

Chapter 9

Conclusions and Recommendations



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9.1 Conclusions

The GDF has established and is carrying out the enormous urban solid waste management system covering its 8.6 million population. With respect to urban environmental aspects, the system effectively functions to provide cleansing services to almost the totality of the DF and it consequently maintains the city clean.

Bordo Poniente's final disposal sites in DF practically employs daily soil coverage on disposed wastes. A high level of final disposal management is practiced in general, only leaving a room for the improvement of leachate management.

It is highly evaluated that the DGSU and all delegations, and their staff in charge of cleansing services, are making routinely good efforts to implement appropriate SWM services.

It is regulated that respective delegations are in charge of the domestic wastes collection. Whereas in its practice, it mainly consists of two components: (i) primary collection by road sweeping staff; and (ii) collection by staff of collection vehicles. Workers engaged in these collection services (both sweeping staff and collection vehicle staff) comprise: (i) formal workers employed by DGSU; and (ii) informal workers voluntarily participating in the services. Formally employed workers constitute Section 1 of the Unique Syndicate of GDF Workers which maintains political influences. On the other hand, the informal workers are voluntary participants in the services and therefore are mostly in a socially vulnerable position.

As the cleansing services workers recover recyclable sub-products from the wastes and gain some income by selling such sub-products, their activities of picking sub-products from wastes received make the efficiency of wastes collection very low. In addition to that, as the majority of the collection vehicles are very old, the collection efficiency is further deteriorated.

Municipal waste generation amount in DF reaches 11,400 ton/day, which derives 1,370g/person/day as waste generation per capita. The waste generation per capita in DF is higher than the average of OECD countries (1,333g/person/day).

The wastes generated in DF are not source-separated and the great majority of them are landfilled. Furthermore, as it is estimated that the service life of the existing landfill (Bordo Poniente Etapa IV) will end up in early 2001, it is urgently needed to secure a new landfill site.

Three (3) Selection Plants (S/Ps) are currently operated to recover recyclable sub-products. However, its recovery ratio is not at a satisfactory level at all. The objective of the 3 S/Ps at the time of establishment was the social welfare of pepenadores who were picking the wastes at open dumping waste disposal sites. These plants still are currently operated in line with that objective.

As a consequence, the primary objective of "selection plant": to recover recyclable materials and to promote resource conservation is put aside in their operation. As only highly marketable sub-products are picked up, waste input amount is more than the

double of the appropriate plant capacity and input wastes are mixed municipal wastes, thus recovery ratios of the 3 S/Ps are very low. Further, all costs incurred on maintenance, repair, operation of the facilities are at DGSU's expenses, while ex-pepenadores groups provide their labor and absorb all sales of recovered sub-products as the groups' income. Whereas the groups are not juridical entities, a set of problems in the operation and management of such facilities are present.

With the principal goal to establish a sound solid waste management by the target year 2010, the M/P aims to:

- promote the citizens' well-being.
- implement sustainable solid waste management.
- contribute to environmental conservation.

In practice, it proposes:

- introduction and dissemination of source separation and separate collection.
- improvement of recovery ration at S/Ps.
- construction of composting plant.
- vertical expansion of Bordo Poniente Etapa IV final disposal site.
- new construction of Bordo Poniente Etapa V final disposal site.

From these components of the M/P,

- construction of composting plant.
- vertical expansion of Bordo Poniente Etapa IV final disposal site.
- new construction of Bordo Poniente Etapa V final disposal site.

were selected as priority projects in view of their urgency. Feasibility studies were carried out for these three priority projects.

It is expected that reuse of resources will be year by year promoted and final disposal amount can be gradually reduced, when the M/P and priority projects are realized. The following can be highlighted in view of the present situation of the SWM in DF:

- Technically, the GDF will not face difficult problems, as the GDF has reserved substantial technical assets.
- In organizational and institutional aspects, inefficiency especially in collection and S/P components are outstanding. Discussion and negotiation with Section 1 and Ex-pepenadores groups should be prepared with due care in a longer time.

With respect to institutional improvement for M/P implementation, the study proposes "recommended alternative for M/P institutionalization" in Table 7-23, which is subject to further analysis by GDF. Annex F presents a set of discussions on particulars to be considered for the organizational and institutional improvement for M/P implementation, therefore it is recommended, when the authority GDF needs to take action for the institutional improvement, to review the set of discussion for their reference.

The M/P was formulated based on the key precondition that the separate collection is introduced and diffused. Therefore, if separate collection is not implemented, targets described in the M/P could not be realized.

Success or not of separate collection largely depends on waste generators moral on dedicating to source separation. Therefore, it is important to formulate and implement the public education program with reference to the public education plan outlined in this report.

When the plans and projects outlined in the M/P are implemented, final disposal sites of DF will have the service lives up to about the year 2013. However, in view of urbanization in and around DF, it will be very difficult after that time to assure a site for a new landfill near the DF (such as Bordo Poniente). Therefore, before that time, the GDF should start discussion and negotiation regarding a regional-use landfill project with neighboring municipalities in the State of Mexico.

9.2 Recommendation

a. Study Continuity

This development study (The Study on Solid Waste Management for Mexico City in the United Mexican States), under the JICA's technical cooperation program, will be finalized and ended when the Final Report of the Study is submitted to the GDF around May 1999. The solid waste management M/P and the priority projects F/S are to be finalized through the study for the Mexico city. If the M/P and priority projects were not implemented, it means that all time and resources devoted to the study result in vain. Furthermore, benefits such as "promotion of citizens' well-being", "implementation of sustainable SWM" and "contribution for environmental conservation" expected in M/P and priority projects implementation will not be attained. Therefore, the study team strongly recommends that the M/P and priority projects should be implemented.

It is judged that the GDF has reserved the technical capability and financial affordability necessary for the implementation of the M/P and priority projects. Therefore, they can be considered to be ready for implementation.

Generally speaking on the other hand, when a new government is introduced after an election, plans and projects prepared by a former government often disappear before their implementation. In a worst case, reports and/or documents on plans and projects disappear. It makes it impossible even to review all the former plans and projects prepared.

In order to avoid this study from suffering such an unproductive ending, efforts should be made to create such circumstances that the study can be continuously followed up and promoted. In practice, it is recommended that a SWM expert, who can be familiar with the study and politically, institutionally and technically be in a neutral position to advise about SWM, should be dispatched to the DGSU. The dispatch of JICA expert, which is another JICA's t/c scheme, is opportune to provide such an expert being neutral and with least to none cost burden on the counterpart institution (i.e., DGSU). The study recommends that DGSU should make a request of expert dispatch to JICA.

b. Compilation and Utilization of Data

It is recommended that data and information regarding such as "waste-flow" should systematically be measured, compiled and utilized every year in order to follow and

verify what are assumed and planned in the M/P. Such compiled data and information will be extremely important to review and modify the M/P when in future it becomes necessary. At the same time, annual trends in respective SWM particulars can then be actually understood. Such data will possibly suggest a key for upgrading the SWM system of the DGSU.

c. Policy Approach for Recycling

It is estimated that recycling activities will be increased in line with the M/P. Resources recovered in SWM are increasingly distributed in the market. On the other hand in its consequence, it is anticipated that sales prices of recycled products may be lowered in response to increased supply of the products and it will contrarily impinge the recycling activities. Therefore, it is recommended that the policy approach (presented in Section 7.2.2) to promote expanding markets of recycled products should be implemented.

9.2.1 Technical aspects

a. Discharge and Storage

Transformation from present "mixed discharge" to "source separation" requires understanding and cooperation by waste generators. Therefore, it is recommended that the public education program on waste management should be formulated and implemented with reference to the public education plan outlined in this report.

b. Collection

As collection is the delegations responsibility, the scope of the M/P regarding collection is limited in terms of "supervision and support" by the DGSU to the delegations. It is strongly recommended that

- Each delegation should formulate a workable long-term plan for separate collection.

The long-term plan of separate collection should include the following items, in order to realize practical and stepwise improvement of separate collection:

- Understanding of Present Condition
 - collection amount (waste flow in respective delegation), collection route, and collection method
 - recyclable materials recovery methods, and flow of recyclable materials
 - public consciousness and cooperation on source separation; separate storage; separate discharge; environmental conservation; etc.
 - consciousness of cleansing workers
 - institutional perspectives on cleansing services
 - SWM expenses and budgets
- Assessment of Present Condition, and Analysis on Problem Solution toward Realization of Separate Collection

- **Formulating Implementation Plan of Separate Collection**

- ◆ setting up targets, framework of the long-term plan on separate collection, examination of implementation methods
- ◆ formulation of public education program on source separation
- ◆ coordination with relevant authorities
- ◆ estimation of required resources (financial and physical) for realizing separate collection, and examination of how to secure the required resources
- ◆ stepwise annual implementation plan for separate collection

- c. **Transfer Station and Transport**

Transfer stations and transport play a crucially important role for controlling the waste flows in which respective wastes have to be delivered to proper destinations according to their categories. Therefore, it is recommended that the DGSU should further keep direct control and monitoring on transfer stations and transport in order to facilitate the integrity of all SWM components. In practice, a single common format for data compilation should be established and utilized in order to strengthen the control on transfer stations and transport. Track scales should be installed in every transfer station.

- d. **Intermediate Treatment**

- d.1 **Selection Plant**

Although currently mixed wastes are fed in the S/Ps for sub-products recovery, it is planned that from the year 2000 separately collected recyclable sub-products are started to be fed to S/Ps. Therefore, before that time, a modified operational mode of S/P to cope with "separated wastes" input should be carefully examined (for example, specification of reception and stockpile area of separate wastes, assignment of one or some of sorting lines to separate wastes input and others to mixed wastes input, etc.) in order to establish optimized operation on time.

- d.2 **Composting Plant**

It is strongly recommended that a pilot composting project on separated organic wastes from sub-system should be implemented in parallel with the basic design of the composting plant, in order to verify the design parameters (such as physical and chemical composition of the waste (organic waste of sub-system), quality of compost, etc.).

Meanwhile, as the success of a composting plant largely depends on (i) compost quality and (ii) size and stability of its market demand, it is recommended that, using the compost products from the pilot project, market promotion and experiment of agricultural application etc. should be tried.

- e. **Final Disposal**

It will be anticipated that a future landfill site for disposing of the wastes after 2013 is very difficult to locate in the DF jurisdiction area or in the CNA land. Therefore, it

will be inevitable to examine the possibility to locate the final disposal site on the land in the State of Mexico, and to examine the possibility of regional use of landfill by GDF, host municipality and others. As it is anticipated that coordination among those parties for future landfill establishment may require substantially long time of discussion before its implementation, the coordination for the future landfill (to be used after 2013) should be started at latest in the year 2007 or around by GDF and other entities.

9.2.2 Institutional Aspect

Contract-out is prevalent in various works of the SWM by the GDF, whose contract terms are all limited to be in a short period (from a several months to maximum two years) by the current budgetary process of the GDF. These contracts of short period have been introducing the GDF's financial demerits with following reasons.

- In case where a contractor uses machinery for the work, the contractor needs to purchase or rent the machinery. The shorter the contract period is, the shorter depreciation period is set by the contractor for the machine provided in the work. Consequently the shorter depreciation period raises the contract price of the work.
- In case where the laborers are employed in the shorter contract, they will not be accustomed to the work nor will their technical skill be improved. In consequence, work efficiency in total remains as low as that the work is initiated. It turns to be a higher labor cost compared with a contract of a longer period.

Therefore, either in case of contract-out or concession, it is recommended that the legal and budget authorization frame of GDF should be improved in order to extend the contract period as long as the useful life of machinery employed by the contractor.

9.2.3 Social Aspect

The following recommendations are proposed:

a. Public Health

- A Program for Solid Waste Separation at the Source should be implemented, which will benefit public health and thus improve the environment. This situation would lead to domestic sanitary management and will prevent the proliferation of harmful fauna at the source.
- Clear occupational health and safety requirements should be set for the GDF's Cleansing Service, for the contractors and concessionaires, and their compliance should be supervised and controlled by the GDF.

b. Community Education and Participation

- The proposed Public Educational Program should be implemented as one of the fundamental devices to suppress or mitigate critical social problems in the SWM of the DF; likewise, to foster community participation and their approach to the GDF's SWM administration.

- Additionally, the Educational Plan should be developed to facilitate the implementation of the three priority projects, whose feasibility has been analyzed.
 - Environmental education should be fostered and remarked, specially in elementary schools.
 - Private sectors, NGOs and communal organizations should also be integrated in the solid waste reduction, reuse and recycling tasks.
- c. **Concertation**
- Concertation should be driven among the participants in the SWM process, based on negotiation and consensus, as an additional instrument to solve critical and underlying social aspects.
 - It should be acknowledged that, in the case of the DF, the separated recyclable material is a social and financial negotiation element within the organization process to be taken into account by the GDF. Yet, it should also be reminded that the price of recyclable materials will decrease due to the larger amount recovered as a direct result from the separation at the source of generation, as well as to the possible economic improvement of the country and the subsequent reduction of unemployment. Likewise, other elements to be negotiated with are tips and *fincas* currently paid by the customers of the service.
- d. **Employment**
- It should be stressed that the changes do not mean personnel layoffs; at least a balance in the total personnel engaged in SWM should be sought that, although position could be changed due to organizational or efficiency purposes. Although the Master Plan is not intended to increase the number of jobs, the socioeconomic features through which most of the population in the DF is undergoing and which will not be improved substantially until year 2010, demand the SWM to keep on performing as a social "buffer" area, so as to provide work to the poorest and less qualified persons in the society. Currently more than 30,000 people in the DF are directly linked with SWM. Not acting along the proposed direction would bring about social problems that do not exist today.
 - Besides, negotiation and concertation of innovative and modern proposals, that stand for positive changes for the promotion of informal personnel (volunteers and others) linked with the sweeping, collection and selection of solid wastes in the DF should be facilitated and supported.
- e. **Legislative Arrangement and Enforcement**
- Laws to reduce the amount of packages and wrappings should be approved and enforced.
 - A system to enforce the law, codes, standards and provisions on SWM should be encouraged, along with public education and the dissemination of the laws on SWM.

9.2.4 Environmental Aspect

The DGSU currently carries out environmental monitoring at final disposal sites and S/Ps. The range and frequency of data compiled through the monitoring are judged to be sufficient and important. Additional requirement for the environmental monitoring would be that format of data collection and compilation system should be improved so as to easily analyze the chronological changes, to detect atypical data, and to understand the reasons of chronological tendency and/or atypical data results.

9.2.5 Financial and Economic Aspect

If the following conditions were satisfied, the DGSU would be able to implement the priority projects by self-financing of the GDF without relying on the external funding, which will be the least cost solution from the financial viewpoint.

- The GDF in the year 1999 decides to commit an investment during 1999 to 2003 equivalent to 30 million US\$ for the priority projects.
- The DGSU, after the construction of the priority projects, annually continues to allocate the budget for operation and maintenance of the priority projects, which should be about 10 to 17% of the DGSU's annual budget amount.

On the other hand, if the priority projects are to be implemented with external financing (such as from international banks), as financing options could mainly be categorized into the following two options (OECF type and World Bank (WB) type), merits and demerits of the two options should be carefully examined in view of GDF's present and future financial situation.

- OECF type: the repayment period is longer, annual repayment amount is smaller than WB type, total repayment amount is larger than the WB type.
- World Bank type: the repayment period is shorter, annual repayment amount is larger than the OECF type, total repayment amount is smaller than the OECF type.







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