Plan

Truck type	Collection area	Collection system
a) Compactor 8 m^3	• 100% of IH area • 30% of BH areas, where narrow roads allow for better mobility	• Manual loading from Open Stations in IH areas • Mechanical loading from 1m^3 containers at BH areas
b) Compactor 12 m^3	• 70% of BH areas • 40% of commercial waste	• Mechanical loading from 1m^3 containers Container Stations
c) Arm roll 6 m^3	• 60% of commercial waste	• Hauling of container to the disposal site after placing empty container in its place.

The following Table 7.1.7 shows the waste amounts hauled by each truck type in the year 2010. Trucks shall be operated six (6) days a week in one shift.

Table 7.1.7 Waste Haul by Truck Type in 2010

(unit: t/day)

Waste	Compactor 8m^3	Compactor 12m^3	Arm roll 6m^3
(1) Domestic waste from IH	162	0	0
(2) Domestic waste from BH	129	300	0
(3) Commercial Waste	0	157	236
Total	290	488	236

Based on the above waste amounts and taking into consideration the expected operation efficiencies of each truck type and distances from the collection zones to the unloading locations, the average number of trips and truck number required for each alternative were estimated as shown in Table 7.1.8.

Table 7.1.8 Required Trucks by Alternative

year / Alternative	2010	
	Truck number	Ave. trip/shift
Alt. 1. West T/S + Karasai D/S		
1) Compactor 8 m^3 (Class 1)	26	2.4
2) Compactor 8 m^3 (Class 2)	14	3.7
3) Compactor 12 m^3	45	2.9
4) Arm roll 6 m^3	38	5.1
Total trucks	123	3.6
Alt. 2. West T/S + Spasskaya T/S + Karasai D/S		
1) Compactor 8 m^3 (Class 1)	22	2.5
2) Compactor 8 m^3 (Class 2)	11	4.0
3) Compactor 12 m^3	40	3.0
4) Arm roll 6 m^3	28	6.5
Total trucks	101	3.9
Alt. 3. West T/S + Karasai D/S + Embek D/S		
1) Compactor 8 m^3 (Class 1)	33	2.2
2) Compactor 8 m^3 (Class 2)	20	3.2
3) Compactor 12 m^3	51	2.6

4) Arm roll 6 m^3	53	4.1
Total trucks	157	3.1
Alt. 4. West IC/P + Spasskaya T/S + Karasai D/S		
1) Compactor 8 m^3 (Class 1)	30	2.5
2) Compactor 8 m^3 (Class 2)	18	3.9
3) Compactor 12 m^3	47	3.0
4) Arm roll 6 m^3	37	6.1
Total trucks	132	3.9

It is clear from the table that the least number of trucks required and the highest average trips per shift will be achieved if a SWM facility is established to serve the waste generated in the city's north and east areas. Both Alternative 2 proposes construction of Spasskaya T/S and Alternative 3 proposes construction of a sanitary landfill site at the current Embek disposal site used by Almaty Oblast. Spasskaya T/S is located in the city's northern part and Embek D/S about 22 kilometers north of the city.

(7) Collection Equipment Manufacturer

Only Russian made collection trucks are used in Almaty at present. They are basically divided into two categories; side loading trucks of capacities 6 to 10 m^3 and dump trucks of 4 to 6 m^3. The side loading trucks have mechanical side loading and waste is loaded from the top of the truck near the driver's cabin. The waste is then mechanically pushed sideways and to the back of the truck. However waste is pushed to only about half of the truck length and the compaction rate appears to be very low, at about 1.2 times based on the surveys of both old and new trucks in the city.

In terms of loading, the trucks need to maneuver at least 2 times when loading from 5 or 6 containers lined side by side. There is some waste of time in that movement also.

In the M/P the trucks proposed are all of Western standards and prices. Based on a comparative analysis between Russian made trucks and their western counterparts this selection was made.

The following table shows a general comparison between both Western trucks (mainly Japanese) and Russian trucks. As the calculated example in the table shows there is negligible difference in terms of operation and maintenance costs between both truck types. This is due to both the low haulage capacities and trip production for the Russian made trucks.

However in terms of number of units to be operated, the number of Russian trucks required is more than double that of the Western trucks in order to perform the same service. This large number will create traffic problems in the city as well as at the waste facilities and the need for larger areas for parking and servicing of the trucks. It is therefore more reliable to use the Western trucks which can provide the required service with a smaller number of trucks and at almost the same cost.

Table 7.1.9 General Comparison between Russian and Western Compactors

Western compactor	Russian side loader
1) Compaction factor	
Not less than 2.0 times	Not more than 1.2 times (survey of newly introduced trucks)
2) Loading	
• Rear loading and side loading available • In case of rear loading hopper loading device provides capacity and compression to increase loading and save time • Rear loading more suitable in the case of manual loading which is required in IH areas	• Mostly side loading • Trucks equipped with rear loading have a smaller size hopper and no compression at hopper loading • Side loading not suitable for manual loading and therefore these compactors can not be used in IH areas (presently dump trucks are there)
3) Maintenance and spare parts	
• Western trucks are mostly not used in Kazakhstan and therefore the servicing and repairs of such trucks is not well established. However a number of work shops have been identified where the servicing of Western made compactors is considered possible.	• Russian trucks have been used for years and there is much familiarity with their maintenance and repair • The models of these trucks do not change much making it easy to be familiar with them. On the other hand there is not much improvement in functions. • Spare parts are in many cases cannibalized from older trucks rather than purchase of new spare parts.
4) Investment Costs	
• Initial investment costs are high, one western compactor truck may cost 4 – 5 times its Russian counterpart.	• Russian trucks are cheap in Kazakhstan, especially after the Rubble problem last year. However with the floating of the KZT early this year prices rose.
5) Operation and Maintenance Costs	
• In Alternative 2 a total of 101 trucks will be required in 2010 to collect and transport the waste. • The collection cost for operation and maintenance using these trucks was estimated to be USD 10.7 per ton of waste collected	• Under the same conditions and using Russian made dump truck and compactor truck in IH and BH areas respectively, the required truck number was more than double at 243 trucks. • The collection O&M cost of using these trucks was USD 10.5 per ton

2) Transportation

(1) Necessity of Decreasing Direct Haul Distances

Direct haul operation refers to the transport of the waste by the collection truck directly to the disposal site or intermediate treatment facility, i.e. the places where the collected waste will be unloaded. In cases where direct haul distances are too long it becomes more cost effective to consider introducing transfer operation or preparing disposal sites closer to the collection zones.

Almaty City is such a case. Karasai disposal site, the city's only official disposal site is located 34 kilometers from the city center. As shall be shown in the following section the

costs for operating direct haul are about 20% higher than that in the case of introducing transfer operation.

The technical alternatives formulated for the M/P considered two options to decrease distances the collection trucks must travel to unload their collected waste. One involves transfer operation through construction of transfer stations. The second option considers provision of a second disposal site closer to the city.

(2) Operation of a Nearer Disposal Site

Karasai disposal site is located west of the city. It has a capacity to last throughout the M/P period (as explained in other parts of this report) and it is therefore considered as one of the SWM facilities of the plan.

As explained in the following section, 4) Disposal System, out of six presently Oblast operated disposal sites, from the environmental point of view three may be considered for inclusion in the technical alternatives, namely, Nika, Barys and Embek.

Since both Barys and Nika are located in the city's west direction selecting either of them would still not solve the long direct haul distances from the city's northern and eastern parts. On the other hand Embek site is located north of the city at a distance of approximately 23 kilometers from Almaty 1 Railway Station.

The largest concentration of IH areas is located in the northern district of Turksibski, where presently 45% of the district's population are living in such areas, and the population in that district is forecast to grow by 1.2 times the present in the year 2010. Collection in such areas requires much time because mechanized loading is not possible (as explained in the preceding section). Therefore a closer disposal site to this area would help in cutting down collection trucks traveling time and increase their trip productivity.

Accordingly Embek disposal site was selected as an additional disposal site to be considered in Alternative 3.

(3) Number and Siting of Transfer Stations

In discussions with the Kazakh side three potential sites were selected for construction of new transfer station facilities (noted in the Minutes of Meeting signed on May 18th, 1999 following presentation of Progress Report). These sites are briefly described in the following Table 7.1.10.

Rehabilitation of existing T/S or construction of new T/S at that site or the nearby processing plant site were not considered as technical alternatives because of the poor environmental conditions at these sites, complaints from nearby residents, and the progress of housing development surrounding both sites.

Table 7.1.10 Potential Sites for New Transfer Station Construction

West	Spasskaya	South of Al Farabi Avenue
1) Possible T/S construction scale		
4ha (capacity 800 – 1,000 t/d)	3ha (capacity 400 t/d)	3 ha (capacity 800 t/d)
2) Land status		
Land reserved for construction of a transfer station	In front of an illegal dump site on state owned land Tursibskii district wants to construct a transfer station there.	Site was used as an illegal dump site.
3) Surrounding land use		
Agriculture and open space	Only present land use nearby is a residential area to the south	Within a second house resort (Dacha) area
4) Previous consideration for T/S construction		
Feasibility study prepared and design reached an advanced stage.	District has conceptual plan to construct a T/S at this site.	Almaty City Architectural and Town Planning Dept. has selected this site as a potential location.
5) Site accessibility		
Collection trucks are accessible to the site up to 2 km where new road is necessary. This road will also serve transfer trucks. Transfer trucks have no problem to access the Almaty – Karasai highway.	Collection trucks are already passing in front of the site to access the illegal dump site north of it with little problems. However about 1 km of road improvement work is necessary.	Accessibility for both collection and transfer trucks is smooth through Al Farabi road which connects with Almaty – Karasai highway. Access road of about 1 km within the site may be necessary.
6) Potential public and environmental objection		
Low potential	Some objection may be expected from residents south of the site	Objection is likely from owners of second houses (Dacha) in this area
7) Site proximity to waste generation centers (Figure7.1.3) (Measured by waste amount within a 10 km radius in 2010, as shown in the figure)		
Approx. 510 t/d	Approx. 310 t/d	Approx. 580 t/d
8) Site proximity to Karasai disposal site		
29 km	40 km	32 km