

Fig. N.1-8 Layout of Main Facilities

ii. buffer zone

The buffer zone is established in the east side of the site and of a 50m width in order to protect residences from landfill operation. It is to exist between the reclaimed area adjacent to the landfill site.

iii. surrounding drain

A bund of 2m height is designed to be placed inside the buffer zone along the land in use for an assured landfill site. The surrounding drain is designed to be placed along the bund.

(2) Clearing and Site Preparation

As described in the design principals, Phase I site development shall consider the disposal and clean-up of the waste disposed of at the site by the end of 1994. The following works, therefore, shall be done for clearing and site preparation.

- clearing plants;
- cleaning-up waste disposed;
- soil excavation;
- soil cover for landfill area by 1994; and
- soil stock.

(3) Main Facilities

At the final disposal site, as basic facilities for landfill disposal, the principals of the main facilities are the guarantee of landfill volume and the reduction of leachate.

a. enclosing structures

i. enclosing bund

Because the disposal site is located on flat land in order to carry out sanitary landfill, enclosing the landfill area will be a bund for the prevention of rain water invasion and the guarantee of the designed landfill volume.

Earth construction is applied to the bund structure based on,

- topography
- construction characteristics; and
- economic characteristics.

The landfill height and bund height are calculated based on the results from the study on the

- designed landfill volume (The target year for the basic Plan is 2000);
- site area: more than 60 ha;
- facilities site (bund, facilities for inspection and administration, buffer zone etc.);
- bund foundation soil;
- covering materials; and
- tide and waves.

The results show the landfill height at 4.0 m and the bund height at 2 m. The bund top functioning as the on-site road is of a 4 m width and a gravel pavement.

As for the bund, a typical cross section is planned and shown in Fig. N.1-9, based on the soil investigation data.

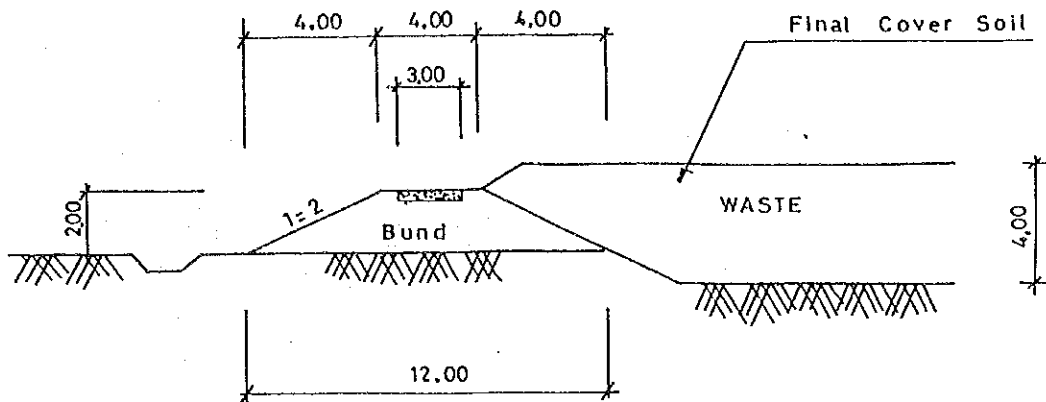


Fig. N.1-9 Typical Cross Section of Enclosing Bund

Within the preliminary designs, by the typical cross section of enclosing bund shown above, the designed landfill volume up until 1997 of Phase I is assured. At the same time, the bund for the waste dumped by 1994, 11 ha will also be constructed in order to prevent the surrounding area from pollution by the waste dumped.

ii. divider

Generally, the divider inside the enclosing bund is established based on the following purposes.

- for efficient landfill work

By limiting the area for landfilling, efficient equipment and landfill operation are assured.

- for the separation of hazardous waste

The types of waste are separated in hazardous waste such as infectious waste and non-hazardous.

- for leachate measures

The rainwater and spring water from non-landfill areas are eliminated thus allowing for limited generation of leachate.

Since waste to be disposed of is not reduced in volume due to non-intermediate treatment facilities such as incinerators, the landfill volume is large. The major purpose of a divider is the reduction of leachate quantity.

The area required for 1996 yearly landfill is calculated at 1.65 ha, after considering the bund height and final covering materials. In addition neither leachate collection nor treatment facility is planned for Phase I. Consequently, a divider for the separation of hazardous waste disposal is considered.

For the maintenance and operation for the divider in order to avoid the leachate seepage from the bund, impermeable soil shall be used for the bund. The site soil permeability coefficient of 10^{-5} - 10^{-6} cm/sec is suitable for the divider construction.

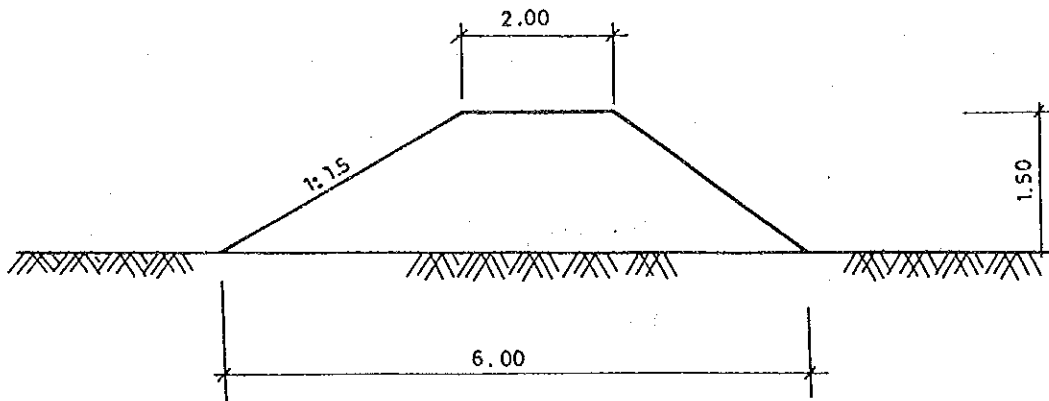


Fig. N.1-10 Typical Cross Section of Divider Drainage System

b. Drainage system

i. general

When waste comes in contact with rainwater, following waste decomposition, there is elusion of many produced contaminants and/or there is suspension resulting in the formation of leachate.

Because leachate contaminates the surrounding area, the target for drainage system is the reduction of leachate volume. The principal purposes for the systems are listed below.

- elimination of rainwater from the water inflow from outside the landfill site.
- elimination of inflowing spring water from side surfaces and/or underground. (At the KM 18-DS, it may not be considered.)

- elimination of rainwater from the non-landfill site partitioned-off by the divider within the enclosing bund.
- elimination of rainwater from the completed landfill site.

As a disaster prevention measure, the drainage discharges outside the disposal site.

ii. design condition

The conditions for the design of economical systems for the effectiveness of the above purposes are as follows:

- The drainage system design is based on the "Feasibility Study on Improvement of Drainage System in Vientiane, March 1990 by JICA"
- discharge design;

Table N.1-16 Discharge Design

Drain	Return Period (year)	One-Day Storm Intensity (mm/day)	Rainfall Intensity (mm/hr)	Run-off Coef- ficient	Discharge (m ³ /sec/ha)	Remarks
Surrounding Drain	2 to 5 yrs.	104 132	45 70	0.50 0.50	0.063 0.098	Rainfall duration is one hour
On-site Drain	0.5	60	30	0.8	0.067	Rainfall duration is 30 min.
Drain for Reclaimed Area	2	104	45	0.8	0.100	- ditto -

iii. design of drainage systems

The following drains are planned and a drainage system is illustrated in Fig. N.1-11.

- surrounding drains
- on-site drains
 - . unlined drains
 - . pipe culvert (see Fig. N.1-12)
- drains for reclaimed area (see Fig. N.1-13)
 - . side ditches
 - . cross drains
 - . vertical drains

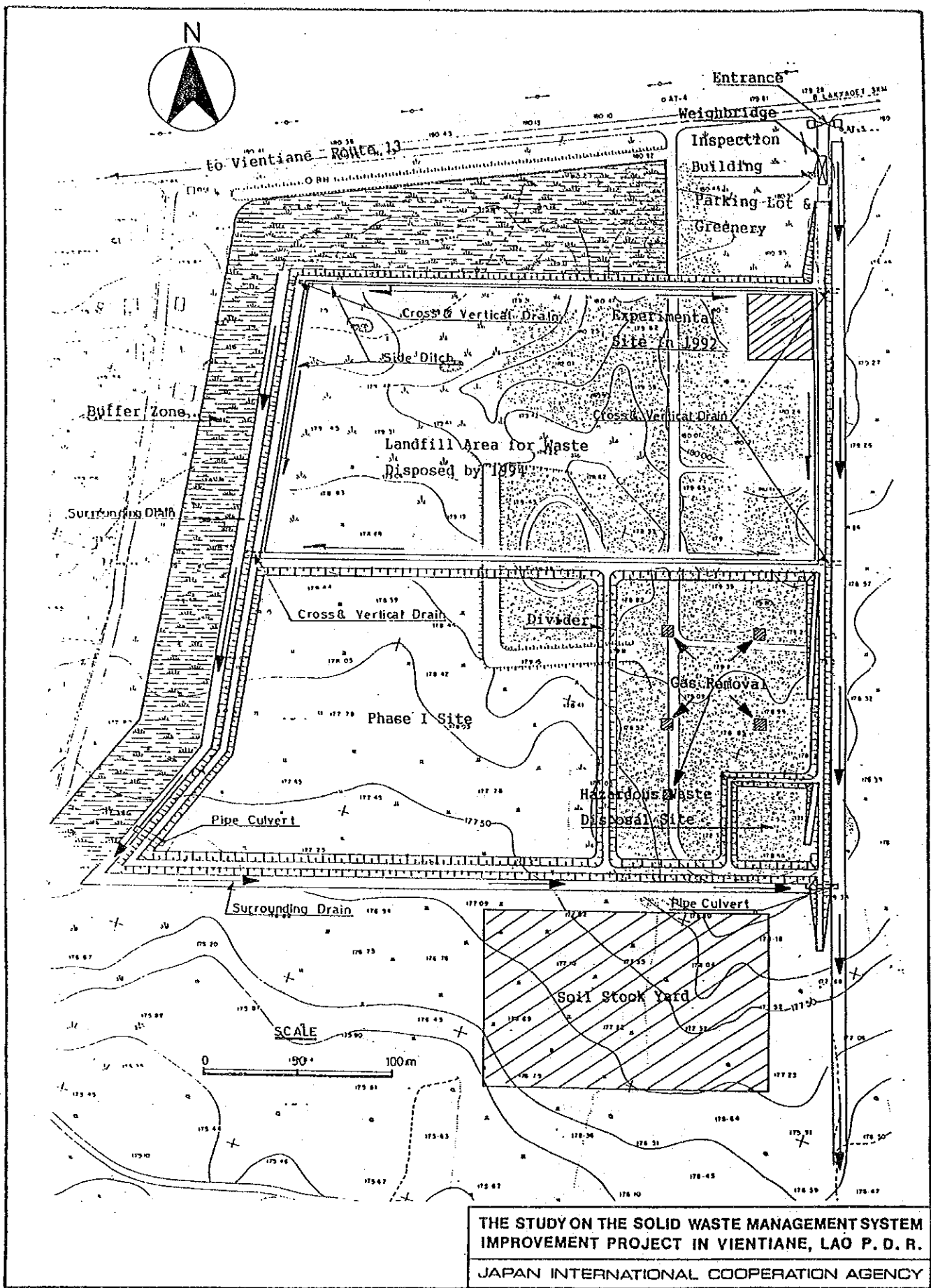
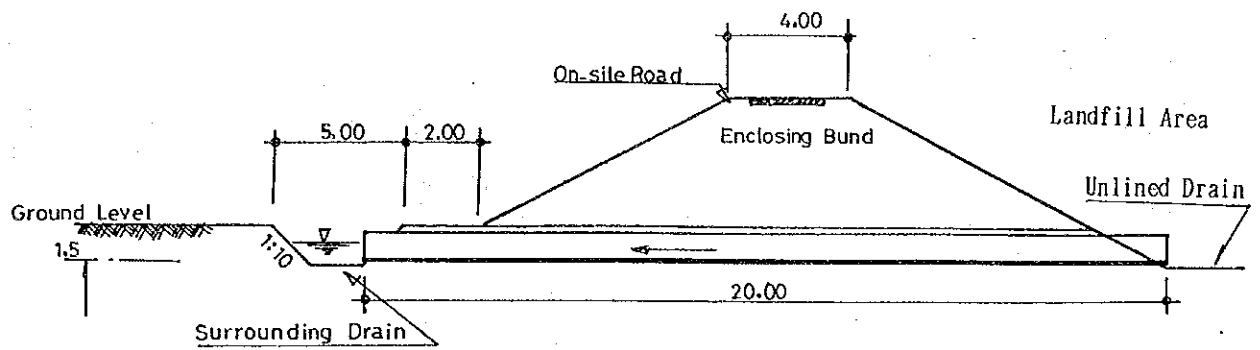
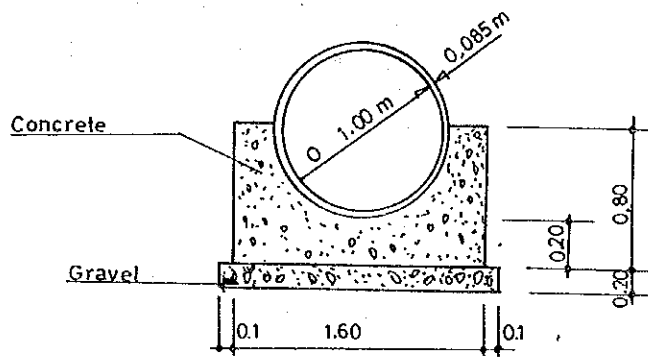


Fig. N.1-11 Proposed Drainage System at KM 18-DS



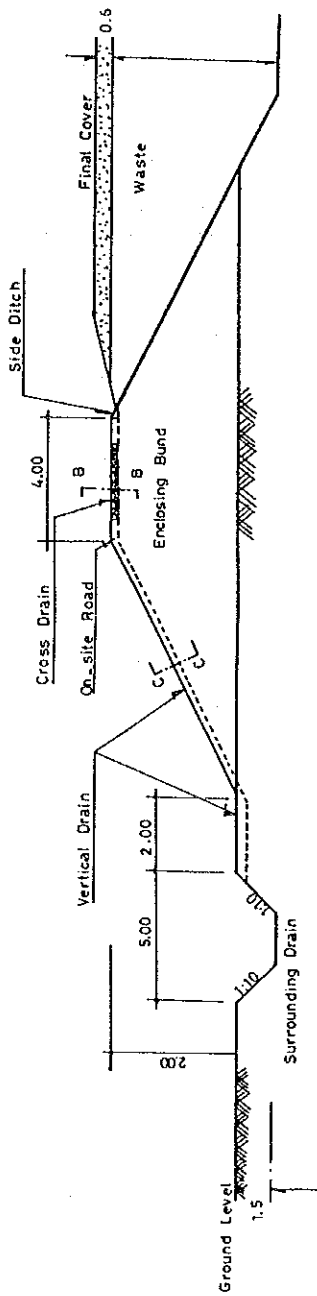
Profile of Pipe Culvert



TYPICAL CROSS SECTION OF PIPE CULVERT

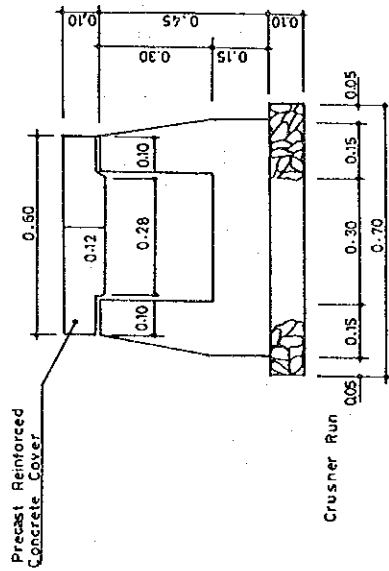
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IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N.1-12 Profil of Pipe Culvert



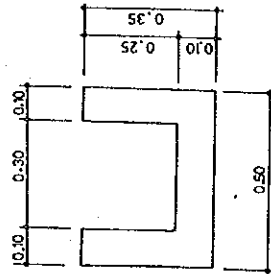
TYPICAL CROSS-SECTION

SECTION B-B



TYPICAL CROSS-SECTION OF A CROSS DRAIN

SECTION C-C



TYPICAL CROSS-SECTION OF A VERTICAL DRAIN

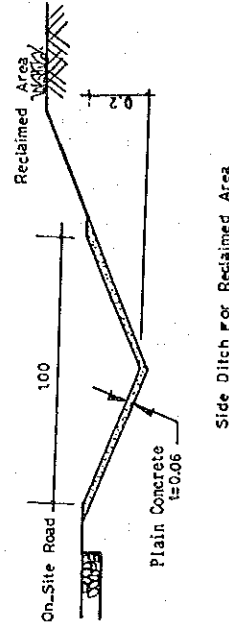


Fig. N.1-13 Drains for Reclaimed Area

Each drain is described as follows,

- surrounding drain

The drain will be installed outside of the enclosing bund, joining the existing drain.

- on-site drain (surface)

- . Since the ground is composed of hard clayey soil, unlined drains are installed.
- . The drainage from the inside of the landfill area to the outside the bund is discharged from pipe culverts.

- drain for reclaimed area

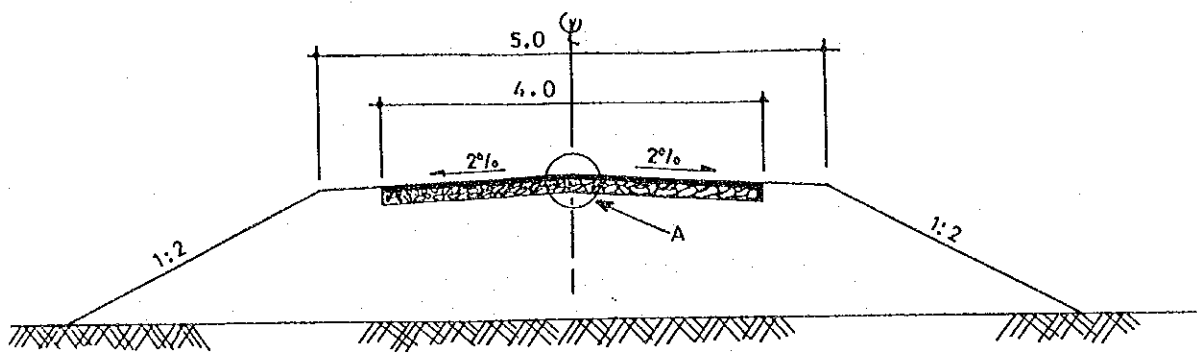
- . These drains are installed at the landfill area for waste disposed by 1994.
- . Side ditches are lined with plain concrete. The slope of the side ditches is less than 2%.
- . In order to discharge rainwater outside the enclosing bund, vertical drains and cross drains are to be installed.

c. Access

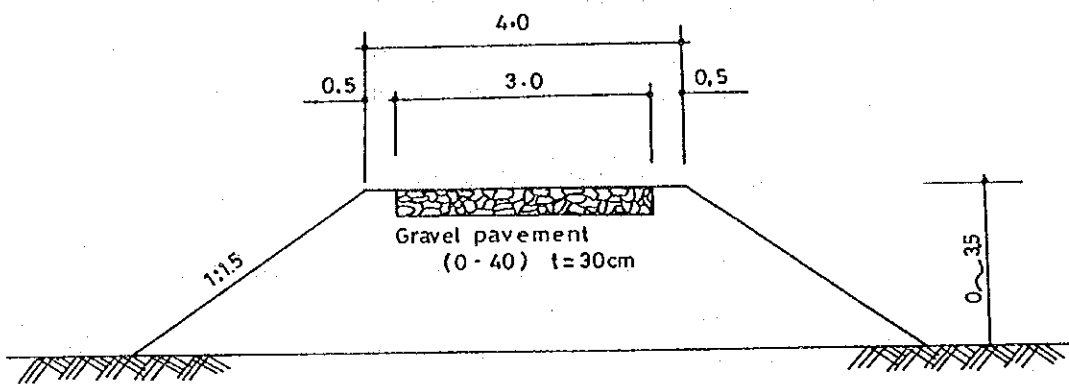
As for the access, the following roads are designed and the typical cross-section of each road is illustrated, as shown in Fig. N.1-14.

- approach road; and
- on-site road.

Each road is described as follows,



TYPICAL CROSS-SECTION OF AN APPROACH ROAD



TYPICAL CROSS-SECTION OF AN ON - SITE ROAD

Wearing Course	0.05	0.35
Asphalt Concrete		
Base Course	0.15	
Crushed Aggregate		
Sub Base Course	0.15	
Sand And Laterite		

A DETAIL OF APPROACH ROAD

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IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N.1-14 Typical Cross-Sections of Access

i. approach road

This road is to harmonize the entrance of the collection vehicle from the Route 13 to the disposal site.

- An approach from the Route 13 into the disposal site will be established.
- The road will be wide enough for one-way traffic with carriageway of 4 m.
- The road will be asphalt-paved.

ii. on-site road

The on-site road includes the road on the top of the bund and the road which joins the bund and working face. The road on the top of the bund also represents the inspection and administration road of the disposal site.

- The road width is to be 4 m.
- 3 m of the road is paved with gravel at a thickness of 30 cm.

(4) Environmental Protection Facilities

The facilities are for the prevention of primary and secondary pollution outbreak during and after completion of landfill operations.

a. buffer zone

This will be constructed between the disposal site and the residential area and the Route 13 for essentially the following purposes.

- to hide the site from direct view;
- to reduce the noise and vibrations emitted during landfilling; and

- to balance the site with the natural surroundings in a harmonious fashion.

The buffer zone is hoped to occupy quite a bit of space. However, since this would result in a reduction in landfill volume, the zone is set at a 50 m width.

For forestry and for environmental protection for the existing residential area, this will expand to a 50 m width outside of the enclosing bund.

b. Litter control facilities

Litter control within the landfill site follows the same measure as is taken for disaster and pest control, wherein principally the covering material acts as the main agent. Nonetheless, there looms the inevitability of litter scattering during the landfill operations before the covering material has been placed. As a means of prevention, a movable fence to catch flying litter will be put up and made by the total materials like bamboo trees and nets.

c. Gas removal facilities

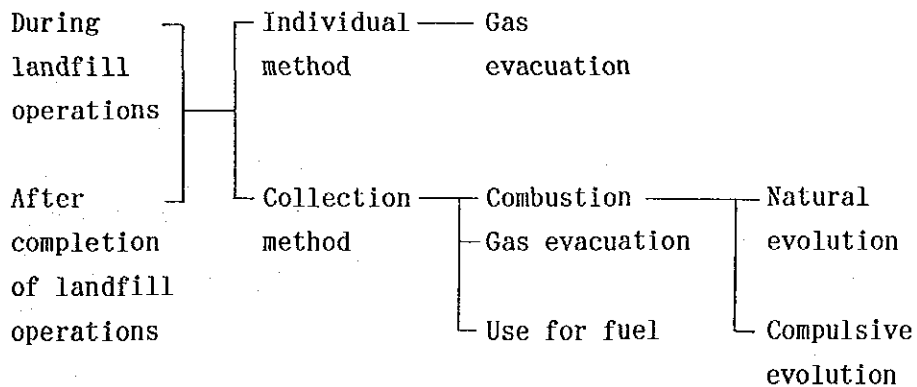
For the organic matters present during landfilling operations, decomposition occurs by loamy microbes and results in the production of water, gas and inorganic chlorines. If the landfill structure houses aerobic matters, this gives rise to aerobic bacterial activity. If the decomposition is early, carbon dioxide, water, ammonia etc. are produced, without a problem. On one hand, if the structure houses anaerobic matters, this gives rise to anaerobic bacteria, which slow decomposition, thus odors and combustible gas, such as methane, carbon dioxide, hydrogen sulfide and ammonia, are emitted, badly affecting the environment.

Generally, as for the outbreak of gas in landfill sites, gushing and exhaust are common at the weak points on the boundary surface between landfill sites and surrounding structures. Disaster prevention measures, which are represented by gas removal facilities are necessary at points where gas unexpectedly gushes and thus produces fires, odors etc.

As for gas removal facilities, as shown in Fig. N.1-15 below, there are three types under consideration : by evacuation, by pumping and by ventilation. Within these designs, the most economical gas removal facility, the one by evacuation, has been selected.

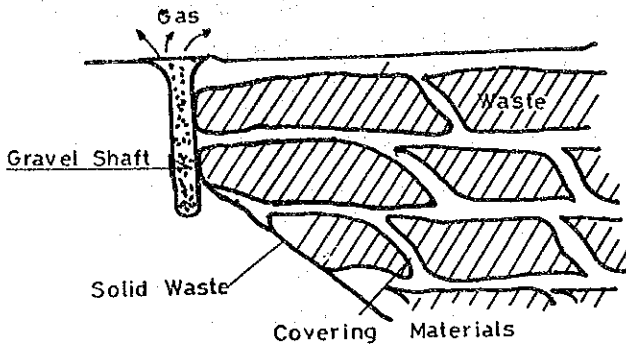
For these gas removal facilities, joined with the leachate collection facilities in the Phase.II, the function of the expansion of the aerobic range within the landfill is expected.

Gas removal facilities by evacuation are set-up as follows.



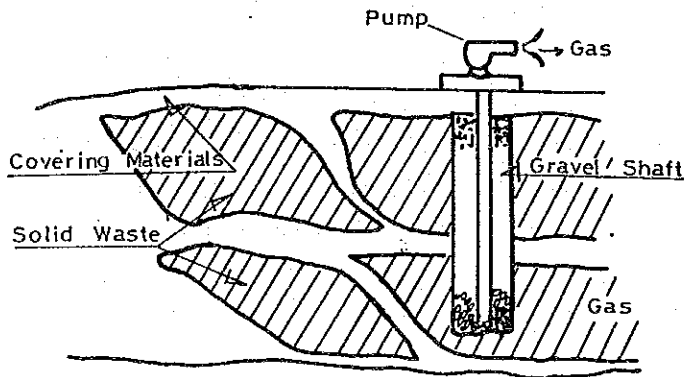
The waste characteristics, stratum thickness and operational conditions for the design conditions of the gas removal facilities by evacuation are the following.

1. BY Evacuation



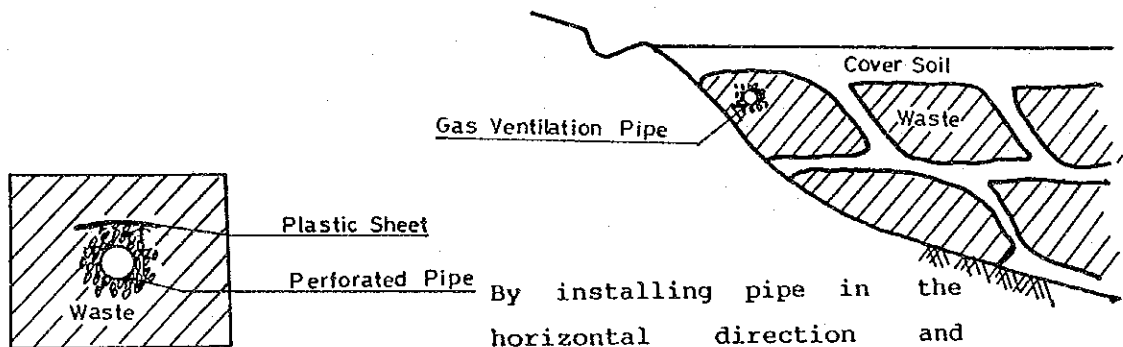
By excavating a shaft in the vertical direction and filling it with gravel, the gas is expelled.

2. BY Pumping



By excavating a well and installing a pump, the gas enters the well and is expelled.

3. BY Ventilation



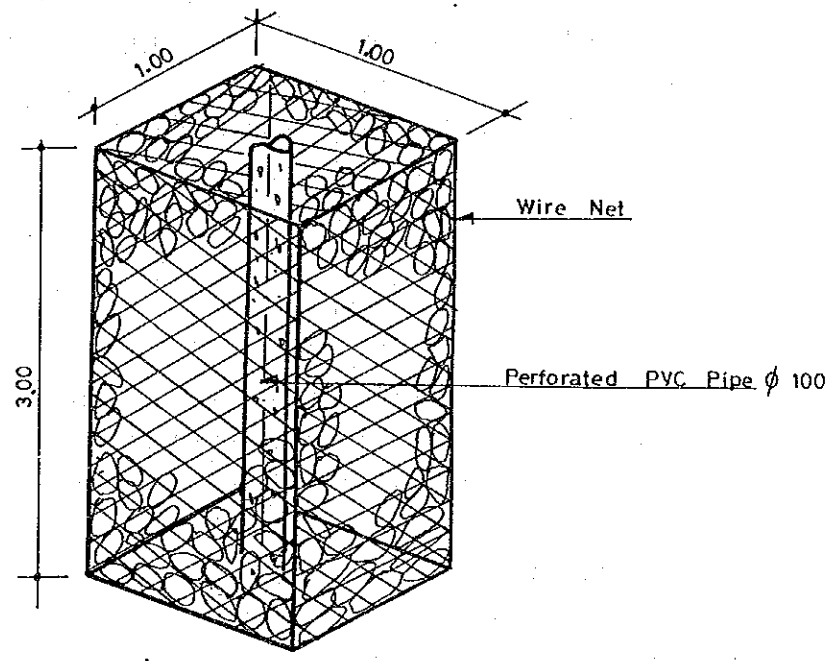
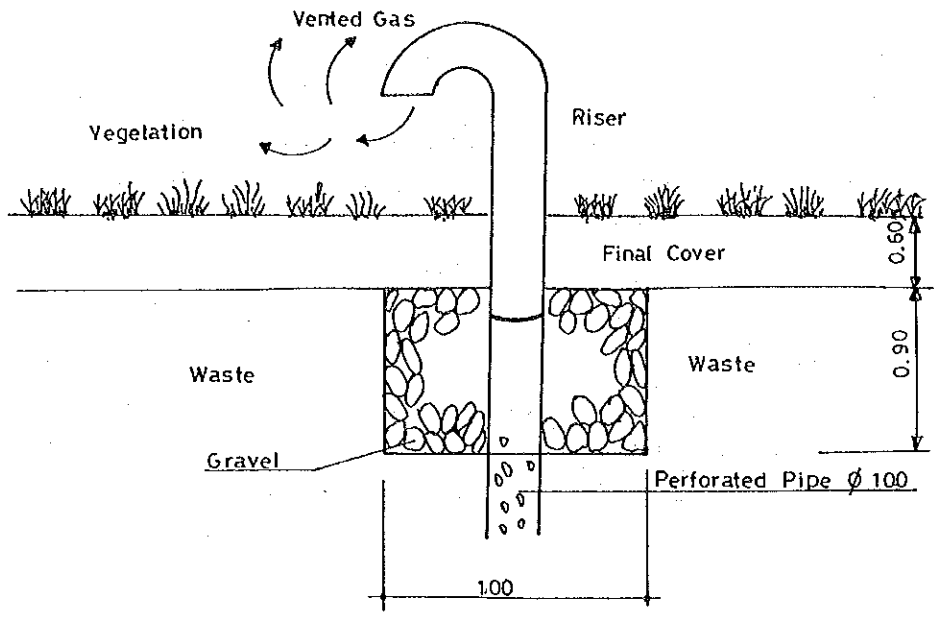
Details of Gas Ventilation Pipe

By installing pipe in the horizontal direction and embedding it with gravel, the gas is expelled by forced ventilation.

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JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N. 1-15 Types of Gas Removal Facilities



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 IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N.1-16 Gas Removal Facilities

- a. waste type.....garbage
- b. landfill layer thickness....approx. 6.6 m
- c. operational conditions....the landfill site area at 25 ha
at site the divider will occupy
2-3 ha.

Based on the above conditions, during landfilling operations the individual gas evacuation method is followed and after the completion of landfill, from the point of view of safety and control, the collective gas evacuation method is followed by connecting individual vertical shafts with horizontal shaft.

An outline of the gas removal facilities is shown in Fig. N.1-16.

The completed landfill site gas removal facilities have been designed at 3-4 positions per hectare. As for disaster prevention measures, the gas removal facilities make prevention quite possible. However, the covering material is the most important factor, as it is necessary to not leave waste exposed over a long term.

d. Leachate collection facilities

Upon consideration of the very limited financial capability of the Municipality, it is proposed to establish Level 2 of sanitary landfill in the Phase I of the project. Then, it will be improved to Level 3 in the Phase II. As such the leachate collection facilities is not designed in this report. As for reference, the purpose and type of leachate collection facilities are described below.

Their purpose is to collect the rainwater contaminated by waste, the water within waste as well as decomposed polluted water and send it to the leachate control facilities. At the same time, they play a shield-like role for the prevention of deterioration of the surrounding areas by the permeation or discharge of contaminated water. Moreover, depending on the joining of the leachate collection facilities to the gas removal facilities, it is also possible to expand the aerobic area within the landfill layer.

As for the leachate collection facilities, depending on the topography, the configuration of the landfill and the structures, there are many combinations considered. The functions are classified below.

i. horizontal leachate collection

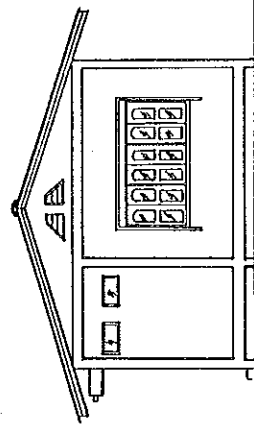
Leachate collection which doesn't allow for leachate to rest in the landfill site is based on a downflowing, natural type of collection. The facilities will be established at the bottom of the landfill site.

ii. vertical leachate collection

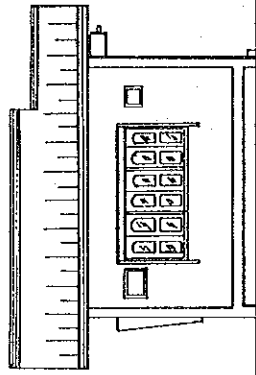
The landfill layer is thick thus suggesting that the time it takes for leachate to reach the bottom of the landfill site for collection is long. In this case, a vertical leachate collection facility will also be established.

iii. leachate drain pipe

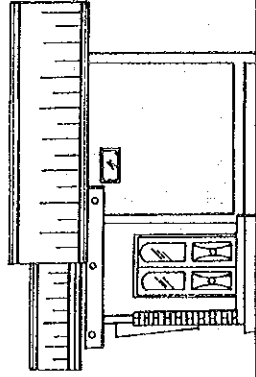
This is to discharge the leachate collected by the site's inner facilities to the outside of the site.



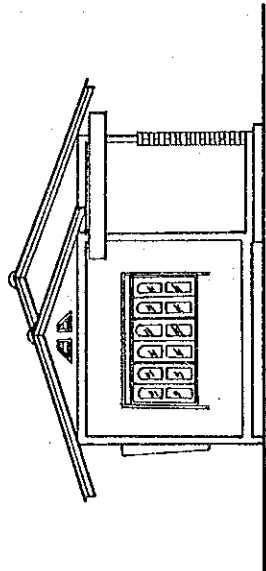
B REAR ELEVATION SCALE B



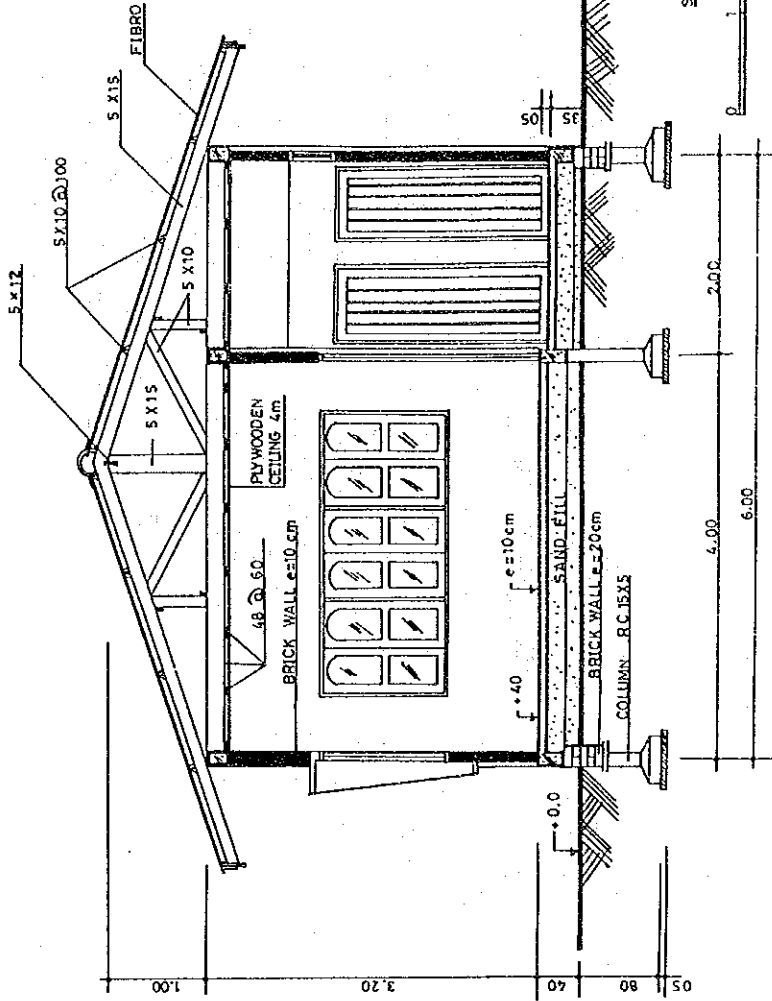
C LEFT SIDE FACE SCALE B



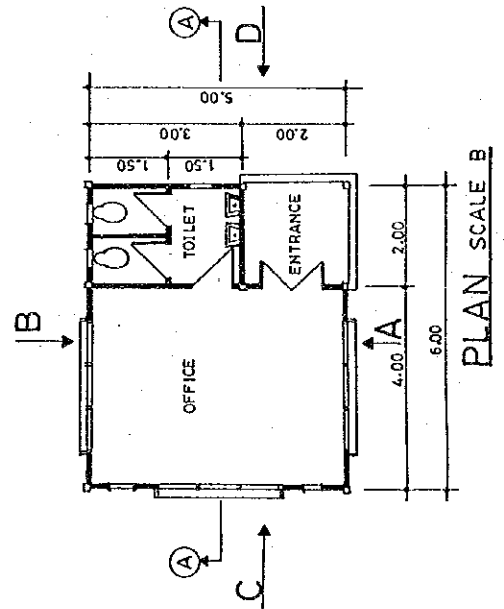
D RIGHT SIDE FACE SCALE B



A FRONT ELEVATION SCALE B



SECTION A-A SCALE A



PLAN SCALE B

Fig. N.1-17 Plan of Site Office

c. Monitoring facilities

As for the monitoring facilities, the existing wells will be used in order to monitor groundwater quality.

(5) Building and Accessories

a. Site office

This will be established for the administration of the disposal site in addition to the existing building for the weighbridge. The principal functions will be carried out in the spaces categorized below.

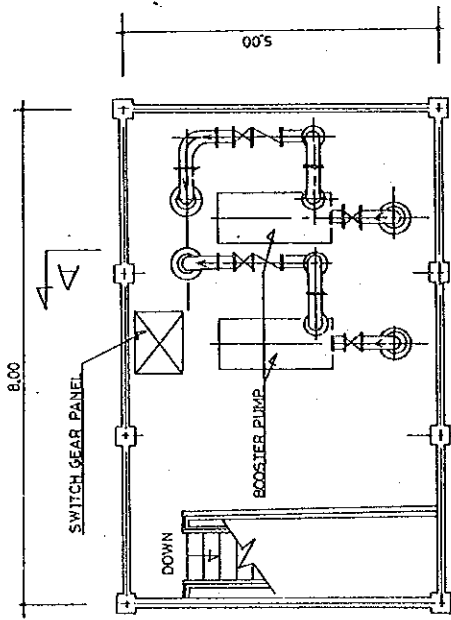
- administration office
- operator's break room
- guard's room
- lavatory
- storage room

This structure will be constructed by the locally available materials, as shown in Fig. N.1-17.

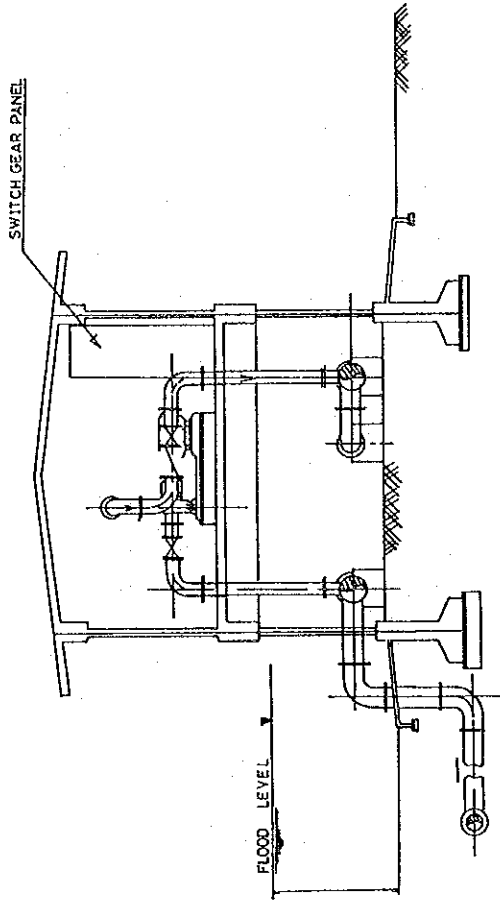
b. Weighbridge

Incoming waste must be weighed for proper operations within the disposal site. The covering material will be kept in balance with the landfill design. Records on weighing of waste are necessary data in determining the fees for incoming individual waste and future disposal site planning.

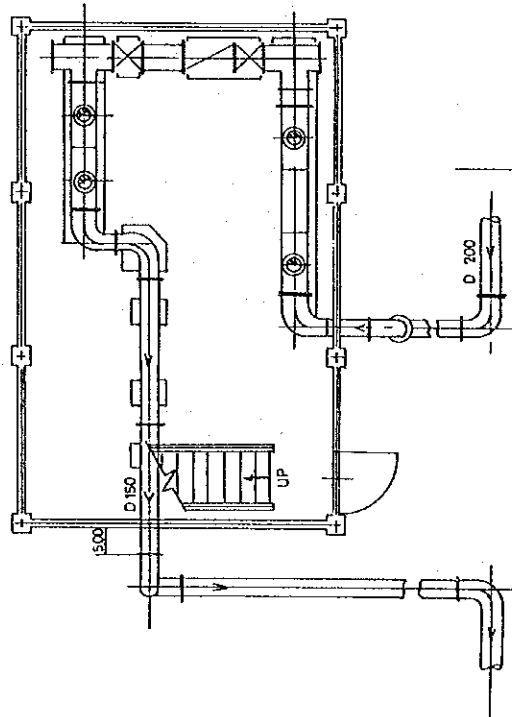
The existing weighbridge installed by JICA will be used continually.



BOOSTER PUMPING STATION 2nd FL PLAN



AA SECTION



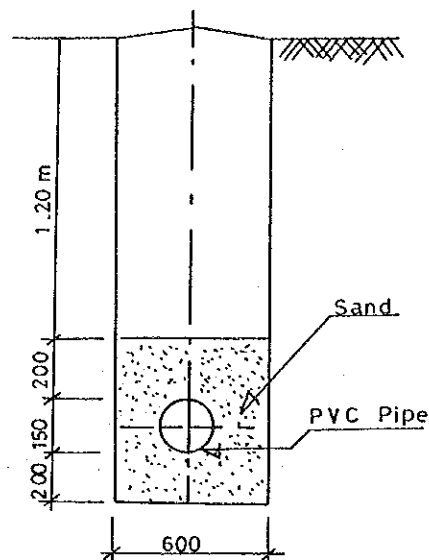
BOOSTER PUMPING STATION 1st FL PLAN



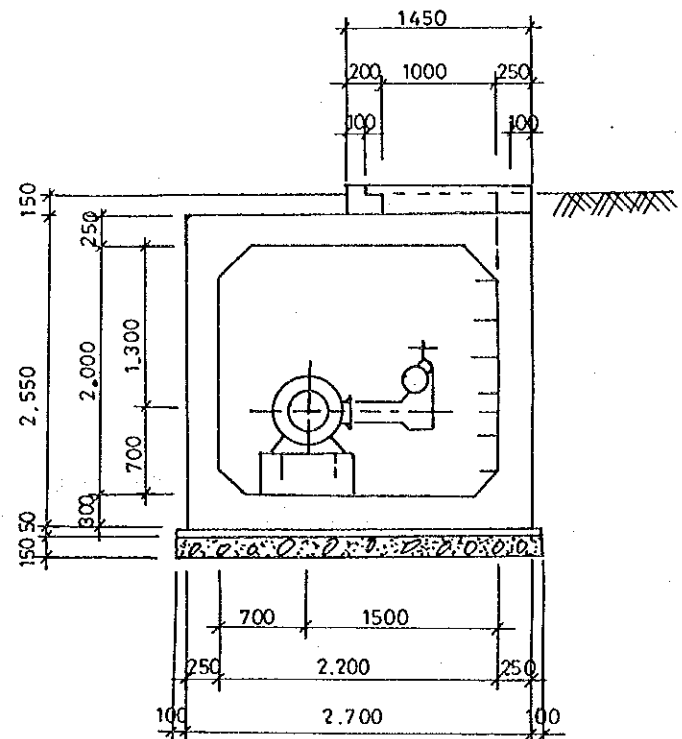
Fig. N. 1-18 Booster House for Water Supply

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IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

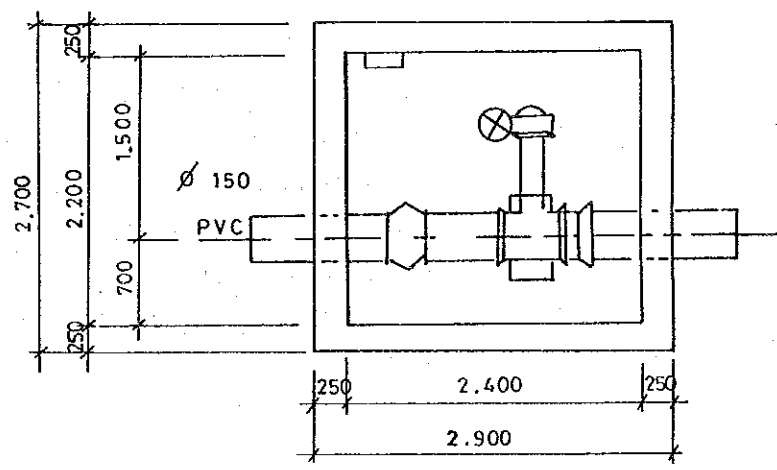
D 150



CROSS-SECTION OF WATER PIPE



VALVE



VALVE

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IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N.1-19 Pipe Construction for Water Supply

c. Fire prevention facilities

A fire extinguisher is to be assured for the site office and other facilities for the prevention of fire.

d. others

In order to prevent anyone from illegally entering the site, a gate and fence are to be constructed. Flashlights will also be provided for the guard. A parking lot will be constructed for visitors and the staff.

(6) Water Supply

Although the permeability of the subsoil of the KM 18 disposal site is less than 10^{-5} cm/sec., impact on groundwater pollution will be fair. It is not recommended to use groundwater for drinking. It is, therefore, necessary to provide potable water to the surrounding area.

In terms of the water supply in Vientiane, the Nampapa Lao, of the state companies under MCTPC, is responsible for construction, operation and maintenance of the potable water supply. As such, the cost of construction for water supply to the surrounding residents of the KM 18 is excluded in the project cost and is not estimated. The contents of the water supply construction, however, are identified and preliminarily designed. The following are the contents of the water supply, as shown in Fig. N.1-18 and N.1-19.

i. booster house

- building
- pump

ii. pipe construction

- o/ 150 PVC Pipe
- communal water tap
- others

3) Operation and Maintenance Plan

(1) Landfill Plan

a. Basic policy

The following basic policy is sustained for preparation of landfill plan.

- i. Solid waste are spread and compacted sufficiently.
- ii. The scattering of solid wastes is minimized.
- iii. The diffusion of offensive odor is minimized.
- iv. Stabilization of wastes as early as possible is arranged.

Compaction of solid wastes is necessary for lengthening the service life of the landfill site, which also is helpful in lessening settlement after completion of landfill. Furthermore, the prevention of scattering of solid wastes and diffusion of offensive odor is required in order to conserve the surrounding environment. For ultimate use of the completed landfill site, early stabilization is necessary for landfill purposes.

b. Landfill structure

Although the semi-aerobic landfill method is desirable, only improved anaerobic sanitary landfill can be achieved due to the application of level 2 of landfill. It will be improved to semi-aerobic landfill in Phase II.

c. Landfill method

The landfill method includes an open dumping, a sandwich and a cell method. The open dumping method has conventionally been carried out at the dumping site in Vientiane but, by this method a highly-compacted landfill cannot be expected, nor can offensive odors or the breeding of vectors and insects.

A comparison of landfill method is illustrated in Fig. N.1-20.

The sandwich method is applied by landfilling solid wastes horizontally, and covering the ground with soil, by which to form different layers. Where the landfill site is narrow, this method is effective, but if the site is wide, solid wastes are left uncovered for a couple days, resulting in unfavorable offensive odor and so on. The cell method is applied by laying soil on solid waste every day. Through this method a highly-compacted landfill can be expected and it is considered possible to prevent scattering of solid waste thus, generation of offensive odor and the breeding of vectors and insects. Since the landfill site is wide at the KM 18-DS, compared with the landfill volume, if the sandwich method is applied, the exposure time period of solid waste could possibly belong. Therefore, the cell method should be applied.

d. Covering materials

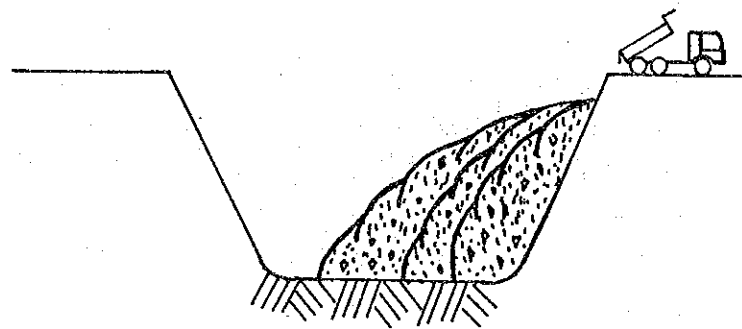
In order to conduct landfilling by the cell method, cover soil is to be supplied in a stabilized manner in balance with the landfill disposal.

i. objectives for cover soil

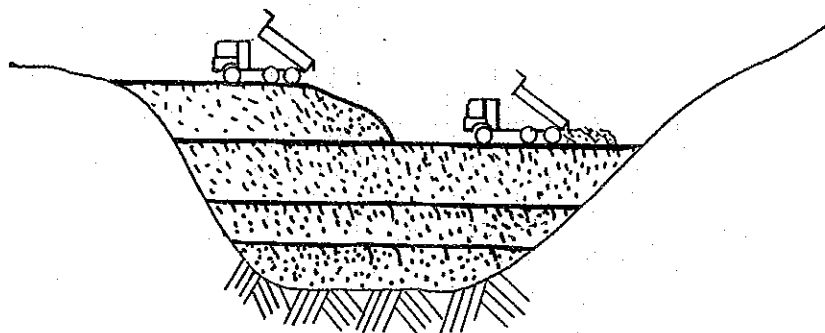
- to prevent gas leakage
- to prevent disaster
- to prevent the scattering of waste
- to support vehicle flow

ii. covering soil amount

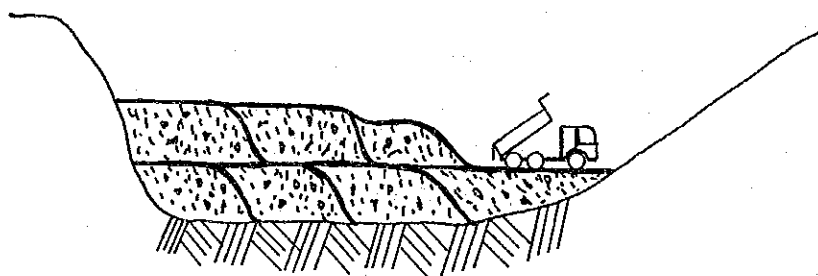
- daily covering soil 20 cm thick
- final cover soil 60 cm thick



Open Dumping Method



Sandwich Method



Cell Method

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IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N.1-20 Comparison of Landfill Method

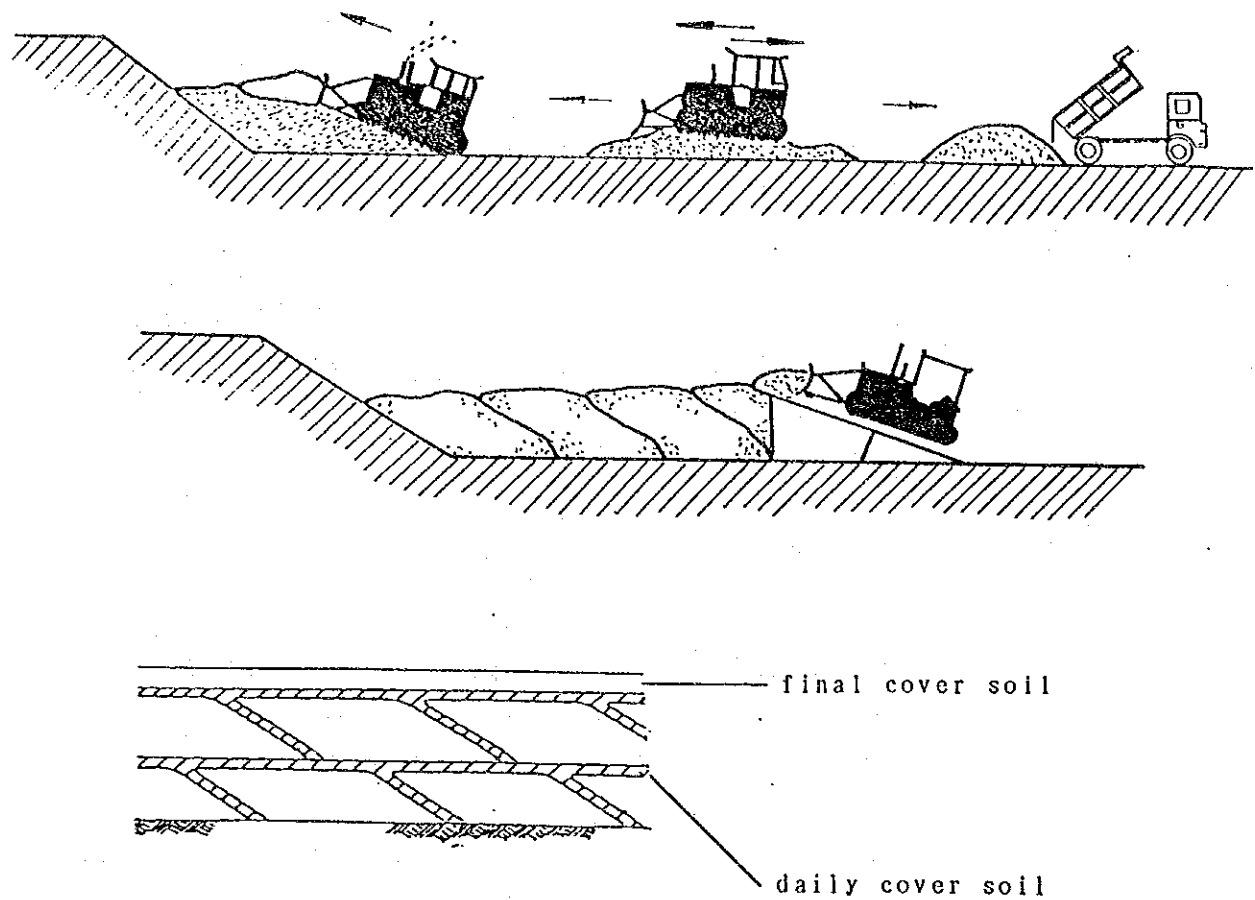


Fig. N.1-21 Cover by Cell Method

According to the calculation, the cover soil will be placed in a 35% ratio to the disposal volume of waste.

iii. guarantee of covering material

As for the quality of the cover soil, daily cover soil; sandy soil for good ventilation and final cover soil; clayey silt of a small permeability coefficient is desirable.

The covering material will be procured basically inside of the KM 18-Ds.

c. Landfill equipment plan

i. planning conditions

Judging from topographical and geological conditions as well as the quality of solid waste, it is essential to consider the following conditions to prepare the landfill equipment plan.

- Equipment should be of a type which functions even over poor ground.
- The landfill material consists of combustibles and non-combustibles, some of which necessitate crushing. Therefore, equipment with a certain capacity for crushing is required.
- Since a large amount of garbage will be disposed at the site, it is essential to carry out covering every day.
- Not only for the ultimate use of the completed site, but also for the preservation of sanitary conditions as well as the lengthening of the life span of the disposal site, equipment with a high capacity for compaction is necessary. The content of the work concerning each type of landfill equipment at the site is shown in Table N.1-17.

Table N.1-17 Content of the Work for Landfill Equipment

Waste Handling	Cover Soil Handling	Other
pushing (moving)	excavation	leveling (site access road & unloading site)
crushing	loading, hauling, spreading and leveling	site maintenance
compaction	compaction	

The features of each type of equipment necessary for the above are indicated in Table N.1-18.

Table N.1-18 Comparison of Landfill Equipment Performance

Machine type	Waste Handling			Soil Covering		
	Leveling	Compacting	Trenching	Leveling	Compacting	Trenching
Crawler-dozer (Bulldozer)	Excellent	Good	Fair	Excellent	Good	Poor
Crawler-loader (Tractor shovel)	Good	Good	Excellent	Good	Good	Poor
Wheel-dozer	Excellent	Good	Fair	Good	Good	Poor
Wheel-loader	Good	Good	Fair	Good	Good	Poor
Scrape-dozer (scraper)	Poor	Poor	Good	Excellent	Poor	Poor
Power shovel	Poor	Poor	Excellent	Fair	Poor	Poor
Landfill compactor	Excellent	Excellent	Poor	Good	Excellent	Poor

b. Equipment selection

The following equipment is selected for efficient operation and maintenance of landfill.

i. bulldozer

For leveling and compaction of cover soil, a bulldozer excels in leveling and compaction of waste and cover soil and has various other uses. For example, it can be used in maintenance of the facilities, the enclosing bund and the on-site road. Considering the area over which the bulldozer will be operating, a bulldozer for swamp use and a 16 ton class weight should be selected.

ii. back hoe (hydraulic excavator)

For excavation of cover soil and drains, a back hoe is inferior in loading capacity to a crawler-loader, but is excellent in excavation, in which a bulldozer is inferior.

iii. selection of number of equipment

- bulldozer (16-ton class)

The equipment needs to be capable of handling 240 m^3 of landfill in 8 hrs. per day. According to the 1997 daily landfill estimations, one vehicle will be necessary for the estimated 196 m^3 .

- back hoe (hydraulic excavator)

For principally excavation of cover soil and drain, one will be necessary.

f. Landfill operations

The landfill operations are outlined in the following.

- i. The waste is filled in places directed to the driver by the staff.
- ii. The dumped waste is spread and crushed by a bulldozer into a flat horizontal layer for sufficient compaction.
- iii. After the completion of landfill operations, the covering operations will be performed on a daily basis by the cell method.
- iv. A second layer of landfill will be laid on the first layer in the same manner, extending to the divider.
- v. Final covering material will be laid on top of the second layer of landfill.
- vi. A divider and gas removal facilities and leachate will be constructed in the adjacent area for the next landfill operations.

g. Landfill plan

This is summarized in the followings.

i. divider

The divider should always be constructed directly adjacent to the soon-to-be completed landfill area.

ii. construction work

According to the landfill progress, the USD (present DCTC) will perform the construction of the following.

- divider
- gas removal facilities
- on-site road
- site ditch

iii. configuration of completed landfill area

To insure the immediate discharge of rainwater on the completed area, the following work will be completed by the USD.

- leveling
- temporary drain construction
 - main.....concrete lined
 - branch.....unlined

iv. procurement of covering material

The cover soil will be acquired inside of the KM 18-DS by the excavation of the next landfill area.

(2) Facilities Maintenance

a. On-site maintenance

In order to execute landfilling in a safe, sanitary and effective manner, the final disposal site facilities must be kept in the best condition by proper maintenance.

i. on-site and approach roads

The on-site roads in the final disposal site are to be constructed following the landfill operation. The on-site road is to be paved with gravel and compacted and the approach road with asphalt to avoid any problems for vehicles.

ii. fire prevention measures

The conceivable cause of fire at the final disposal site can be the ignition and explosion of combustible gases such as methane, the spontaneous combustion of combustibles by the effect of lens on glass waste, the ignition and explosion of fuels for landfill equipment and so on. Although the method of burning combustible gases such as methane can be applied, it should not be the policy to install spontaneous combustion equipment for gas because the gas removal facility to be installed at the disposal site is capable of removing enough generated gas. Spontaneous combustion caused by the effect of lens on glass waste should be prevented by timely covering of soil.

iii. sanitation control

Rodents, flies, mosquitoes, vectors and birds very often swarm at the final disposal site, which causes a problem to be tackled. Therefore, it is essential to work out a measure to prevent breeding of vectors, insects and so forth as much as possible. The most effective measure is to carry out daily covering of soil by the cell method, and it is important to prohibit solid wastes from being exposed and standing water from being produced. Only when absolutely necessary should insecticides be used and only very sparsely.

A conceivable cause of offensive odor is solid wastes themselves and decomposition of wastes after landfilling. The odor caused by anaerobic fermentation is said to be more offensive than that caused by aerobic fermentation because of volume and quality of generated gas. An effective measure is to thoroughly cover organic solid waste, which is the cause of offensive odor, and to keep the inside of the landfill site in a good aerobic state by immediately draining rain water.

iv. waste scattering prevention

A fence will prevent waste from scattering outside the site, in addition, scattered waste within the site will be constantly checked and collected.

v. on-site maintenance (equipment)

The following is necessary equipment for effective on-site maintenance.

- disaster prevention.....water sprinkler truck
- on-site patrol.....inspection vehicle

b. Main facilities maintenance

At the final disposal site, the main facilities are the bund structure and drainage facilities. These facilities must be maintained in top condition as one breakdown could effect all of them, resulting in mass damage.

- i. The bund must be checked for any breaks or holes.
- ii. The drainage system should be constantly checked and cleaned out as it can be stopped up by sand, leaves, weeds and other objects.

c. Equipment maintenance

In order to perform maintenance for effective operations, if during periodic investigation problems are discovered, they should be analyzed and equipment should be repaired by only skilled engineers. Necessary spare parts should be kept in stock.

d. Hygiene and safety control

i. hygiene control

As the final disposal site operations are outdoors, dust, odors, landfill gas and other things can badly affect the staff working in this already tenuous environment. Hygiene control, as well as safety control, are assured by grasping the working conditions and improving certain aspects when necessary. Periodic health check-ups are performed and medicine is given for any possible accident. In addition, the staff will possess full knowledge of hospital location and access in case of any emergency.

ii. safety control

Methane outbreak and fuels for landfill equipment should strictly be controlled, and, in order to prevent fire caused by carelessly thrown cigarettes, a measure such as a no-smoking rule should be taken at the landfill site. Of course, the staff will be well educated on disaster prevention.

(3) Personnel Plan

a. Organization structure

The organization structure for the operation of KM 18-DS is proposed as shown in Fig. N.1-22.

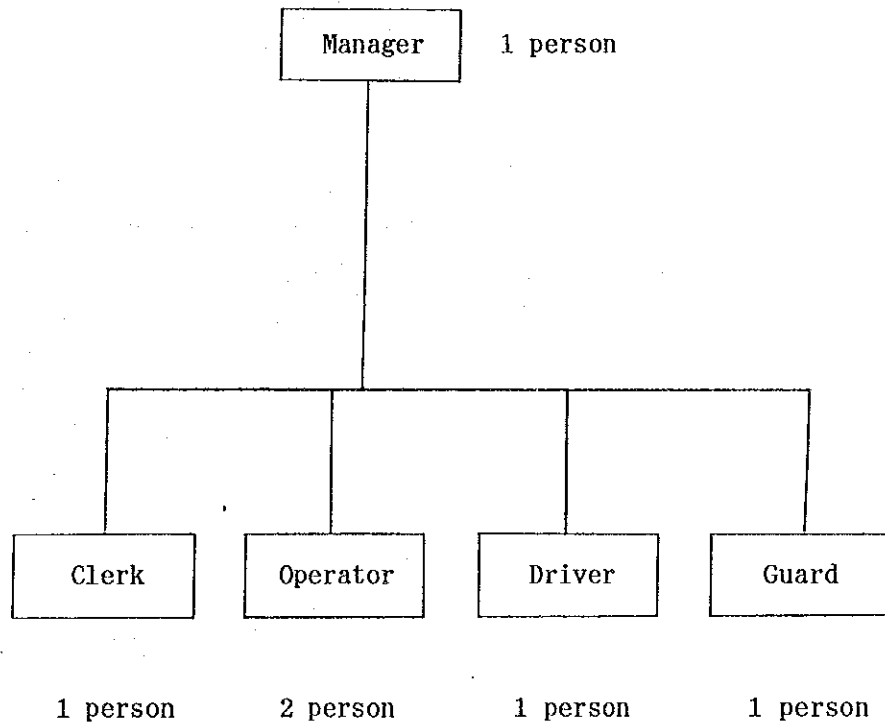


Fig. N.1-22 Organization structure

b. Personnel

i. Manager-----1 person

Representative of the final disposal site who controls the entire structure and manages the work of the entire staff, and daily patrol of disposal site facilities.

ii. clerk (accountant)-----1 person

Work includes the whole phase of accounting work at the disposal site, including calculation of tipping fee, and weighing and inspection of hauled waste.

iii. guard-----1 person

His work covers supervisions for illegal entry and dumping, as well as night-time patrol.

iv. operator and driver----- 3 persons

Work includes leveling and compaction of hauled solid waste, excavation, leveling and compaction of cover soil, construction and maintenance of site access road and maintenance of gas removal facility, as well as daily maintenance of equipment, and excavation of reclaimed area drainage.

(4) Environmental Monitoring

In the process of carrying out landfill work, they should prepare a monitoring (or supervision) plan, which includes water quality inspection and scattering of solid wastes, in order to conserve the environmental conditions of the final disposal site.

a. water quality monitoring

The following monitoring methods shall be effected for ample control.

- i. monitoring of groundwater by existing wells;
- ii. monitoring of surface water in surrounding drain; and
- iii. monitoring of leachate.

b. Waste monitoring

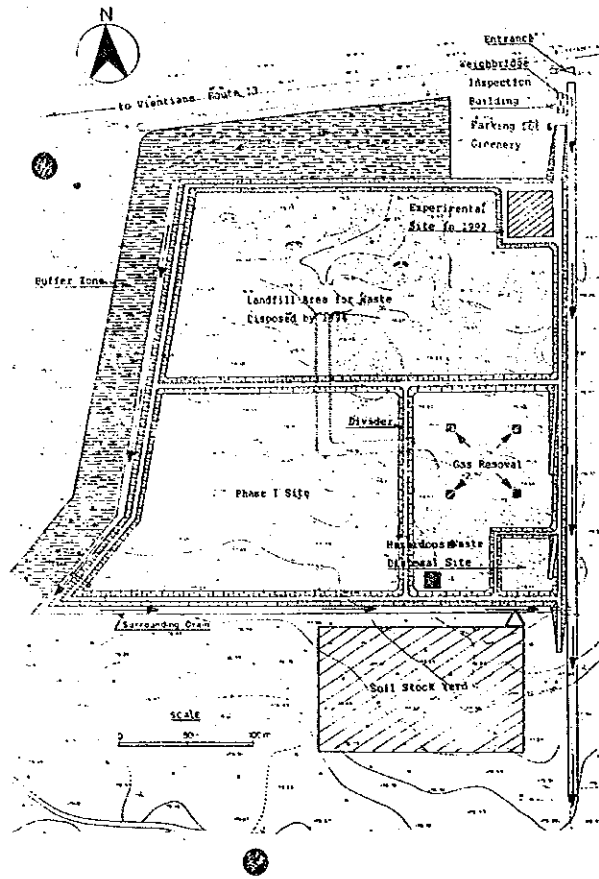
- i. monitoring of directly-hauled waste by the generators themselves, in particular, checking of unacceptable industrial wastes;
- ii. monitoring of scattered waste outside the site; and
- iii. monitoring of illegal dumping.

4) Ultimate Use

(1) Basic Conditions on Ultimate Use

The following are basic considerations necessary for ultimate use of completed landfill sites.

- problems related to settlement;
- problems related to gas generation; and
- maintenance of completed landfills.



LEGEND

- ⊗ Monitoring Well
- △ Surface Water Sampling
- Leachate Sampling

Fig. N.1-23 Location of Water Monitoring System

a. Settlement

Settlement of the landfill is dependent on the depth of the fill, composition of wastes, compaction of the material, moisture content, and other factors. Studies have indicated that approximately 90 percent of the ultimate settlement will occur in the first 5 years. The final 10 percent will occur over a much longer period.

Settlement is classified into the following two types:

- settlement of refuse layers; and
- settlement of soft sub-soil layers.

i. settlement of refuse layer

Settlement of refuse layer is caused by two factors namely;

- compaction
- decomposition

Compaction is caused by surcharge such as upper layer and vehicle weight. The amount of settlement by compaction varies according to materials and water content.

Little information is available on the decomposition of buried material in a sanitary landfill. It is extremely difficult to predict the time required for complete decomposition. Many items, particularly paper, have been found unchanged in landfill that had been completed 15 to 25 years previous. The rate of decomposition is primarily dependent upon the moisture content and generally takes place at a very slow rate.

ii. settlement of soft sub-soil layer

Settlement of soft sub-soil layer is classified into the following.

- immediate settlement; and
- settlement by consolidation.

The amount of settlement depends on the following factors:

- characteristics of sub-soil;
- depth of sub-soil layers; and
- weight of surcharge.

b. Gas generation

Decomposition of the wastes will result in the production of gases, principally methane, carbon dioxide, nitrogen, hydrogen, and hydrogen sulfide. The rate of gas production will usually reach a peak within the first 2 years and then slowly taper off. Methane gas causes the most concern because of its explosive character.

A counter measure for gas generation is construction of gas removal facilities such as installation of perforated pipes and gravel.

c. Maintenance

Completed landfill generally require maintenance because of differential settlement. Maintenance consists primarily of resloping the surface to maintain good drainage and filling in small depressions that result from uneven settlement.

(2) Ultimate Use Plan

a. Possible ultimate use

As for the ultimate use of the completed site, the land used immediately after reclamation is in the form of a car park, golf links, farmland, park, playground and so forth. On the reclaimed land many years later, one-storey rambling-type buildings can be constructed. From a standpoint of plant growth, tall trees which spread roots soon after completion of reclamation work are hard to grow due to gases such as methane and sulphuretted hydrogen contained under the reclaimed land and changes in temperature; on the other hand an underbrush like turf grows fast. It is essential to sufficiently study the thickness of the final covering material, following the objective for ultimate use of the completed site.

i. ultimate use as farmland

A number of ultimate use cases for the completed site are intended for farmlands by reclaiming swamp and mountainous area (valley) to a leveled ground suitable to farmland through landfilling wastes. In order to use the land as a farmland, it is required, in most cases, to select a final cover soil suitable to farming, and to make the thickness of the material approximately 1 - 2 m. Additionally, in order to prevent crops from being affected by generated gas, it is essential to install a gas removal facility. Periodical inspection and maintenance are necessary because of distortion and impairment of gas removal pipes and rain water drains due to settlement of the foundation. And especially, because of the clogging of the pipe which causes the spread of generated gas over the farmland and wither crops to death. In order to obviate negative effects caused by gas, a periodical examination of conditions of generated

gas should be conducted, and thereby, a necessary measure should be worked out.

ii. ultimate use as sporting facilities and parks

A number of disposal sites are used ultimately as a soccer grounds, sports facilities and a park. In order to use the site for these facilities, it is easy and simple to decide the nature and thickness of covering materials, as compared to that for farmland.

Considering that a number of people including children and the elderly use these facilities more often than they would farmland, it is a prerequisite to pay attention to the handling and location of generated gas. The generated gas is treated by diffusing it into air and burning it, but, if the releasing height of gas diffusion and exhaust gas by burning is low, those gases remain in the utilized facilities, depending on climatological conditions such as wind direction, which in turn displeases people by the production of offensive odor. It is necessary to take the aesthetic aspects into account.

iii. ultimate use as car park

As for the ultimate use of the completed site as a car park, although there still remain the problems of the handling of rust produced on cars by gas, the improvement work for this use is easy compared with that for farmlands and parks. Inspection of gas removal facilities and generated gas should be conducted in the same manner as that in other uses, however there still arise a small number of problems such as settlement, in comparison with other methods of ultimate use.

b. Recommendations on ultimate use

Due to settling and gas problems, construction of buildings on completed landfills site is not recommended for at least up to a certain amount of years (over 15 years). Thus, the following ultimate uses are recommended.

A park for the surrounding inhabitants is recommended. The reasons are:

- a great contribution to the surrounding residents;
- in harmony with the existing landscape;
- compatible with the surrounding land use; and
- one of the least expensive methods of land use.

3.5 Cost Estimation

PADS first phase site development project cost is estimated and tabulated in Table 3.5-1. Operation and maintenance cost are estimated and tabulated in Table 3.5-2.

N.1.5 Operation and Maintenance of Equipment

The present operational capability is very limited, because the Maintenance Section of DCTC does not have any maintenance workshop, data on daily, weekly, monthly inspection sheets, and one year operational records for all equipment.

The establishment of the repair, maintenance and back-up services will help the effective use of the equipment and vehicles.

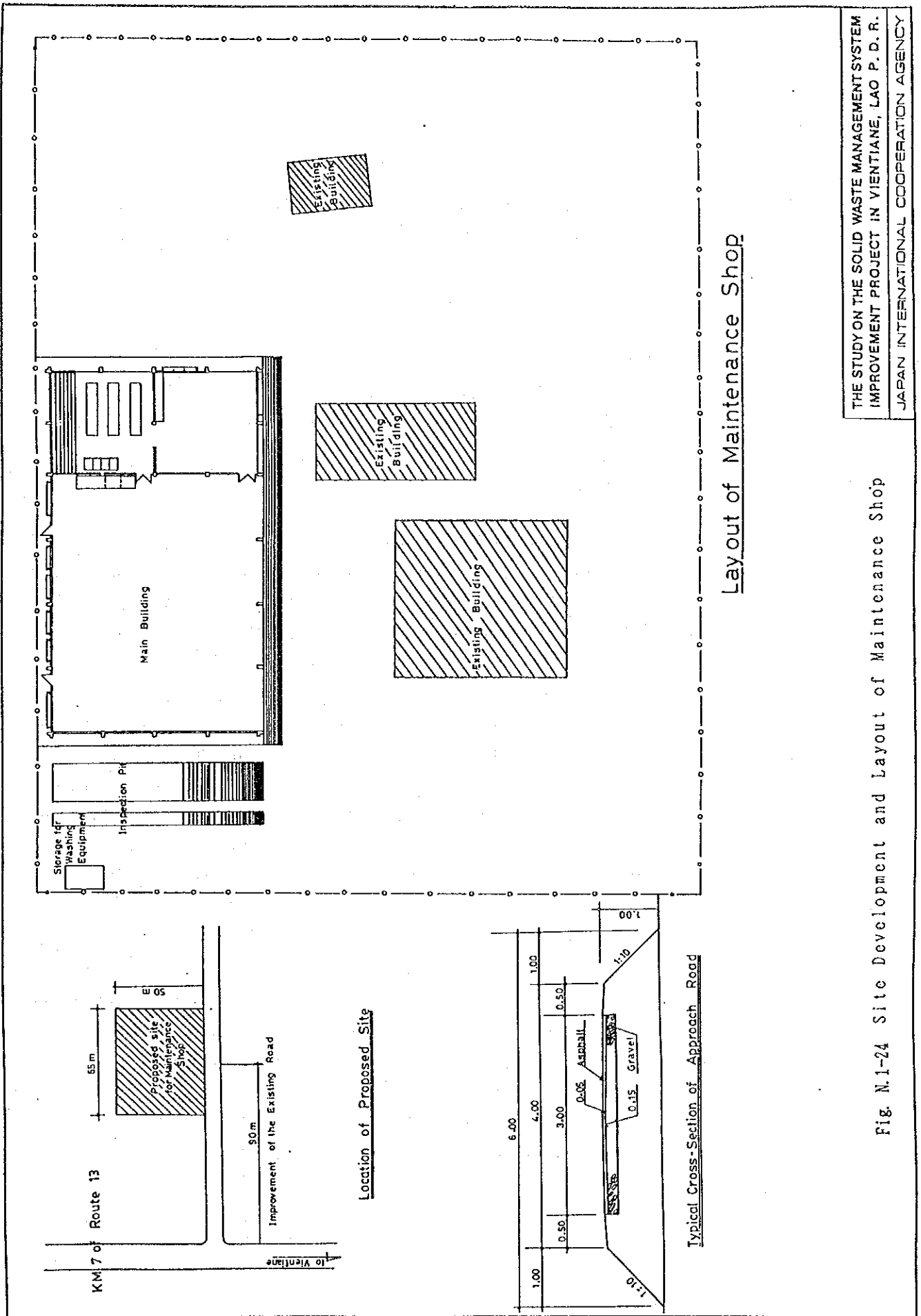
In order to achieve efficient operation and maintenance system for the equipment to be supplied, a maintenance shop at KM 7 and a field storage at KM 18-DS are planned. In addition, the present compound of DCTC headquarters will be used for the vehicle depot. The following are their function and major contents of the equipment to be supplied;

1) Maintenance Shop

a. Site development

In order to establish proper operation and maintenance system for vehicles and equipment, a maintenance shop is planned to be constructed in the compound of previous State Sanitary Company (SSC) of the Municipality located at the KM 7 on the way to the KM 18-DS. A layout of the maintenance shop is designed, as shown in Fig. N.1-24. As shown in Figure, the previous compound shall be developed in order to establish the maintenance shop as follows:

- embankment of the site by imported soil; and
- improvement of the approach road by embankment and asphalt pavement



THE STUDY ON THE SOLID WASTE MANAGEMENT SYSTEM
 IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N.1-24 Site Development and Layout of Maintenance Shop

b. Buildings

The maintenance shop consists of the following structures, as shown in Fig. N.1-25 and N.1-26.

- main building;
- inspection pit; and
- storage for washing equipment.

The functions of the above are described in Table N.1-19.

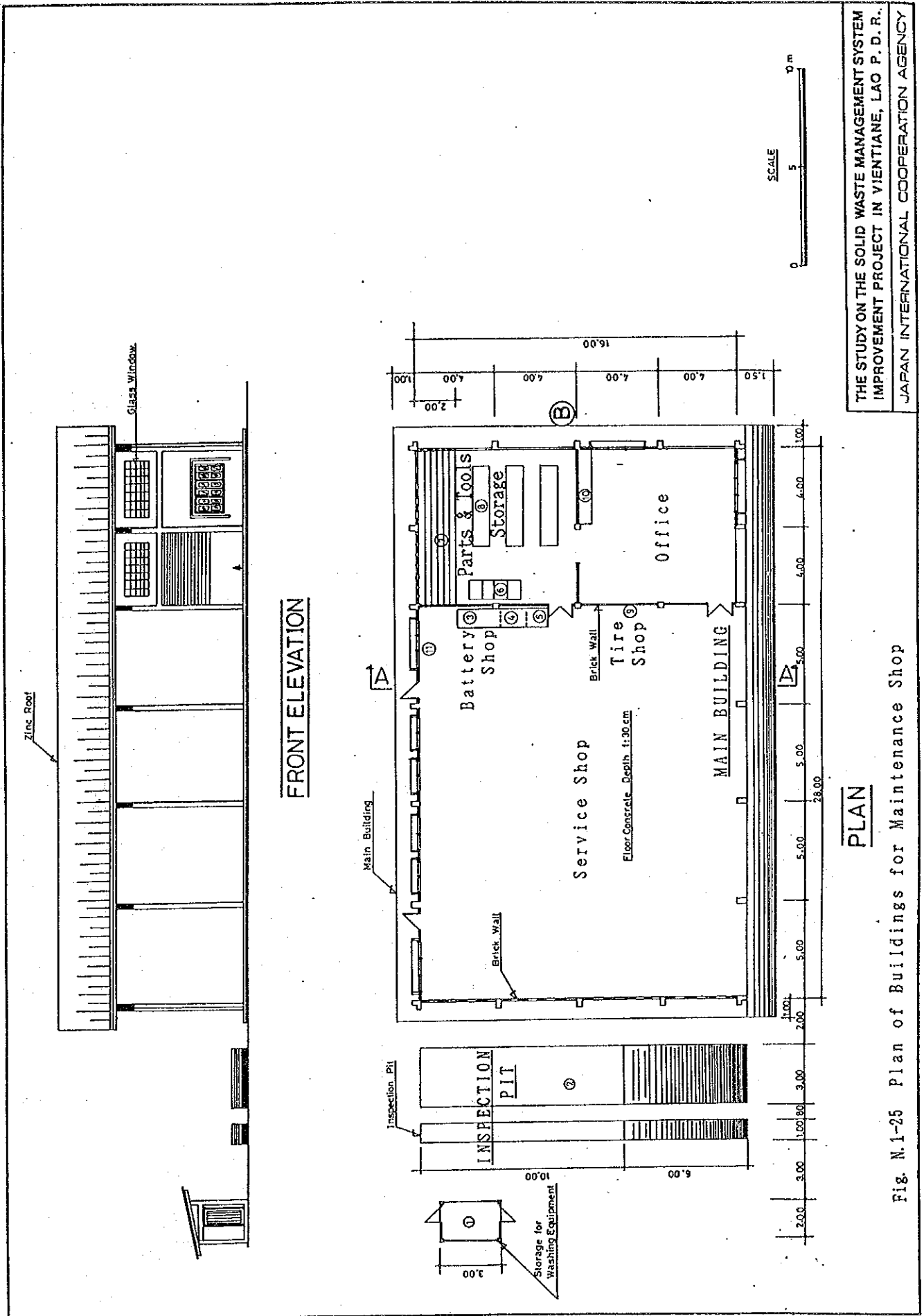
c. Maintenance equipment

The equipment and tools will be furnished for the maintenance and repairing of the vehicles and equipment, thereby ensuring their sufficient operating rate. It is desirable, therefore, that periodical maintenance and repair at an appropriate interval be carried out using these equipment and tools.

Basically, the maintenance and repair of motor vehicles can be largely done by ordinary tools including, open-end wrench, offset box wrench, and other types of wrench, pliers, screw driver, hammer, etc. In addition to supply of the ordinary tools equipment and tools is to be furnished to allow the maintenance of landfill equipment, thereby ensuring a wide range of maintenance and repair service.

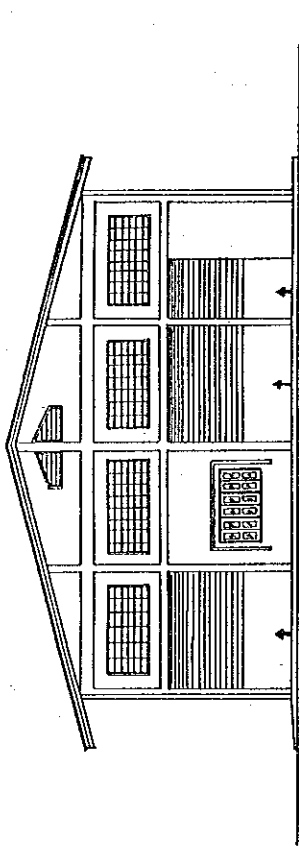
Particular emphasis is placed on those which can be used to disassemble, assemble and measure component parts of the engine and power train. In addition, portable types of equipment and tools were selected to assure the convenience of the works.

Consequently, the following equipment is planned for the maintenance of vehicles and landfill equipment.

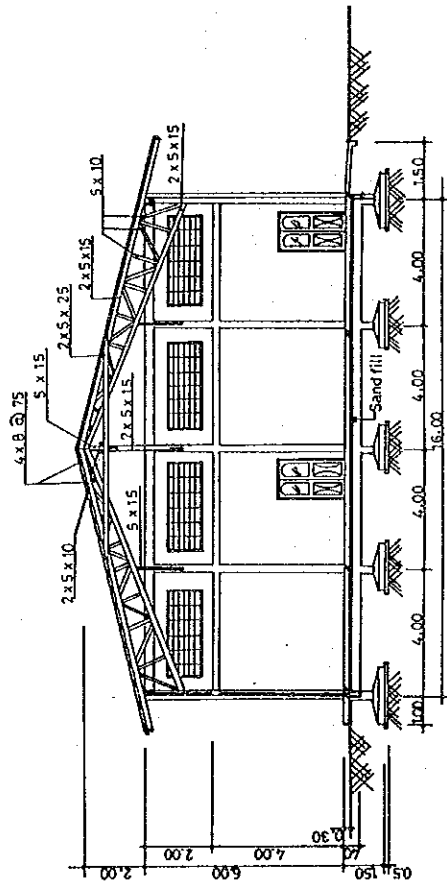


THE STUDY ON THE SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

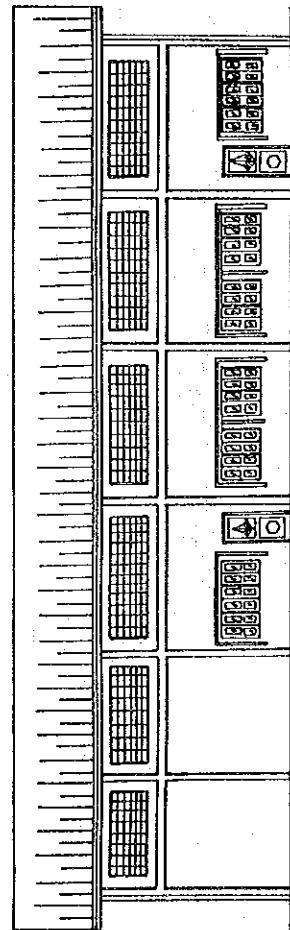
Fig. N.1-25 Plan of Buildings for Maintenance Shop



(B) SIDE



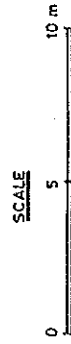
A - A SECTION



REAR ELEVATION

REMARK

- 1 HIGH PRESSURE CAR WASHER AND STEAM CLEANER
- 2 INSPECTION PIT
- 3 BATTERY QUICK CHARGER
- 4 AIR COMPRESSOR
- 5 ELECTRIC WELDER AND GAS CUTTING EQUIPMENT
- 6 OIL STAND
- 7 HEAVY DUTY SHELF
- 8 TOOL SHELF
- 9 TIME RECORDER
- 10 CABINET FOR DOCUMENT
- 11 SHELF FOR DISMOUNT PARTS



THE STUDY ON THE SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N. 1-26 Elevation of Buildings for Maintenance Shop

Table N.1-19 Function of Maintenance Shop

... 1

Items	Function	Major Equipment Required
<p><u>1. Main Building</u></p>		
<p>I. Office</p>	<ul style="list-style-type: none"> - Administration - Management of workers - Control and filing of maintenance record, manual and caraloges - Accounting - Management of vehicles and equipment - Inventory control of fuel, spare parts, tools, oil and tyre - Cost management on operation, maintenance and repair - Key control of vehicles and equipment 	<ul style="list-style-type: none"> - Time Recorder - Cabinet for document
<p>II. Parts and Tools Storage</p>	<ul style="list-style-type: none"> - Control and storage of spare parts and tools - Storage of oil and lubricant 	<ul style="list-style-type: none"> - Oil stand - Heavy duty shelf - Tool shelf

Items	Function	Major Equipment Required
III. Service Shop(4bays)	<ul style="list-style-type: none"> - Regular inspection and maintenance • oil change • valve adjustment • change of fuel elements • minor repair - Final inspection after repair - Issue of the repair specification 	<ul style="list-style-type: none"> - Nozzle tester - Electric welder - Gass cutting equipment - Working table with devices - Shelf for dismount parts
IV. Tire Shop	<ul style="list-style-type: none"> - Inspection and repair of tire 	<ul style="list-style-type: none"> - Tire repair set - Air compressor
V. Battery Shop	<ul style="list-style-type: none"> - Inspection and charge of battery 	<ul style="list-style-type: none"> - Battery quick charger
<u>2. Inspection pit</u>	<ul style="list-style-type: none"> - Inspection of vehicles and landfill equipment - Washing vehicles and equipment - Loading and unloading of landfill equipment 	
<u>3. Storage for Washing Equipment</u>	<ul style="list-style-type: none"> - Storage of high pressure car washer and steam cleaner 	<ul style="list-style-type: none"> - High pressure car Washer - Steam cleaner

i. for general maintenance and repair

- work bench
- machine vice
- tool stand
- hydraulic garage jack
- portable jack
- rigid rack
- parts washing stand
- bench drill machine with floor stand
- bench grinder with floor stand and eye shields
- hydraulic press
- oil lubricator
- grease gun with 3 kinds of micro hose
- drum pump
- drum can carrier
- air inflator
- arc welder with welding accessories
- gas cutting & welding equipment
- nozzle tester
- diesel timing tacho tester
- diesel compression gauge
- service creeper
- hand truck

ii. for tire shop

- tire bead remover
- chuck gauge
- air impact wrench with impact socket and impact wrench holder
- tube tire repair set
- tube-less tire repair set
- tire service tool set
- high power wrench
- housing nut wrench
- air compressor

- refrigerated air dryer
- air regulator
- air transformer
- air hose
- hose band

iii. for battery shop

- battery quick charger
- battery hydrometer set
- battery filler
- polyethylene funnel
- polyethylene measure
- battery tester
- booster cable
- circuit tester
- insulation tester
- solderless terminal kit
- wire stripper

iv. for parts and tools storage

- tool and parts shelf
- heavy duty shelf
- pallet, plastic type
- oil measure
- pistol oiler
- handy can
- drum spanner
- drain plug wrench
- oil filter wrench
- quick hose connector, socket and plug
- vice plier & welding plier
- metal cutting snips
- hack saw frame
- hack saw blade
- spray gun with container

- car-air-conditioner service kit
- vacuum pump for car-air conditioner
- refrigerant leak detector
- clutch linger
- air impact wrench
- electric drill
- drill set
- impact driver set
- test hammer
- sledge hammer
- tool set, portable type
- tool set, heavy duty type
- torque wrench
- universal puller set
- chisel & punch set
- electric soldering iron
- solder
- wire brush
- tool tray
- garage lamp
- vernier caliper
- outside micrometer set
- tape measure
- steel rule
- straight edge
- iron bench level
- thermometer
- thickness gauge
- dial gauge
- magnetic base
- v block
- hand spring balance
- surface plate

v. for office work

- time recorder
- time card
- card rack
- cabinet for time recorder
- desk & chair

vi. for inspection pit

- high pressure car washer
- hot water car washer

2) Field Storage at KM 18-DS

For the efficient operation of vehicles and landfill equipment at KM 18-DS, a field storage at KM 18-DS is necessary. The functions of the storage are,

- to execute maintenance and minor repair of vehicles and equipment at the site; and
- to keep fuel, oil and lubricant.

Consequently, the following maintenance equipment is necessary.

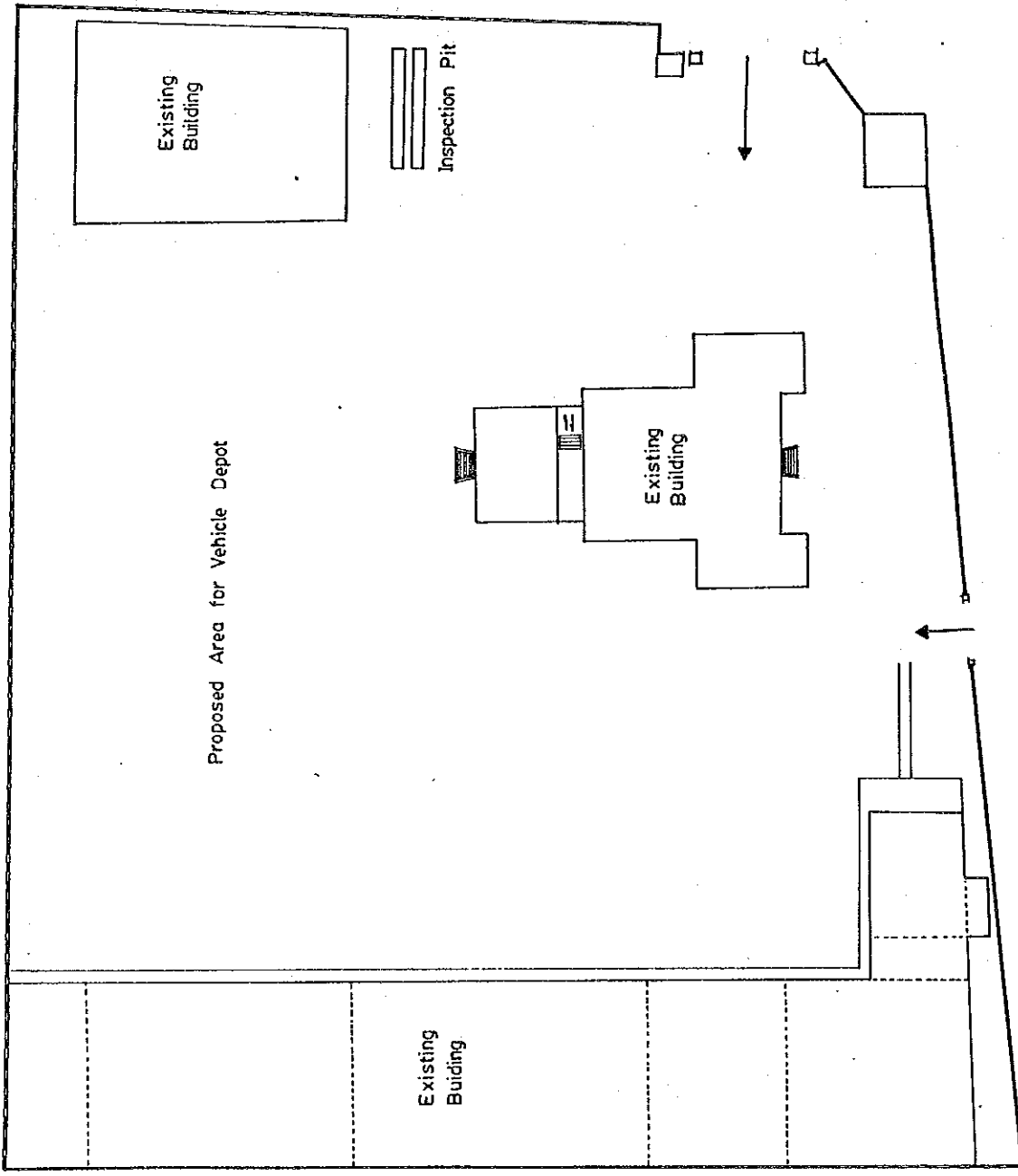
- hand tool set
- heavy duty tool set
- grease gun with 3 kinds of micro hose
- oil measure

3) Vehicle Depot

In order to execute the first priority project (Phase I), the Municipality shall increase the number of vehicles and equipment. Thus a large area of land will be necessary for the depot of them in order to properly operate and keep them. It is proposed that the present compound of DCTC headquarters will be used as the depot. As shown in Fig. N.1-27, enough area (9,000 m²) is available for the depot and the location of the site is desirable.

4) Operation and Maintenance of Equipment

An operation manual for SWM is prepared and described in the section N.5.1. The operation and maintenance of equipment is described in the manual.



THE STUDY ON THE SOLID WASTE MANAGEMENT SYSTEM
 IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. N.1-27 Proposed Vehicle Depot

N.2 Institutional Plan

N.2.1 Organization

1) Organization Scheme

In order to realize the Basic Plan, establishment of the USD (Urban Service Department) is proposed. For the smooth implementation of the first priority project, the USD is to be set up by 1995. An organization scheme, as shown in the Fig. N.2-1, is proposed for the new Urban Service Department of the Vientiane Municipality which would be established by employing additional personnel in addition to deploy the existing cleansing personnel.

Note:

- a. The Cleansing Service Section I is responsible for collection and haulage of solid waste.
- b. The Cleansing Service Section II is responsible for road sweeping, grass-cutting, drain cleansing and clean-up of illegal dumps.
- c. Details of the functions and role of each section is described in Appendix J.2-2, Supporting Report (2).

2) Manpower Scheme

Personnel requirements projected for 1995 according to sections are shown in Table N.2-1. In total 197 persons will be required which about three times large of the present manpower size. 130 personnel shall be recruited.

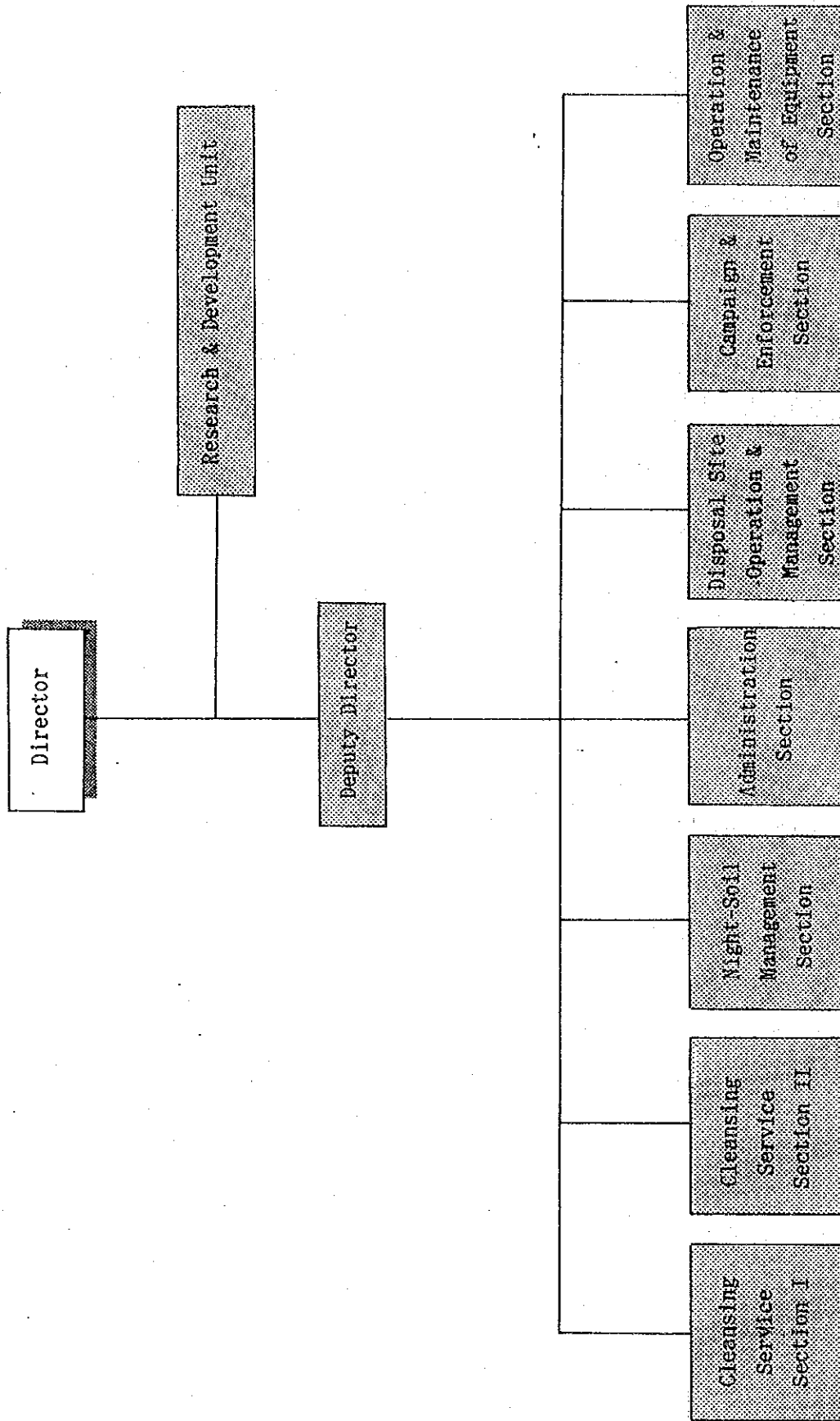


Fig. N.2-1 Proposed Organization of the USD

Table N.2-1 Proposed Number of Personnel According to Section (1995)

Name of Section	Position	Manager	Engineer	Supervisor	Technician (Mechanic) or Operator	Clerk or Fee Collector	Driver	Worker	Total
1. Research & Development Unit		1	-	-	1	-	-	-	2
2. Administration Section		4	-	-	-	24	-	-	28
3. Cleansing Services Section I		1	1	3	-	-	17	59	81
4. Cleansing Services Section II		1	-	2	1	-	6	29	39
5. Night-Soil Management Section		1	-	1	1	2	7	15	27
6. Disposal Site Operation & Management Section		1	-	-	2	1	1	1	6
7. Campaign & Enforcement Section		1	-	1	-	2	-	-	4
8. Operation & Maintenance of Equipment Section		1	-	1	4	4	-	-	10
Total		11	1	8	9	33	31	104	197

FILE : ORGAN-1

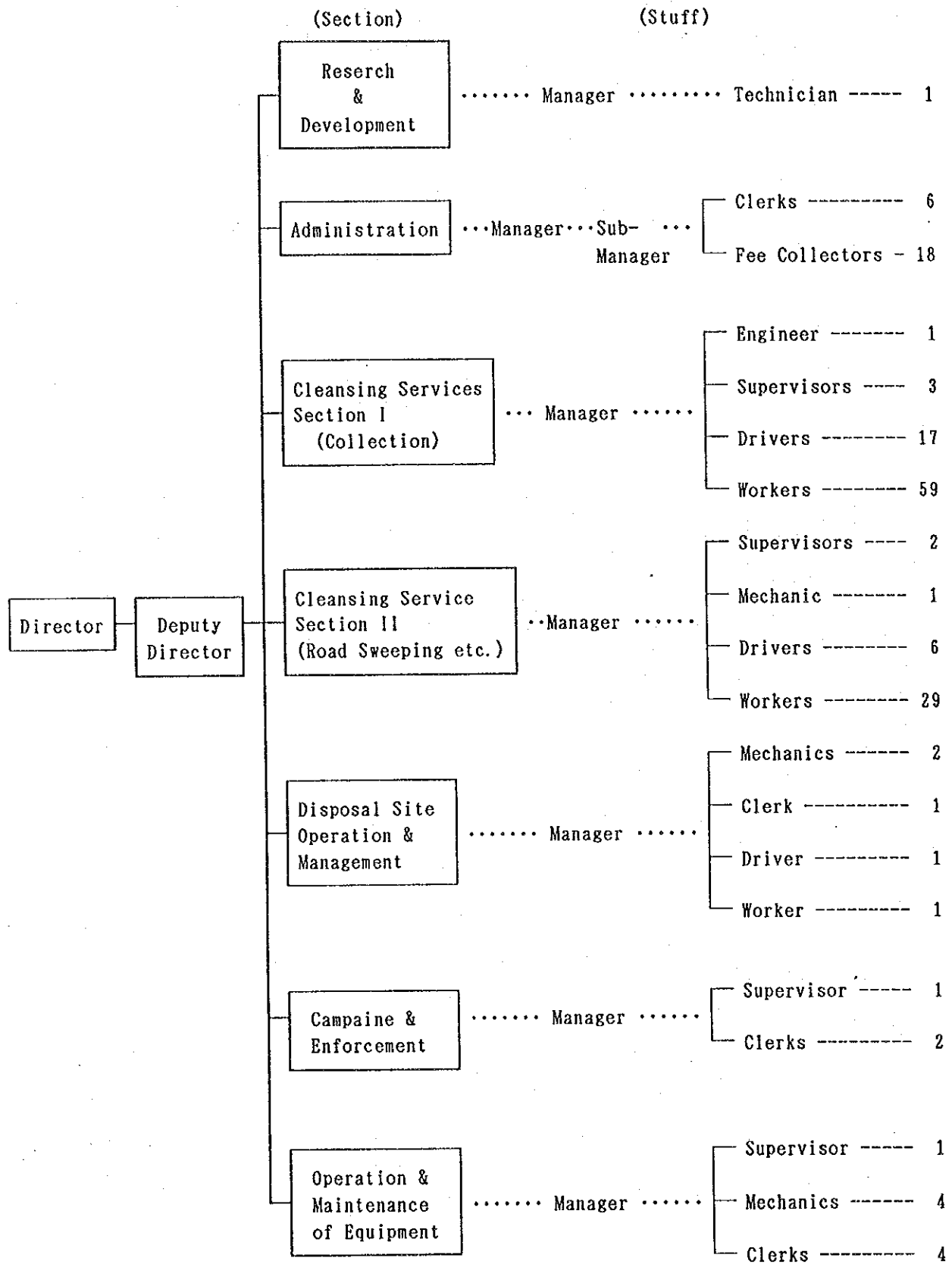


Fig. N.2-2 Organization Scheme of USD

3) Organization Scheme for the USD

The organizational scheme, as shown in Fig. N.2-2, is proposed for the USD. It is proposed that both manager and supervisor would generate more managerial and planning inputs rather than occupying themselves with daily routine.

The managers are expected to concentrate on non routine matters such as

- identification of fundamental problems;
- planning for system improvement and expansion of collection area;
- maintaining effective disciplinary control and strengthening employees work-morale;
- inter-sections communication to exchange experience and know-how;
- overall supervision;
- monitoring the service performance of the section's workers;
- data gathering and analysis; and
- measurement of productivity and cost control.

4) Establishment of Appropriate Role of Each Organization

The roles of the organizations involved in solid waste management shall be reviewed and the needs for modification and enhancement of their roles shall be identified. The functions, responsibilities and authorities of each organization on solid waste management shall be re-defined. Then, the appropriate role of each organization including the private sector shall be established. The establishment of an inter-ministerial or inter-departmental committee shall also be encouraged.

5) Improvement of Working Conditions

The Municipality's labour management is generally weak and loose in terms of its disciplinary control and work-morale support. The loose management, in fact, is an important element which explains why the Municipality is more inefficient than private contractors in terms of waste collection.

In order to improve the labour management, it is necessary to improve the working conditions by means of the supply of lockers, shower rooms, uniforms, etc. to the workers.

In addition, the good labour management requires fair and quick evaluation of employees job performance and behavior. Results of such evaluation then should be expressed in terms of disciplinary actions and rewards.

6) Establishment of Regulatory System of Private Companies

Even after the improvement of SWM shouldered by the Municipality, there will remain some works done by the private companies. It is, therefore, necessary that a regulatory system of private companies shall be established in the Campaign and Enforcement Section in the USD. The system will include the following works;

- licensing; and
- supervision of collection services done by the private companies.

7) Establishment of Training System

It is recommended that the National Government will establish the education/training programs as shown below.

- a formal post-diploma course on SWM for relevant personnels
- sanitary engineering course at university
- seminar/workshop on SWM

It is recommended that Local Authorities should provide SWM training in the following forms:

- to promote discussion horizontally among same level of positions and vertically among different level of positions in order to identify and solve problems.
- to give engineers and supervisors opportunities to visit other Local Authorities including abroad to observe their SWM systems and exchange opinions.
- on-the-job-training.

N.2.2 Finance

1) Basic Concept

As mentioned in the Basic Plan, the establishment of 100% self-finance system through fee collection in 2000, i.e. the Beneficiary-Pay-Principle, is a main objective. Although the participant ratio in the collection experiment was about 30%, considering income level and fee set up (1,000 kips/household/month), the residents of Vientiane Municipality were found to be rather willing and cooperative in the payment of collection fees. It is, however, also necessary to examine a self-finance system by means of the cross-subsidy through the introduction of a new tax system for the Municipality or the increase of the present land tax. Further, in addition to maintain the Beneficiary-Pay-Principle, it is also important to make efforts which would make sure of the fixed collection time, the equal allocation of shares concerning the collection fees, and the use and flow of the fees collected.

The Phase I level aims to establish the foundation for a 100% self-finance system in 2000 by promoting the improvement of the fee collection and accounting systems.

For the establishment of the equal allocation of shares, there are following problems to be solved.

a. Weak financial foundation

The first problem is the weak financial foundation of Vientiane Municipality. Aside from an unimproved local tax system, its ability to manage its budget to cope with the annual increase in the volume of waste to be collected is also a big problem, as the budget for investment is almost dependent on foreign assistance. Nevertheless, nothing much can be done on this aspect except to leave it under the care of the capital city administration regarding waste disposal services.

As stated in the Basic Plan, the costs of road, drain and park cleansing services and the collection and disposal costs of waste discharged by the public institutions under the Municipality shall be shouldered by the Municipality.

b. Tipping fee

The expensive tipping fees will reduce the benefits which private enterprises gain by independently hauling waste to the disposal site and might increase dependency on the collection services of the administration. It is, therefore, desirable to gain the cooperation of private enterprises in Phase I where collection ratio is low, to aid the insufficient collection services. Further, the imposition of expensive tipping fees would only motivate illegal dumping. The cost of the container system proposed for institutional wastes is more expensive than the use of bamboo baskets. The use of containers, however, is tremendously labour saving when large volume of wastes have to be discharged, and is, therefore, much more desirable in the long run.

Although a financial study is basically done in accordance with the Beneficiary-Pay-Principle, a study will be made on the partial allocation of the share of the costs; i.e. Although landfill cost shall be about 4,200 kips/ton, it is set at 400 kips/ton in order to avoid illegal dumping and the balance is allocated to the collection fee.

2) Fee Collection System

The fee collection for collection and disposal services was proposed under 3 systems, however, partial modifications were deemed necessary after the collection experiment.

The fee collection system according to the services is as shown below:

- Basic collection services : Basic Fee
- Extra discharge : Extra Fee
- Large discharge (by mean of container) : Special Fee
- Disposal service (no collection service) : Tipping Fee

a. Basic and extra fee

Before the collection experiment, the need for door to door services was supposedly strong. As observed during the collection experiment, proper instruction to the residents could realize their cooperation in the discharge of waste. The collection fee of wastes in households and shops will consists of both the basic fee and extra fee system to meet with the smooth acceptance of temporarily large discharge.

The monthly contract for basic fees will be calculated according to the number of bamboo baskets, and only marked bamboo baskets will be collected. Extra fee coupons shall be sold during contract negotiations. These coupons shall be handed over to the waste collectors when the collection of waste excluded from the contract is required.

b. Special fee

The special fee for containers shall be based on the collection frequency, that is, the number of times collection, which would depend on the volume and kind of waste, is conducted. As a rule, collection will be conducted 4 times a month, once every week.

c. Tipping fee

As a truck scale is provided in the disposal site, a tipping fee system according to the amount of waste is possible. In consideration of the former fee collection system, however, the tipping fee will depend on the type of vehicle used for collection.

The basic fee, extra fee and special fee does not only cover the collection and transportation costs but also the final disposal cost.

3) Expenses and Fee Table

The cost of the Feasibility Study project is shown in section N.3 Based on the 313 working days of a year, the amount of waste, service cost and necessary share according to the services' recipient are calculated and tabulated in Table N.2-2.

Table N.2-2 Amount of Waste, Service Cost and Necessary Burden in 1995
(Unit: ton/day and million Kips/year)

Services Items	to be collected	to be disposed	to be cleaned	Ton per Year
1. Amount of Waste				
Household & shop	50.3	50.3		15744
Institution	7.1	7.1		2222
Public	0.9	0.9	0.9	282
Collected by PC*		10.0		3130
Direct haul		4.0		1252
Total	58.3	72.3	0.9	22630
	collection	disposal	cleansing	Total
2. Service Cost				
Cost required by the work	230.2	122.3	126.3	478.8
Management cost	13.2	0.8	4.4	18.3
Maintenance shop	21.0	5.2	5.4	31.7
Total	264.4	128.4	136.0	528.8
3. Necessary Burden				
Household & shop	228.1	89.3	0.0	317.4
Institution	32.2	12.6	0.0	44.8
Public	4.1	1.6	136.0	141.7
Collected by PC*	0.0	17.8	0.0	17.8
Direct haul	0.0	7.1	0.0	7.1
Total	264.4	128.4	136.0	528.8

Note: PC* means private contractors

Based on the Table N.2-2, necessary cost share according to the services' recipient is calculated in Table N.2-3.

Table N.2-3 Necessary Cost Share according to Services' Recipient

	Cost Share (million Kips per year)	Collected Volume (ton per year)	Cost Share (kips per ton)
a. Share of Household and Shop	413.2	25,584	16,148
b. Share of Institution	38.5	2,385	16,148
c. Public Share	142.4	282	504,964
d. Direct Haulage*	18.7	4,470	4,176

Note: * Direct haulage includes waste collected by 3 private companies.

From the above-mentioned cost share and willingness of the residents to pay, the tariff will be increased in step by step up to the necessary cost share as shown below:

Table N.2-4 Tariff for SWM (Unit : Kips)

Fees	year	1995	1998
Basic Fee(per basket/month)		1,000	1,200
Extra Fee(per extra basket)		250	250
Special Fee(per container/month)*		30,000	50,000
Tipping Fee			
per small vehicle		600	900
per middle vehicle		800	1,200
per large vehicle		1,000	1,500

Note : * The Fee is determined based on once a week collection. In case of twice a week or once a month collection, it is twice or one fourth of the settled fee, respectively.

It is necessary to check monthly the change in the cost by keeping the cost analysis sub-program in the accounting system installed in the collection experiment. By accumulating these data and analyzing them, it is possible to revise the proposed tariff in the future.

It is also necessary to yearly allocate VM budget to cover public share.

4) Fee Collection System

Fee collection system in Vientiane is conducted through bank remittance and direct payment to fee collectors. Generally, fee collection by fee collectors causes trouble, though little trouble is observed in Vientiane mainly due to the nature of the people of Lao. To avoid problems, however, it is necessary to keep customers' records and conduct daily book keeping as in the collection experiment.

The collection of tipping fee at the disposal site should be continued also. But it may be more advantageous to issue pre-paid coupons for private cleaning companies.

5) Related Measures

a. Examination of the reduction of the proposed collection fee (1000 kips/household/month)

By the year 1995, the proposed collection fee system shall be maintained and collection service ratio will be increased from 4.8% to 50%. This target could be achieved by the expansion method proposed by the Study. It seems, however, to be very difficult to increase the ratio from 50% to 100% by 2000 due to the existence of the poor households. It shall be, therefore, necessary to reduce the proposed collection fee making up the deficit by means of the cross-subsidy through the introduction of a new tax system for the Municipality or the increase of the present land tax.

b. Clear record keeping and computerized data processing

The issuance of receipts and the keeping of customers' records should be continued, as in the collection experiment, for fee collection. Accordingly, the effective use of the personal computer supplied for the execution of a Seminar and the continuance and improvement of the training program for the staff is necessary.

When collection services are extended all throughout the Vientiane area, back-up equipment like computer and its accessories will be necessary, and is subjects of future studies in Lao.

Further, the establishment of a new department would necessitate the clarification of collection responsibilities and the investigation of an independent accounting system.

c. Monitoring of illegal dumping and imposition of fines

To continue the collection of tipping fees, the establishment of a monitoring system for illegal dumping of wastes and the imposition of fines are most important. Although managing sections will be established in the new department, satisfactory results can not be expected from the efforts of the employees alone. Therefore, a study on how to gain the active participation/cooperation of the residents should be made.

d. Improvement of work conditions and securing qualified staff

To make the work appealing to the workers, the terms of employment should be improved by raising wages, working time, and social welfare benefits. It is particularly important to establish an incentive system to counteract the workers' acceptance of tips. Acceptance of tips, therefore, should be prohibited.

Moreover, as bribing of those in charge of the enforcement of the laws against illegal dumping is very much possible, it is doubly important to employ people of integrity for this position. In addition, the employment of retired individuals for this post could prove to be beneficial.

N.2.3 Laws and Enforcement

1) Establishment of Proper Legislation and Regulations

The existing legislation and regulations shall be reviewed and the needs for modification and enhancement of them shall also be identified. Then, the proper legislation and regulations on solid waste management shall be established.

2) Aspects for Legal Control

Some legal control is necessary in the following aspects of solid waste management.

- waste storage and discharge method to be applied to households and business establishments;
- waste collection fee and tipping fee;
- control of toxic waste;
- control of illegal dumping; and
- control of anti-littering.

3) Establishment of Enforcement System

Vientiane Municipality is weak and poor in law enforcement. Whether or not the Municipality can effectively enforce the law depends entirely on the intention of the Municipality's Administrators. Their firm determination is much desired. It is necessary to establish the law enforcement system.

Campaign and Enforcement Section will be set up in the USD to expand its collection service, to stop the illegal dumpings and littering of waste, and to improve its SWM.

This Section will have one manager, one supervisor and four overseers who will be mobilized for campaign and enforcement. Both manager and supervisor are expected to prepare a plan to strengthen the law enforcement system.

N.2.4 Public Education

1) Objective of Public Education

Both National and Municipal Governments should be responsible for educating the public concerning the following aspects,

- proper storage and discharge manner;
- reducing litter in public places;
- eliminating illegal dumping of waste; and
- resource recycling

2) Public Education by the National Government

There may be two major forms of public education on SWM which can be given by the National Government: one through school and the other through mass-media.

Basic education with respect to cleanliness and health is given at primary schools in Lao P.D.R.. It is recommended that some education on waste should be given at primary or secondary school levels. A solid waste education program for the primary school is prepared and used for the campaign in the collection experiment. The program is written both in English and Lao, as shown below.

A scenario for environmental education (draft)

the principal object: to make children understand the necessity of waste disposal and its treatment method

target : higher graders of elementary schools

method : a form of dialogue between teacher(B) and pupil(A) using simple pictures

material: an illustration of each subject---a total of about eight illustrations

subject : there will be eight subjects and they are as follows:

1. What is waste?
2. Is waste harmful?
3. Why is waste generated?
4. How is the waste disposal condition in Vientiane?
5. What do you think of the disposal system in other countries?
6. How should we dispose waste?
7. Where do wastes come from and how are they disposed?
8. What can we do to get rid of waste in our town?

1. What is waste?

A : What is waste?

B : It's a thing which we can't use any more.

A : Such as?

B : I'll give you some examples. Food refuse, and, waste paper are all wastes.

AB: Let's study more.....(a teacher considers the problem with pupils).....

A : What kind of garbage is at your home?

B : Leftover foods, such as banana peels and fruit pips, wrapping papers, small fabrics, broken papers and magazines,

empty cans and bottles, twigs and fallen leaves in the garden, broken bamboo baskets, broken shoes, broken tubes of bicycles, mud and pebbles appearing when we clean-up the garden, and also father's cigarette butts.

A : A lot of things! Anything else?

B : Garbage can be found in shops, restaurants and factories, too. Corrugated cardboard boxes can be found in shops, lots of inedible foods and leftovers in restaurants, and residues of various materials in factories. Wastes are generated in the offices and the hospitals, as well. Let's consider what kind of wastes are generated in such places by thinking about the nature of the job.

A : I guess they make documents in offices....Oh, I got it! Documents are made of papers. So there are many useless old papers and documents with many errors in it. A Hospital is the place where you send patients for treatment. I wonder what kind of wastes are generally generated from hospitals?

B : Empty medicine boxes, sterilized gauze used before doctors give patients shots, small medicine bottles, used needles, both blood-stained gauze and bandages used in operations--- a lot of things are disposed from hospitals.

A : Are there good and useful wastes?

B : Actually, there is no such thing as bad wastes, but because man throw waste away, they become harmful. There are even some useful ones.

A : What kind of wastes are useful?

B : For instance, empty cans can be recycled in the factories. Also, empty bottles can be used repeatedly by cleansing them. I'll give you another example. Trash is used for making newspaper and toilet paper. Plastic is also used to produce new ones if it is in bulk.

B : Leftover foods and fallen leaves can be used as fertilizers for vegetable spots in the backyard and even for trees or potted plants.

A : Really? There are indeed some useful wastes, aren't there!?

2. Is waste harmful?

A : Are wastes only considered as dirty things, or are they harmful?

B : Newly discharged wastes are not harmful. But as time passes, they rot and a lot of bacteria thrive on it. If you are playing at roads or open spaces where garbages are scattered, bacteria would stick on your hands, feet and legs and penetrates unknowingly into the body through the mouth or the eye. Bacteria in the body becomes gradually active, causing eye and stomach pains. Weak children or old people could die from the diseases caused by bacterias.

A : I remember seeing worms and cockroaches in the garbage before. There were flies and rats eating it, too.

B : Insects usually inhabit unattended wastes and without our knowing it, we are actually helping them propagate.

A : They are terribly harmful, aren't they? But there are some wastes that never decompose, like plastic.

B : Plastic can be troublesome, too. It gets blown by the wind into a waterway, blocks the waterway and prevents the flow of water. Standing water causes stench and the propagation of various bacteria and harmful insects. You can get infected with dengue fever, malaria, or any serious disease when bitten by these insects.

A : Is dengue fever a terrible disease?

B : Yes. When bitten by a mosquito, you start having fever, headaches, develop eczema all over your body, and finally you die from excessive bleeding from the eczema. 10 out of 100 persons infected with dengue usually die. You have already heard about the effects of malaria, haven't you?

A : Then, it is necessary to clean the waterway for the water to run smoothly.

B : It is not only the waterways, it is also very important not to make water stand by not throwing empty cans or old tires just about anywhere.

A : Sometimes my parents burn garbage at home. It's very

smoky.

B : The problem lies not with the smoke but with the possibility of inhaling the toxic gases emitted from burning plastic. You should avoid doing so and also tell your family about it.

A : O.K. By the way, I think the garbage of sick person is very dangerous because it contains bacteria and is stained with various kinds of medicine.

B : It certainly is. You must especially pay attention to discarded needles and gauze or bandages because they are filled with bacteria and you might get contaminated with diseases.

A : Now I understand that there are many kinds of waste. Harmful ones, useful ones, although I think a large quantity of these wastes are harmful.

3. Why is waste generated?

A : I wonder why waste is produced.

B : Wastes are usually produced wherever man lives.

A : Then, are there no wastes in deserted places?

B : No, there aren't. For instance, no waste is found in an uninhabited island. Human beings can't live without food, and the inedible ones become garbage. The more civilized and cultured we become, the more wastes we produce. For example, we wear clothes, right? There are always some fabrics which can not be used anymore whenever a dressmaker finishes making a dress. You also watch TV, right? Well, the production of TV sets require the use of various materials and there are always those which are not usable anymore. These become waste.

A : Well, I don't think I make garbage at all.

B : When you buy candy at the shop, don't you throw the wrapping paper away after eating? By doing so you produce garbage. Even the plastic bag used for the items you bought, you probably throw it away into a trash can, after taking all the contents out.

A : OH! Now I know we produce waste without being aware of doing so. Even if the garbage produced by one person is very little, the amount multiplies immediately in crowded areas.

B : That's right. When a large crowd turns out during festivals in particular, wastes can be found here and there.

4. How about the waste in Vientiane?

A : There are lots of wastes in our city now, and I want to know the present waste disposal condition.

B : Your mom and dad do not fully know how harmful the waste can be. It has been the practice of many for ages now to put out waste in vacant lots, into waterways or rivers, because they are not aware of the effects.

A : At home, sometimes we throw away garbages into the Mekong or just burn them.

A. Yes, I know. Because everybody burns garbage at home, the the city must be filled with smoke. If the air is always filled with smoke, the throat of small children and unhealthy persons would weaken, and coughing would be developed. In addition to this, there are some poisonous gases in the smoke, such as those from burning plastic, that even healthy people like you can get sick.

A : At home, my parents dig a hole at the corner of our garden and deposit garbage in it.

B : It's a very good idea. But the hole must be deep enough to prevent bad insects and rats from digging the hole and eating the garbage.

A : At my house, when the garbage is piled up, my parents ask the collector to take the garbage away in exchange for money. I wonder if there are many waste collection companies around.

B In Vientiane, there are three private contractors

(collection company) and one such as DCTC belonging to the government. They don't own many trucks, however, and those they have are very old and often out of order. So even if you ask them to come, the regularity of their services is questionable. In addition, many people think that the discharge of waste is permitted anywhere, therefore only a few have their waste collected in exchange for money.

A : How many homes are under contract with the collection companies?

B : Only seven homes out of one hundred are under contract now. Very few.

A : Only seven homes!! Waste collection might as well never exist. No wonder the city is filled with garbage. It's embarrassing. By the way, where are the collected waste disposed to?

B : There is a dumping ground in the suburbs of the city. But the garbage is just left as it is. For this reason, the garbage is scattered around, and flies, cockroaches and rats can be seen moving everywhere. Also the waste is sometimes burnt at the disposal site, so the air is very smoky and the place stinks. And it is also very dangerous because harmful wastes are not separated from the rest.

5. How is the disposal system of other countries?

A : Although I understand the waste disposal condition in Vientiane now, what about in other countries?

B : In every country, they first tried to get rid of the waste around the houses and waterways, to avoid diseases. Then, they cooperated in removing wastes from roads and parks to create a comfortable environment. For example, cities like Washington D.C. of U.S.A., London of England and Tokyo of Japan are very beautiful. Dustbins can be found anywhere in crowded places and littering is not observed. Singapore, our neighboring country, is particular the best, as the towns are clean without a single litter. Although there are many

people assigned to do cleaning services in these countries, everybody cooperates in cleaning the towns. The citizens of these countries are very proud of their clean cities.

A : There must be some who do not abide by the rules and throw wastes carelessly.

B : If you throw litter in the waterways or the roads there, you would either be fined or imprisoned. Of course, this is not the only reason why they don't litter waste, what is uppermost is their desire to keep their country clean.

A : They are very strict in other countries, aren't they?
Do they pay for the collection service?

B : Of course, they do. It is their waste that will be collected and disposed of anyway. But money is not very important here. The most important thing is everybody's voluntary avoidance of throwing waste anywhere and the efforts of minimizing the production of waste.

A : The collection of waste put out, I guess, would require many laborers and trucks, and also a place where they will be managed properly.

B : Many workers and trucks are employed in these countries. A lot of money is being used, too. However, since Lao does not have lots of funds, it can not employ many workers or buy many trucks. It shall, therefore, require everybody to cooperate more than what is observed in other countries. The people who willingly pick up scattered wastes and workers engaged in waste collection services are highly respected in other countries.

A : That's true. We should, therefore, keep our country clean by not littering waste to be able to contend with other countries.

6. How should we put out waste?

A : Then, what should we do if garbage is produced?

B : It's easy. Put it away in a trash can, and don't throw garbage away into open spaces, waterways and rivers.

A : How about if there are no trash cans?

- B : You have to find a dustbin and throw it in or, if you can't find one, you'll have to take it home with you.
- A : That's troublesome. I think it's O.K. to throw it somewhere if only a little is involved.
- B : If everybody says so, the towns will become full of garbage, will never be clean, and be filled with bacteria forever. The garbage you throw could harm other people. You should be responsible for putting your waste away, therefore, and follow the 'do it yourself' motto.
- A : Okay, I promise to be responsible for my waste. But even if I put my waste in the dustbin at home, they might get blown away by the wind and scatter.
- B : Good question. What will you do in order not to prevent your waste from scattering?
- A : It's easy. We have to keep the waste covered by using a lid.
- B : You're right. Any kind of lid will be acceptable as long as the bin is covered to keep the garbage from scattering. Then a little idea such as this could save the town. Encourage your parents about the idea and make lids by yourselves.
- A : I'll try! By the way, how do I deal with reusable wastes?
- B : What do you think is going to happen if you do not separate reusable wastes from useless ones?
- A : We will have to select the reusable waste from the lot and it will be very messy! Oh, I got it. We can put the wastes out separately by using one trash can for useless wastes and another for reusable wastes.
- A : I know that wastes should be kept in dustbins. But what if the dustbin is full? Should I take it out somewhere and dispose of it?
- B : You have to take the waste to the designated place and put it out properly. In Vientiane, there is a disposal site far from town. The individual disposal of waste would take a lot of time and the disposal site might be crowded with cars if all the people are headed there. That's why there are people working for the waste collection service, and they collect wastes from the houses and carry them to the

disposal site by truck.

A : Do they collect waste for nothing?

B : You have to pay for it, as it is your waste that is going to be collected. Further, the collection would also require trucks, gas and drivers.

A : I would rather pay money than get sick. And also, it will make the town become comfortable.

7. Where do wastes come from and how are they disposed?

A : A baby is born from a mother. He goes to kindergarten, goes to primary school as we do, becomes an adult, works hard, grows old and finally goes up to the heaven. But how about waste?

B : You do understand now where wastes come from, don't you? Waste is generated, and, is placed in a trash can. Waste likes to play outside like your brothers and sisters running in the kindergarten playground. It also tends to fly away into waterways or roads, and should, therefore, be properly placed in trash cans. You have to keep an eye on it. The waste stays in the can for two to three days, and it goes to school called collection vehicle. At first the waste is piled up in a big truck called dump truck. The quantity of the waste increases gradually as the truck travels from house to house until a lot is tightly piled up in the dump truck, leaving no more space for more. The trucks then heads to the suburbs.

The waste in the dump truck arrives at a disposal site. First the waste in the truck is scale and is emptied onto the ground. After the dump truck leaves, a heavy tractor comes along and covers the waste with dirt. Thus, as years go by, the waste gradually decays and melts and becomes soil. But some wastes like plastic, however, never change to soil.

A : What is the shape of the disposal site? Is it like my house?

B : They are going to build a new one, where a measuring machine is to be installed in front of its entrance. A management

office will be built, too. The waste house will be surrounded by 2m tall embankments. The house will have no roof. And a place for washing trucks will be installed, too. The construction of such a disposal site is being planned now.

A : What are the embankments for?

B : To keep the waste in its place and to store the water generated from the waste in the banking.

A : Like a dam to keep waste.

B : Yes, it's like a small dam.

A : Why do they weigh the waste? I don't think there is a relationship between cleaning and weighing.

B : If you know how much waste is brought in from each district, you can assume how much waste will be brought in next from new districts. You will be able to know, too, the weekly quantity of waste by studying it for a long time. Thus, you can calculate the quantity of the waste per month and per season, too. Then you can easily estimate how many trucks you need, how big they should be and how big a disposal site should be required. It is, therefore, necessary to weigh the waste for planning.

A : I don't think it's good to weigh the waste while it is still contained in the truck. I mean they should be weighed after they are discharged from the truck.

B : It's troublesome. You have to put the waste on the truck again to take it to the disposal site. It is a lot easier to calculate the weight of the waste in the truck first, discharge it, and then weigh the empty truck alone.

A : I got it well!! Subtraction!!

A : Why do they cover the garbage with soil?

B : They cover the garbage with soil to prevent scattering and animals like birds from eating them away. It is also meant to prevent the propagation of bad insects like flies, and to protect the garbage from rain.

A : Why do they wash trucks?

B : The trucks in the disposal site are stained with garbage and bacteria, therefore, they have to be washed when they go back to town so as not to contaminate other

objects in town.

A : Are there many people working for the disposal service?
What kind of job do they do?

B : Waste collectors, dump truck drivers, fee collectors, weighing people, people who give signals to the dump truck drivers where to put the garbage down, and people who cover the garbage with soil. There are lots of people working among harmful wastes. Thanks to them we can live our lives in peace.

A : It is very important that we, residents and workers, mutually cooperate in the waste disposal activities.

8. What can I do to get rid of the waste in our town?

A : I fully understand now the waste disposal system. Let's lay out what we have learnt so far, and strive to make our town free from waste.

B : Good, then let's try to lay out the problems on waste that we have to deal with.

.....(The teacher thinks along with the pupils and let them speak.)

A : We inevitably produce waste everyday.

A : Rotten waste causes diseases.

A : It is necessary for us to decrease the quantity of waste.

A : Some wastes are harmful from the very start.

A : We have to take full responsibility for our own waste.

A : We must not throw waste away except in trash cans.

A : We must put a lid over a dustbin.

A : When we find litter, we must pick it up and put it in a trash can.

A : Let's call the attention of people who conducts littering.

A : Let's clean-up the waterways and roads in front of our houses.

A : If we work together like this, all the town will become neat and tidy.

A : We should have waste experts collect and dispose our waste.

A : Let's respect the people working for waste collection

services.

B : Well, all of you did a good job. The most important thing is for every body to cooperate in making the town clean. If you do not clean your own surroundings, you will be a nuisance to others. It's time, therefore, to start doing what we talked about!! We will clean and beautify the city of Vientiane and be a good example to other cities.

The following pages is the Lao version of a scenario for environmental education program which prepared by the Study Team.

ເອກກະສານສົດສອນກ່ຽວກັບວິທີກໍາຈັດຊີເຫຍື້ອ

1. ຊີເຫຍື້ອແມ່ນຫຍັງ ?

- ດ. ຊີເຫຍື້ອແມ່ນຫຍັງ ?
- ຄ. ຊີເຫຍື້ອແມ່ນສິ່ງຂອງທີ່ໄຊ້ບໍ່ໄດ້ອີກ
- ດ. ສິ່ງຂອງທີ່ໄຊ້ບໍ່ໄດ້ມີຫຍັງແດ່ ?
- ຄ. ອາໄວ, ເສດອາຫານແດ່, ເສດເຈັ້ງແດ່... ມີຫຍັງອີກແດ່ພວກເຈົ້າລອງຄິດເບິ່ງ.
- ດ. ໃບຕອງ, ເຈັ້ງທີ່ເຄື່ອງ, ຖົງຢາງ, ໃບໄມ້ແຫ້ງ, ກະປອງ, ແກ້ວເປົາ, ເກີບຂາດ.
- ຄ. ຊີເຫຍື້ອມາຈາກຮ້ານອາຫານ, ໂຮງງານ, ໂຮງການ, ໂຮງຫມໍ, ຊີເຫຍື້ອມາຈາກຮ້ານອາຫານມີຫຍັງແດ່ ?
- ດ. ເສດອາຫານ, ຈອກແຕກ. ກໍ່ມີ.
- ຄ. ຊີເຫຍື້ອມາຈາກ ໂຮງງານມີຫຍັງແດ່ ?
- ດ. ເສດເຈັ້ຍ.
- ຄ. ຊີເຫຍື້ອມາຈາກ ໂຮງຫມໍມີຫຍັງແດ່ ?
- ດ. ສໍາລິ, ເຂັມສັກຢາ, ຫລອດຢາເປົາ, ຝ້າຊັບເລືອດ.
- ດ. ເສດອາຫານແດ່, ແກ້ວເປົາກໍ່ຍັງໃຊ້ໄດ້ອີກ.
- ຄ. ແມ່ນ, ຊີເຫຍື້ອຢູ່, ແຕ່ຍັງໃຊ້ເປັນປະໂຫຍດໄດ້ອີກກໍ່ມີ. ພວກເຈົ້າລອງຄິດເບິ່ງວ່າມີຫຍັງແດ່ ?
- ດ. ເສດອາຫານກໍ່ເອົາໄວ້ລ້ຽງຫມູ, ແກ້ວເປົາເອົາໄວ້ແລກເງິນ.
- ຄ. ມີໂຮງງານທີ່ເອົາເສດເຈັ້ງໄປຜະລິດເປັນເຈັ້ງອານາໄມ. ໃບໄມ້, ເສດອາຫານຖ້າຜັງດິນກໍ່ເປັນປຸຍເລີຍ, ປລາສຕິກ, ຖ້າມີຫລາຍກໍ່ສາມາດຜະລິດເປັນປລາສຕິກອີກ. ຊີເຫຍື້ອທີ່ເປັນປະໂຫຍດກໍ່ມີຫລາຍແດ່ທີ່ເປັນອັນຕະລາຍກໍ່ມີຫລາຍ.

2. ຊີເຫຍື້ອມີຜົນສະທ້ອນຫຍັງແດ່ ?

- ຄ. ເວລາມີຊີເຫຍື້ອໄຫມ່ໆ ອາດບໍ່ເປັນຫຍັງແດ່ຖ້າປະໄວ້ໄລຍະນຶ່ງຊີເຫຍື້ອຈະເຫນົ່າເຈັດໃຫ້ເກີດມີເຊື້ອພະຍາດ. ຖ້າຖິ້ມຊີເຫຍື້ອຊະຊາຍເຊື້ອພະຍາດ ຕິດຕິນຕິດມີ ເດັກນ້ອຍທີ່ຫລິ້ນຢູ່ປ່ອນນັ້ນ.
- ເຊື້ອພະຍາດຈະເຂົ້າໄປທາງຕາ, ທາງດັງ, ທາງຢາກ ແລະເຂົ້າໄປໃນຮ່າງກາຍໂດຍບໍ່ຮູ້ສຶກຕົວ.
- ເຊື້ອພະຍາດນັ້ນຄ່ອຍໆຂະຫຍາຍຕົວເທື່ອລະນ້ອຍ ເຈັດໃຫ້ເດັກນ້ອຍເຈັບຕາແດ່ ເຈັບຫ້ອງແດ່ ບາງເທື່ອເດັກນ້ອຍອ່ອນເພັດອາດຕາຍກໍ່ມີ.
- ດ. ໂອ ! ອັນຕະລາຍແທ້ນີ້. ແຕ່ວ່າຊີເຫຍື້ອບໍ່ເຫນົ່າກໍ່ມີໃດ ຄືຖົງຢາງກໍ່ບໍ່ເຫນົ່າ.
- ຄ. ຖົງຢາງກໍ່ມີບັນຫາຫລາຍ, ເວລາລົມພັດກໍ່ຕົກລົງໃສ່ຮ່ອງລະບາຍນໍ້າແລ້ວ ເລີຍຂັງນໍ້າໄວ້ ເຈັດໃຫ້ນໍ້າບໍ່ໄຫລ ແລະເຫນົ່າເຫມັນ ແລ້ວເຈັດໃຫ້ມີເຊື້ອພະຍາດ ແລະແມງໄມ້ເກີດຂຶ້ນ. ປ່ອນທີ່ນໍ້າບໍ່ໄຫລພາໃຫ້ຍຸງອອກໄປ. ຖ້າຍຸງນັ້ນມາກັດເຮົາຈະພາໃຫ້ເປັນພະຍາດໄຂ້ຍຸງ ແລະພະຍາດໄຂ້ເລືອດອອກ.
- ດ. ພະຍາດໄຂ້ເລືອດອອກກໍ່ເປັນອັນຕະລາຍບໍ່ ?
- ຄ. ໂອ ! ເປັນພະຍາດທີ່ອັນຕະລາຍແທ້ ຖ້າຍຸງກັດກໍ່ເປັນໄຂ້, ເຈັບຫົວ ແລ້ວເກີດຕຸ່ມຫົວຮ່າງກາຍ ສຸດທ້າຍມີເລືອດອອກຕາມຮ່າງກາຍ ແລ້ວເຈັດໃຫ້ເຮົາຕາຍໄດ້. ຖ້າສົມມຸດວ່າມີຄົນເປັນພະຍາດນີ້ 100 ຄົນ ມີຄົນຕາຍຮອດ 10 ຄົນ. ພະຍາດໄຂ້ຍຸງກໍ່ອັນຕະລາຍຄືກັນ ພວກເຈົ້າຮູ້ຈັກແລ້ວບໍ່ ?
- ດ. ຄັນຊັ້ນຮ່ອງລະບາຍນໍ້າກໍ່ຕ້ອງເຈັດອານາໄມ ໃຫ້ນໍ້າໄຫລເລື້ອຍໆ.
- ຄ. ບໍ່ແມ່ນມີແຕ່ຮ່ອງລະບາຍນໍ້າຊຶ່ງ ສໍາຄັນວ່າບໍ່ໃຫ້ມີນໍ້າຂັງ.
- ຕົວຢ່າງ : ຢູ່ໃນກະປ້ອງແດ່, ໂປະຫມາກພ້າວແດ່ ຢາງລົດແດ່ ສິ່ງເຫລົ່ານີ້ຖິ້ມໄວ້ບໍ່ໄດ້.

- ດ. ຢູ່ບ້ານເຮົາບາງເທື່ອກໍຈູດຂີ້ເຫຍື້ອຢູ່ໃນສວນ ມີຄວັນເຮັດໃຫ້ແສບຕາຫລາຍ.
- ຄ. ຄວັນກໍມີບັນຫາໄດ້.
 - ຖ້າຈູດຖົງຢາງກໍພາໃຫ້ເກີດອາຍພິດ ເພາະສະນັ້ນຕ້ອງລະວັງ ບໍ່ຄວນຈູດ ຈະເກີດອັນຕະລາຍ.
- ດ. ເອີ ! ຂ້ອຍຄິດວ່າຂີ້ເຫຍື້ອມາຈາກໂຮງຫມໍ ກໍມີອັນຕະລາຍຄືກັນໄດ້.
- ຄ. ຖືກຕ້ອງ, ສຳລິ ແລະເຂັ້ມຊັກຢາ ມີເຊື້ອພະຍາດ. ກໍລະນີເຫລົ່ານີ້ພາໃຫ້ເຮົາຕິດພະຍາດກໍມີຕ້ອງລະວັງທີ່ສຸດ,
- ດ. ຂີ້ເຫຍື້ອເປັນອັນຕະລາຍກໍມີ, ເປັນປະໂຫຍດກໍມີ.

3 . ເປັນຫຍັງຈຶ່ງມີຂີ້ເຫຍື້ອ ?

- ດ. ເປັນຫຍັງຈຶ່ງມີຂີ້ເຫຍື້ອ ?
- ຄ. ການດຳລົງຊີວິດປະຈຳວັນ ຂອງມະນຸດຕ້ອງມີຂີ້ເຫຍື້ອ.
- ດ. ຄັນຊັ້ນ, ປ່ອນທີ່ບໍ່ມີມະນຸດກໍບໍ່ມີຂີ້ເຫຍື້ອບໍ່ ?
- ຄ. ຖືກຕ້ອງແລ້ວ, ຖ້າບໍ່ມີມະນຸດ ກໍບໍ່ມີຂີ້ເຫຍື້ອ.
 - ຕົວຢ່າງ : ຢູ່ເກາະກາງທະເລ ກໍບໍ່ມີຂີ້ເຫຍື້ອ. ມະນຸດເຮົານີ້ຖ້າບໍ່ກິນເຂົ້າ ກໍບໍ່ອາດມີຊີວິດຢູ່ໄດ້.
 - ນີ້ເຄື່ອງກິນກໍຕ້ອງມີປ່ອນທີ່ກິນບໍ່ໄດ້.
 - ຕົວຢ່າງ : ຫມາກໄມ້ເຮົາກໍກິນເບືອກໍບໍ່ໄດ້ອັນນີ້ເປັນຂີ້ເຫຍື້ອເລີຍ.
 - ຖ້າເຮົາມີການດຳລົງຊີວິດທີ່ດີອັນ ເຮັດໃຫ້ມີຂີ້ເຫຍື້ອຫລາຍຂຶ້ນ.
 - ຕົວຢ່າງ : ຜົມທີ່ຕິດອອກແລ້ວກໍກາຍເປັນຂີ້ເຫຍື້ອ. ເວລາຕັດເສື້ອເສດຜ້າແພທີ່ເຫລືອກໍກາຍເປັນຂີ້ເຫຍື້ອ.
 - ພວກເຈົ້າມັກເບິ່ງ ໂຫລະຫັດບໍ່ ?
 - ເວລາເຜີ້ມຜະລິດ ໂຫລະຫັດວັດຖຸທີ່ເຫລືອ ກໍເປັນເສດຂີ້ເຫຍື້ອ.
- ດ. ຂີ້ເຫຍື້ອເຮົາກໍມີບໍ່ ?
- ດ. ມີ, ເວລາຊື່ຂະຫນົມກິນ ເຈັ້ງທີ່ຂະຫນົມກໍເປັນຂີ້ເຫຍື້ອ, ເວລາຊື່ຂອງ ເຜີ້ມ ໃສ່ຖົງຢາງ ໃຫ້ແລ້ວຖົງຢາງນັ້ນ ກໍກາຍເປັນເສດຂີ້ເຫຍື້ອ.
 - ທຸກຄົນບໍ່ຮູ້ສຶກຕົວວ່າຕົນເອງມີຂີ້ເຫຍື້ອ, ຖ້າຄົນຜູ້ດຽວກໍມີຂີ້ເຫຍື້ອຫລາຍ ແຕ່ຖ້າຫລາຍຄົນກໍເຮັດ ໃຫ້ມີຂີ້ເຫຍື້ອ ຫລາຍ. ຕົວຢ່າງ : ພາຍຫລັງເຮັດບຸນແລ້ວເຮົາຈະເຫັນຂີ້ເຫຍື້ອເຕັມ ໄປຫມົດ.

4 . ຂີ້ເຫຍື້ອ ໃນວຽງຈັນຈະເອົາໄປໃສ ?

- ຄ. ປະຈຸບັນນີ້ຂີ້ເຫຍື້ອ ໃນວຽງຈັນກໍມີຫລາຍຂຶ້ນ, ຄົນເຮົາຈະເຮັດແນວໃດກັບຂີ້ເຫຍື້ອເຫລົ່ານີ້ ?
- ດ. ຢູ່ບ້ານຂ້ອຍກໍຖິ້ມຢູ່ນ້ຳຂອງ, ບາງເທື່ອກໍຝັງ.
- ດ. ບ້ານຂ້ອຍກໍຈູດ.
- ຄ. ແມ່ນແລ້ວ, ນັ້ນແມ່ນຄວາມຊັ້ນເຄີຍ, ຫລາຍໆຄົນກໍຄິດແບບນັ້ນ. ຫລາຍຄົນກໍຈູດຂີ້ເຫຍື້ອ ເພາະສະນັ້ນ ຫົວວຽງຈັນຈຶ່ງເຕັມ ໄປດ້ວຍຄວັນ. ແລ້ວຄວັນນັ້ນເຮັດໃຫ້ເກີດພະຍາດຢອດກັບເດັກນ້ອຍອ່ອນ ແລະຜູ້ໃຫຍ່ກໍມີ ສຸກຂະພາບບໍ່ດີ. ດຽວນີ້ພວກເຈົ້າຫາຍໃຈເອົາຄວັນ ໂດຍບໍ່ຮູ້ສຶກຕົວ ແຕ່ຖ້າຄົນ ໄປຈະພາໃຫ້ສຸກຂະພາບເຮົາ ບໍ່ດີກໍມີ.
- ດ. ບ້ານຂ້ອຍກໍເອົາລົດມາເກັບຂີ້ເຫຍື້ອໄດ້ .
- ຄ. ແມ່ນ, ໂຍຫາກຳແພງນະຄອນ ແລະສາມບໍລິສັດ ເອກະຊົນ ກໍສົ່ງລົດມາເກັບຂີ້ເຫຍື້ອ ແຕ່ຈຳນວນລົດມີໜ້ອຍ ຫຼັງເກົ່າ ແລະເປັນເສດຊ່ວຍ ເພາະສະນັ້ນ ລົດຈຶ່ງບໍ່ໄດ້ມາເກັບຕາມສັນຍາ. ອີກຢ່າງນຶ່ງຫລາຍຄົນ ຄິດວ່າ ຖິ້ມຂີ້ເຫຍື້ອປ່ອນ ໃດກໍໄດ້ ຈຶ່ງເຮັດໃຫ້ມີຄົນຈຳນວນນຶ່ງ ບໍ່ຢາກຈ່າຍເງິນ ໃຫ້ລົດມາເກັບຂີ້ເຫຍື້ອ.

ດ. ຫນ້ອຍຊໍ້າໃດນີ້ ?

ຄ. ລິມມຸດວ່າມີເຮືອນ 100 ຫລັງ ມີແຕ່ 7 ຫລັງເທົ່ານັ້ນຢາກຈ່າຍເງິນໃຫ້ລິມມາເກັບ.

ດ. ໂອ ! 7 ຫລັງເທົ່ານັ້ນຫວາ, ຄືຫນ້ອຍແທ້. ເພາະສະນັ້ນຂີ້ເຫຍື້ອ ໃນວຽງຈັນຈິ່ງມີຫລາຍ. ລິມມາເກັບເອົາຂີ້ເຫຍື້ອໄປໃສ່ນໍ້ ?

ຄ. ມີປ່ອນຖອກຂີ້ເຫຍື້ອຢູ່ຫລັກ 18. ລິດເກັບຂີ້ເຫຍື້ອມາກໍ ໄປຖິ້ມຢູ່ຫ້ວນຊຶ່ງ ເຮັດໃຫ້ຂີ້ເຫຍື້ອປົວ ໄປຊະຊາຍ ແລະມີແຜງວັນ, ແຜງສາຍ, ຫນູຫລາຍ. ຢູ່ໃນນັ້ນເອົາເຈົ້າຈູດຂີ້ເຫຍື້ອເປັນບາງປ່ອນເຮັດໃຫ້ມີຄວັນ ເຫມັນຂົວຂະຫນາດ. ແລ້ວຂີ້ເຫຍື້ອທຳມະດາ ແລະຂີ້ເຫຍື້ອອັນຕະລາຍ ກໍຖິ້ມປົນກັນ, ອັນຕະລາຍຫລາຍ.

5. ຂີ້ເຫຍື້ອຢູ່ຕ່າງປະເທດເປັນແນວໃດ ?

ດ. ຢູ່ຕ່າງປະເທດເພິ່ນເຮັດແນວໃດກັບຂີ້ເຫຍື້ອ ?

ຄ. ເພື່ອບໍ່ໃຫ້ເປັນພະຍາດ ປະເທດທີ່ຈະເລີນແລ້ວເພິ່ນອານາໄມຮ່ອງນໍ້າ, ເກັບມ້ຽນຂີ້ເຫຍື້ອອ້ອມເຮືອນ ແລ້ວທຸກຄົນສາມະຄິກັນອານາເກັບມ້ຽນຂີ້ເຫຍື້ອຕາມທຶນຫາງ ແລະສວນ ເພື່ອຈະເປັນເມືອງທີ່ສວຍງາມ. ຍົກຕົວຢ່າງ ເມືອງວໍຊິງຕັນຢູ່ປະເທດອາເມລິກາ ແລະເມືອງລອນດອນຢູ່ປະເທດອັງກິດ, ເມືອງໂຕກຽວຢູ່ປະເທດຍີ່ປຸ່ນ ຊຶ່ງນະຄອນຫລວງຂອງປະເທດເຫລົ່ານັ້ນສະອາດງາມຫລາຍ. ສະຖານທີ່ສາທາລະນະ ປ່ອນທີ່ຄົນມາລວມກັນຫລາຍຕ້ອງມີຖັງຂີ້ເຫຍື້ອ ໄວ້, ທຸກຄົນຖິ້ມຂີ້ເຫຍື້ອໃສ່ໃນນີ້ ໂດຍສະເພາະປະເທດສິງກະໂປບໍ່ມີຂີ້ເຫຍື້ອຈັກຫນ້ອຍຢູ່ໃນເມືອງ. ຖ້າຜູ້ໃດຖິ້ມຂີ້ເຫຍື້ອໂລເລ ຈະຖືກປັບໃຫມ.

ແຕ່ລະປະເທດມີຄົນເຮັດວຽກອານາໄມຫລາຍ, ແລ້ວທຸກຄົນພະຍາຍາມຊ່ວຍກັນ ເຮັດໃຫ້ເມືອງສະອາດສວຍງາມ, ກໍເທົ່າກັບປະຊາຊົນມີກຽດ.

ດ. ໃຫ້ມາເກັບຂີ້ເຫຍື້ອກໍຈ່າຍເງິນບໍ່ ?

ຄ. ຫຳມະດາກໍຕ້ອງຈ່າຍແລ້ວ ເພາະວ່າໄດ້ໃຊ້ລິດມາເກັບຂີ້ເຫຍື້ອແຫນເຮົາ. ອັນນີ້ບໍ່ແມ່ນເລື່ອງເງິນ ແຕ່ແມ່ນເລື່ອງໃຫ້ທຸກຄົນພະຍາຍາມບໍ່ຖິ້ມຂີ້ເຫຍື້ອໂລເລ.

ດ. ປະເທດອື່ນມີລິດມາເກັບຂີ້ເຫຍື້ອຫລາຍຄັນບໍ່ ?

ຄ. ຫລາຍແລ້ວ ເພາະວ່າພົນລະເມືອງກໍຫລາຍ, ຂີ້ເຫຍື້ອກໍຫລາຍ ຖ້າລິດຫລາຍຄັນກໍຕ້ອງເສັຽເງິນຫລາຍ. ປະເທດເຮົາກໍບໍ່ມີລິດຫລາຍ ເພາະສະນັ້ນທຸກຄົນຕ້ອງພະຍາຍາມຮ່ວມມືກັນກຳຈັດ ບໍ່ໃຫ້ມີຂີ້ເຫຍື້ອຫລາຍ. ຢູ່ປະເທດອື່ນມີຄົນສະຫມັກໃຈ ເກັບຂີ້ເຫຍື້ອຢູ່ປ່ອນສາທາລະນະ. ຖ້າຢາກເຮັດໃຫ້ບ້ານເມືອງສວຍງາມ ຫລາຍຄົນຕ້ອງຮ່ວມມືກັນ.

ດ. ແມ່ນ, ພວກເຮົາກໍຕ້ອງພະຍາຍາມຄືກັນກັບປະເທດອື່ນ.

6. ຖ້າມີຂີ້ເຫຍື້ອຈະເຮັດແຜນວິໄນ ?

ຄ. ມະນຸດເກີດມາຕ້ອງມີຂີ້ເຫຍື້ອ, ຂີ້ເຫຍື້ອເປັນປະໂຫຍດກໍມີ, ເປັນອັນຕະລາຍກໍມີ ເຮົາຈະເຮັດແຜນວິໄນ ?

ດ. ເຮົາບໍ່ຄວນຖິ້ມຂີ້ເຫຍື້ອໂລເລເຊັ່ນ: ທຶນຫາງ, ຮ່ອງລະບາຍນໍ້າ, ເຄິ່ນເປົ່າຫວ່າງ.

ຄ. ເຮົາຕ້ອງຖິ້ມຂີ້ເຫຍື້ອໃສ່ກະຕ່າແມ່ນດີຫລາຍ.

ດ. ຖ້າບໍ່ມີກະຕ່າຈະເຮັດແຜນວິໄນ ?

ຄ. ເຮົາຕ້ອງຖືເມືອຖິ້ມໃສ່ກະຕ່າຢູ່ບ້ານ.

ດ. ຂີ້ຄ້ານຖືເມືອ, ຖ້າມີຫນ້ອຍດຽວຖິ້ມປ່ອນໃດປ່ອນນຶ່ງໄດ້ບໍ່ ?

ຄ. ແຕ່ລະຄົນຫາກຖິ້ມໂລເລ ຈະເຮັດໃຫ້ມີຂີ້ເຫຍື້ອ ແລະ ເຊື້ອພະຍາດເຕັມໄປຫມົດ. ຍ້ອນຂີ້ເຫຍື້ອຕົວເອງຖິ້ມ ພາໃຫ້ຕົວເອງເກີດພະຍາດກໍຢ່າ ແຕ່ວ່າຜູ້ອື່ນອາດຕິດເຊື້ອພະຍາດໄປນໍາ. ຂີ້ເຫຍື້ອຕົວເອງກໍຕ້ອງຮັບຜິດຊອບເອົາເອງ.

ເລື່ອງຂອງຕົວເອງກໍຕ້ອງປະຕິບັດເອົາເອງ.

ດ. ຖ້າຖິ້ມຂີ້ເຫຍື້ອໃສ່ກະຕ່າເວລາລົມພິດປົວໄປເດ ?

- ຄ. ໂອ! ເຈົ້າຄິດດີຫລາຍ. ຖ້າລົມພັດບໍ່ຢາກໃຫ້ຂີ້ເຫຍື້ອຢົວໄປ ຈະເຮັດແນວໃດດີ ເຈົ້າລອງຄິດເບິ່ງດູ.
- ດ. ໂອ! ງ່າຍ, ເອົາຝາອັດກະຕ່າກໍແລ້ວ.
- ຄ. ແມ່ນແລ້ວ. ຝາແນວໃດກໍຢາ ຖ້າອັດໄວ້ລົມພັດກໍບໍ່ຢົວ. ຖ້າເຮັດໄດ້ແບບນີ້ກໍພາໃຫ້ບ້ານເມືອງເຮົາຈົບງາມ ຖ້າເມືອງບ້ານ ພວກເຈົ້າລອງເຮັດຝາອັດລອງເບິ່ງດູ.

7. ການຫມູນວຽນຂອງຂີ້ເຫຍື້ອແບບໃດ ?

- ດ. ມະນຸດເຮົານີ້ເກີດມາຈາກແມ່-ພໍ່ ໃຫຍ່ຂຶ້ນກໍເຂົ້າໂຮງຮຽນ ເປັນຜູ້ໃຫຍ່ແລ້ວກໍເຮັດວຽກຫລາຍໆ ເຖົ້າ ໄປກໍຕາຍແລ້ວຂຶ້ນສະຫວັນ, ຂີ້ເຫຍື້ອເດ ເປັນຈິ່ງໃດນໍ ?
- ຄ. ພວກເຈົ້າເຂົ້າໃຈວ່າຂີ້ເຫຍື້ອເກີດມາຈາກໃສ ? ຂີ້ເຫຍື້ອເກີດມາແລ້ວ ໃສ່ກະຖັງຂີ້ເຫຍື້ອຄື: ພວກເຈົ້າມັກຫລິ້ນຢູ່ນອກຂີ້ເຫຍື້ອກໍມັກຫລິ້ນຢູ່ນອກ ເພາະສະນັ້ນເຮົາຕ້ອງການຮັກສາຂີ້ເຫຍື້ອ ໄວ້ຢູ່ໃນກະຖັງຖ້າຂີ້ເຫຍື້ອຫລິ້ນຢູ່ນອກເຮົາຄວນເອົາຂີ້ເຫຍື້ອເຂົ້າໄວ້ໃນກະຖັງ.
- ຂີ້ເຫຍື້ອຢູ່ໃນກະຖັງ 2-3 ມື້ແລ້ວ ລົດກໍມາເອົາ, ໄປໃສ່ໃນລົດເວລາທຳອິດຂີ້ເຫຍື້ອກໍມີຫນ້ອຍ ລົດຜ່ານໄປຫລາຍເຮືອນຂີ້ເຫຍື້ອກໍມີຫລາຍຂຶ້ນ ຫລັງຈາກຂີ້ເຫຍື້ອເຕັມລົດແລ້ວກໍເອົາໄປຖິ້ມຢູ່ບ່ອນຖອກຂີ້ເຫຍື້ອລວມ. ເທື່ອທຳອິດຊຶ່ງນ້ຳຫນັກຫມົດລົດ ແລ້ວຖອກຂີ້ເຫຍື້ອຖິ້ມເອົາລົດມາຢຽບຂີ້ເຫຍື້ອໃຫ້ແປລົງແລ້ວເອົາດິນມາຖືມຝານຫລາຍປີໄປຂີ້ເຫຍື້ອກໍເປັນອ່ອນເຫນົ້າເປັນຂີ້ດິນ ແຕ່ວ່າຢູ່ໃນຂັ້ນຂີ້ເຫຍື້ອບໍ່ເປັນຂີ້ດິນກໍມີຄືກັນ ປາລາສະຕິກດິນ ໄປກໍຄືເກົ່າ.
- ດ. ບ່ອນຖອກຂີ້ເຫຍື້ອແບບໃດ ? ຄືເຮືອນຂ້ອຍບໍ່ ?
- ຄ. ຫາງຫນ້າບ່ອນຖອກຂີ້ເຫຍື້ອ ມີເຄື່ອງຊຶ່ງນ້ຳຫນັກ ມີທ້ອງງາມນ້ອຍໆ ສຳລັບຄຸ້ມຄອງ ບ່ອນຖອກຂີ້ເຫຍື້ອເຮືອນຂີ້ເຫຍື້ອເປັນຂຸມ ບໍ່ມີຫລັງຄາ, ມີແຜນການໂຫມ່ຈະເຮັດບ່ອນລ້າງລົດ.
- ດ. ເປັນຫຍັງຈິ່ງເຮັດຂຸມດ້ວຍຂີ້ດິນ ?
- ຄ. ເພື່ອບໍ່ໃຫ້ຂີ້ເຫຍື້ອຊະຊາຍ ແລະ ເກັບນ້ຳເປື້ອນບໍ່ໃຫ້ໂຫລອອກມາ.
- ດ. ໂອ ! ຄືເຂື່ອນເກັບຂີ້ເຫຍື້ອນໍ.
- ຄ. ແມ່ນແລ້ວຄືເຄື່ອນນ້ອຍ.
- ດ. ເປັນຫຍັງຈິ່ງຕ້ອງການຊຶ່ງນ້ຳຫນັກຂີ້ເຫຍື້ອ, ຖອກຂີ້ເຫຍື້ອໃຫ້ດີກໍແລ້ວໄປບໍ່ ?
- ຄ. ຖ້າຮູ້ຈັກຈຳນວນຂີ້ເຫຍື້ອທຸກມື້ ເຮົາຈະກຳໄດ້ວ່າມີຂີ້ເຫຍື້ອຫລາຍຊໍາໃດຈາກເຂດທີ່ ເຮົາຈະໄປເກັບ. ຖ້າສຳຫລວດໄລຍະຍາວ.
- ເຮົາຈະຮູ້ວ່າອາຫານນຶ່ງ, ເດືອນນຶ່ງ ຫລືລະດູນຶ່ງ ເຮົາມີຂີ້ເຫຍື້ອຊໍາໃດ ຖ້າເຮົາຮູ້ໄດ້ວ່າ ມີຂີ້ເຫຍື້ອຊໍາໃດ ເຮົາຈະຂຶ້ນແຜນການໄດ້ງ່າຍ ວ່າຈະຕ້ອງການລົດຈັກຄັນ, ບ່ອນຖິ້ມຂີ້ເຫຍື້ອກ້ວາງຊໍາໃດ ເພາະສະນັ້ນຈິ່ງຕ້ອງການຊຶ່ງນ້ຳຫນັກຂີ້ເຫຍື້ອ.
- ດ. ຊຶ່ງນ້ຳຫນັກລົດຊຶ່ງ ກໍຮູ້ຮອດນ້ຳຫນັກຂອງຂີ້ເຫຍື້ອບໍ່ ? ເອົາຂີ້ເຫຍື້ອລົງຊຶ່ງກໍຮູ້ໂລດບໍ່ແມ່ນຫວາ ?
- ຄ. ອ້າວ ! ເອົາຂີ້ເຫຍື້ອລົງຊຶ່ງແລ້ວເອົາຂຶ້ນລົດອີກ ມັນກໍຫຍຸ້ງຍາກຫລາຍເທື່ອຕວາ. ຊຶ່ງຫມົດລົດແລ້ວເອົາຂີ້ເຫຍື້ອຖິ້ມລົງ ຫລັງຈາກນັ້ນ ກໍຊຶ່ງລົດເປົ່າ ເຮົາກໍຈະຮູ້ນ້ຳຫນັກຂອງຂີ້ເຫຍື້ອວ່າມີເທົ່າໃດ.
- ດ. ໂອ ! ເຂົ້າໃຈແລ້ວ. ຈາກນ້ຳຫນັກຂອງລົດຂີ້ເຫຍື້ອ ໃສ່ຂີ້ເຫຍື້ອທັງຫມົດເອົາມາລົບໃຫ້ນ້ຳຫນັກລົດເປົ່າ ເຮົາກໍຮູ້ໄດ້ນ້ຳຫນັກຂອງຂີ້ເຫຍື້ອ.
- ດ. ເປັນຫຍັງຈິ່ງເອົາຂີ້ດິນຖືມໃສ່ຂີ້ເຫຍື້ອ ?
- ຄ. ສຳລັບບໍ່ໃຫ້ຂີ້ເຫຍື້ອ ຢົວໄປແດ່, ບໍ່ໃຫ້ມີກ ແລະ ສັດອື່ນໆມາກິນຂີ້ເຫຍື້ອແດ່, ບໍ່ໃຫ້ແມງວັນ ແມງໄມ້ຕ່າງໆມາອອກໄຂ່ໃສ່ຂີ້ເຫຍື້ອແດ່ ແລະ ບໍ່ໃຫ້ຝົນຕົກໃສ່ຂີ້ເຫຍື້ອ.
- ດ. ເປັນຫຍັງຈິ່ງເຮັດບ່ອນລ້າງລົດ ?
- ຄ. ລົດທີ່ໃສ່ຂີ້ເຫຍື້ອກໍມີເຊື້ອພະຍາດຫລາຍ ຖ້າບໍ່ລ້າງລົດຈະເຮັດໃຫ້ ເມືອງວຽງຈັນເປື້ອນຫລາຍ.

ດ. ມີຫລາຍຄົນບໍ່ ທີ່ເຮັດວຽກກ່ຽວກັບຂີ້ເຫຍື້ອ ?

ຄ. ຄົນ ໄປເກັບຂີ້ເຫຍື້ອແດ່ ຄົນຂັບລົດຂີ້ເຫຍື້ອແດ່ ຄົນເກັບເງິນແດ່ ຄົນຊ່ວງນໍ້າຫນັກຂີ້ເຫຍື້ອ ຄົນຊີ້ນໍ້າປ່ອນຖອກຂີ້ເຫຍື້ອແດ່ ຄົນຖືມື້ດິນໃສ່ຂີ້ເຫຍື້ອແດ່ ໂອ້ ! ຫລາຍໆວຽກຢູ່ນໍ້າຂີ້ເຫຍື້ອອັນຕະຫລາຍຫລາຍ ຍ້ອນພວກເຂົາເຈົ້າເຮົາຈຶ່ງຢູ່ໄດ້ຢ່າງປອດໄພ .

ດ. ປະຊາຊົນ ແລະຄົນເກັບຂີ້ເຫຍື້ອ ຕ້ອງຮ່ວມມືກັນ .

8. ເພື່ອບໍ່ໃຫ້ມີຂີ້ເຫຍື້ອ ຢູ່ໃນຕົວເມືອງ

ເຮົາຈະເຮັດແນວໃດດີ ?

ຄ. ພວກເຈົ້າເຂົ້າໃຈບໍ່ກ່ຽວກັບເລື່ອງຂີ້ເຫຍື້ອຝ່າຍນາ ? ເຮົາຈະເຮັດແນວໃດດີເພື່ອບໍ່ໃຫ້ມີຂີ້ເຫຍື້ອ ?

ດ. ຖ້າເຮົາປະຊາຊົນໄວ້ດິນ ອາດຈະພາໃຫ້ເປັນພະຍາດ .

ດ. ຂີ້ເຫຍື້ອອັນຕະຫລາຍ ກໍ່ມີຫລາຍ. ຂີ້ເຫຍື້ອຕົວເອງ, ຕົວເອງກໍ່ຕ້ອງຮັບຜົນຊອບ ພະຍາຍາມບໍ່ໃຫ້ມີຂີ້ເຫຍື້ອຫລາຍ .

ດ. ເອົາຝາອັດຢູ່ກະຖັງຂີ້ເຫຍື້ອ ບໍ່ຖິ້ມຂີ້ເຫຍື້ອໂລເລ. ຖ້າມີຂີ້ເຫຍື້ອກໍ່ເກັບໃສ່ກະຖັງຂີ້ເຫຍື້ອ.

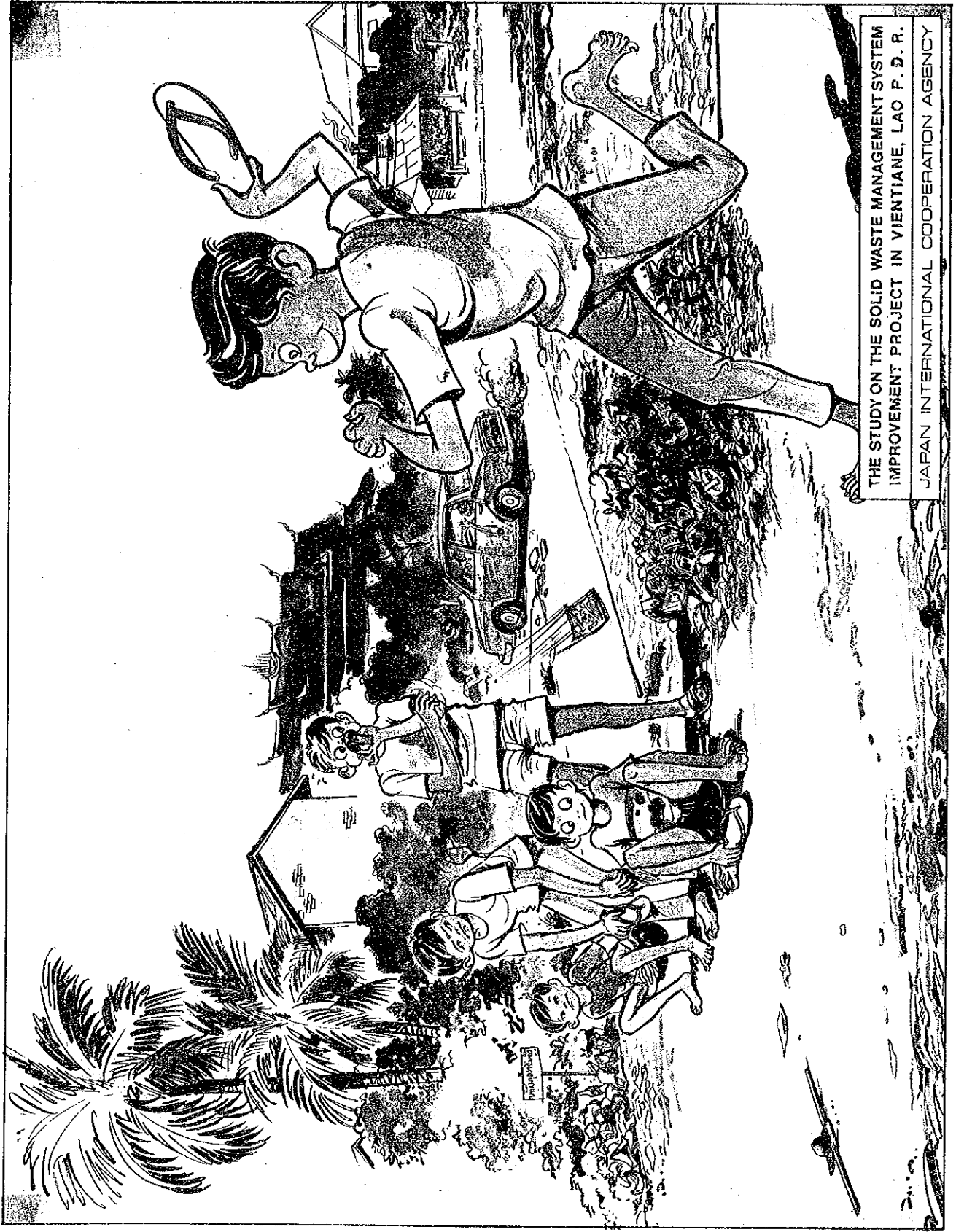
ດ. ຖ້າເຫັນຄົນຖິ້ມຂີ້ເຫຍື້ອ ໂລເລເຮົາກໍ່ຕ້ອງບອກຂະເຈົ້າ ເຮົາຕ້ອງເຮັດອະນາໄມຕາມຫົນທາງ ແລະຮ່ອງລະບາຍນໍ້າສະເຫມີ .

ດ. ຖ້າມີຂີ້ເຫຍື້ອກໍ່ຕ້ອງຂໍລົດມາເກັບ. ເຮົາຕ້ອງນັບຖືຄົນທີ່ເຮັດວຽກກ່ຽວກັບຂີ້ເຫຍື້ອ. ຖ້າເຮົາສາມະຄີກັນຮັກສາຄວາມສະອາດໄດ້ ບ້ານເມືອງເຮົາຈະສະອາດງາມຕາ.

ຄ. ໂອ້ ! ທຸກຄົນເຂົ້າໃຈດີນີ້.

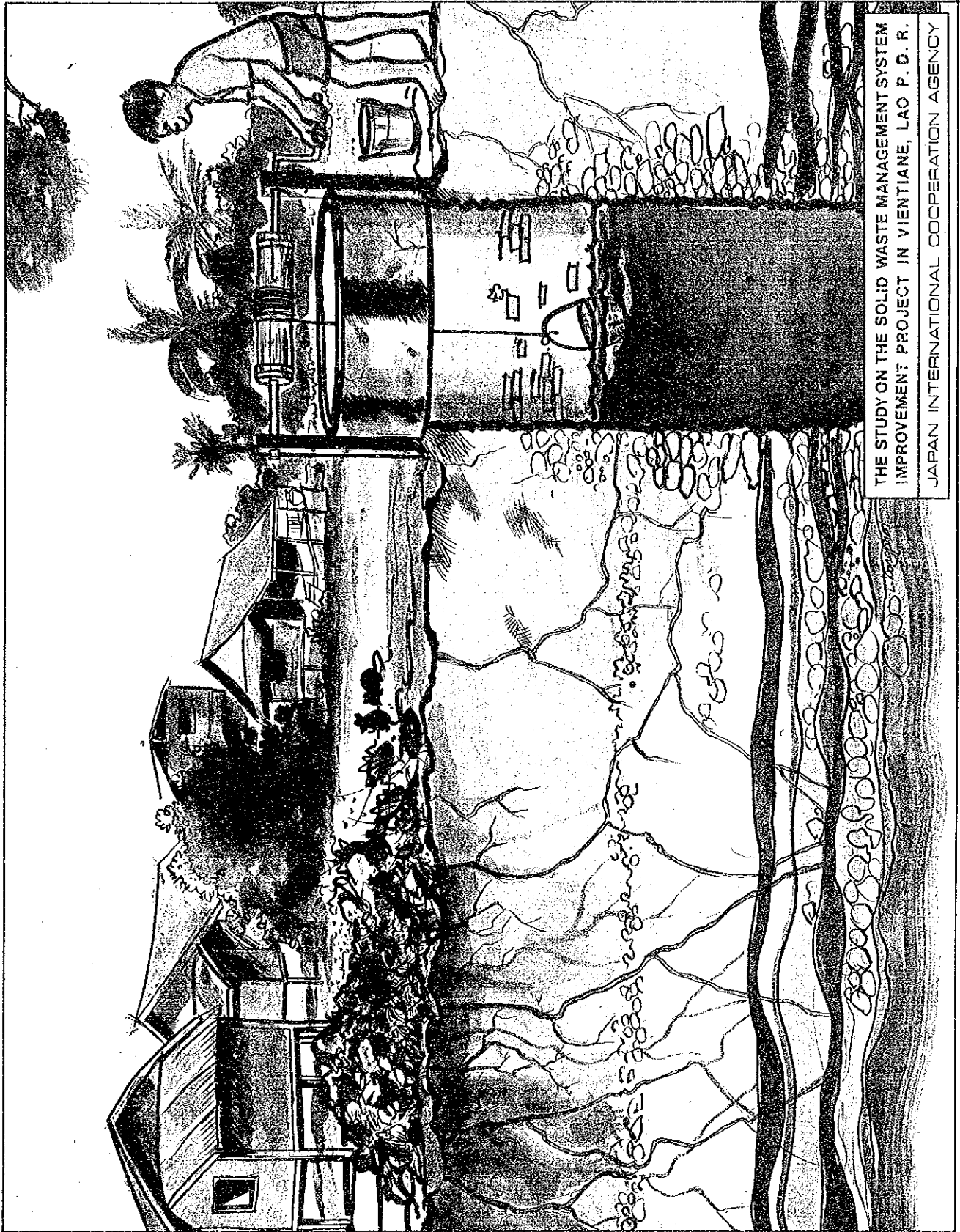
ຖ້າຕົວເອງບໍ່ຮັກສາຄວາມສະອາດ ມັນຈະລົບກວນຜູ້ອື່ນ. ແຕ່ສໍາຄັນວ່າທຸກຄົນ ຕ້ອງຮ່ວມມືກັນປະຕິບັດຕົວຈິງ.

ດ. ໂອ້ ! ພວກເຮົາຈະເຮັດໃຫ້ເມືອງວຽງຈັນສະອາດ ແລະເປັນແບບຢ່າງໃຫ້ແກ່ເມືອງອື່ນໆ.



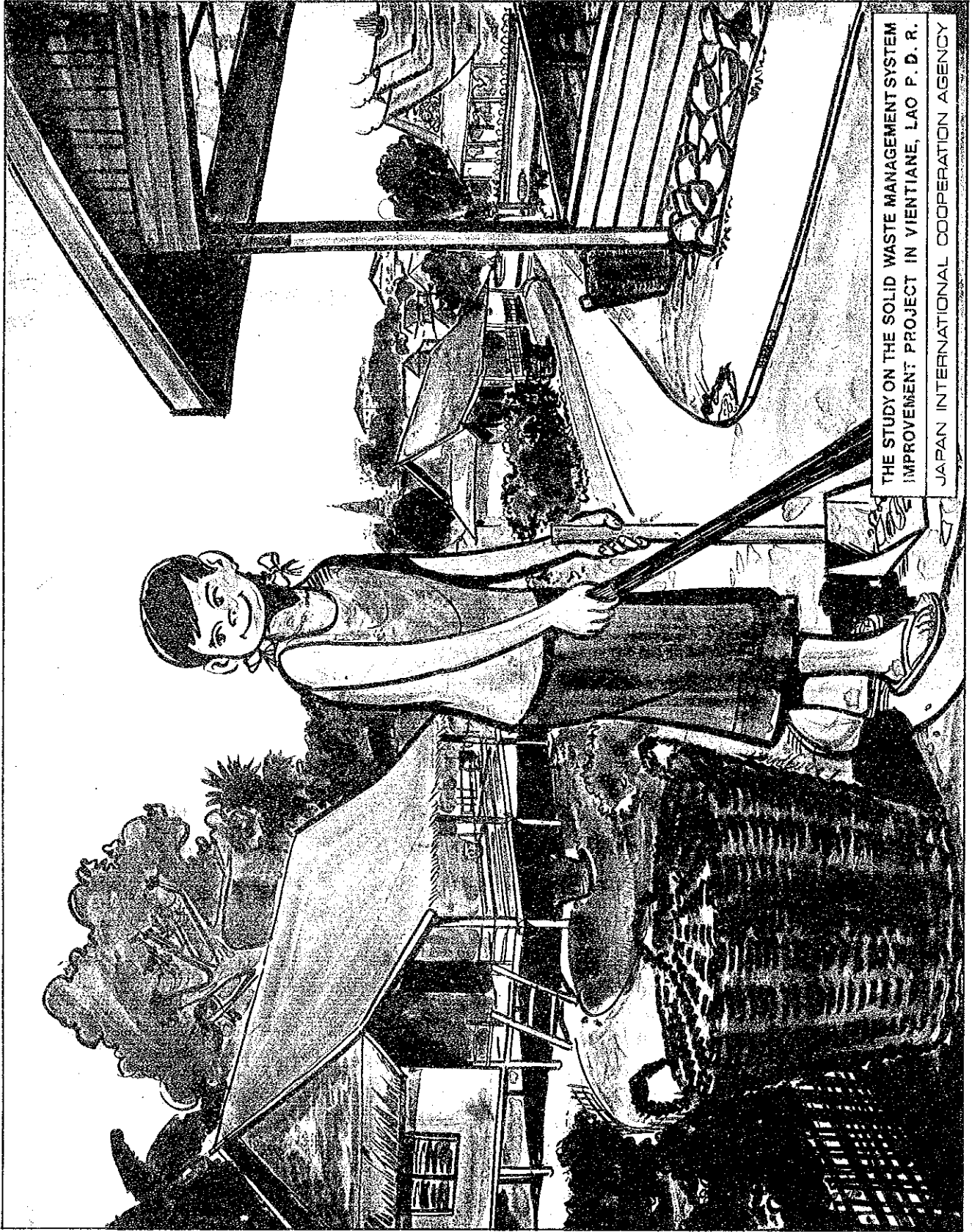
THE STUDY ON THE SOLID WASTE MANAGEMENT SYSTEM
IMPROVEMENT PROJECT IN VIENTIANE, LAO P. D. R.
JAPAN INTERNATIONAL COOPERATION AGENCY

The Drawing Board prepared by the Study Team for Education Program



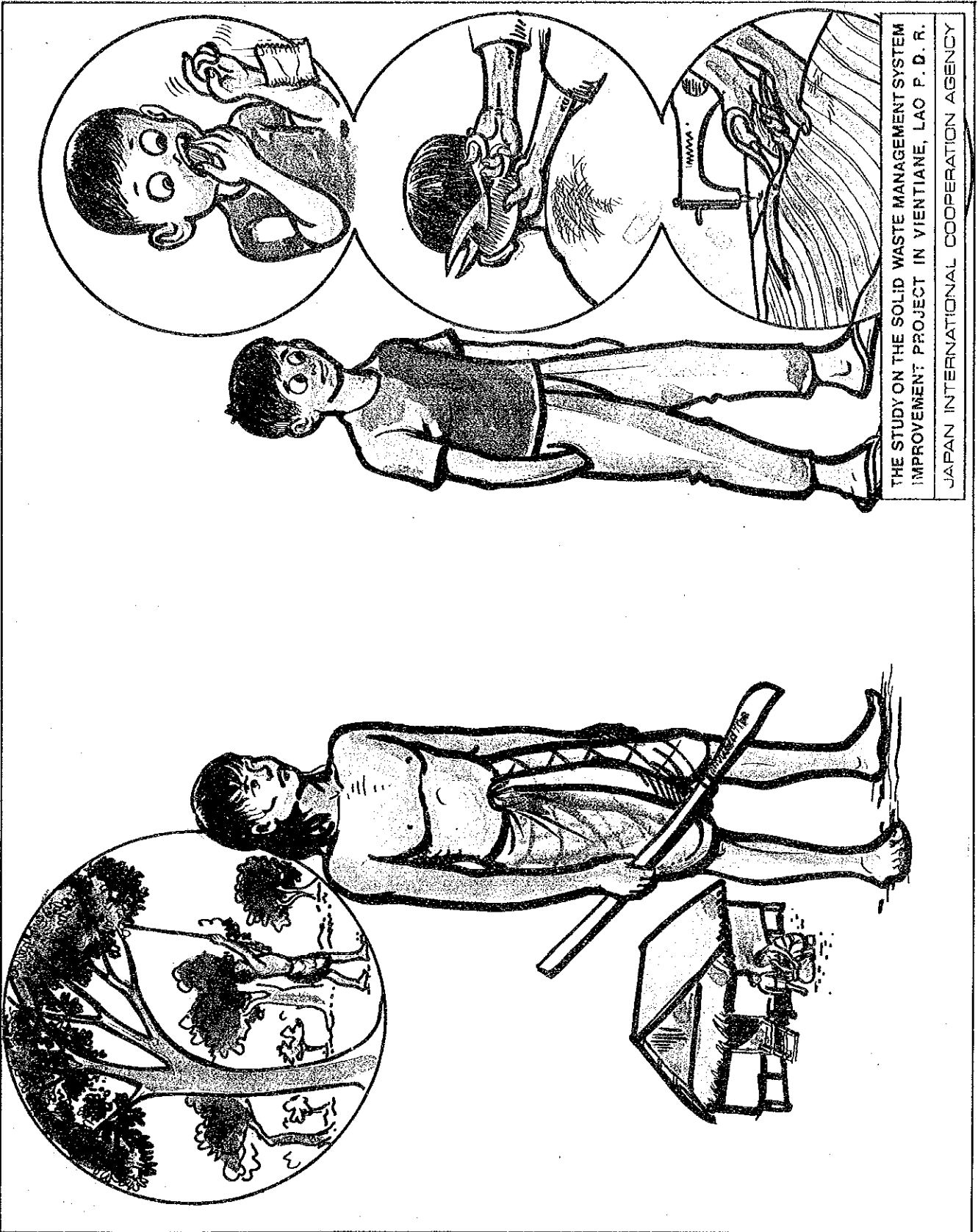
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