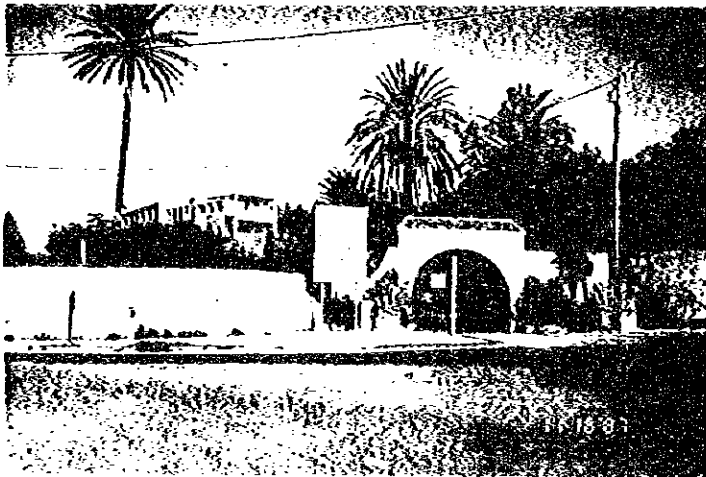
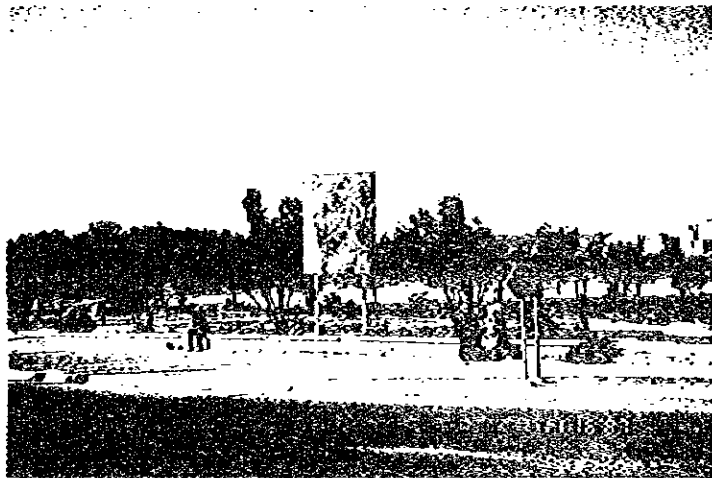
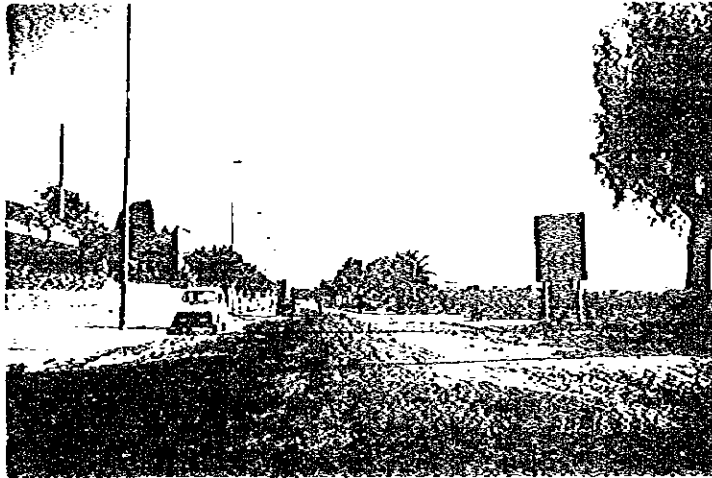
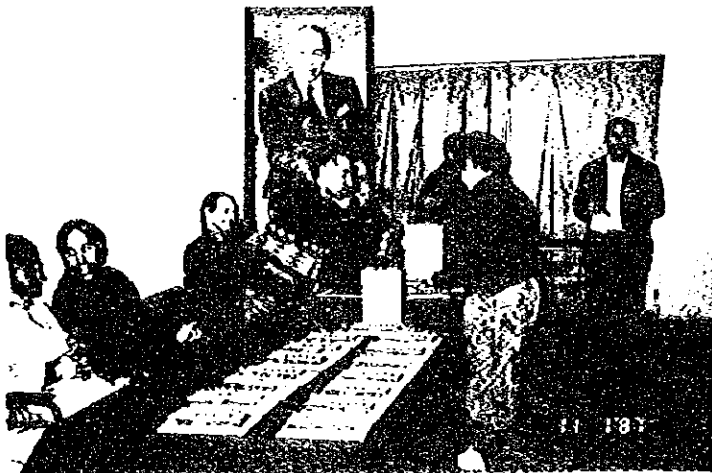
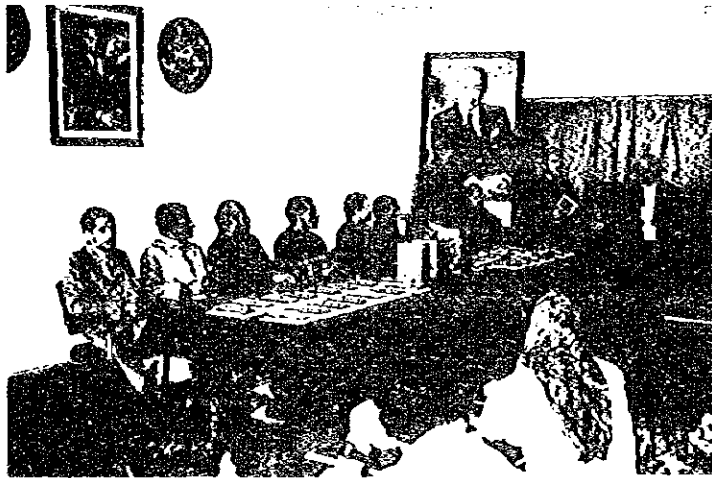


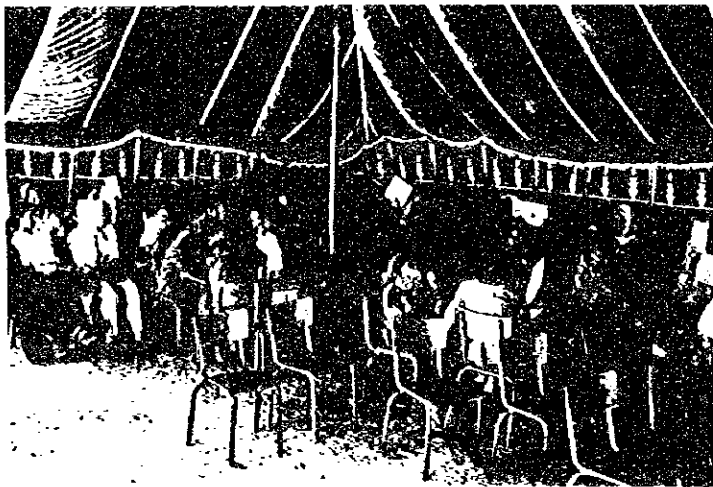
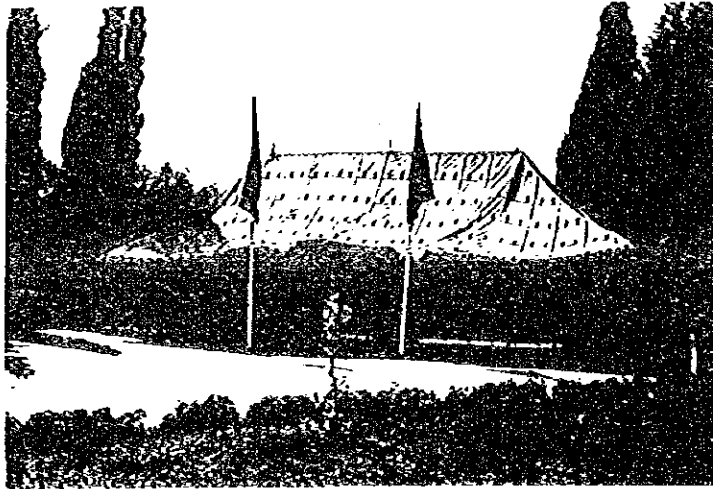
Views about the settling of metal stands for the giant posters



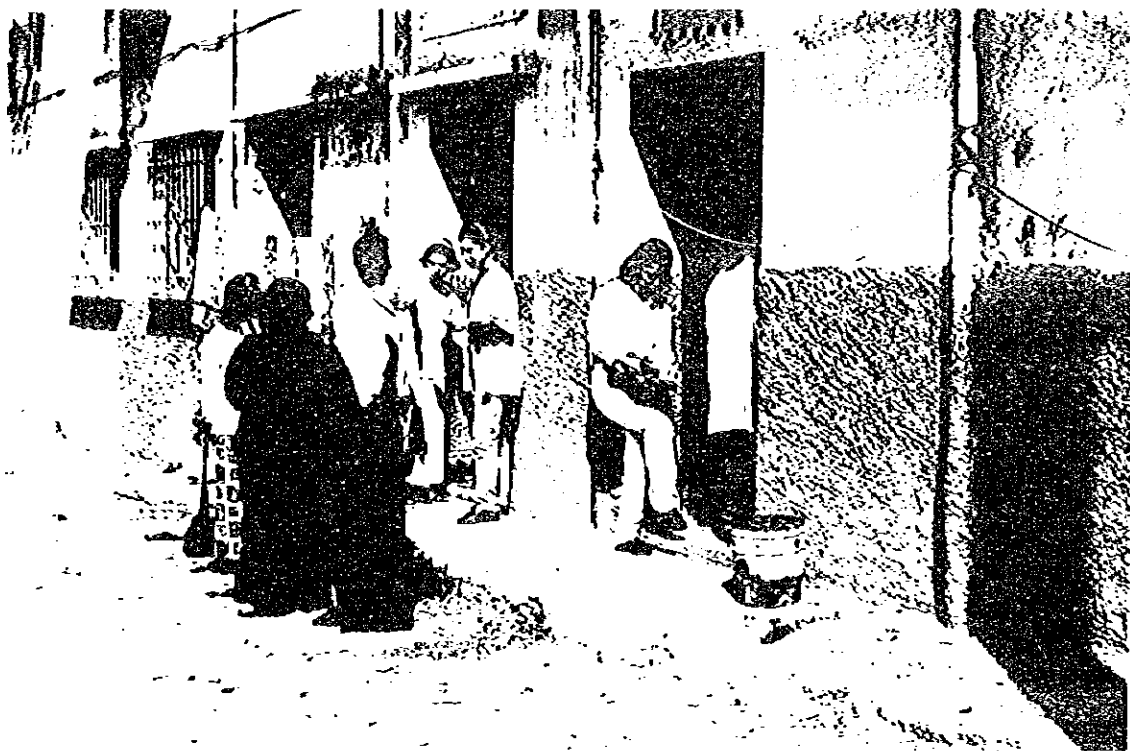
Examples of metal stands set up for the giant posters



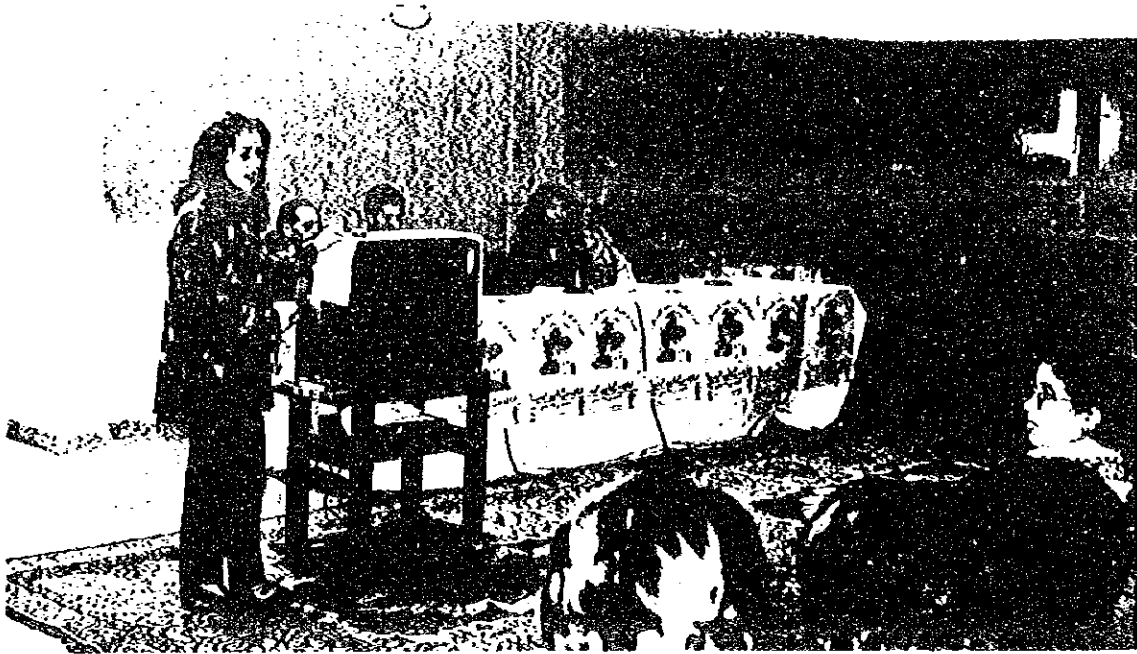
Ceremony of distribution of prizes organized in the locals of the Delegation of National Education, on 29 January 1997



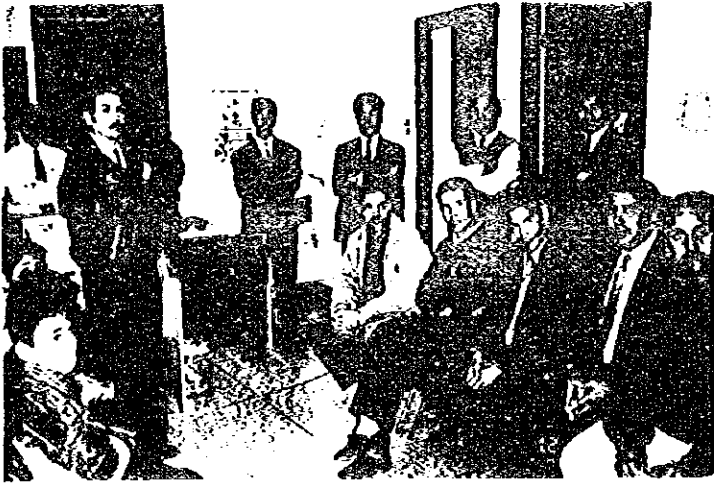
An awareness heightening day at Biada, on 14 April 1997



An awareness heightening day at Boudheb, in the locals of ACL, on 15 April 1997, and an example of door to door activity



An awareness heightening day at Zaouia, in the locals of the women center, on 16 April 1997



Ceremony of the final distribution of prizes to prize winning pupils and artists of the drawing competitions, at the cultural center of Safi (JICA study team office), on 27 February 1997

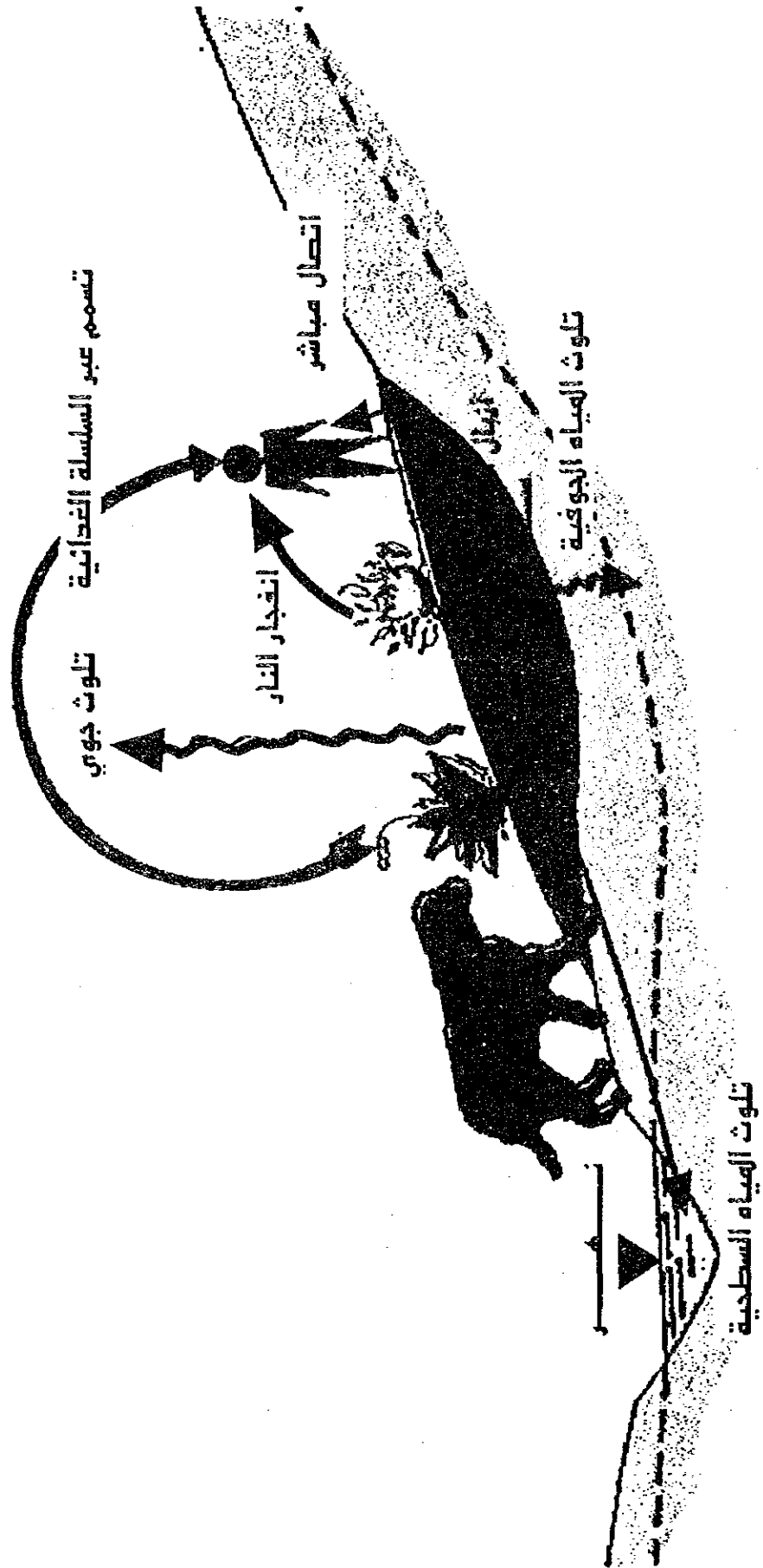


Two examples of giant posters settled in May 1997 at the central square in front of the Province and the Urban Community of Safi

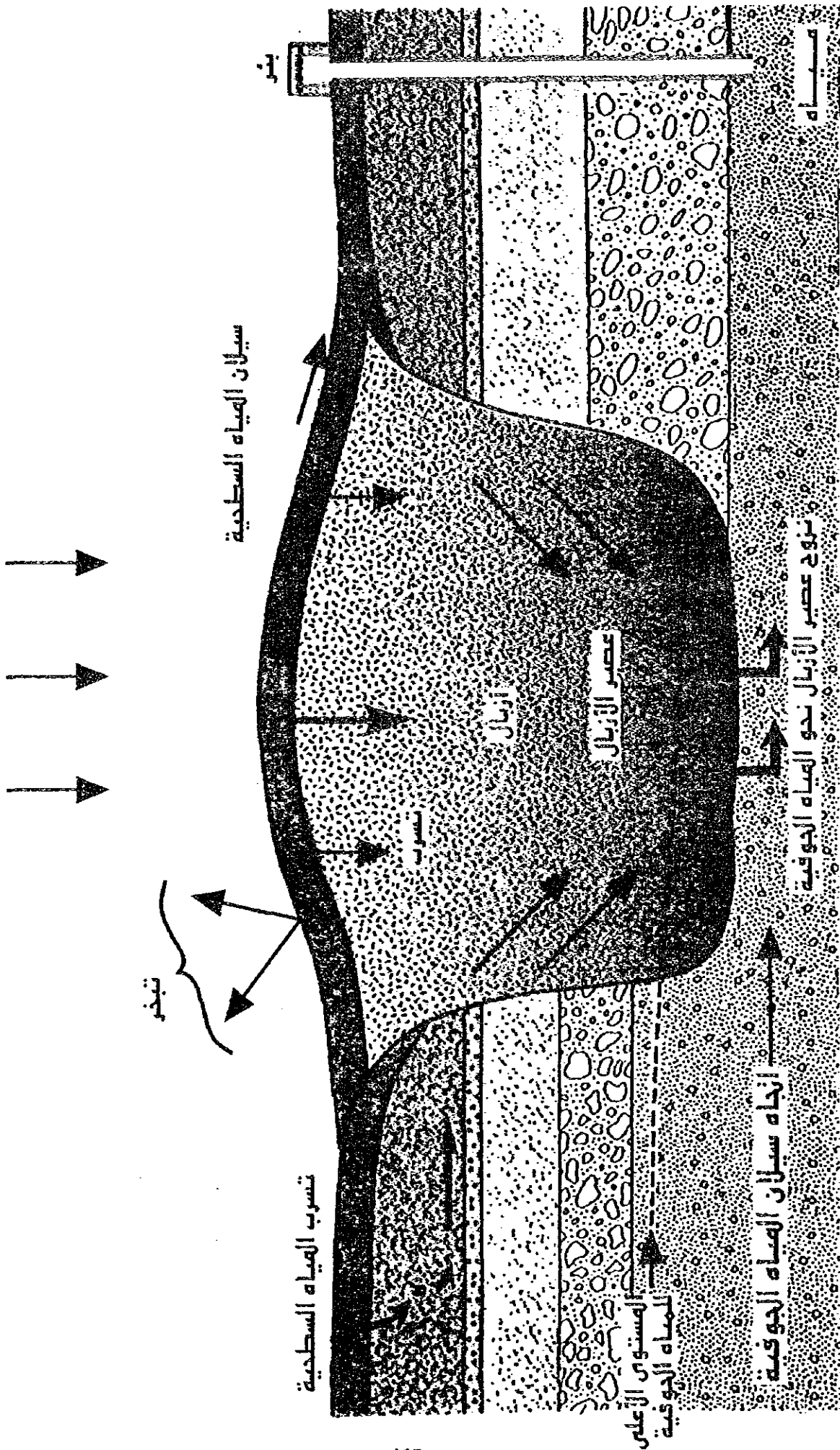


Close view of a giant poster settled at the central square in May 1997, in front of the Province and the Urban Community of Safi

التأثير المباشرة وغير المباشرة للزبال على الصحة

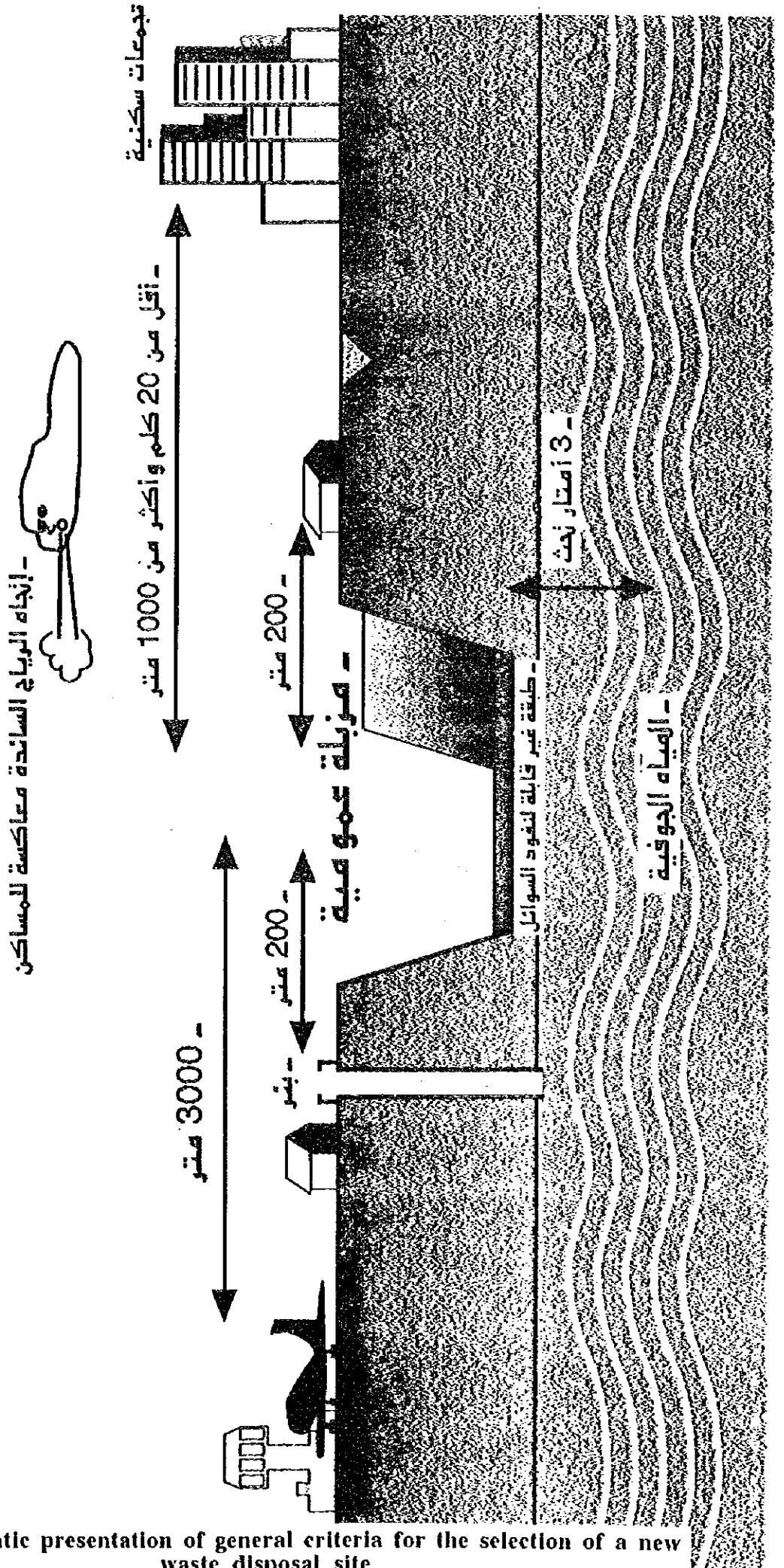


1. Summary of the direct and indirect effects of waste on health

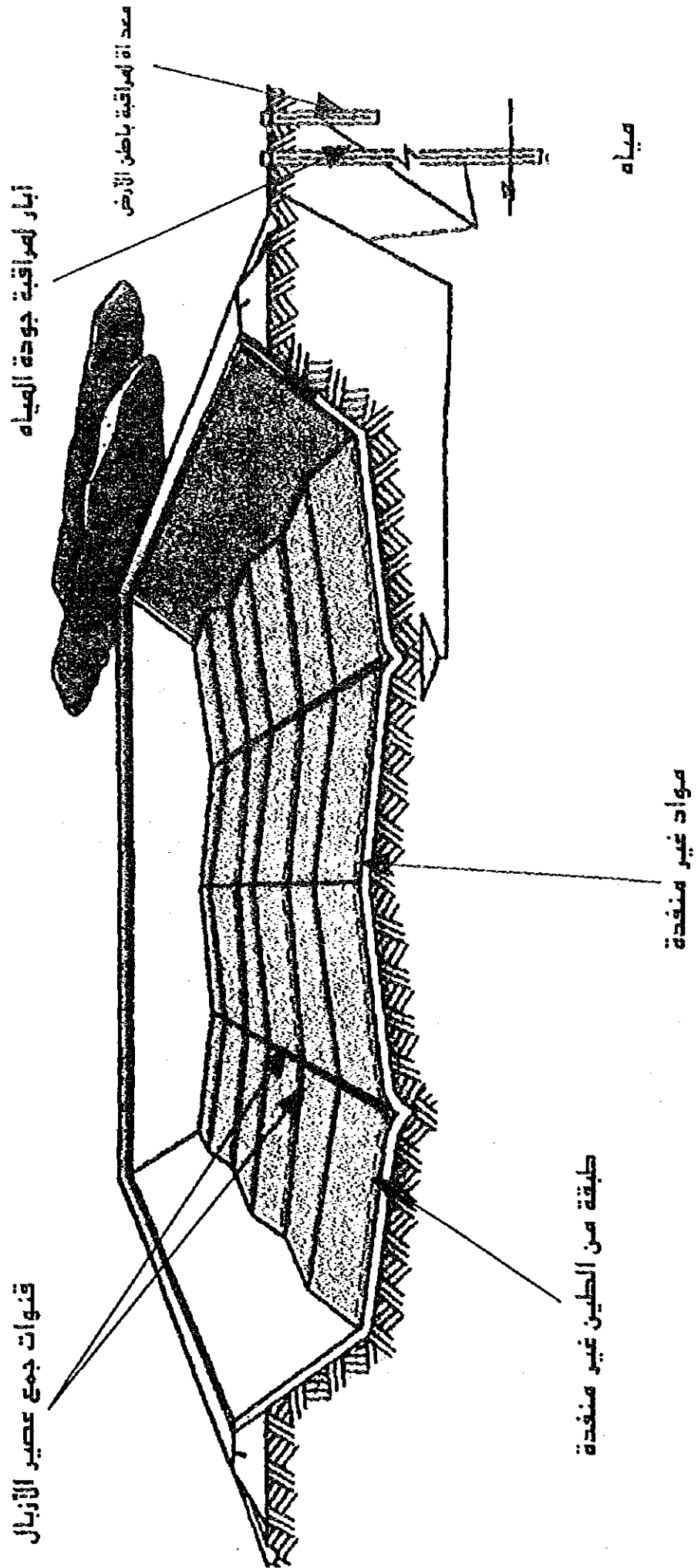


2. Groundwater contamination in a waste disposal site

المعايير العامة لاختيار موقع مزبلة عمومية

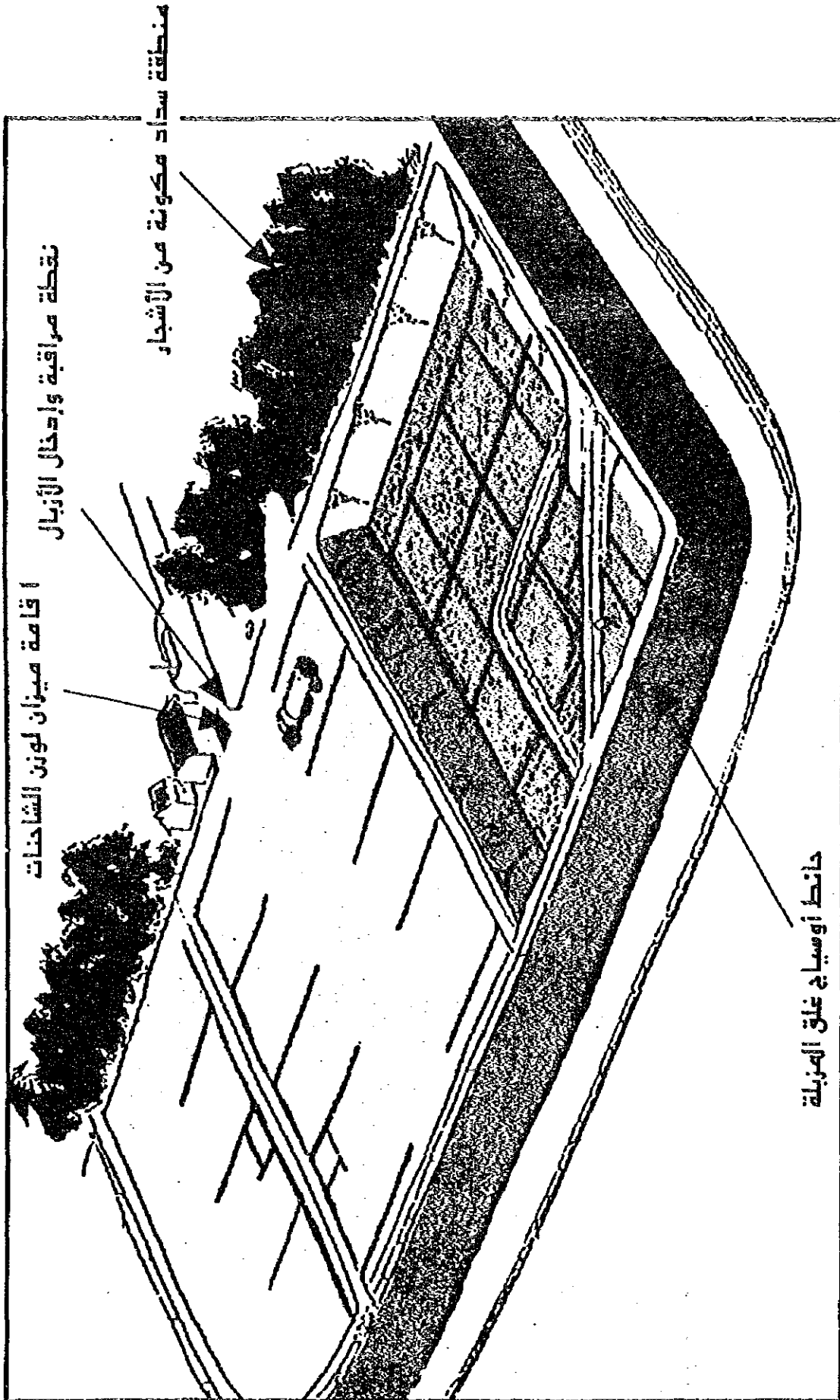


تهيئة الموقع



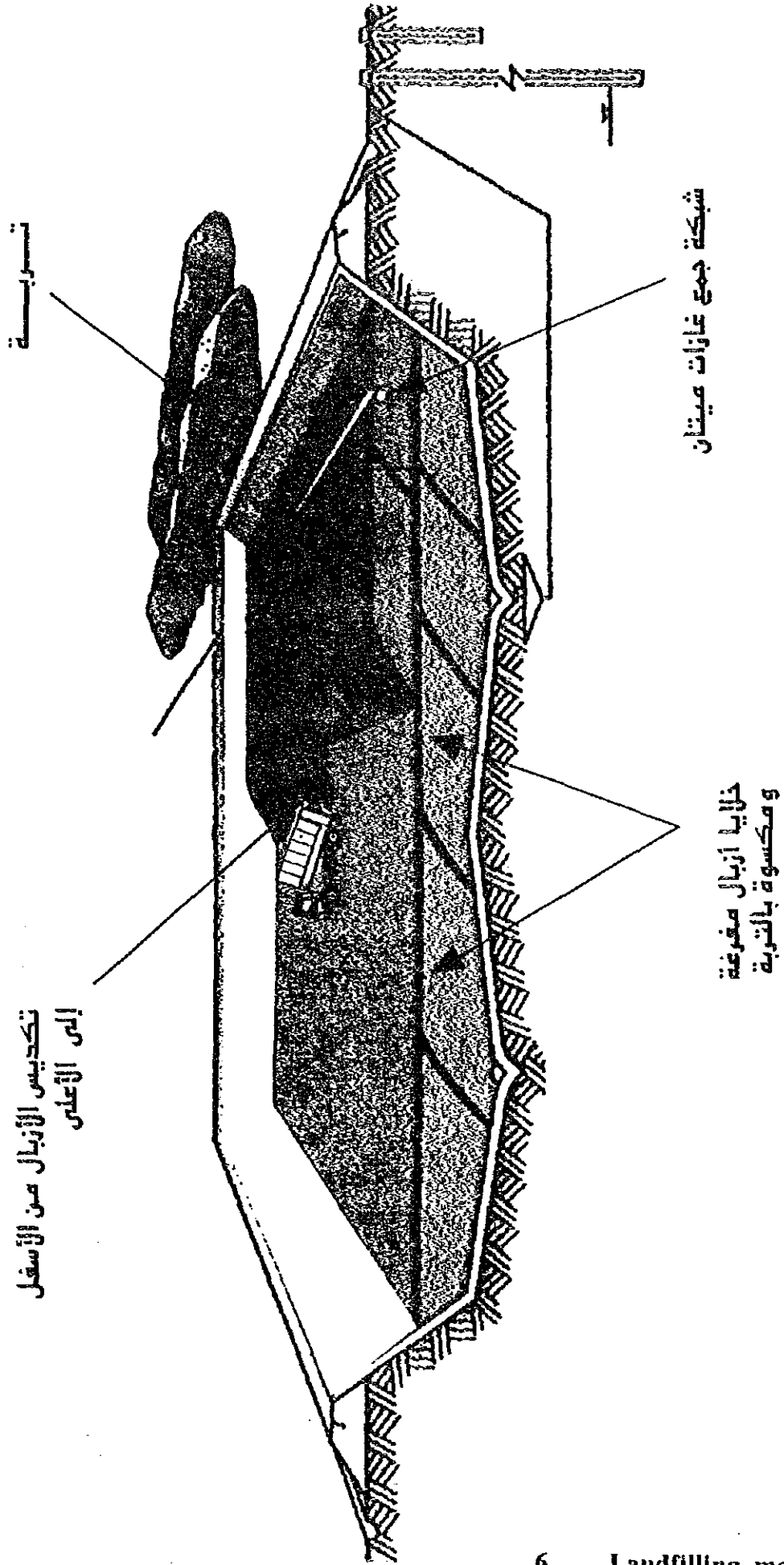
4. Development of a new waste disposal site

عناصر مراقبة المزرعة



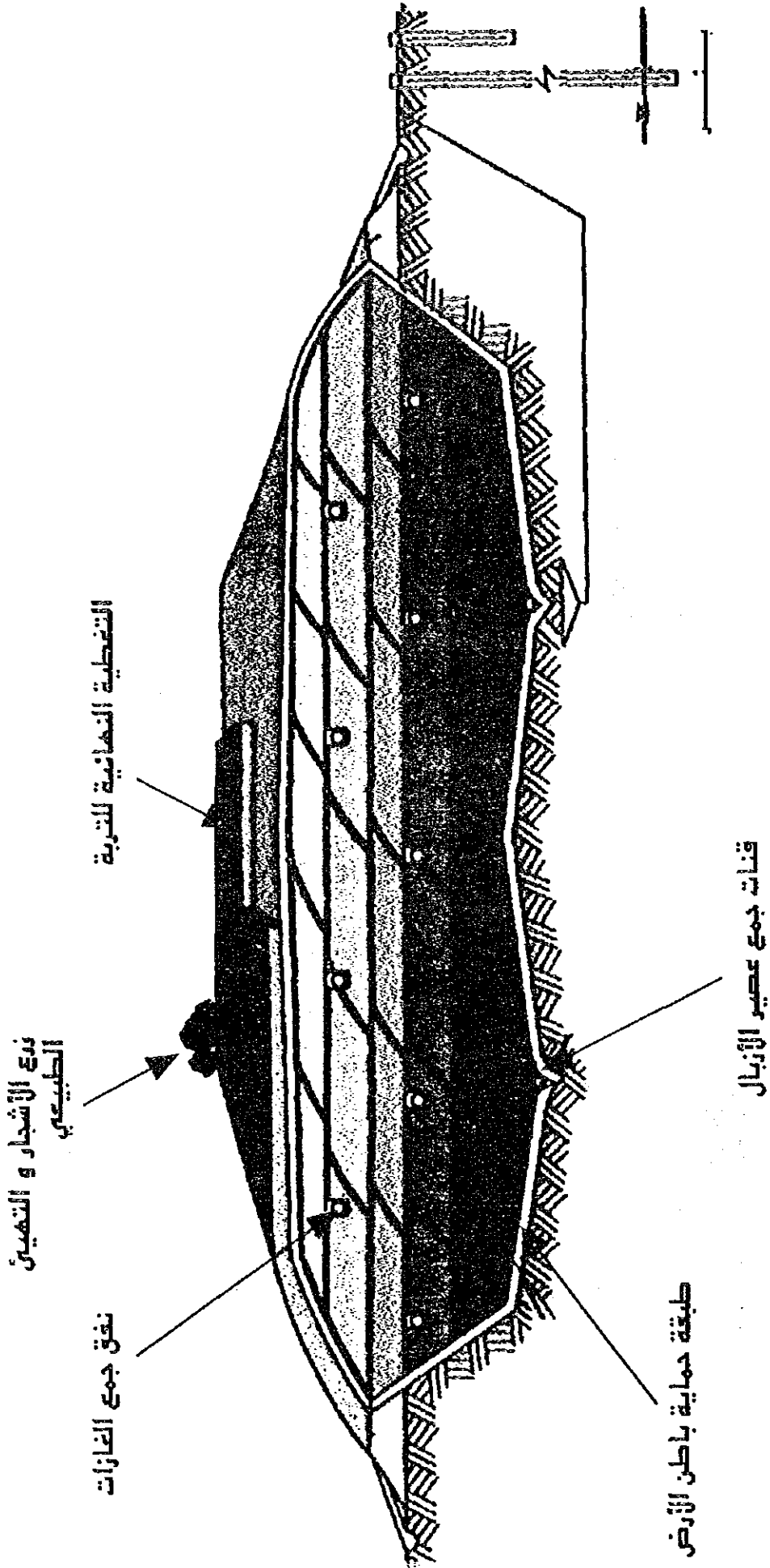
5. Settlements for the control of security and environment in a waste disposal site

طريقة إخراج الأتبال



6. Landfilling method

المرحلة الأخيرة في موقع إخراغ الأتبال



7. The final step of a waste disposal site

طريقة إخراج النفايات مع
تكريس النفايات نحو الغوق



8. Lanfilling method: push-up method

أول خلية أزال مع تغطية

التربة



9. Lanfilling method: First cell of waste materials with soil cover

تغطية يوميّة التربة سمكها

20 سنتيمتر



10. Lanfilling method: Daily coverage with soil (20cm thickness)

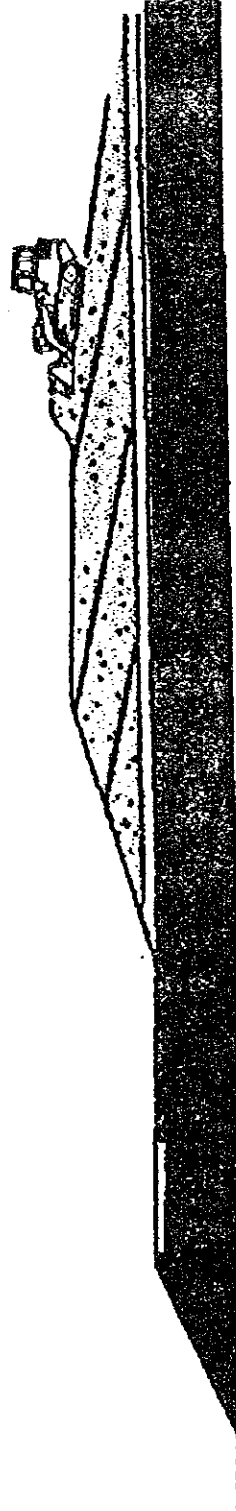
تغطية أولى للتربة

المستوى الأول سمكها 50 سنتيمتر



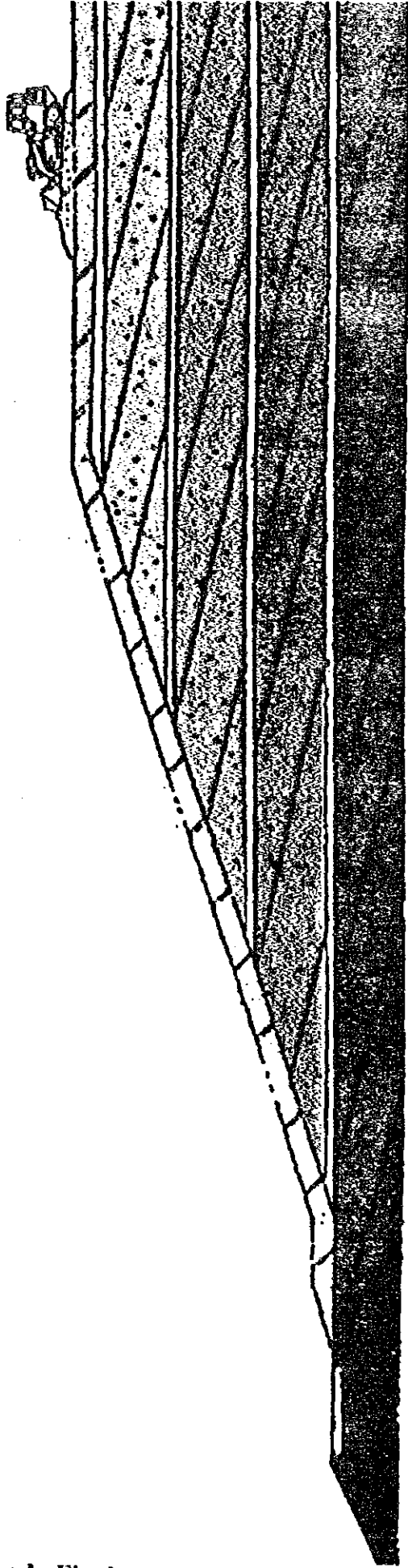
11. Lanfilling method: intermedlate cover of soil on the first landfilled level (50cm thickness)

نهاية المستوي الثاني من
مرحلة إفراغ الأزيل



12. Lanfilling method: Achievement of the second level of landfiling

الجزء الأخير من إخراج النفايات
 بعد إنهاء المستويات الأربعة
 تغطية نهائية للتربة سمكها 1 متر



13. Landfilling method: Final step of the waste disposal site after achievement of 4 levels landfiling in this example; final coverage with soil (1m thickness)

DEMONSTRATION PROJECT OF PUBLIC EDUCATION IN SAFI

Report of progress in the execution of the project
(22 - 24 April 1997; JICA Study Team)

1) Schedule for the evaluation of the progress of the project in Safi

The period of evaluation has been from 22nd April to 24th April 1997, through discussion with members of the committee in charge of follow-up of the awareness heightening project. Following a general meeting which was gathering all the parties involved in the project, several individual meetings have been held. They have permitted understanding of the progress in the execution of the project.

2) Summary of progress

Execution of the awareness activities within the scope of the project have started in April 97, at different dates according to the agency involved. The Urban Community has organized coordination meetings of the follow-up committee on 26 and 31 March, in order to arrange about the campaign and to finalize the quota for the distribution of the educational materials prepared for the campaign (leafets, postcards, notebooks).

Most of the educational materials have been distributed, at the exception of those attributed to the ACL and the Delegation of National Education, which have planned distribution for May. Postcards have been very attractive among the public. Leaflets have been appreciated for their function of information and their high quality, as this was underlined at the meeting of April 22nd by communes and delegations. Notebooks will be distributed in May to the children. Posters have been displayed in several places, at the exception of giant posters.

The distribution of the materials has shown that each of them was positively appreciated by distributors as well as the receiving public, to the point that there was some difficulties to satisfy the demand.

Awareness activities have been: Showing of the video film, distribution of educational materials, display of posters, and public discussion. These activities have been partly achieved. Activities of the Delegation of National Education and of ACL are planned for May. Display of giant posters should start during the week of April 28th. In any case, these posters should be completely displayed during beginning of May.

Provincial delegations with ACL have been the leading agencies for execution. Each delegation has developed public awareness activities on 2 fronts: on its own, using its own network; and in coordination with other delegations or associations. The schedule of the coordinated activities has been from 14 to 16th April, covering each commune. In this schedule, the awareness heightening sessions, one per day, have been coordinated by the representatives of the delegations all together.

The 3 communes have participated into the activities managed by the delegations. The commune of Boudheb has taken its own initiatives to execute activities with the support of local associations.

Awareness addressed to the communal technicians and engineers of Boudheb and Zaouia communes is planned to be done during councils meetings, with presentation of the video film. This has already been done by the Biada commune.

The result of the evaluation is that execution has started, and that communes and delegations are quite active to do the execution the best as possible. They are quite aware of the importance of the project. The quality of the materials prepared for the campaign has retained attention among regional delegates as well as the general public. For giant poster, the concern for success of the objective, specially the long period of display, has been the major preoccupation. This is why display has been delayed. There are still small technical aspects in the display that must be decided under the responsibility of the Urban Community in view of making sure that the posters will remain about half a year, as planned.

The fact that distribution of materials has been made later than expected is explained by factors like:

- the responsible person of the printing company has changed;
- reprinting of the notebooks has been more time consuming than expected, since each notebook cover has been separated, reprinted and rebinded;
- weather conditions have been bad (wind, rain), and they have encouraged to find strong dispalying method for the giant posters;
- there were holidays at school and the Feast of the Sheep (18 to 20) which have also restricted activities.

3) State of activities

Awareness activities are explained below for each member involved in execution of the project. The order of this presentation follows the order of meetings held during the stay in Safi. Only the association for environment and development is cited.

Association for Culture and Leisure (ACL)

During the meetings, the ACL has explained its position within the scope of the project. The ACL is aware of the importance of this project, since it considers that the project is not a campaign but a permanent activity to educate the people. ACL has proposed that it would be fully and permanently engaged in this task. According to the ACL, one important success of the project that can already be observed is that the purpose of educating the people has been clear and executed. The remaining difficulty for the future is to better develop the planning capacity so that execution can be realized smoothly.

ACL was not able to start its planning since the educational materials have not been dispatched at time to make ready its program. Educational materials have been received in end of April. Awareness activities at the ACL will be from 10 to 30 May, as follows:

- a) The ACL will manage awareness activities on its own, consisting of 3 showings of the video per week towards adherents of the association (1800 adherents), and with the support of technicians of the commune, and the BMH. Distribution of notebooks is planned at end of the showing. The ACL will make a simple evaluation based on a questionnaire addressed to the public with the following purpose: To report the activities to the follow-up committee; and to evaluate the impact and the needs for further actions. Typical questions will be for example: How did you get the information? which kind of communication tool has been the source of information or has influenced (the behavior or else)? The type of further action which is expected by ACL is awareness heightening directly organized by the adherents of the association, specially taking opportunity of the Earth Environment day on June 5th.

Distribution of postcards and leaflets is already planned, using the network of ITA, EST, and schools of professional training (which depend of the Ministry of Public Works), and of course the ACL itself.

Standard posters are displayed using the same network, and including local associations of quarters.

- b) In addition, ACL provides its locals and the video showing material for awareness activities made by the delegations. ACL has already been selected as the video showing place for the commune of Boudheb on April 15 by the Delegation of Youth and Sports. ACL will be also used 2 times per week (Tuesday and Thursday) by the Delegation of Youth and Sports, the BMH, and the Delegation of Mutual Aid.

The ACL has provided to the JICA team a program in French of the scheduled activities in May. This program will be printed and diffused on its monthly leaflet of presentation of the activities of the association. The ACL will take pictures during the activities.

Delegation of National Education

The delegation has insisted to explain that it was engaged in the project since the beginning and was quite aware of the importance of this project. This is why it considers that waste management related awareness must be a permanent preoccupation at schools. For the moment, the delegation has planned the showing of the video film from April 29th to May 13, with participation of Delegation of Public Health and communes.

Awareness will be conducted as planned during this period, which means video showing, distribution of notebooks or postcards, and dedication of 5 minutes time by the teachers in each lesson to discuss SWM problems. Teachers involved are those of natural sciences and history / geography. Video showing will be done with coordinators of the delegation. Targets are classes of 5th and 7th years (11000 pupils). Each college will get a copy of the video tape. Reuse of the video tape is considered for next year.

Delegation of Public Health

The delegation has received the educational materials for distribution, as planned. Most of the materials have been distributed during awareness activities from March 31st until April 11th.

The activities have been as follows:

- a) short awareness sessions in health centers and hospitals:
There was 411 sessions in health centers and hospitals, reaching a total of 11015 persons, during the period of March 31st until April 11th. These activities were coordinated by the nurse, or the major of the health center, in most cases. Posters were already put on the walls of the waiting rooms, and coordinators discussed about hygiene and waste disposal (5 minutes). Postcards and leaflets have been distributed after the speech. Places have been the 9 health centers and the provincial hospital.
- b) special one day awareness sessions in coordination with the Delegation of Youth and Sports and the Delegation of Mutual Aid, from 14 to 16 April:
Themes of discussion and other details are described below in activities of the Delegation of Youth and Sports.
- c) Distribution of posters, leaflets and postcards to sanitary establishments (health centers, hospitals).
- d) Distribution of the leaflets and postcards in coordination with the order of medical doctors, the order of dentist doctors, and the syndic of pharmacies.

Commune of Boudheb

The commune of Boudheb has managed awareness activities according to the following approach:

- a) in coordination with local associations, mixing awareness and cleansing:

This has been done in March 22 with the association of international youth and cooperation, with the association Shoula, and with the Moroccan association for environment and development. Activity has been cleansing of black points in a selected area of collective habitat, and public awareness using the educational materials. These materials have been those prepared within the scope of the JICA project, including also a tract of practical recommendations regarding waste handling. This tract was prepared by the commune before that materials of the JICA project were ready. Materials have been delivered door to door. People have participated in the cleansing. Recommendations put in the tract were: put the waste in plastic bags; avoiding to put these waste on roads and avoiding that children play with the waste; waiting the collection truck and facilitating the work of collecting staff; maintenance of cleanliness and protection of the historical places.

- b) directly under coordination of the technician in charge of cleansing, during the period from 2 to 13 April:

A big tent has been established in the central place of Safi in front of the medina for presentation of the video film and public debate. Purpose was to receive public opinion and to provide information. Notebooks (those prepared for the project) were available to the people in order to write their observations. Interviews have been done and registered on audio tapes. All these informations must be classified now in order to carry out recommendations towards the commission on environment and cleanliness, which holds 4 meetings per year. Communication was initiated through the video showing, discussion by the coordinator, distribution of materials, and exhibition of some explanation panels prepared by the commune. The basic approach during this manifestation was about communal obligations and role of citizens. Attendance was each day from 8.00am to 9.00pm.

- c) in coordination with the Delegation of Youth and Sports and the Delegation of Mutual Aid, during the 14 to 16 April period (see next section).
- d) in diffusing the materials to BMH offices, districts, pharmacies, cafes, private hospitals, hotels, and medical doctors. Posters have been displayed on the collection trucks (1 per truck).
- e) in showing the video film to the collection workers and to the councilors, taking opportunity of the meeting with the commission on environment and cleanliness to be hold on April 24th. Distribution of materials is planned.

Delegation of Youth and Sports

The Delegation of Youth and Sports has contributed to the following 3 kinds of awareness activities:

- awareness campaign from 14 to 16 April, together with the Delegation of National Aid and the Delegation of Public Health;
- door to door awareness from 8 to 11 April;
- specific campaign using its own network in Safi, namely the women centers, and youth centers, from April 28th, for 1 week.

During the awareness campaign from 14 to 16 April, there was 1 public meeting per day in each commune. The selected places have been the cultural center in Biada commune (14/4), where a tent has been installed outside, the ACL locals in Boudheb commune (15/4), and the women center in Zaouia commune (16/4). In each meeting, the themes of discussion have been:

- effect of waste handling conditions on health;
- effect of black points on esthetics (landscape);
- responsibility of citizens;
- environmental protection and education / behavior.

The public was composed of the members of the centers managed by the delegations of concern, and the people leaving around. Each meeting was managed by 3 coordinators, 1 coordinator per delegation. At the exception of Biada, communal technicians have not attended the meeting to answer the questions.

The problems raised by the people have been summarized by the delegation according to the following themes:

- people expect an increased effort on the part of the communes to improve collection of waste;
- areas which are not provided with collection service have been stressed by the people;
- waste disposal should be improved to avoid nuisances and pollution.

Door to door awareness from 8 to 11 April has been realized by coordinators of the delegation in selected urban quarters of each commune; Members of women centers have also participated after 1 day training together with coordinators and after showing of the video film. During the door to door visits, postcards and leaflets have been distributed.

Delegation of Mutual Aid

The Delegation of Mutual Aid has contributed to the awareness activities in the same way as for the Delegation of Youth and Sports:

- awareness campaign from 14 to 16 April, together with the Delegation of Youth and Sports and the Delegation of Public Health, mainly focused on the public of the women centers, the professional training centers, and mutual aid centers.
- door to door awareness from 8 to 11 April, by 20 coordinators of the delegation. Main contacts have been with women, representing 3498 households in total: 2340 in Boudheb, 674 in Biada, and 484 in Zaouia.
- specific campaign using its own network in Safi for video showing and distribution of materials, and starting on 21 April.

Delegation of Cultural Affairs

This delegation has not qualified staff or equipment for awareness like in the other delegations mentioned. However, the delegation has initiated an awareness meeting on 21st April towards the 60 people staff of the delegation. 80% of this staff is illiterate. The delegate has explained that several persons of the staff have been indirectly concerned by the campaign led by the delegation of Youth and Sports together with the delegation of Public Health and the delegation of National Mutual Aid, which shows the impact of activities led by these delegations. Materials (postcards, notebooks and leaflets) have been distributed. Video showing should follow during the week of 28 April, and should concern as well the institute of music (30 students). Posters have been put in historical monuments and museums. The delegate has proposed that SWM information days should be organized in historical monuments, specially on Fridays, which are free entrance days for the public.

Commune of Biada

The commune of Biada has already taken the opportunity of the municipal council's meeting to discuss with councilors about the awareness campaign, and to distribute the materials prepared during the project. Public (15 persons) was free to attend the meeting. It seems that the public has already noticed the stands for giant posters, which are installed through the city.

The commune has also directly participated to the awareness campaign of delegations on its territory, on April 14. It is worthwhile to note that only this commune has been able to provide a SWM related person in school related activities.

Leaflets and notebooks have been distributed. Postcards are still available. They have been distributed for example to the households that have been selected during the JICA study team opinion survey. Posters have been displayed on the waste collection trucks and in public edifices.

Commune of Zaouia

Awareness campaign in the commune of Zaouia can be described in 3 stages. Actually, most of the materials have been distributed. Notebooks have been reserved specially for the staff of the commune and for the councilors.

- a) Door to door awareness heightening from 8 to 11 April in the commune by the delegations, as already described.
- b) One day of awareness heightening in the commune on April 16 organized by the delegations at the women center, as already described. The commune has also started the distribution of materials at this stage. Distribution has been organized as follows: Door to door distribution of leaflets and postcards by waste collection workers and by corporal of the cleansing service; distribution by technicians of materials to public edifices (health, administration) and to pubs; posters placed in public places, on waste collection trucks, and in the communal services.
- c) Two days of awareness heightening organized by the commune on April 28 and 29, in coordination with the 3 delegations of concern (Youth and Sports, Health, and Mutual Aid). The first day will be addressed to technicians, waste collection workers and councilors of the commune. The second day will be addressed to the general public, with purpose of information about SWM and the JICA project, and exchange of views. The showing of the video is planned for this manifestation. Leaflets, postcards and notebooks will be distributed during the first day. Coordination of the discussion between municipal staff and public will be managed by the coordinators of the 3 delegations.

Urban Community

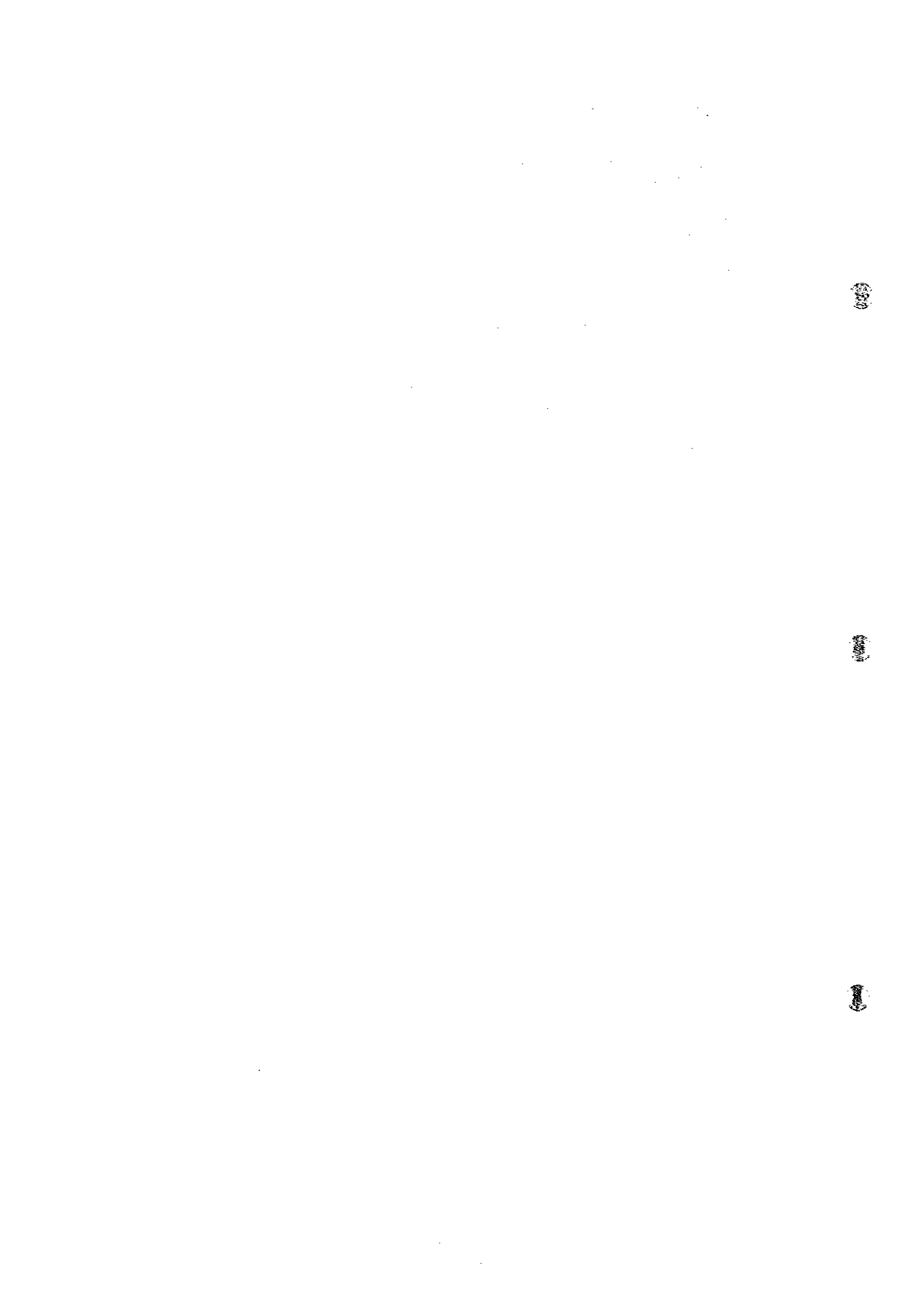
The urban community has been involved as organizer of the awareness activities. Coordination meetings have been held in March (14, 17, 18 and 27), specially regarding the discussion of the JICA reports. Meetings of the follow-up committee have been organized on 26 and 31 to coordinate the distribution of awareness materials according to the quota, and the actions. Meeting of the Environment and Cleanliness Committee has been held on April 4th. The meeting of councilors will follow on April 29th, being the opportunity for showing the video and distributing of educational materials.

Regarding the distribution of educational materials, the 250 notebooks have been reserved for the staff of the community and the councilors (distribution on April 29th). Posters and / or leaflets and postcards have been distributed to RATS (city buses), municipal workshop, cultural center, children garden, wholesale market, community's BMH, and bus station.

Regarding the display of giant posters, the situation is managed by the urban community as follows:

Exhibition of giant posters has been delayed for technical reasons. The purpose is to get long term exhibition, which means a very strong fixation. Actually, the problem is that plastified posters does not strongly adhere with iron. The idea is to put the poster on a wood panel, and to fix the panel on the iron board. However, some persons consider that wood could be stolen, which is also a factor against durability of the exhibition.

Then, each commune is expected to provide its own solution. The urban community wants to make sure that the best conditions are gathered to start exhibition and distribute the giant posters to the communes. Exhibition of giant posters should start in the week of 28 April.



CONTENTS OF THE LEAFLET

1) On the recto page, from left to the right

Facet 1

In Safi, We Think of our Future, We Aim to Manage Waste

Cleanliness is Culture and Education

I participate in the cleanliness of my city...! What about you? (mascot)

Facet 2

Definitions

Urban Waste: this types of waste comes from households, markets, streets, and schools. Urban waste includes different materials and even toxic substances in small quantities.

Hospital Waste: is generated by hospitals and it consists of medical waste that is harmful or infectious. Normally, hospitals are supposed to ensure the treatment of their waste. Yet, in Safi, hospital waste is collected by the communes and it ends in the dump site.

Agricultural Waste comprises farming animal faeces, cultivation waste, and the waste of food industry. In Safi, farming waste as animal faeces pose problems.

Industrial Waste: comes from industries and it is either inert or very dangerous. Industries are supposed to be responsible of the treatment of their waste. But the lack of control and responsibility makes this waste transported directly to the dump site.

Waste Treatment: There are different ways of treating, i.e. eliminating, the urban waste: incineration, composting, and discharging at the dump site. This latter way is the one used in Morocco for it is easier and less expensive. But it should be accompanied with control; otherwise, it will cause many nuisances.

Facet 3

What is the Quantity of Waste Generated by Households Everyday?

The quantity of waste which is collected by the 3 communes of Safi city goes beyond 40.000 tons per year, i.e. the equivalent of 15 000 trucks of collection. The quantity of waste generated is about 130 tons per day. But there is a part of the municipal waste that we estimate as more than the third of the waste generated and which is not collected yet. With the economic growth and the improvement of living conditions, the quantity of waste increases. This increase can be 3% per year according to recent estimation.

What is the Cost of Waste Treatment?

The estimated total cost of the management of municipal waste in Safi goes up to about 11 million Dhs per year. The cost per ton of waste collected and treated increases to about 300 Dhs per ton (study of Safi city with JICA). But the real cost becomes difficult to estimate if we take into consideration the negative effects such as the effects on health. However, we know that the cost of prevention is less than the cost of repairing damages. When residents consider that the cleanliness of the city is a duty and a daily attitude, they will participate in the reduction of the costs of the service of the maintenance of cleanliness.

Why Are We Interested in Domestic Waste?

The urban waste is more and more numerous and complex. If it is not managed correctly, it will constitute a growing nuisance for the residents' every day life. It can affect the health of residents. It creates different nuisances such as the multiplication of insects. Everyone agrees on the fact that these undesirable effects are contradictory to the objective of improving the quality of life.

2) On the verso page, from left to the right

Facet 4

How can the Resident Participate in Solving the Problem of Waste?

By thinking more of his waste: Most of the time we get rid of waste without asking ourselves any questions. Every one of us should, however, think of the fact that society changes and, therefore, it generates more and consumes more than before. We should not regard waste as if it does not exist; otherwise, we will let ourselves overcome by the complexity of problems which can threaten the urban development. At present, the only positive attitude is to "think of our waste" without shame or pretension.

Cleanliness of our city is between our hands

Facet 5

Extracts from:

- Chapter (or sura of): Romaeans - Verse 41 of the Koran
- Prophetic Hadith
- An excerpt from His Majesty the King's Letter of October 30th, 96.

Among the objectives of the "National Strategy for Environment Protection and Sustainable Development we find:

- *Improvement of waste management
- *Increase of the rates of waste collection and recycling
- *Progressive elimination of uncontrolled dump sites

Facet 6

Who Treats the Urban Waste?

The communal charter presents the management of waste as one of the important duties of the local communes.

Urban Communes and Community in Safi intensify their actions in order to improve the management of waste. The communes employ about 400 persons to collect domestic waste and sweep the streets. They use about 30 trucks of collection. However, this, as the persons who are responsible recognize, remains insufficient. 2 sophisticated trucks have been introduced in 1996 as well as 200 communal waste containers. This change has permitted the improvement of collection efficiency thanks to the cooperation of residents.

At present, some studies are going on in order to know the quantities of waste generated by households and, therefore, to improve the service of collection. The urban

community is looking for a site that is appropriate for being a sanitary dump site. Finally, the communes organize campaigns of cleansing and eradication of black spots. The last campaign took place in June 96 and it yielded good results.

CONTENTS OF THE SCHOOL NOTEBOOK

1) First page, verso of cover

If we think for a while about municipal waste?

What is municipal waste ?

Municipal waste is the waste which is collected by the communes. In the cities, this waste includes household waste, market waste, street waste, school waste. All these wastes are urban waste. Household waste contains diverse materials like paper, plastic, and even toxic substances in small quantities, like batteries or outdated medicines. What does the waste we throw in waste container become?

We discharge waste in the public disposal site. The disposal site is a very adequate solution if the waste quantity is controlled. The discharged waste is covered with soil to prevent insects and other nuisances. Measures are also taken for the treatment of waste water and gas as well as for the prevention of ground water pollution. A well-controlled disposal site does not present any danger or nuisance for man and environment. A disposal site which is not controlled is a source of danger and harm.

In an illegal disposal site, waste is decomposed : waste water penetrates into the soil, the fact which often pollutes ground water if the soil is permeable. In such a case, well-water which is near becomes not clean. Gas is formed and burst into flames. That is why there is always smoke coming from disposal sites. Therefore, the air is polluted. What is worse is the existence, in the disposal site, of dangerous waste coming from industries and hospitals.

The problem is that there are also wastes which are never collected. People who throw waste in a corner of the street or in an empty land contribute unknowingly in the making of mini-disposal sites. Such irresponsible actions not only render the city unpleasant and the resident and the tourist dissatisfied, but also contribute to the proliferation of flies and rats, and this threatens the population's health.

What shall we do in order to protect the city against waste?

We produce more and more waste. If everybody keeps on with throwing his waste in the street, there will be many more mini-disposal sites, and these will grow in size. Nobody wants to see his city dirty and full of waste. Therefore, each one of us should participate to avoid such an end.

- At first, we must take care not to throw our waste — even if it is a small quantity — in the street. Waste must be thrown in the container and not anywhere else.
- When we go for a picnic, or when we go for a walk in the forest or on the seashore, we must not leave our rubbish there; we must take them with us and put them in the places meant for that purpose.
- Waste container must be put in a place where it can be collected by the commune trucks. To throw the waste container in an empty land or in the sea is really harmful for everybody; besides, such an action is sanctioned by law.
- When we discharge our waste in the public waste container, we must take care to do it correctly so that waste will not remain on the floor after the passage of the truck.

Appendix 4

- And of course everybody is aware of how dangerous is waste and how it causes diseases. Therefore, we must be responsible when we carry out waste disposal.

2) Second page, verso of cover

FRANCE	JAPAN
<p>Total population: 56 million inhabitants quantity of municipal waste per year: 24 million tons, 15 million tons of them are household waste.</p> <p>Practically, all household wastes are collected (98%). 65% of them are discharged at the disposal site; 30% are incinerated.</p> <p>In France, we try to give priority to incineration and recycling of waste. Actually, most of household waste are incinerated or discharged at the disposal site. The disposal site becomes a site of ultimate waste, that is to say, a "sanitary landfill site". But this evolution is very difficult to be accomplished. This takes a long time and renders waste management more and more expensive. Selective collection for waste recycling is one of the most expensive and most difficult treatment methods. Selective collection is mainly done in dumping sites, and also in waste containers placed in the streets in which people throw bottles and newspapers, in order to recycle them and recover glass and paper.</p>	<p>Total population: 124 million inhabitants quantity of municipal waste per year: 50 million tons.</p> <p>In Japan, 75% of collected municipal waste are incinerated, 14% are discharged in the disposal site, and 4% are recycled. Actually, recycling of waste in Japan is very much important. It is carried out by both the municipalities and the private companies. About 10 million tons of household waste (paper, glass bottles, aluminium, ...) have been recycled in 1993. More than half produced paper is recycled. Almost half of the municipalities proceed to selective collection. In Japan, there are 120.000 professional associations from the population in order to reduce waste amount. People participate a great deal in selective collection of waste. They put their waste in different waste containers depending on waste types (glass, aluminium boxes, or newspaper, for example).</p>
MOROCCO	TUNISIA
<p>Total population: 26 million inhabitants, more than 50% is urban population. quantity of urban waste per year: 5 million tons per year</p> <p>Kitchen waste represents more than half household waste. 5 millions of tons of waste per year represents about 5000 trucks full of waste which clear the Moroccan cities of their waste everyday. 85% of the population are served with waste collection service, which means that 15% of the waste is not collected. These wastes remain on site (in the streets, empty lands) and they constitute what is called "black points".</p> <p>In Morocco, almost all communes waste are discharged in the disposal site. But unfortunately, there is still no controlled disposal site, which renders waste treatment a source of danger and nuisance. Recycling is an activity which is not known, but it is a source of living for many scavengers. Therefore, we would rather talk about a scavenging activity, which poses many problems, like for example the risk of diseases for scavengers.</p>	<p>Total population: 8.4 million inhabitants (the urban population : 5.4 million). quantity of urban waste per year: 1.3 million tons per year</p> <p>In Tunisia, most of the waste are discharged in the disposal site. These sites are not controlled. In Tunis city, one controlled disposal site has been set up in 1984, but it has not been well-managed. Tunisia has prepared a national program of solid waste management, which aims at setting up 29 controlled disposal sites. Actually, recycling is still an activity of scavenging which is not well-studied and without regulation. However, the program of solid waste management includes a project of waste sorting at the source, to improve the organization of recycling of waste materials.</p>

3) First page, recto of cover

- 1) In Safi, we think for the future, we act for waste management.
- 2) I participate to keep my city clean...! And you ?

4) Second page, recto of cover

Citations from:

- The Koran, the Romacans Chapter - Verse 41.
- Prophetic tradition

CONTENTS OF THE POSTERS

1) The giant posters

Mascot:

I contribute to the cleanliness of my city...! What about you?

Messages:

- a) This is the result of our indifference
- b) What is this? Is this the right way to get rid of waste?
- c) Let us all participate

2) The standard posters

Mascot:

I contribute to the cleanliness of my city...! What about you?

Messages:

- a) Waste disposal means tranquility
The elegance of our city is at our disposal
- b) Cleanliness is culture and education
All of us are concerned with the cleanliness of our city

CONTENTS OF THE POSTCARD

Mascot:

I contribute to the cleanliness of my city...! What about you?

Messages:

Who can be satisfied with this life?

10/10/10

10/10/10

10/10/10

Chapter 10 Formats and TORs

**Terms of Reference for
Surveys Conducted by the City of Safi**

Studies to be Conducted by the City of Safi

1. Type of Studies to be Conducted

The city of Safi will conduct the following surveys according to the terms of reference provided by the JICA Study Team.

1. Household waste generation survey
2. Household waste physical composition survey
3. Waste collection quantity survey
 - 3.1 Truck scale survey
 - 3.2 Trip counting survey at disposal site
4. Time and motion study of waste trucks
5. Industrial waste inventory survey
6. Household opinion survey

Objectives and Outlines of the Studies Conducted by the City of Safi

	Objectives	Outline
1. Household waste generation survey	to estimate household waste generation quantity by knowing 1) average waste generation per person per day and 2) population	<u>Samples:</u> 180 households will be selected, i.e., 60 households per commune. 20 households from each of low, middle and high income levels. <u>Method:</u> Households are requested to put their waste into a plastic bag every day, which are delivered for 8 consecutive days. Weight of waste sample (20 bags in one group) is weighed every day.
2. Household waste physical composition survey	to know physical composition and bulk density of household waste	<u>Data to be Obtained:</u> 1) Waste composition on wet base 2) Bulk density 3) Waste composition on dry base 4) Water content Large drier is necessary for above 3) & 4). <u>Sample:</u> 1 waste sample will be made from waste of 20 bags. Each commune should make and analyze 3 samples (one from each income class). There will be 9 samples in all.

3. Waste collection quantity survey	to estimate quantity of waste collected by each commune	<u>Method:</u> Collection quantity will be estimated by the formula: $a \times b$ where, a: Average weight of waste put in truck by its type (Truck scales will be used for measurement of weight of waste) b. Average number of trips made per day by truck according to type (trip counting survey will be conducted at the entrance of the existing disposal site.) Each of these 2 surveys will be separately conducted for about one week.
4. Time and motion study of waste trucks	to know collection efficiency in terms of waste amount collected per truck or per worker, Dirham spent for collection of one ton of waste	<u>Method:</u> - A surveyor will follow a waste truck, and check time spent for each activity such as waste loading, transport, and dumping. - By using data of waste collection quantity survey (Item 3 above), waste quantity collected by a truck or by a worker per trip will be estimated.
5. Industrial waste inventory survey	to know what kind of and how much industrial waste is generated, how the waste is disposed of, and by whom	Survey activities include the following: 1) Identify sources (factories) which generate industrial waste of significant quantity 2) Prepare, and deliver questionnaire to the factories 3) Request the factories to fill in the questionnaire 4) Collect and analyze the questionnaire answers
6. Household opinion survey	to know 1) how the citizens discharge their waste, 2) opinion about communes' waste collection service, 3) willingness to pay	<u>Sample:</u> Each commune will select 100 households; 40 from low income, 40 from middle, and 20 from high income households including those selected for the household waste generation survey described in Item 1 above. <u>Method:</u> Each commune will use 1 or 2 surveyors, who will visit sample households, and ask questions according to the questionnaire.

2. Responsible Body for the Survey

Each of the three urban communes, Asfi Biyada, Asfi Boudheb and Asfi Zaouia are respectively responsible for the implementation of the survey. Safi Community Urban will coordinate and monitor the progress of the surveys.

3. Survey Period

Each of the 3 urban communes should submit the results of the surveys to the Study Team by 12 December 1996.

Appendix 1.

Terms of Reference for Household Waste Generation Survey

1. Objective

The objective of the survey is to estimate quantity (weight) of household waste generated per day and per year in each urban commune, i.e., Asfi Biyada, Asfi Boudheb and Asfi Zaouia.

2. Method

- 1) Each urban commune will select 60 households, i.e., 20 households respectively from low, middle and high income category. In total, 180 households will be selected from the 3 urban communes.
- 2) Each commune will appoint 3 surveyors. Each surveyor will visit 20 households in the morning around 9 am, explain the purpose of the survey, request them to cooperate for the survey, deliver 1 plastic bag to each household every morning for 8 consecutive days. (The JICA Study Team will supply necessary plastic bags; 60 bags/day x 8 days = 480 bags for each commune)
- 3) A household is requested to put their waste of the day into delivered plastic bag. The surveyor will visit the household next morning and collect the bagged waste.
- 4) The surveyor will measure weight of 20 waste-filled plastic bags immediately after collection of the 20 bags from one income category, and record the weight in a data format supplied by the JICA Study Team. JICA Study Team will supply a scale to each commune.
- 5) During the survey, the surveyor should carry out the household questionnaire survey according to the terms of reference (shown in Appendix 6). The questionnaire will include a questions concerning size of the household (number of persons living in the household). Such information is needed to estimate average waste generation per person per day
- 6) Based on the 2 types of data (weight of waste and number of person), each commune should estimate average weight waste discharged per person per day for each income category.
- 7) Use the following formula for estimation of average per capita waste generation rate:

$$z = x \div y \div 7 \text{ days}$$

where,

- z: average weight of waste of an income category (20 households) discharged per person per day
- x: Aggregate weight of waste discharged from an income category (20 households) for 7 days. The measurement record of the 1st day will not be used because the waste of the first day may contain waste discharged in previous days.

y: Number of persons living in the income category (20 households) during the survey period

- 8) Divide the current population of the commune into the 3 income category; low, middle and high
- 9) Estimate the commune's household waste generation quantity by using the data sheets 1, 2 and 3 attached hereto.

Household Waste Generation Survey Data Sheet 0

1. Name of Commune: _____

2. Surveyors

Role in the Survey	Name	Post
1. Chief surveyor		
2. Surveyor		
3. Surveyor		
4. Surveyor		
5.		
6.		

3. Survey Period

Start: _____ Finish: _____

4. District (Zone) Selected

Income Category	Name of Zones	Number of Household Surveyed	Number of Persons in Surveyed Households
1. Low income area			
2. Middle income area			
3. High income area			

Household Waste Generation Survey Data Sheet **1**

Name of Commune: _____

Date of Waste Bag Collection: _____

Daily Weight Measurement Record Sheet

Kg/household/day

No.	Low Income	Middle Income	High Income
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
Sub-Total (1)			
Weight of 20 bags (2)			
Total (1)-(2)	a1	a2	a3

Household Waste Generation Survey Data Sheet 2

Number of Persons Living in Households Surveyed

No.	Low Income	Middle Income	High Income	
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
Total	b1	b2	b3	$b4=b1+b2+b3$

Household Waste Generation Survey Data Sheet **3**

Survey Summary

Unit: kg/day

Measurement date day/month h		Low Income (20 households) (a)	Middle Income (20 households) (b)	High Income (20 households) (c)	Total (a)+(b)+(c) = (d)
	0				
	1st	a1-1			
	2nd	a1-2			
	3rd	a1-3			
	4th	a1-4			
	5th	a1-5			
	6th	a1-6			
	7th	a1-7			
Total of 7 days (1st - 7th)		c1	c2	c3	c4 (c1+c2+c3)

Household Waste Generation Survey Data Sheet 4

Household Waste Generation Quantity of Each Commune

	Estimated Household Waste Generation Rate (kg/capita/day) (1)	Population in Commune by Income Category (2)	Estimated Waste Generation (ton/day) {(1) x (2)}/1000 = (3)
1. Low income	(c1 / b1 / 7 days)		
2. Middle income	(c2 / b1 / 7 days)		
3. High income	(c3 / b1 / 7 days)		
4. Average/Total	(Y/X*1000)	(X)	(Y)

Note 1: Column (2) should be filled by the communes.

Note 2 Calculate column (1) according to the formula shown.

Appendix 2

Terms of Reference for Household Waste Physical Composition Survey

1. Objective

The objective of the survey is to know physical characteristics of household waste in terms of physical composition. The following data will be obtained:

- 1) Bulk density (kg/liter)
- 2) Waste composition on wet base
- 3) Waste composition on dry base
- 4) Waste content (%)

2. Method

1) Sampling

Samples will be prepared from the household waste to be collected by the *Household Waste Generation Survey* explained in Appendix 1.

	Quantity of Samples	Remarks
1. Bulk density	9	3 samples/commune x 3 communes = 9 1 sample is collected from each of 3 income categories (low, middle and high). 1 sample is prepared from 20 households (selected from the Household waste generation survey) of an income category.
2. Physical composition on wet base	9	The same samples used for bulk density survey should be used. See below for waste classification,
3. Physical composition on dry base	3	Of the 9 collected samples, only 3 samples of the largest commune (Boudheb) will be used. A large drying machine is needed.
4. Water content	3	Water content will be estimated based on the difference in the weight measured before and after drying.

For the both composition analysis, waste will be sorted according to the following classification:

- Kitchen waste
- Paper
- Wood and straw
- Plastics
- Metal
- Glass
- Leather and fiber

- Other combustible waste
- Other non combustible waste

2) Sample Preparation

Detailed methods of sample preparation and analysis will be explained by the Study Team.

Appendix 3 Waste Collection Quantity Survey

1. Objective

The objective is to estimate actual quantity (weight) of waste regularly collected by each commune. Ultimately, annual waste collection quantity will be estimated.

2. Methods

1) Principle

In principle, the following formula will be used to estimate annual quantity of waste collected by a commune.

$$W = (a^1 \times b^1 \times c^1) + (a^2 \times b^2 \times c^2) + \dots \dots \dots (a^n \times b^n \times c^n)$$

where,

W = Annual total waste collection quantity (ton) collected by a commune

a¹ = Average weight of waste collected per trip per truck of type 1

b¹ = Average number of trips to be made by a truck of type 1

c¹ = Number of operating trucks of type 1 used by the commune

a² = Average weight of waste collected per trip per truck of type 2

b² = Average number of trips to be made by a truck of type 2

c² = Number of operating trucks of type 2 used by the commune

aⁿ = Average weight of waste collected per trip per truck of nth type

bⁿ = Average number of trips to be made by a truck of nth type

cⁿ = Number of operating trucks of nth type n used by the commune

As can be seen, the 3 types of information is needed; a, b and c.

The average weight of waste collected per trip (a) will be estimated by using truck scale. This survey is referred to as the Truck Scale Survey.

The average number of trips made by a truck during 1 year will be estimated through the Trip Counting Survey to be conducted at the entrance of the existing disposal site.

Number of operating trucks by type of truck will be calculated based on the Truck Operation Records kept at the workshop.

2) Truck Scale Survey

One truck will be selected from each type of truck. For example, if a commune has 5 types of trucks, 5 trucks will be selected. Weight of waste collected by one truck will be estimated by measuring the weight of the truck before and after dumping the waste at disposal site. The difference is considered as the weight of waste transported by the truck. Average weight of waste collected by the truck will be estimated by averaging at least 3 measurements.

3) Trip Counting Survey

The objective of the trip counting survey is to estimate number of trips made by a truck for certain period.

At the entrance of the existing disposal site, all the incoming (and out going) trucks will be recorded by using a format attached hereto.

In order to estimate number of trips made during one year, some assumptions should be made concerning, for example, seasonal fluctuation, and truck operation records.

4) Truck Operation Records

By checking the truck operation records kept at the workshop, estimate number of trucks which are actually used.

In the above explained formula, it may not be possible to know information b and c separately. In this case, total number of trips made by a group of truck of the same type should be estimated based on the truck operation records and also by making some appropriate assumptions.

Appendix 4

Industrial Waste Inventory Survey

1. Objective

The objective of the survey is to know what kind of, and how much industrial waste is generated by which enterprises, and how the waste is disposed of, and by whom.

2. Method

Necessary information will be collected mainly by asking waste generators (factories) to answer the questionnaire. The surveyors will visit the factories to explain the questionnaire, to collect answers, to observe waste disposal process, to ask any relevant questions.

The survey activities will include the following:

- 1) Identify sources (factories) which generate industrial waste of significant quantity.
- 2) Prepare, and deliver questionnaire to the factories.
- 3) Request the factories to fill in the questionnaire.
- 4) Observe the disposal process
- 5) Collect and analyze the questionnaire answers

Attached questionnaire format will be used.

3. Survey period

Survey should be completed and the survey report should be submitted to the Study Team by 15 December 1996.

Industrial Waste Inventory Survey Questionnaire

- Name of Surveyor: _____

- Survey Date: _____

- Interviewee: Name: _____

Position: _____

Phone: _____

1. Name of Enterprises: _____

2.1 Address of Head office: _____

2.2 Address of Factory: _____

3. Number of Employees: _____ persons

4. Major Products

Type of Products	Quantity (ton/year) or (units/year)
1.	
2.	
3.	
4.	

5. Quantity and Disposal Method of Industrial Waste Generated

Type of Industrial Waste	Quantity (ton/year)	Disposal Method
1.		
2.		
3.		
4.		

Appendix 5 Household Opinion Survey

1. Objective

The objective of this survey is to know:

- a. Household waste discharge conditions
- b. Level of citizens' satisfaction with respect to the communes' collection services
- c. Willingness to pay

2. Methods

2.1 Method

Each commune will appoint surveyor(s). The surveyor(s) will visit 100 households in each commune, and ask questions based on the questionnaire, which is hereto attached. The surveyor(s) will fill completely in the questionnaire.

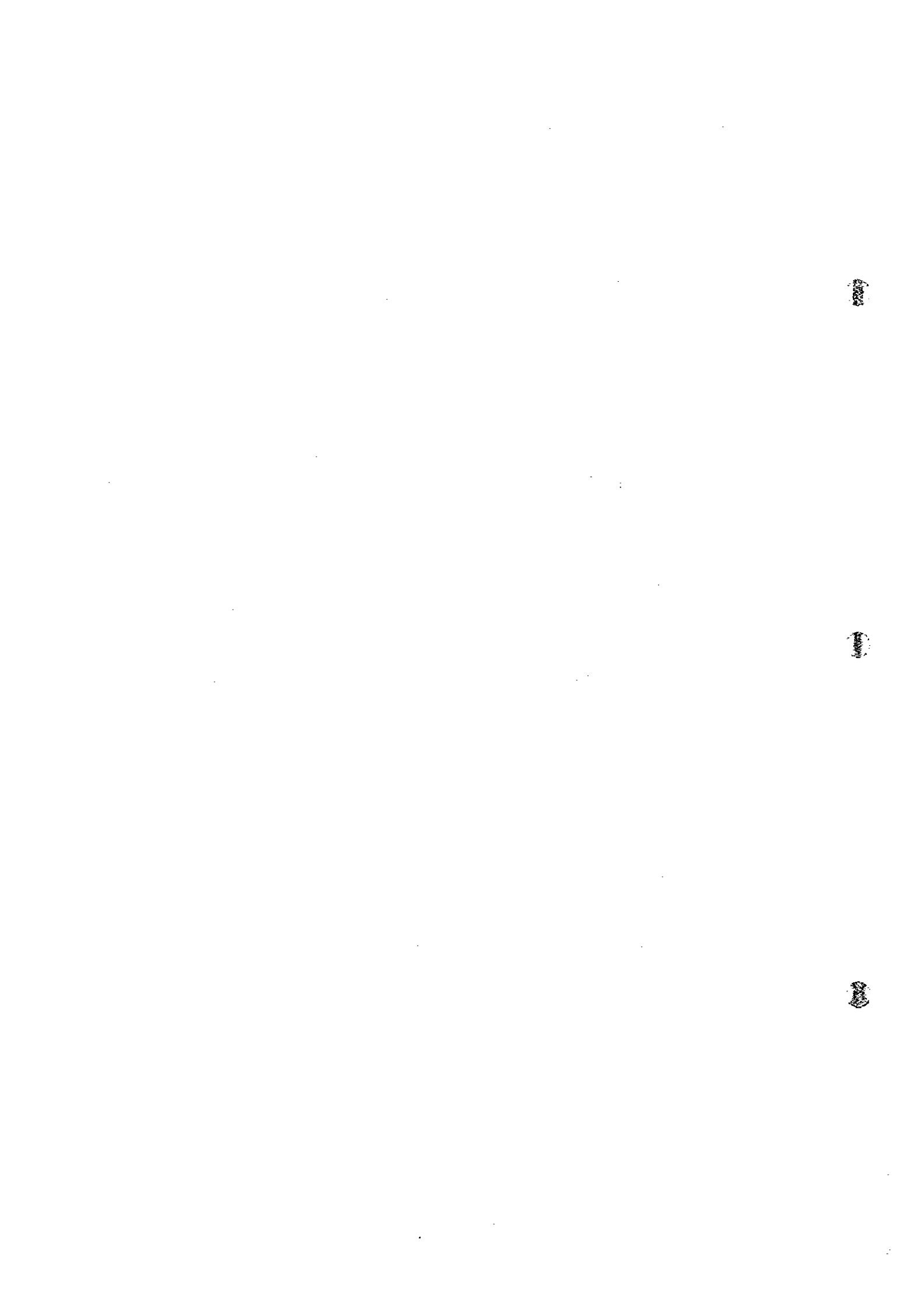
2.2 Sampling

Each commune will select 100 households of which 60 households should be same as those selected for the household waste generation survey. There will be 300 households selected in the 3 communes.

	Low Income (1)	Middle Income (2)	High Income (3)	Total (1 + 2 + 3) (4)
a. to be selected for the Household Waste Generation survey	20	20	20	60
b. Additional selection	20	20	0	40
c. Total (a + b)	40	40	20	100

2.3 Information Processing

After conducting the questionnaire survey, each commune should summarize and analyze the collected information by using the information processing sheet, which will be supplied by the Study Team.



**Formats for
Waste Collection Quantity Survey
with Truck Scale**

100

100

100

Waste Collection Quantity Survey with Truck Scale (Boudheb) Date: Day _____ Month _____ 1996 Sheet No. _____

1. No.	2. Truck Plate No.	3. Type of Truck (Use the code below)	4. Collection Zone	5. Type of Waste (Use the code below)	6. 1st Measurement with Waste (kg.)	7. 2nd Measurement without Waste (kg.)	8. Weight of Waste (6 - 7) (kg)	9. Time of 1st Measurement	10. Time of 2nd Measurement	11. Name of Driver
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
							Total			
							Weight			

Note: 2nd measurement (of weight of empty trucks) will be done only one time for each truck during the survey.

Type of Trucks: a. Compactor, b. Dump truck, c. Flat bed truck, d. Pick-up, e. Covered dump truck, f. Multipurpose truck, g. Others

Type of Waste: 1. Domestic, 2. Commercial (store, restaurant, hotel), 3. mixed, 4. Institutional (office, public building), 5. Street sweeping, 6. Garden, park, 7. Hospital, 8. Industrial, 9. Market, 10. Construction, 11. Others

(Boudheh) Waste Collection Quantity Survey at Disposal Site Sheet No. _____

Date: Day _____ Month _____ 1996

1. No.	2. Truck Plate No.	3. Type of Truck (Use the code below)	4. Collection Zone	5. Type of Waste (Use the code below)	6. Time of Incoming	7. Time of Outgoing	8. Time Spent on Site (7 - 6)	9. Name of Driver
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Type of Trucks: a. Compactor, b. Dump truck, c. Flat bed truck, d. Pick-up, e. Covered dump truck, f. Multipurpose truck, g. Others

Type of Waste: 1. Domestic, 2. Commercial (store, restaurant, hotel), 3. mixed, 4. Institutional (office, public building), 5. Street sweeping, 6. Garden, park, 7. Hospital, 8. Industrial, 9. Market, 10. Construction, 11. Others

(Private Trucks) Waste Collection Quantity Survey at Disposal Site Sheet No. _____

Date: Day _____ Month _____ 1996

1. No.	2. Truck Plate No.	3. Name of Waste Generator Company	4. Address (Name of commune only)	5. Type of Waste (Use the code below)	6. Time of Incoming	7. Time of Outgoing	8. Time Spent on Site (7 - 6)	9. Name of Driver
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Type of Trucks: a. Compactor, b. Dump truck, c. Flat bed truck, d. Pick-up, e. Covered dump truck, f. Multipurpose truck, g. Others

Type of Waste: 1. Domestic, 2. Commercial (store, restaurant, hotel), 3. mixed, 4. Institutional (office, public building), 5. Street sweeping, 6. Garden, park, 7. Hospital, 8. Industrial, 9. Market, 10. Construction, 11. Others

Waste Collection Quantity Survey - Summary 1.1

Boudheb Summary of Daily Waste Collection Weight by Truck Measured at Truck Scale

Plate No.	Type of Truck	Unit: kg (trip number)							Total of 7 Days
		26 November Tuesday	27 November Wednesday	28 November Thursday	29 November Friday	30 November Saturday	1 December Sunday	2 December Monday	
1.		()	()	()	()	()	()	()	()
2.		()	()	()	()	()	()	()	()
3.		()	()	()	()	()	()	()	()
4.		()	()	()	()	()	()	()	()
5.		()	()	()	()	()	()	()	()
6.		()	()	()	()	()	()	()	()
7.		()	()	()	()	()	()	()	()
8.		()	()	()	()	()	()	()	()
9.		()	()	()	()	()	()	()	()
10.		()	()	()	()	()	()	()	()
11.		()	()	()	()	()	()	()	()
12.		()	()	()	()	()	()	()	()
13.		()	()	()	()	()	()	()	()
14.		()	()	()	()	()	()	()	()
15.		()	()	()	()	()	()	()	()
16.		()	()	()	()	()	()	()	()
17.		()	()	()	()	()	()	()	()
18.		()	()	()	()	()	()	()	()
19.		()	()	()	()	()	()	()	()
20.		()	()	()	()	()	()	()	()
Sub-Total (a)		()	()	()	()	()	()	()	()
Waste collected during campaign (b)		()	()	()	()	()	()	()	()
Regular Collection (c)=(a-b)		()	()	()	()	()	()	()	()

Note: Fill the number of trips in parenthesis().

Private Trucks Summary of Daily Waste Collection Weight by Truck Measured at Truck Scale

Unit: kg (trip

number)

Plate No.	Name of Waste Generator Company	26 November Tuesday	27 November Wednesday	28 November Thursday	29 November Friday	30 November Saturday	1 December Sunday	2 December Monday	Total of 7 Days
1.		()	()	()	()	()	()	()	()
2.		()	()	()	()	()	()	()	()
3.		()	()	()	()	()	()	()	()
4.		()	()	()	()	()	()	()	()
5.		()	()	()	()	()	()	()	()
6.		()	()	()	()	()	()	()	()
7.		()	()	()	()	()	()	()	()
8.		()	()	()	()	()	()	()	()
9.		()	()	()	()	()	()	()	()
10.		()	()	()	()	()	()	()	()
11.		()	()	()	()	()	()	()	()
12.		()	()	()	()	()	()	()	()
13.		()	()	()	()	()	()	()	()
14.		()	()	()	()	()	()	()	()
15.		()	()	()	()	()	()	()	()
16.		()	()	()	()	()	()	()	()
17.		()	()	()	()	()	()	()	()
18.		()	()	()	()	()	()	()	()
19.		()	()	()	()	()	()	()	()
20.		()	()	()	()	()	()	()	()
Total		()	()	()	()	()	()	()	()

Note: Fill the number of trips in parenthesis

Table Waste Collection Quantity Survey - Summary
Safi Total (excluding waste collected during the campaign)

							Unit: Kg
Items	Boudheb 1	Zaouia 2	Biada 3	Community Urban 4	Sub-Total 5 = (1+2+3+4)	Private Trucks 6	Grand Total 7 = (5+6)
A Waste Collection Quantity (kg)							
A1 Surveyed 7 Days Total (26 Nov. - 2 Dec.) <small>note1</small>							
A2 Daily Average (A1/7days)							
A3 Annual Quantity (A2*365)							
B Trips (Number)							
B1 Surveyed 7 Days Total (26 Nov. - 2 Dec.)							
B2 Daily Average (B1/7days)							
B3 Annual Trip Number (B2*365)							

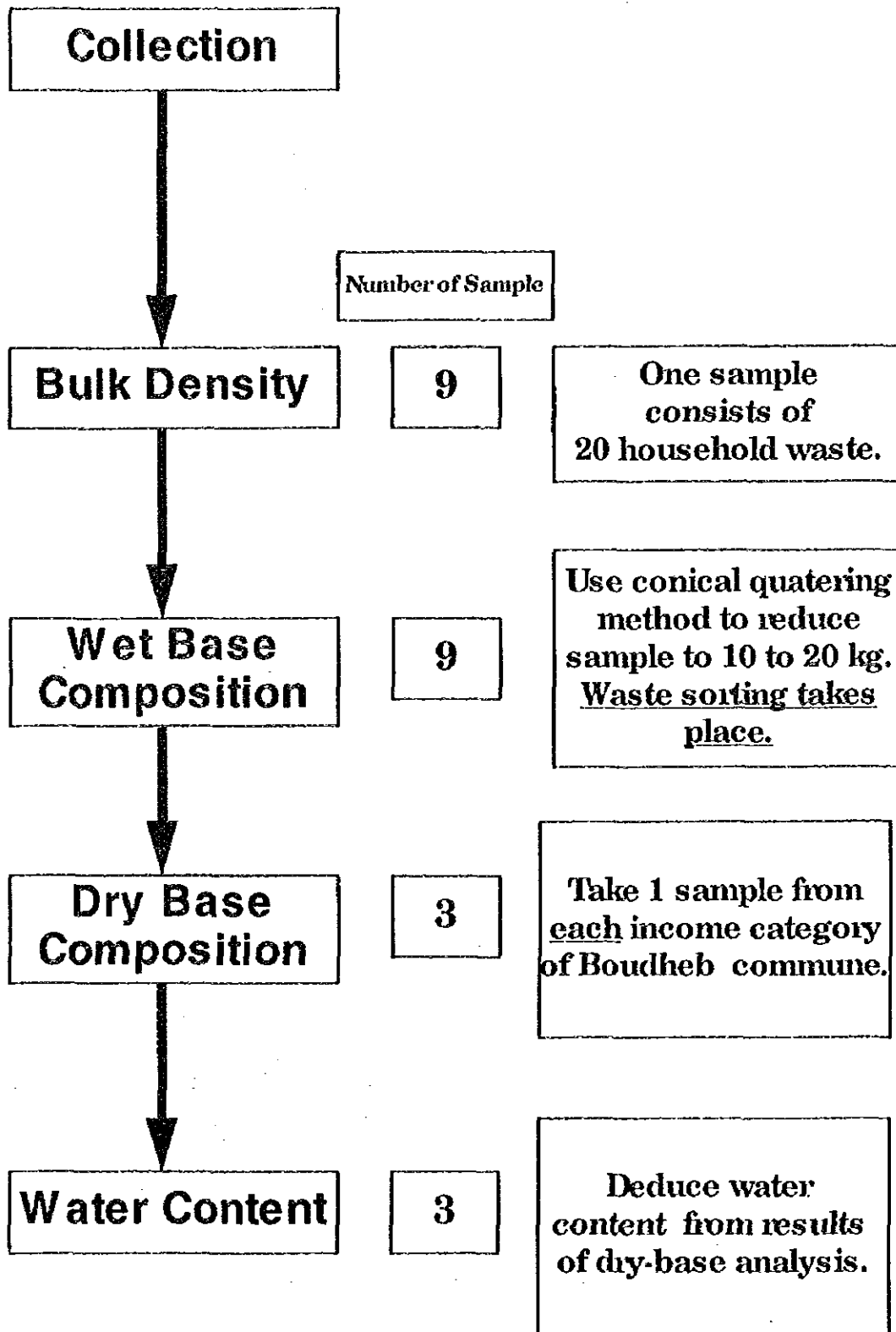
Note 1: Use figures of *Regular Collection* of three commune.



**Manual for
Household Waste Physical Composition Survey**



SURVEY FLOWCHART



WHEN YOU STUDY "BULK DENSITY"

BEFORE YOU START, YOU WILL NEED...

1. A large plastic sheet (about 7m x 7m) to place sample wastes on
2. A plastic waste bin of 60 l

FIRST OF ALL...

The following paragraphs tell you every aspect of surveys. Please remind that "at any time of the following surveys, wastes from different income categories do NOT mix together."

PLEASE DO

- Gently place sample waste in a plastic waste bin. When the bin is filled, hold it up at about 30 cm high and drop it freely to make some space. Fill up the space with another sample waste. Repeat these procedures two more times. (Namely, 3 drops and 3 refills).
- Measure the weight of a waste-filled bin each time.
- Empty the bin on a large size plastic sheet. Keep the sample from soil and any other foreign materials.
- Measure all the 20 household waste

PLEASE DON'T

- Do not cram the sample waste in the bin.
- Do not mix waste from different income categories.

WHEN YOU START "HOUSEHOLD WASTE GENERATION SURVEY"

BEFORE YOU START, PLEASE DO

- Measure the total weight of plastic bags in advance. Later on, you will extract it from the total weight of household waste. See a little mathematics below.

$$\text{Waste weight} = \text{Waste weight in plastic bags} - \text{Plastic bag weight}$$

- Clearly separate wastes by income categories; Low, Middle, and High. Different colors of bags are used for distinguishing categories.
- Always carry "Household Waste Generation Survey Data Sheet 1, 2, and 3" with you.

WHEN YOU CONDUCT "PHYSICAL COMPOSITION SURVEY" ON WET BASE

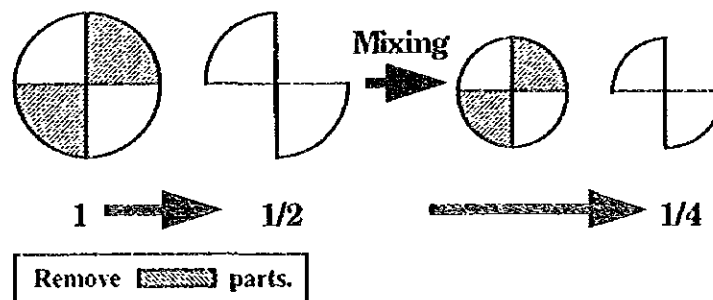
BEFORE YOU START, YOU WILL NEED...

1. A large plastic sheet (about 7m x 7m) to place sample wastes on
2. Ten large size cardboard boxes
3. Another nine large size cardboard boxes clearly indicating a waste type respectively to sort wastes. Extra boxes are welcome.

WHEN YOU REDUCE SAMPLE WASTE...

PLEASE DO

- Reduce sample waste weight to 10 to 20 kg by taking the following steps.
1. Gently place all the sample waste on a plastic sheet.
 2. Remove **large non-combustible waste** such as particularly metal, cans, PET bottles, large plastic materials, etc. into boxes separately. Wipe off water from the removed waste.
 3. Before mixing, crash **large combustible** waste into pieces, using scoops, cutters, etc.
 4. Mix the sample heap well. Very well.
 5. Make a corn (mountain) with sample waste.
 6. Remove two quarters of the corn to reduce sample waste half as shown in a below figure. Repeat the procedure 3 and 4 until the remaining sample weighs 10 to 20 kg.



PLEASE DON'T

- Don't mix the plastic bags you have given to families into your sample. They are **NOT** your sample waste.
- Please avoid collecting waste and soil outside the plastic sheet. Such wastes are **NOT** your sample.

WHEN YOU SORT AND MEASURE "REDUCED SAMPLE WASTE"

PLEASE DO

- Sort sample waste by type in respective boxes.
1. Locate 9 large boxes around sample waste before sorting the sample.
 2. Sort the sample into the boxes as assigned.
 3. Weigh each type of reduced and sorted sample.
 4. Weigh large non-combustible wastes by type. These are already sorted if you have proceeded correctly.
 5. Calculate the each type of waste weight. Take "plastic waste" as an example, what we call "weight of plastic waste" is the sum of "plastic waste after conical quartering reduction" and "first-removed large plastic waste reduced according to reduction ratio" See a sample formula below.
 6. Calculate percentage of each waste type. Remind you, "weight" is "the sum of two kinds of weights as you have just read in step 5.

$$\text{Weight of plastic waste (P)} = P1 + P2$$

P1 = Weight of sorted plastic waste **excluding** large non-combustible

P2 = Reduction Ratio (R) x (Weight of large non-combustible plastic waste)

Reduction Ratio (R) = $c / (a-b)$

a: Weight of 20 household waste

b: Weight of large non-combustible waste

c: Weight of reduced sample waste in conical quartering

PLEASE DON'T

- Avoid exposing the sample waste to rain, water, and any other foreign materials.

WHEN YOU STUDY "WASTE COMPOSITION ON DRY BASE"

PLEASE DO

1. Use the sample studied in wet-base composition analysis.
2. Place sample in separate metal buckets according to types.
3. Start drying sample.
4. Keep the temperature of the drier at 90 to 100 degree centigrade for 3 - 5 days.
5. Measure and record the weight of sample waste in the drier at the end of each day.
6. When the decrease of the weight stops the procedure is over. Terminate the dryer.
7. Weigh each type of dried waste.
8. Add according portion weight of large non-combustible waste in the weight obtained in step 7.
9. Calculate percentage that each type of waste shares in the total weight.

PLEASE DON'T

- Avoid exposing the sample waste to rain, water, and any other foreign materials.

WHEN YOU CALCULATE "WATER CONTENT"

PLEASE DO

Simply use the formula below to find water content of waste.

$$\text{Water Content (W\%)} = \frac{(\text{Sample Weight BEFORE Drying}) - (\text{Sample Weight AFTER Drying})}{(\text{Weight of Sample BEFORE Drying})}$$







JICA