

6.5.2 Different Forms of PPS in Solid Waste Management

There are different forms of PPS, and their selection depends on the type of market, characteristics of the particular situation of the system and on the objectives by the regulator. Therefore, some forms of PPS in other sectors (e.g., drinkable water) differ from PPS related to solid waste sector in their concept, scope and applicability.

It is important to analyze and review the models implemented, both in developing and developed countries and learn from those experiences. The selection of the optimal PPS model is defined by several elements such as the following:

- Market size and type;
- Objectives of the client and/or regulator, such as equity VS efficiency;
- Long-term objectives;
- Level of rent-seeking activities of the system;
- Levels of the existing human assets;
- Institutional capacity to regulate; and
- others.

Before selecting the best model that fits the characteristics of the municipalities of AMSS, the institutional structure, free-riding activities level, auditing system, legal sanctioning system, information and control systems, level of the trained staff for regulation, the public perception of a private operation, etc., should be analyzed.

Table 6-64 summarizes the most common forms of participation by the private sector in solid waste management.

Table 6-64: Options for Participation by Private Sector in Solid Waste Management

Forms of PPS	Assets owned by	Investment	Operation/ Management	Commercial risk	Price fixing	Quality of service
Contract of service	Private	Private	Private	Public	Bid	Regulated
Contract of operation						
Competitive prices (lump sum or unit prices)	Public	Public	Private	Public	Bid	Regulated
Cost-Plus	Public	Public	Private	Public	Verified	Regulated
Contract of administration						
Fixed payment (lump sum)	Public	Public	Private	Public	Bid	Self-regulated
Fixed payment +incentives	Public	Public	Private	Public	Bid	Self-regulated
Franchise						
Competitive prices	Private	Private	Private	Private	Bid	Regulated
Regulated prices	Private	Private	Private	Private	Regulated	Regulated
Concession						
Competitive prices	Private	Private	Private	Private	Bid	Regulated
Regulated prices	Private	Private	Private	Private	Regulated	Regulated
Non-regulated franchise or license (exclusive or non-exclusive)	Private	Private	Private	Private	Free price	Regulated or not (as desired)
Open regulated competition (no license is paid)	Private	Private	Private	Private	Regulated	Yes
Open regulated no competition or informal markets	Private	Private	Private	Private	Free price	No
BOT – Direct or Inverse BOOT-Direct or Inverse BOO – Direct or inverse	Private or public	Private or public	Private or public	Private or public	bid	Regulated

Source: Madrid-Aris (1999).

Notes: BOT: Build, Operate and Transfer
BOOT: Build, Operate, Own and Transfer
BOO: Build, Operate and Own

It should be noted that competitive prices can be attained by the lump sum mode, or by means of unit prices.

In economic regulation theories, PPS forms are considered by means of bids such as “optimal regulation”. The bid corresponds to a competitive bid in a closed envelope. This type of regulation is optimal, since the bid process is competitive (there is no collusion and the number of participants for the bid is high), efficient prices are obtained easily and without a high regulation cost.

6.5.3 Description and Analysis of the Different Forms of PPS in Solid Waste Management

The diverse forms of PPS in solid waste management are described and analyzed next.

6.5.3.1 Contract of Service through Competitive Tender

a. Definition of Service Contract

The service contract is a broadly utilized form in developing countries to allow PPS in solid waste management.

This mode has replaced the traditional direct municipal operation. It incorporates PPS through a competitive public tender system, as in the contract-out of public works.

The service contract is the simplest form of PPS, by means of which efficiency can be achieved and thus reduce operation costs. In general, the service contracts are applied intensively for functional activities that do not require an important amount of capital. Therefore, the collection and sweeping system and the operation of sanitary landfills are viable categories to apply this type of PPS.

b. Regulation of prices: Unit Price VS Lump Sum

In general terms, prices can be arranged by means of unit prices or lump sum in the "services contracts". Generally, in this type of PPS prices are not regulated, as they are fixed by the competitive proposal presented at the moment the tender is open.

In developing countries there is the great problem of awarding contracts by unit prices (i.e., per ton collected or disposed of), due to the following factors:

- Under this regulation of prices, the private operator has the great incentive to perform free-riding activities, specially those aimed at forging (increasing) the volume collected or disposed of. Generally, this is carried out by putting additional weights on the truck, soaking the wastes, fixing the weighbridges, etc. Due to the aforementioned, the auditing and monitoring problem gets complicated and regulation costs increase considerably
- This type of price regulation also creates incentives for rent-seeking activities, the most common activities are corruption in the inspection and/or weighting process.

Aiming the private party to bear the business risk and really get incentives to become efficient and thus cut costs (enough to implement a reduction policy), many countries (specially Chile and Argentina) have adopted contracts for the provision of collection services in lump sum.

For AMSS it is recommended to make contract-out by lump sum through a public tender or known as competition for the product. It is also recommended a participation of at least 5 price bids in the opening process of the price bids, in order to ensure that the contract is competitive and the most economically-efficient price is obtained.

Taking into account the technical fundamentals previously explained and considering the specific conditions in San Salvador, the awarding of service contracts by means of lump sum is recommended instead of unit prices.

c. Other Regulation Elements for the Service Contracts

Terms

The term in this type of contracts depends on the type of services to be rendered. In general, this contract is frequently used for waste collection activities (that include haulage and/or transfer to the sanitary landfill).

The recommendable term to award a service contract for AMSS should last 7 years. Under this term, the useful life of the equipment is maximized, as well as the tariff impact is reduced, since the capital account of the collection trucks is discounted in 7 years.

“Force majeure” revision and cost transfer

The “force majeure” revision is considered as a mechanism not widely used that allows the adjustment of tariffs under circumstances regarded as exceptional and/or significant, totally out of the control by the service provider and by the client (e.g., climatic events such as an earthquake, hurricane or any other element) that generates an additional amount of wastes not considered in the bid price.

6.5.3.2 Operation Contract

a. Definition of an Operation Contract

This is basically a service contract, where the private party does not provide the capital but the entire operation and administration of the system; i.e., the ownership of the trucks belongs to the public sector in collection.

The private operator is not paid for the costs of capital account (depreciation and capital cost), and it just receives the costs from the O&M account.

This form of PPS can generate significant regulation costs, which depend mainly on the forms of regulating prices.

The prices for the operation contracts can be set as forms of: (i) lump sum; (ii) unit prices; (iii) cost-plus.

(i) Operation Contract with Lump Sum

The price to be paid to the private operator or the service provider is defined in the economic proposal presented at the moment of the tender in this regulation form. Therefore, the price presented by the operator includes its profits and the risks in the volume changes. This is the price regulation mode whose regulation cost is less.

(ii) Operation Contract with Unit Prices (or per volume)

The price to be paid to the operator is defined in the economic proposal, but based on ton collected by the operator. In general terms, in developing countries there is the great problem of awarding such contracts per volume; i.e., per ton collected, due to the following factors:

- This type of contracts increases incentives for “rent-seeking” activities.
- The private operator has the great incentive to forging or increasing the volume collected. Due to the aforementioned the auditing and monitoring problem gets even more complicated and the regulation costs increase.

(iii) Operation Contract with Cost-plus

The operator presents an estimate or forecast of operation costs (not including capital costs, since the assets belong to the client) and the municipality or client pays a percentage above the estimated costs (a rate between 7-10%), which corresponds to the profit or earnings for private operator.

b. Summary on the Three Forms of Price Regulation Under the Operation Contract

In order to allow the private party to bear the total risk of the business, to reduce regulation costs and make incentives to reduce costs, the price regulation through a lump sum system is recommended for the contracts of operation.

c. Other Regulation Elements for Operation Contracts

Terms

The operation contracts can be variable and the maximum duration is defined by the service life of the main assets involved in the corresponding functional category. That is, in the case of collection, the maximum duration of the contract should be 5 to 7 years.

6.5.3.3 Administration Contracts by means of Competitive Proposal

a. Definition of an Administration Contract and Terms

In these types of contracts, the public sector receives supports to improve the administration of the enterprise. This is conducted through the contract-out of specialized consultants in these matters, or by just transferring the administration of the public enterprise into private hands. The private operator holds the responsibility of managing and controlling the costs of the entire system.

In most of the cases, the private party (administrator) obtains its revenues according to a "minimum fixed payment" plus the incentives based on predetermined goals, such as reduction of administration costs, or reduction of operation costs, increase in the user registration, incentives for increases in invoicing and collection, etc.

This type of contract, when applied to inefficient systems, generates great incentives to increase the efficiency of the systems and allow both parties (administrator and client) generate revenues.

b. Other Regulation Elements for Administration Contracts

Terms

The term depends on the type of service rendered, ranging from 2 to 5 years for the collection and the commercial system. The optimal is to award such contracts through a competitive proposal.

Price adjustment or automatic price indexing

These contracts are based on lump sum; therefore, there is no price indexing.

6.5.3.4 Regulated Franchises

a. Definition of Regulated Exclusive Franchise

Under this mode, the municipality or regulating entity hands the service exclusively to a private enterprise within the geographical boundaries or defined routes.

On the other hand, the private party pays the municipality or regulating entity a license fee for such franchise (in the case of concession such charge for the license is eliminated). The franchise can be called regulated franchise, where prices are regulated, and in the case such franchise is granted for a long term.

Under this type of PPS, the private enterprise is responsible for the operation, maintenance and administration of the system and, in some cases, even of the investment. The public sector is still responsible for the tariff policies, but not of the invoicing and collection.

When a regulated franchise is for a long term, generally the offer of initial prices (first period) is conducted through a bid process (competitive tender). The only difference between a franchise and a concession is that, under the franchise, the private party pays a fee or charge to the client as a right for the franchise.

The charges or prices are regulated by a maximum price (price cap) set by the municipality or regulating authority. The municipality has the right to monitor the private party and revoke the license in case it is necessary. In a franchise system, the private party is in charge of collecting the charges for the service.

In the franchise system, the operator is responsible for bearing all the costs, be it capital (investment), operation and maintenance, and commercial. It is also responsible for the commercial part and bears the risk. Please note that the price is regulated, but the invoicing and collection (commercial risk) is in hands of the private operator. Under this modality, all the regulation parameters of services, customers and tariffs must be clearly defined. The tariff is set by the municipality according to a "price cap" or by a "return rate" system.

Advantages of the exclusive franchise

- The level or quality of the service that users are used to is maintained.
- It minimizes the administrative effort to monitor contracts. That is, the transaction cost is reduced. The reduction of administrative costs is mainly due to the fact that the municipality has no invoicing and collection costs.
- In the long-term franchise (with regulated price) the interruption of the service is prevented during the transition periods.
- The municipality gets the flexibility of introducing new services or equipment and making changes in the programs without the need to change the operator.

Disadvantages of the long-term exclusive franchise

- The municipality could end in high tariffs as a result of the charge for the franchise (10% or higher), or because efficiency is not achieved.
- Under a long-term franchise system, it is easy to result in information lag. That is,

the regulating entity is unaware of the accurate costs of the private party and, in consequence, efficiency through the tariff reduction is not achieved.

- Under a long-term franchise system, there is a relatively high cost for regulation; therefore, this cost is transferred to the users.

6.5.3.5 Franchise, Non Regulated or Non-exclusive Franchise (or Operation Licenses)

Under this PPS system, the owner of an operation license reaches agreements with the users. It is worth mentioning that such system is not applied to residential services. In general, this PPS form is applied for the industrial, commercial and construction waste collection services.

In some cases, under this type of franchise, the municipality or regulating entity tends to regulate the following:

- Policies on the minimum requirements of collection equipment.
- Policies to renew licenses.
- Policies for recycling and quality of the service in case the providers render the recycling service.
- Minimum standards.
- Requirements of reports and delivery of information.

The problems of this type of franchise are the following:

- Lack of a standard service quality.
- There might be price discrimination towards some customers, in case few enterprises participate in the market.
- Traffic jam problems could arise due to the several operators that work at a route or zone.
- Illegal dumping sites might arise if the operators are not duly controlled with regards to the final disposal, specially at developing countries.
- The generator must solve the service problems directly with the service provider.

Advantages

- In case of a great number of participants, the price could be competitive. The experience in the United States shows that the prices of a non-regulated franchise are lower than those from a regulated franchise whenever there is competition.
- There are no significant regulation costs, therefore tariffs can be lower than those from the regulated franchise.
- Different alternatives for the users are available and they can pay from diverse levels of service as they wish to.

It is important to note that the current industrial and construction waste collection system in AMSS is operated almost 100% by private parties, but they do not pay for licenses. That is, it is an informal competitive market. It is recommended that this market work on a future basis under a non regulated franchise system or the granting of operation licenses in order to be able to track the final disposal and to estimate the volume generated.

6.5.3.6 Concession

Under a solid waste management concession system, the concessionaire enterprise is fully responsible for the services such as the operation, maintenance, administration and investment to expand the services.

It is also in charge of the invoicing and fee collection of the services; therefore, it also bears the commercial risk. In other words, a concession is equivalent to a franchise but without a payment or operation license.

The contracts of concession can last from 6 to 30 years, depending on which functional category they are developing (collection, final disposal or so).

Technically speaking, the concession is defined by the capital account of the functional category; i.e., it is directly linked with the investment plan. For example, for a sanitary landfill the duration depends on the service life of the selected site (generally from 20 to 25 years).

6.5.3.7 Free Competition – Private Providers (both Formal and Informal)

This PPS model is defined as a free market one, which is not regulated (it could be intentional or due to a lack of a model). In this case, the operator reaches an agreement or enters a contract with the solid waste generators directly and freely.

The application of this system upon “residential users” has the disadvantage of losing the economy of scale and quality of the service can be deteriorated. For such reason, **the application of this modality upon residential wastes is almost null.**

This free market approach is employed (or expands naturally as a market) in the case of industrial wastes and large commercial generators such as supermarkets, hotel, malls, etc. This system is also applied for construction wastes.

Currently there is free competition in AMSS for the collection of commercial, industrial and construction wastes, which is motivated by the lack of capacity of municipal services to cope with the increasingly demand.

When there is free competition in developing countries, collusion might be common, in case that a limited group of operators exists. In this case, private parties might tend to collude and increase the price artificially.

Price setting is an alternative but it generates regulation costs; therefore, both effects must be evaluated.

6.5.3.8 BOT or BOT Inverse Contract and its Variants

The BOT, BOOT and BOOT inverse contract systems and all its possible variants are generally applied to specific projects for the construction of drinkable water facilities or for wastewater treatment plants, power production plants, etc. In the case of solid wastes, this modality is mainly applied for the construction of sanitary landfills or transfer stations.

Under a BOT system and its variants, the private enterprise has the responsibility of engineering design, construction, operation, maintenance, administration, initial investment and expansion of the services. It may also be in charge (or not) of the invoicing and collection of the services; therefore, in this case the private enterprise bears the commercial risk. BOT projects are awarded through a competitive bid with a closed envelope (bidding method).

A BOT can be implemented under a rate of return type price regulatory system, although it can also be implemented under a pure price-cap system, or price-caps form of a model enterprise.

6.5.4 Rules of Competition for the Diverse Forms of PPS

The above achievement of efficiency for the different forms of PPS are based on clear competition rules. If the tender process is not implemented correctly, it is obvious that expenses are generated and eventually the situation might come of a greater inefficiency than in the present situation.

Given the above, minimum rules are set to ensure competition, which also appear in the "Institutional and Regulatory Framework" that will be subject to the consideration by Salvadoran authorities and are as follows:

a. Competition in Service Contract for Collection and Final Disposal

- In case of competition for the product (or for the market), i.e., a bid for a service contract in lump sum or unit prices, once the participants are selected according to minimum experience requirements, the awarding of the final contract (when the proposal is opened) will be only based on prices.
- The referential price will have to be delivered along with the bid bases.
- For the opening of the envelopes a minimum of 4 economic proposals are required for the award (in order to be regarded as competitive).
- If the price of the lowest economic proposal is greater than 25% of the specified or referential price delivered, the proposal will be declared null and a new invitation will be called.

b. Competition in Administration Contracts

- In case of competition for the product (or for the market), i.e., a bid for an administration contract in lump sum or unit prices, once the participants are selected according to minimum experience requirements, the awarding of the final contract (when the proposal is opened) will be only based on prices and level of incentives.
- For administration contracts, the referential price and proposed incentives will

have to be delivered along with the bases.

- For the opening of the envelopes, a minimum of 3 economic proposals are required for the award (in order to be regarded as competitive).
- If the price of the lowest economic proposal is greater than 25% of the specified or referential price delivered and/or of the level of the incentives proposed (referential price) the proposal will be declared null and a new invitation will be called.

c. Competition in Franchises and Concessions

- For concession/franchise contracts, the invitation to tender will be published at an international level.
- A referential price will be delivered along with the bid bases.
- For franchise or concession contracts a minimum of 3 economic proposal is required to be presented in the opening of the proposal in order to consider it competitive.
- If the price is higher than 25% of the specified price (referential price), the proposal will be declared null.
- No concessions or franchises for a period greater than 7 years for the collection activity will be accepted (equivalent to the service life period of the equipment). The application of this PPS model for collection is not recommended, as a monopoly might be generated because the operator owns the customer database.
- A concession for final disposal whose ownership is private can be awarded without a competitive process, but its price will have to be regulated.

6.5.5 Criteria for Selection of the Most Appropriate PPS Model for Solid Waste Management in AMSS

Each of the most common PPS models for the management of municipal solid wastes has been defined above.

From the efficiency analysis (Progress Report 1 – April, 2000), it can be concluded that the situation of the diverse functional categories in AMSS is as follows:

- a. Collection and sweeping system:** its costs are very high and a low quality of the service; therefore, these two activities are considered as highly inefficient.
- b. Commercial system:** it is analyzed upon two relevant aspects; the first one refers to the invoicing and collection contracted out to two power distribution companies (CAESS and DEL SUR). It is considered that the cost of the service of 1.50 to 2.00 colones per invoice is very high; in other Latin American countries the cost ranges around 3% of the invoice value.

The second aspect is linked with the management of the information used for invoicing. The customer database supplied by CAESS and DEL SUR has not been analyzed nor compared with the database of San Salvador municipality (cadastre), reminding that the customers of the service are billed in two manners: for the

sanitary landfill according to the electricity consumption and the cleansing fee according to the surface of the real estate.

It can be considered that the management system is inefficient due to the following reasons: (i) the cadastre database or users is incomplete, (ii) a wrong codification of users; (iii) lack of an appropriate classification; (iii) lack of control of income per activity, location and type of users; (iv) there is a price discrimination, as some users are billed with an amount greater than the real one due to a mismanagement of the database.

- c. **Final disposal system:** the price system is very high and with a moderate efficiency (wastes are not covered with soil every day). On the other hand, the environmental control of this activity is not conducted, and the damages due to a mismanagement upon the environment can be high; therefore, this might imply that the cost were higher and thus more inefficient.

6.5.5.1 Selection Criteria for the Most Appropriate PPS Model for Collection and Sweeping in AMSS

The criteria used for selecting the model that fits better for the case of AMSS are as follows:

Criterion 1: Capacity to improve the service quality

This means not only improvements in the coverage by the municipality but improvements of the environment and customer service as well. Customer service is an area where there can be several improvements due to a poor performance in the past.

Criterion 2: Skills to reduce or keep tariffs

This means the ability of PPS to reduce fees and keep costs low, which is one of the main goals of the PPS model.

Criterion 3: Equity and fulfillment of social objectives

The PPS will have to fulfill a double function: on the one hand there will be the need to provide a service with fair charges; on the other, it will be forced to provide a service at subsidized costs to sectors of the population with scarce economic resources. This last point can be removed if the municipality decides to intervene with subsidy policy and the service is rendered with a "lump sum" system.

Criterion 4: Implementation feasibility

This criterion measures the potential to implement the type of PPS proposed. It takes into account the political desire for an efficient implementation and the opposition to the type of PPS by certain groups such as the Management office and labor unions.

Criterion 5: Regulation costs and risks

This criterion measures the difficulty and cost of properly regulating the different alternatives of PPS for the collection sector. The greatest cost is assigned number 1, and the least cost number 5. Risk is regarded in the sense of falling in information lag (the private party handles the information about customers).

6.6 Database Management

6.6.1 Introduction

Most of the billing systems of the municipal services concerning collection and final disposal charge the rate in accordance with the total area of the property or charge an annual uniform rate. In San Salvador Metropolitan Area (AMSS), a new billing method has been implemented as from April of 1999, jointly with MIDES Project.

This new method consists of the rate fixation for the cleansing and final disposal fee in proportion to the average of electricity consumption, and its collection is in charge of Electricity Distribution Companies (EDE). It is very innovative but attention should be paid to Data Base (DB) management, fee rate assignment and users' categories that are detailed below.

6.6.2 Current Structures

From April 1999, the use of this collection method began jointly with MIDES project. Whereas final disposal rates are charged according to the average electricity consumption that varies according to the different municipalities, the Electricity Distribution Companies (EDE) charge a commission for the fee collection through the corresponding invoice (See Table 6-65).

Table 6-65: Commission of EDE for Rate Collection

Municipality	Rates	Commission	
		CAESS	DELSUR
San Salvador	Cleansing and final disposal and public lighting	¢ 2.00+VAT	¢ 2.00+VAT
Cuscatancingo	Cleansing and public lighting	¢ 2.52+VAT	
Soyapango	Cleansing and final disposal and public lighting	¢ 1.55+VAT	
Nejapa	System is not applied		
Apopa	Final disposal	¢ 1.55+VAT	
Mejicanos	Final disposal	¢ 1.55+VAT	
Ayutuxtepeque	Final disposal	¢ 1.55+VAT	
Ciudad Delgado	Final disposal	¢ 1.55+VAT	
Ilopango	Final disposal	¢ 1.55+VAT	
San Marcos	Final disposal		¢ 1.55+VAT
Nueva S. S.	Cleansing and final disposal		¢ 1.55+VAT

6.6.2.1 Information Flow between the Municipalities and Electricity Distribution Companies

EDE send the relative information biannually about the customers (biannual consumption database) to the municipality, with their respective electricity consumption, by means of diskettes or CDs, so that these data can help the municipalities update their users' database (regarding new, inactive or disconnected users). Then the municipalities should process the information of the average consumption and update their users' database by assigning their respective rates, and then send this information back so that these rates can be charged in the invoice that will be issued monthly by EDE. Consequently, when invoices are collected, such information should be returned again to the corresponding municipality to allow the updating of its DB again.

6.6.2.2 Data Processing

Currently, the above-mentioned database processing of the collection system is not being carried out by the respective municipalities due to a lack of human and economic resources (See Table 6-66).

Table 6-66: Entities in charge of DB Process

Municipality	In charge of DB process	Distributor in charge of Fee Collection
San Salvador	By itself	CAESS, DELSUR
Cuscatancingo	By itself	CAESS
Soyapango	By itself	CAESS
Nejapa	Not using this system	
Apopa	MIDES-CINTEC	CAESS
Mejicanos	MIDES-CINTEC	CAESS
Ayutuxtepeque	MIDES-CINTEC	CAESS
Ciudad Delgado	MIDES-CINTEC	CAESS
Ilopango	MIDES-CINTEC	CAESS
San Marcos	MIDES-CINTEC	DELSUR
Nueva S. S.	MIDES-CINTEC	DELSUR

In view of this current situation, the information flow and process is summarized as follows (See the figure below).

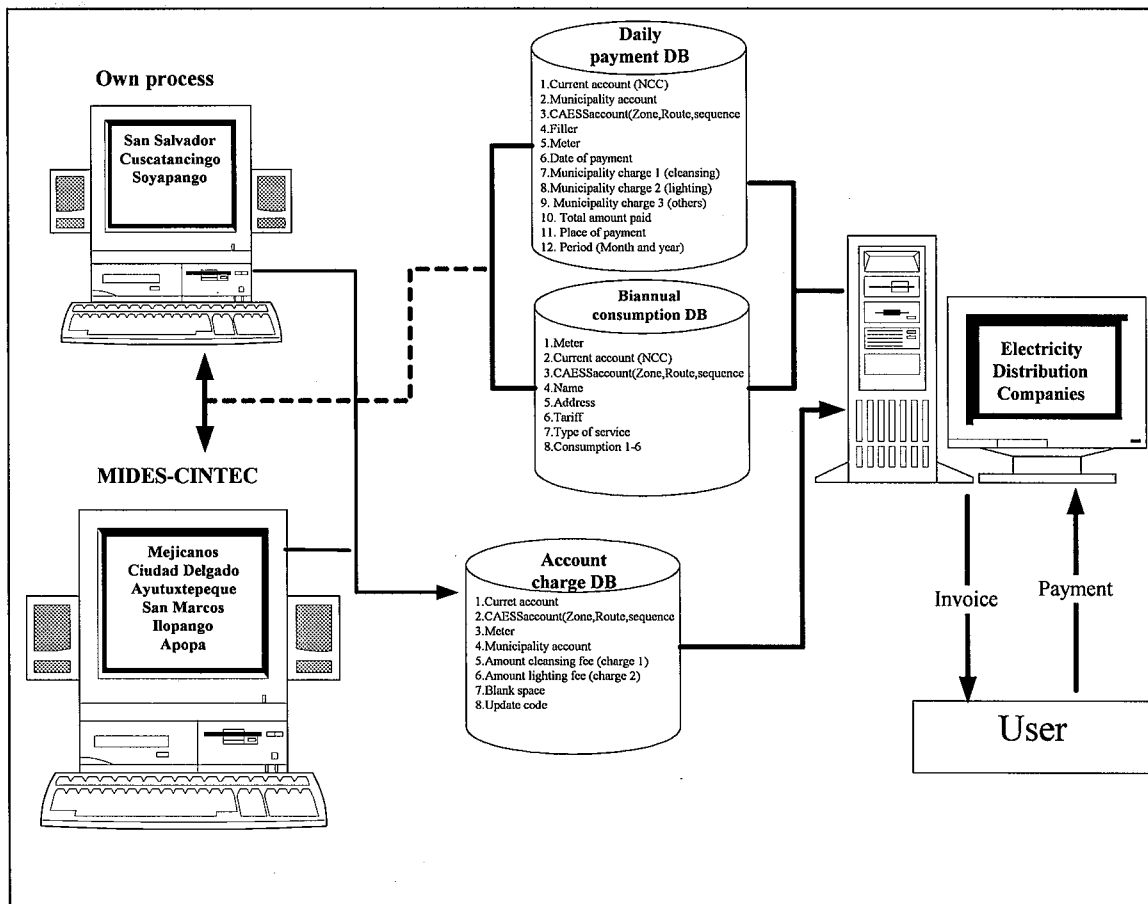


Figure 6-11: Data Flow of Current Fee Collection System

The municipalities that are processing data with their own resources have knowledge of data flows and their corresponding problems, which will be solved by introducing new technologies and human resources. Other municipalities only have data of the total invoices collected or pending invoices etc; however, they have no direct control over the data of users nor the categories in which the cleansing services are being rendered directly. That is to say, they neither know with accuracy how many houses, nor the categories of the users they are providing the service to.

Municipalities are left without such information that it is of supreme importance to allow the cleansing service continue being efficient and at a low cost. They will have to take urgent measures to solve this problem, municipalities should manage their own DB and have knowledge on the number of users to whom the service is being provided, as well as what will be the rate that will be assigned to them.

6.6.3 Problems and Deficiency of the Current System

Due to the absence of databases in the municipalities and difficult access to that of the municipalities being processed by MIDES, access and analysis of the database has only been possible in San Salvador municipality.

The control of customers' portfolio, the assignment of rates and the classification of users has not been controlled appropriately. It is important to mention that serious problems exist with customers' database, their categories and the assignment of rates.

If these data are not controlled and updated, it will be very difficult that this method operates efficiently.

6.6.3.1 Deficiency in the Users' Database

It has been noticed that the users' service database is not being updated and controlled appropriately. In any system the customers' or client's portfolio is the most important thing, and if it is not managed, neither estimations nor an appropriate global vision will ever be achieved to provide the city's cleansing service efficiently.

The following deficiencies can be observed in the users' database:

- A meticulous analysis of the users' DB by EDE and the municipalities' cadastre DB has not been conducted yet. Unified lists of the customers is therefore unavailable.
- Updating of the users' DB is not carried out periodically along with EDE's DB. In such a way, the registry or discharge of customers is not known with accuracy.
- Users' category of activities or income level cannot be identified. Under such conditions residential, commercial and industrial customers may be paying the same rate.
- It is very difficult to identify the users geographically speaking. This implies that whether the service is being provided with accuracy is unknown.
- The control of fee assignment and its updating is not conducted periodically. This implies that errors in assigning high fees can occur and that will bring about customers' dissatisfaction and thus income reduction.

6.6.3.2 Analysis of San Salvador Municipality DB

The municipality San Salvador collects the final disposal fee in proportion to the consumed electricity amount (0.075 colones/kWh), being the minimum charge of 5 colones/month and a maximum of 300 colones/month through the collection service by CAESS and DELSUR. All the analyses that will be detailed below were conducted based on the DB of fee assignment, collections and customers, in the period of April 1999 through March 2000.

a. Users' Databases

It is clearly shown that the collection system using the service provided by EDE is very efficient since they can bill up to 98% (CAESS) and 92% (DELSUR) of the customers. The collection average percentage of both is more than 80%.

An important aspect that should be kept in mind is the low billing percentage of the cleansing service that only accounts for 58% to 65%. This is due to the fact that the municipality's cadastre database does not match unified with EDE's DB, and therefore the corresponding billing cannot be carried out. Urgent measures should be taken in order to update the cadets DB and be able to manage an updated users' DB and, in this way, a complete billing will improve revenues.

There are some customers that were not assigned to a category with regard to their consumption because the users' DB is not updated periodically along with that of EDE's. Therefore, the average consumption of these users is unknown and the corresponding fees cannot be assigned.

b. Customers' Categories and Assignment of Fees

With the existing users' DB it is impossible to distinguish to what categories they belong to; i.e., it is unknown whether they are residential or ICI customers. For such reasons, this report differentiates between residential ones (consumption less than 500 kWh/month), and the rest are classified as ICI, keeping in mind the average consumption per subscriber published by SIGET (see Table 6-67). In Table 6-68, about 13,618 customers are assumed to be ICI, plus some businesses that probably do not consume a lot of electricity, however they generate more wastes and pay the same fee that residential ones.

Table 6-67: Monthly Average Consumption per Subscriber in 1999

Tension	Demand	Consumption type	AVERAGE (KW/H)	
			CAESS	DELSUR
Low voltage	I. -Low demand (0 < kW < 10)	Residential (consumption < 200 kWh)	83	78
		Residential (consumption > 200 kWh)	379	367
		General use	390	340
		Public lighting	7,725	3,237
	II. -Medium demand (10 < kW < 50)	Without power metering	2,986	937
		With power metering	5,095	3,732
Half voltage	I. -Medium demand (10 < kW < 50)	With power metering	5,763	11,092
	II. -High demand (> 50 kW)		57,300	78,775

Source: Super Intendencia General de Electricidad y Telecomunicaciones (SIGET)

It is urgent to identify every single ICI, as well as the recording of their waste generation, in order to assign a fair fee to all of them.

Table 6-68: Monthly Average of Users and Number

Category of User consumption (kWh)	Monthly average									Total No. of users	Residential and ICI
	CAESS				DELSUR						
	Number of users	Consump tion	Fee		Number of users	Consump tion	Fee				
		Cleansing	Landfill			Cleansing	Landfill				
00. N/A	326	0.0	205.6	0.0	268	0.0	45.8	0.0	594	326	
01. 1-49	11,293	25.0	19.8	4.9	187	28.0	35.2	0.0	11,480	77,648	
02. 50-99	17,811	74.0	16.8	5.7	7,292	73.8	14.1	5.3	25,103		
03. 100-149	14,353	122.8	22.8	9.1	4,508	123.2	16.8	8.6	18,861		
04. 150-199	10,897	172.6	29.4	12.8	3,480	173.0	22.1	12.0	14,377		
05. 200-249	7,559	222.5	37.4	16.5	2,138	222.2	26.8	15.5	9,697		
06. 250-299	5,235	272.8	40.4	20.2	1,319	272.2	30.1	19.1	6,554		
07. 300-399	6,708	344.4	48.5	25.5	1,450	341.7	33.1	24.2	8,158		
08. 400-499	3,793	444.6	57.0	32.9	662	444.6	42.8	31.7	4,454		
09. 500-999	7,302	687.7	75.5	51.0	998	674.8	55.7	48.3	8,300		
10. 1000-1499	2,288	1,209.6	102.1	89.8	220	1,209.0	85.4	86.9	2,508		
13. 2500-2999	1,862	2,048.1	125.2	152.1	150	1,962.6	121.1	137.4	2,011	13,618	
14. 3000-3499	202	3,219.2	125.4	237.3	13	3,276.8	123.7	240.2	215		
15. 3500-3999	118	3,740.9	206.4	279.6	7	3,685.5	104.1	276.4	125		
16. 4000-	420	7,456.5	122.0	292.4	38	6,171.5	173.3	263.4	458		
Total	90,165	1,336.0	82.3	82.0	22,730	1,243.9	62.0	77.9	112,895		

Categorization of customers according to the average of electricity consumption must be conducted periodically. In the municipality of San Salvador in the period from April/1999 to March/2000, a single average calculated from January/1998 to December/1998 was used. It is therefore that during this whole collection period the averages were not updated; this is why a fair fee cannot be achieved. Table 6-69 shows a calculation for a customer for the period of July/1999 to May/2000. The final disposal fee that has been assigned to this user is ¢ 6.075 for an average consumption of 81 kWh/month; since the consumption categories have not been updated, the same fee was charged to this customer throughout the whole period. It is observed that the user has had an average consumption from July/1999 to December of the same year not so variable, but from January/2000 its consumption increased; however, it continues paying the same fee since rates were not updated. In the **Cost 2** column of Table 6-69 a biannual average has been calculated; i.e., an average of the last 6 months and the different fees to be paid by the customer each month are observed. It is indispensable that fees be updated periodically, if it is expected to assign a fair fee related with the electricity consumption.

Table 6-69: Comparison of Assigned Fee

Period of consumption	Monthly consumption (kWh)	Continuous biannual average (kWh)	Cost 1	Cost 2
			Cost assigned by consumption of 81kWh (¢ 6.075)	¢ 0.075/Kwh
Jul-1999	81	81.0	6.075	6.08
Aug-1999	86	83.5	6.075	6.26
Sep-1999	77	81.3	6.075	6.10
Oct-1999	83	81.8	6.075	6.13
Nov-1999	75	80.4	6.075	6.03
Dec-1999	76	79.7	6.075	5.98
Jan-2000	213	101.7	6.075	7.63
Feb-2000	399	153.8	6.075	11.54
Sea-2000	398	207.3	6.075	15.55
Apr-2000	256	236.2	6.075	17.71
May-2000	305	274.5	6.075	20.59
		Total	66.83	109.59

c. Billing

Regarding the billing process, a high percentage is observed for cleansing fee (83%) and final disposal fee (80.1%), but it is also remarkable the low percentage of customers that have an average consumption of more than 3000 kWh/month. It can be assumed that ICIs that generate more wastes are both paying a low fee and are to date with respect to their payments.

Table 6-70 compares the monthly amounts that MIDES bills to municipalities for final disposal fee. It also calculates the amount of commissions charged by EDE that is ¢ 0.67 per invoice, considering that EDE charge ¢ 2 for public lighting, cleansing and final disposal rates fees. A deficit of more than 9 million colones is perceived.

Table 6-70: Total Amount Billed by MIDES (Final Disposal)

Year	Month	Total users	Invoices		Amount (colones)		Commission 0.67 ¢/bill	Total income	Billed by MIDES	Balance
			Billed	Collected	Billed	Collected				
1999	04	112,622	111,137	90,065	2,456,260	2,068,605	74,091	1,994,513	1,572,633	495,971
	05	112,230	107,427	86,876	2,389,765	2,001,353	71,618	1,929,735	2,734,579	-733,226
	06	112,279	110,398	89,086	2,436,279	1,857,957	73,599	1,784,359	3,047,977	-1,190,019
	07	110,479	108,674	87,665	2,336,083	1,834,242	72,449	1,761,793	3,149,577	-1,315,335
	08	111,233	109,003	87,849	2,349,136	1,832,992	72,669	1,760,323	3,149,577	-1,316,585
	09	111,473	108,878	87,945	2,347,286	1,847,069	72,585	1,774,484	3,062,897	-1,215,827
	10	111,579	108,954	87,703	2,348,742	1,837,683	72,636	1,765,047	3,117,502	-1,279,819
	11	117,619	109,437	87,787	2,361,309	1,838,325	72,958	1,765,367	2,856,969	-1,018,644
	12	116,379	113,646	90,624	2,427,124	1,872,047	75,764	1,796,283	3,008,267	-1,136,220
2000	01	110,062	107,494	87,140	2,123,711	1,777,072	71,663	1,705,409	2,841,018	-1,063,946
	02	114,269	111,705	90,742	2,389,365	2,006,822	74,470	1,932,352	No data	
	03	114,510	106,511	83,466	2,274,857	1,839,079	71,007	1,768,072	No data	
Total		1,354,734	1,313,264	1,056,948	28,239,918	22,613,247	875,509	21,737,738	28,540,996	-9,773,650

The collection system by means of EDE is a good option, but for the fee assignment according to energy consumption an in-depth study and identification of all ICIs will have to be carried out. Table 6-70 clearly shows that with the current fee assignment it is not possible to meet the high cost of final disposal fee (US\$18/ton).

6.6.4 Proposal of the Collection System Improvement

6.6.4.1 Objectives of the Improvement

It is of supreme urgency to have the effective control and to improve the collection system, which will bring about efficiency for billing and thus will generate greater revenues, an improved service and larger collection coverage without having to increase the fees.

6.6.4.2 Data Flow

For a better database control, it is necessary to make some changes in data flows and changes in controlling devices. The purpose of the system proposed is to become an integral system in which manipulation of data and bills is avoided, thus increasing efficiency in the registration of clients, assignment of a fair fee and collection efficiency.

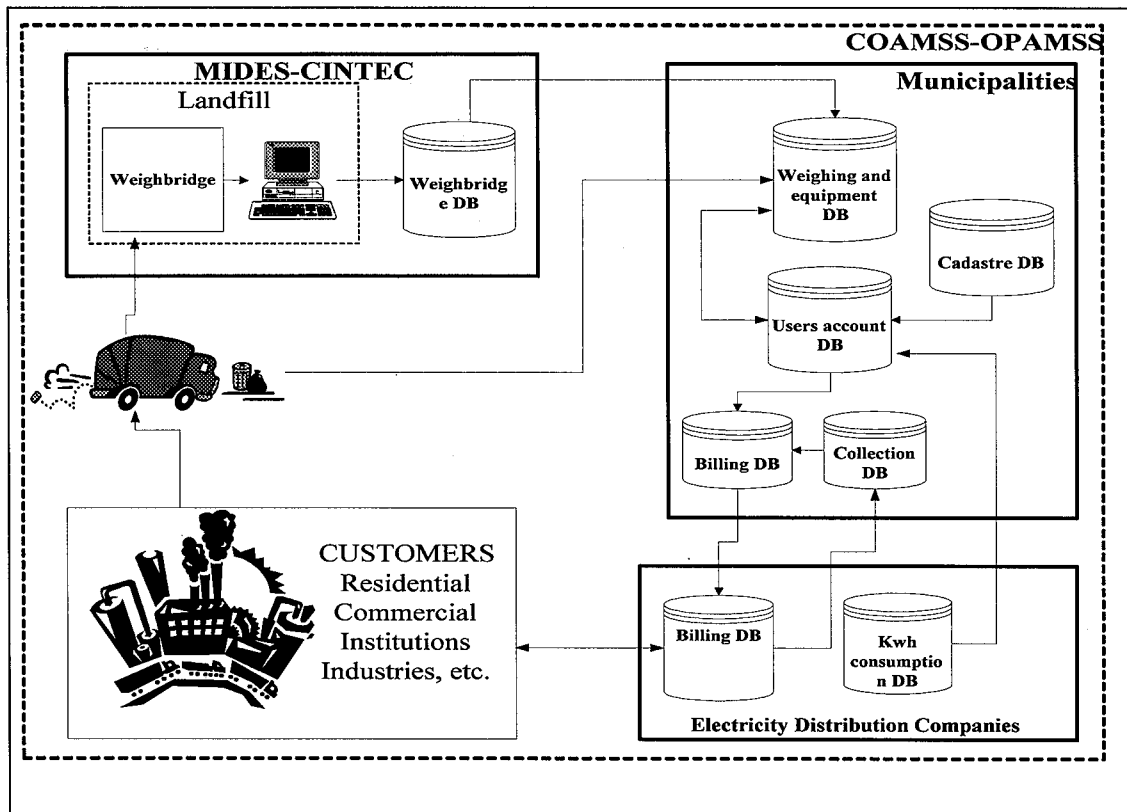


Figure 6-12: Proposed Data Flow

6.6.4.3 Entities Involved in the System

- Municipalities

The municipalities will have to invest more in human resources and computer equipment to begin managing databases, which are indispensable for the control of this billing system. Figure 6-13 shows the databases that the respective municipalities should control.

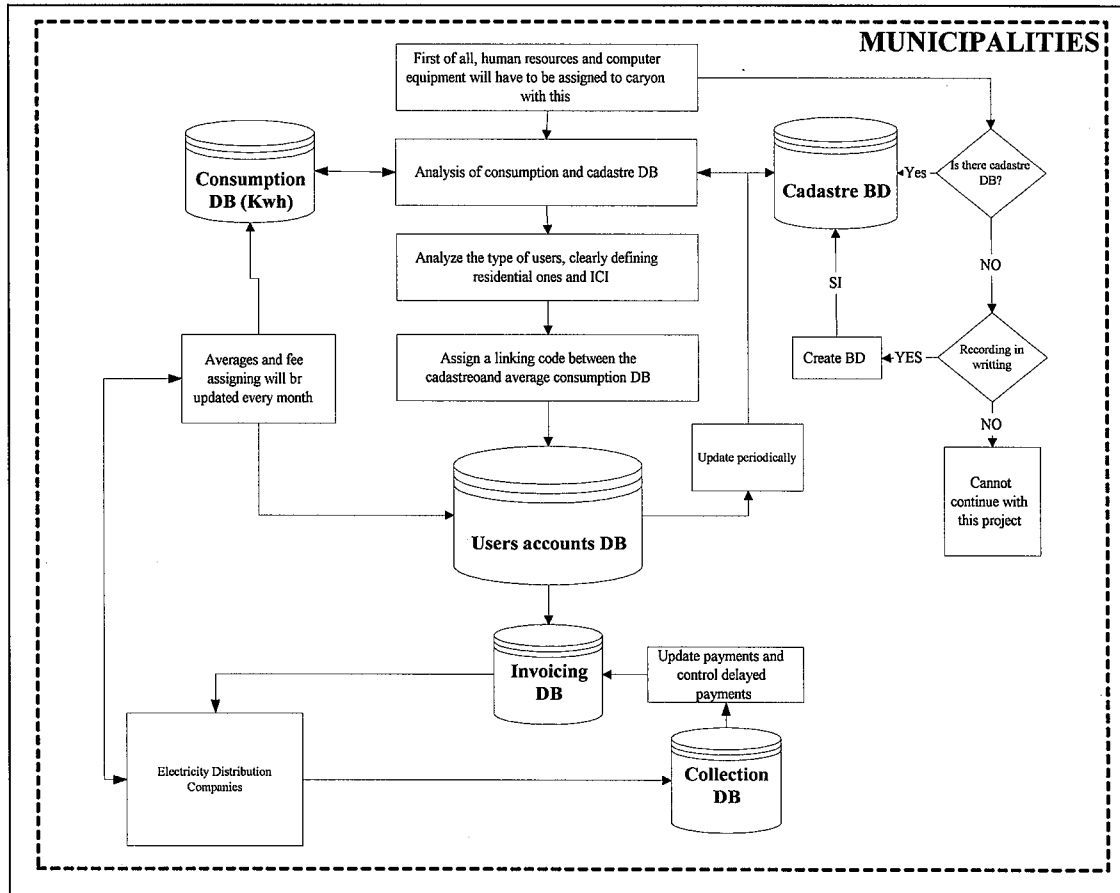


Figure 6-13: Databases under the Municipality's Control

By having a users database, the municipalities will have to see the possibility of connecting to the records of the sanitation department in order to verify if the collection service is actually being provided to the user. This is very important, otherwise, inappropriate cleansing and final disposal fees will be charged upon the citizens. The coverage of the electricity service and the collection service coverage should be kept in mind.

Figure 6-14 presents the databases that should be managed for the control of the daily waste collection works, the collection routes and equipment. If there is no such DB, it will be very difficult to have a general control. Therefore it is necessary that the whole data become digital, so that an efficient and sustainable cleansing service can be provided.

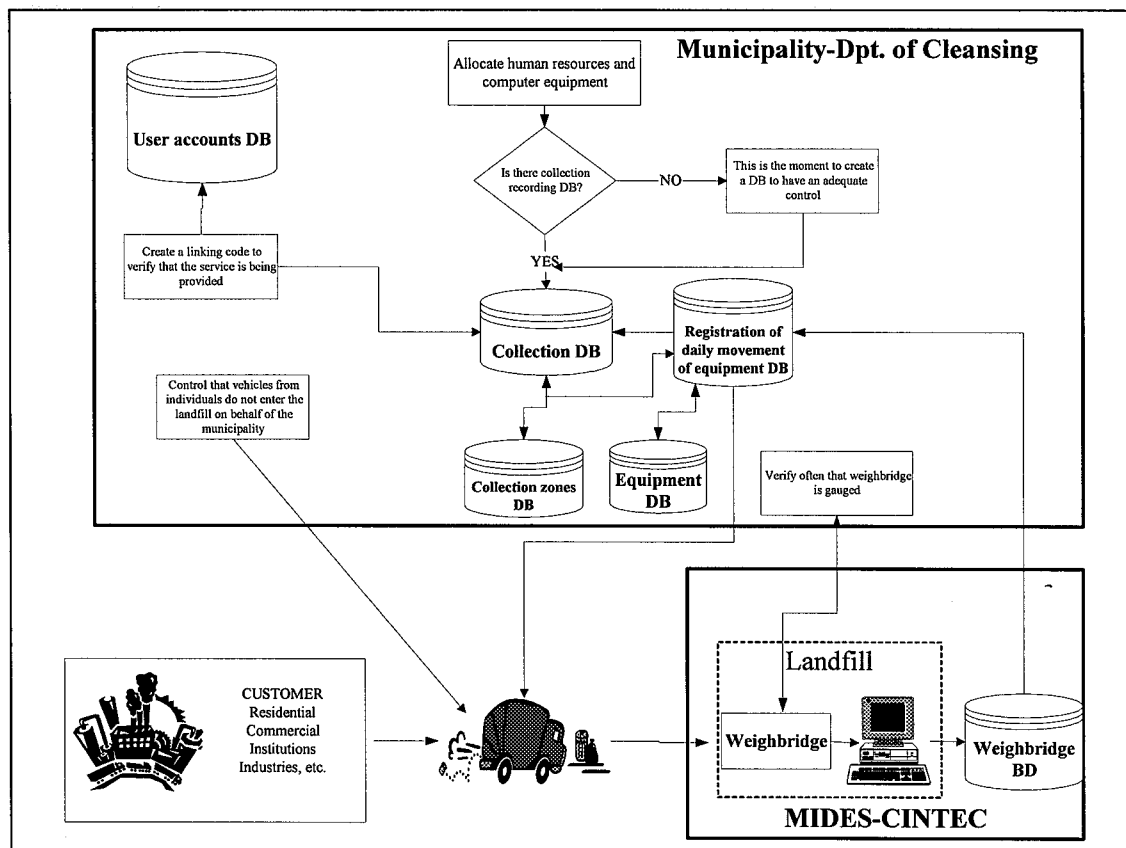


Figure 6-14: Database for Collection Control

- MIDES-CINTEC

This entity will have to provide the municipalities with the weight data of the waste disposed of at the landfill and control the calibration of the weighbridge periodically.

- COAMSS-OPAMSS

It should be the body controlling the entire procedure, processing and managing all the DB. It should detect boundary problems among the municipalities and take action for solving this problem. It should offer technical support to the municipalities that cannot process said database by themselves.

- Electricity Distribution Companies

EDE should provide DB of the customers' consumption every month, as well as update registration and discharge of the clients. Municipalities and EDE should jointly analyze the boundary problems among the municipalities, and in this way the users' DB will match each other.