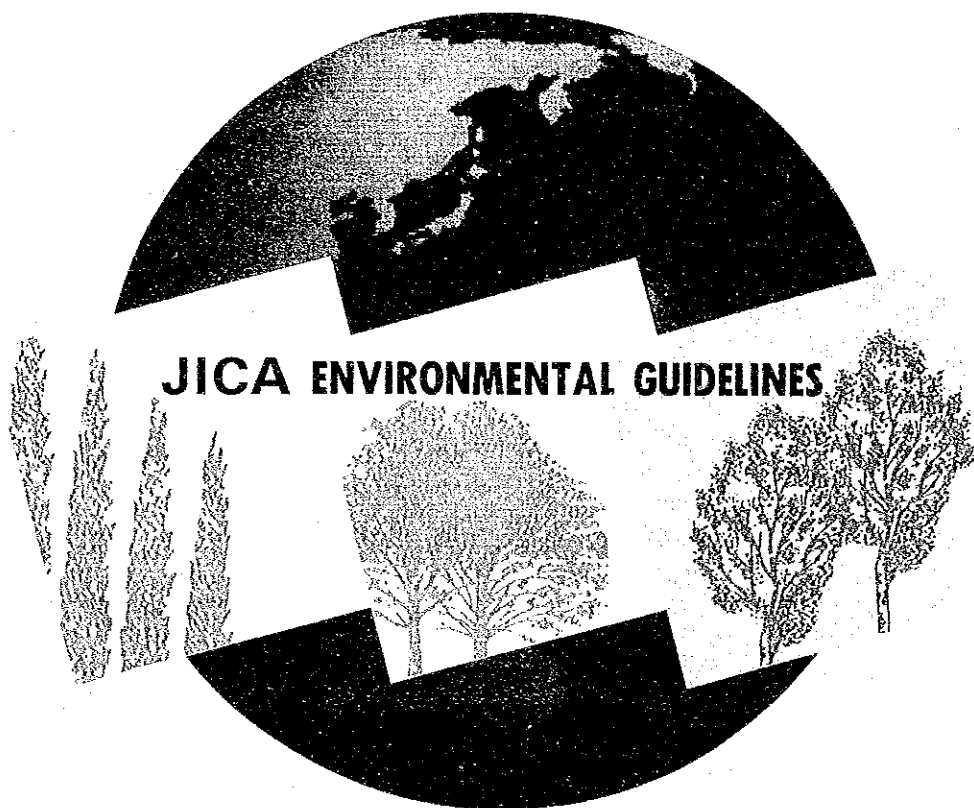


ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

VI SOLID WASTE MANAGEMENT



SEPTEMBER 1992

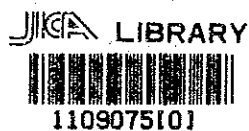
JAPAN INTERNATIONAL COOPERATION AGENCY

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ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

VI SOLID WASTE MANAGEMENT

JICA ENVIRONMENTAL GUIDELINES



SEPTEMBER 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団

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Environmental Guidelines for Infrastructure Projects

"Environmental Guidelines for Infrastructure Projects" was prepared to enable preparatory study members to conduct screening and scoping of environmental impact studies effectively and efficiently while maintaining a dialogue with their counterparts and officials concerned in the host countries for the purpose of predicting possible environmental problems caused by the infrastructure projects and to incorporate adequate environmental consideration into the projects.

The guidelines consist of the thirteen sectors below. This volume deals with environmental consideration for "Solid Waste Management".

Sector I	Ports and Harbors
Sector II	Airports
Sector III	Roads
Sector IV	Railways
Sector V	River and Erosion Control
Sector VI	Solid Waste Management
Sector VII	Sewerage
Sector VIII	Groundwater Development
Sector IX	Water Supply
Sector X	Regional Development
Sector XI	Tourism Development
Sector XII	Transportation Development
Sector XIII	Urban Transportation Development

Note: The guidelines for dam construction were published in February 1990 as a separate volume.

PREFACE

In order to support sustainable development in developing countries, it is of great importance to give sufficient consideration to the environment in the implementation of development programs.

The Japan International Cooperation Agency (JICA) has continually placed special emphasis on environmental technical cooperation and has taken into account pertinent environmental consideration in development studies and implementation of projects.

Based on the recognition of the importance of environmental issues, JICA has prepared the guidelines concerning screening and scoping methods of environmental impact studies for the purpose of contributing to the planning of infrastructure development projects with sufficient environmental consideration.

The guidelines are to be used by JICA study team members when conducting preparatory studies of social and economic infrastructure development projects.

JICA committed the preparation of the guidelines to the International Engineering Consultants Association and organized an advisory group headed by Mr. Michio Hashimoto, president of the Overseas Environment Cooperation Center. Designated advisors of the group were from the Ministry of Health and Welfare, the Ministry of Transportation, the Ministry of Construction, and the Environment Agency. Also, the Ministry of Foreign Affairs provided sound and useful advice to the advisory group.

To all of these organizations and the personnel involved, I wish to acknowledge their much appreciated support.

September 1992

Akira Kasai
Managing Director
Institute for International Cooperation
Japan International Cooperation Agency

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TERMINOLOGY

Environmental Consideration

To study whether a development project will have serious environmental impacts on the project site and its surrounding areas, analyze the study results, and establish necessary measures for avoiding or alleviating any adverse environmental impacts.

Environmental Impact

The undesirable effect on the existing overall conditions of air, water, soil, and living things, assets, social information and circulation of goods, which are related to human life, or on their combined structures.

Preliminary Environmental Survey

The environmental survey conducted during the preparatory study stage of a development project. This includes screening and scoping of the environmental impacts of a particular project. This survey is regarded as a component of the initial environmental examination.

Initial Environmental Examination (IEE)

The examination undertaken at the outset of the development project planning stage to determine the environmental impacts that may be created by the particular project based on existing information and data, easily accessible information relating to the particular project, and comments and judgements of specialists who are familiar with the environmental impacts of past similar projects. This examination should be carried out in a short period at a low cost.

IEE has the following two objectives : 1) to evaluate whether EIA is necessary for the project and, if so, to define its contents; 2) to examine, from an environmental viewpoint, the measures for alleviating the effects of the project which requires environmental consideration but not a full-scale environmental impact assessment.

Environmental Impact Assessment (EIA)

To study, forecast, and evaluate the environmental impacts of a development project, which is judged a detailed environmental examination, and to propose the establishment of an environmental protection standard and measures for avoiding or alleviating environmental impacts.

Environmental Management Plan

To formulate an environmental monitoring system or methods based on the environmental protection standard to monitor the project's environmental impacts on surrounding areas, aiming at adequately protecting the environment both during and after project implementation.

Screening

To evaluate whether or not it will be necessary to include an environmental consideration in a development project. Screening conducted in Japan before the preparatory study is called preliminary screening.

Scoping

To identify the important environmental impacts among those which can be caused by the implementation of a development plan or development project, and to define the study items of the IEE or EIA based on the findings.

Project Description (PD)

The major contents and features of the project. It includes the background of the project (including its upper level plan), the objectives, the executing agency, the beneficiary population, and the project scale.

Site Description (SD)

The compact description of the project site which includes the natural and social environmental conditions in the areas that may be affected by the project.

Preparatory Study (PS)

To examine the contents of the full-scale study of a requested project and to discuss the scope of work (S/W) of the full-scale study with the host country. This study is conducted at the preparatory stage of the project prior to conducting the full-scale study including the master plan and the feasibility study.

Full-scale Study

The study generally conducted continuously after the preparatory study by carrying out field surveys to prepare the study report of a development project. The study report, with its conclusions and recommendations for project realization or project implementation, is submitted to the government of the host country. The full-scale study includes the master plan study, feasibility study, detailed design study, and map preparation.

Master Plan Study (M/P)

The study for preparing the basic plans for various development projects. In general, it is sectoral, or for each project.

Feasibility Study (F/S)

The study for evaluating the possibility, adequacy, and investment efficiency of a project. In general, it attempts to objectively verify the feasibility of a project from social, technical, economic, and financial viewpoints.

F/S is the core of JICA's development studies. The study report provides the government of the host country with the information needed to decide whether or not to implement the project. It is also used by international financial institutions to evaluate the appropriateness of financing the project once the government submits its loan request.

ABBREVIATIONS

TOR (T/R) :	Terms of Reference
S/W :	Scope of Work
M/M :	Minutes of Meeting
Q/N :	Questionnaire
IC/R :	Inception Report
DF/R :	Draft Final Report
F/R :	Final Report
OECD :	Organization for Economic Cooperation and Development
DAC :	Development Assistance Committee

Use of the Guidelines

The guidelines were prepared to provide personnel involved in JICA's preparatory study (including the preparatory work in Japan) with information that can be used to prepare the preparatory study report or compile project specifications while carrying out field surveys, hearings, and holding discussions with the officials of the host country during a short-time visit.

The use of the guidelines is shown in Figure i and explained herewith.

«Preparatory work in Japan»

1) Examination of the request

After examining the request, follow the procedure given below, unless it is judged a soft-type infrastructure project, which is supposed to have no serious environmental impacts, such as the preparation of topographical maps or a telecommunication project.

2) Preliminary screening

Based on the request, collect and analyze the data and information and prepare the PD and SD in Japan, and conduct the preliminary screening by using them.

If any serious environmental impacts are suspected, the preparatory study team should include an environmental specialist.

Prepare questionnaires to the recipient government concerned and the draft of S/W including environment related items.

«Work in the host country»

3) Examination of the country's guidelines

At first, investigate the country's IEE/EIA implementing structure, the laws, and any existing guidelines (hereinafter referred to as the country's EIA guidelines). Then, it should be confirmed whether or not the project is subjected to IEE/EIA.

Case 1: If the contents of the country's EIA guidelines are sufficient, follow their guidelines.

Case 2: If the contents of the country's EIA guidelines are insufficient, follow their guidelines and add JICA's screening and scoping items.

Case 3: If the country has no EIA guidelines, follow JICA's guidelines.

4) Screening

Reexamine the PD, SD, and the contents of screening prepared in Japan, based on the findings of the field surveys and data analysis. If it is evaluated that an IEE or EIA is required for the project, scoping should then be undertaken.

5) Scoping

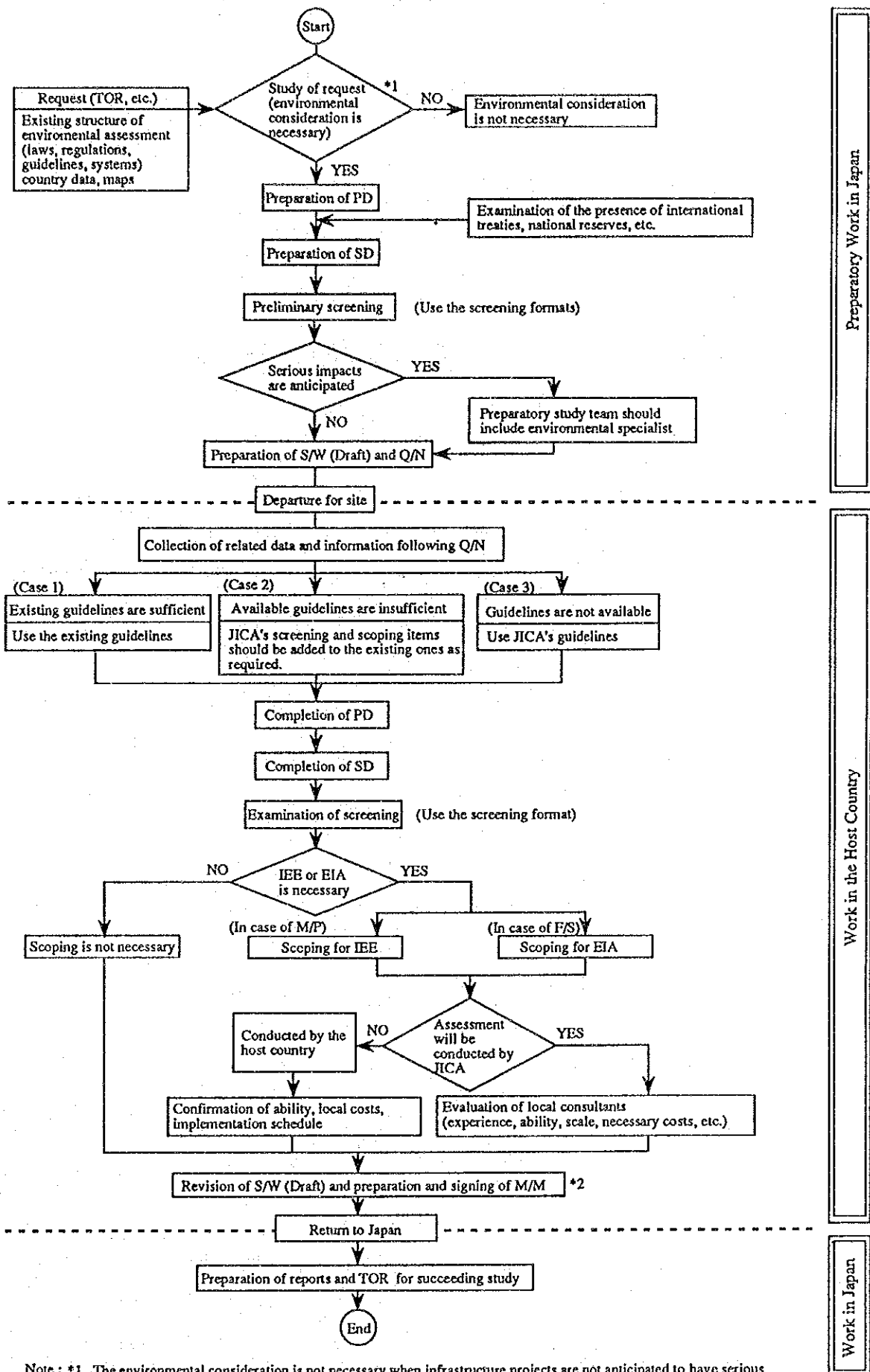
Evaluate the magnitude of impact on each environmental item, using the checklist method, to specify the items that are to be studied in IEE for M/P or EIA for F/S. In this process, making use of the explanation of items in the guidelines, try to grasp the features of possible environmental impacts. The results should be noted in the scope of work (S/W) and the minutes of meeting (M/M). When the environmental factors which may have serious impacts are not identified, it is necessary to mention in the M/M that such factors would be clarified through the full-scale study.

«Work in Japan»

6) Report preparation

Based on the above-mentioned results, compile a preparatory study report which makes it possible to carry out the appropriate IEE or EIA in the full-scale study. TOR for the succeeding study should reflect the contents of the report.

Figure i Procedure of Environmental Consideration



Note : *1. The environmental consideration is not necessary when infrastructure projects are not anticipated to have serious impacts, such as preparation of topographic maps and telecommunication projects, etc.

*2. When the environmental factors that may have serious impact are not identified, it is necessary to mention in the M/M that such items would be clarified in the full-scale study.

CHAPTER 1

OUTLINE OF ENVIRONMENTAL CONSIDERATION

CHAPTER 1 OUTLINE OF ENVIRONMENTAL CONSIDERATION

1.1 Basic Concept

JICA's aid study report "Sectoral Study for Development Assistance-Environment" published in 1988 defined that "Environmental Consideration" is to study whether a development project will have significant impacts on the environment or not, to assess the impacts and to incorporate measures to prevent or alleviate their effects, if necessary.

The premise of this definition is the understanding that development aid should not end with a one-time involvement but should be continuous and sustainable. Thus, it is believed that environmental consideration is prerequisite for securing the sustainability of the development.

For the implementation of development projects in developing countries with the cooperation of the Japanese government, a careful environmental consideration should be carried out from the early stages of project planning with a long-term perspective in order to accomplish a well-balanced development.

As such development projects are implemented in the host countries, based on the decision making process of these countries, it is necessary to conform to their laws, rules and regulations related to environmental consideration.

In some developing countries, however, such laws, rules and regulations do not exist, while in others they are not properly enforced. The policies and structures for environmental consideration vary from one country to another.

Therefore, when undertaking the environmental consideration, it is necessary to take into account of the developing country's policies and structures and to understand the country's awareness of environmental problems, while holding sufficient discussions with the people concerned in a flexible manner.

With regard to environmental consideration, JICA's basic principles are to promote sustainable development aimed at improving the living standard of the residents, and harmonize the development with a desirable environment based on the country's willingness.

If environmental consideration is not sufficiently undertaken for implementing a development project and, if careful attention is not paid to the management of the surrounding natural resources, the base of the development might be jeopardized and the development might be halted. The base of the people's livelihood or even their subsistence can be also threatened. It is necessary, therefore, to try to ensure the sustainable development by harmonizing the development project with natural resources and the base of livelihood and subsistence of the residents in the area.

The guidelines describe screening and scoping procedures at the preparatory study stage to deal with the negative impacts of a development project on the environment of the project site and its surrounding area.

The process of environmental consideration in a project cycle is shown in Figure 1-1.

A development project begins with its finding and formulation. At each stage of the cycle, a series of environmental considerations, such as a preliminary environmental survey, an initial environmental examination (IEE), environmental impact assessment (EIA), and the design of environmental protection measures take place. Environmental monitoring is then conducted with project implementation. Through this process, sustainable development can be attained.

Definition of the environmental management plan mentioned here is limited to the monitoring system which handles the environmental impacts caused by the project.

Tables 1-1 and 1-2 illustrate the time flows corresponding to the project implementation stages and the environmental consideration stages. The flows start with an environmental survey, followed by the EIA, proceed to the examination of environmental conservation measures, and then to the monitoring stage.

Figure 1-1. Flow of Environmental Considerations in Project Cycle

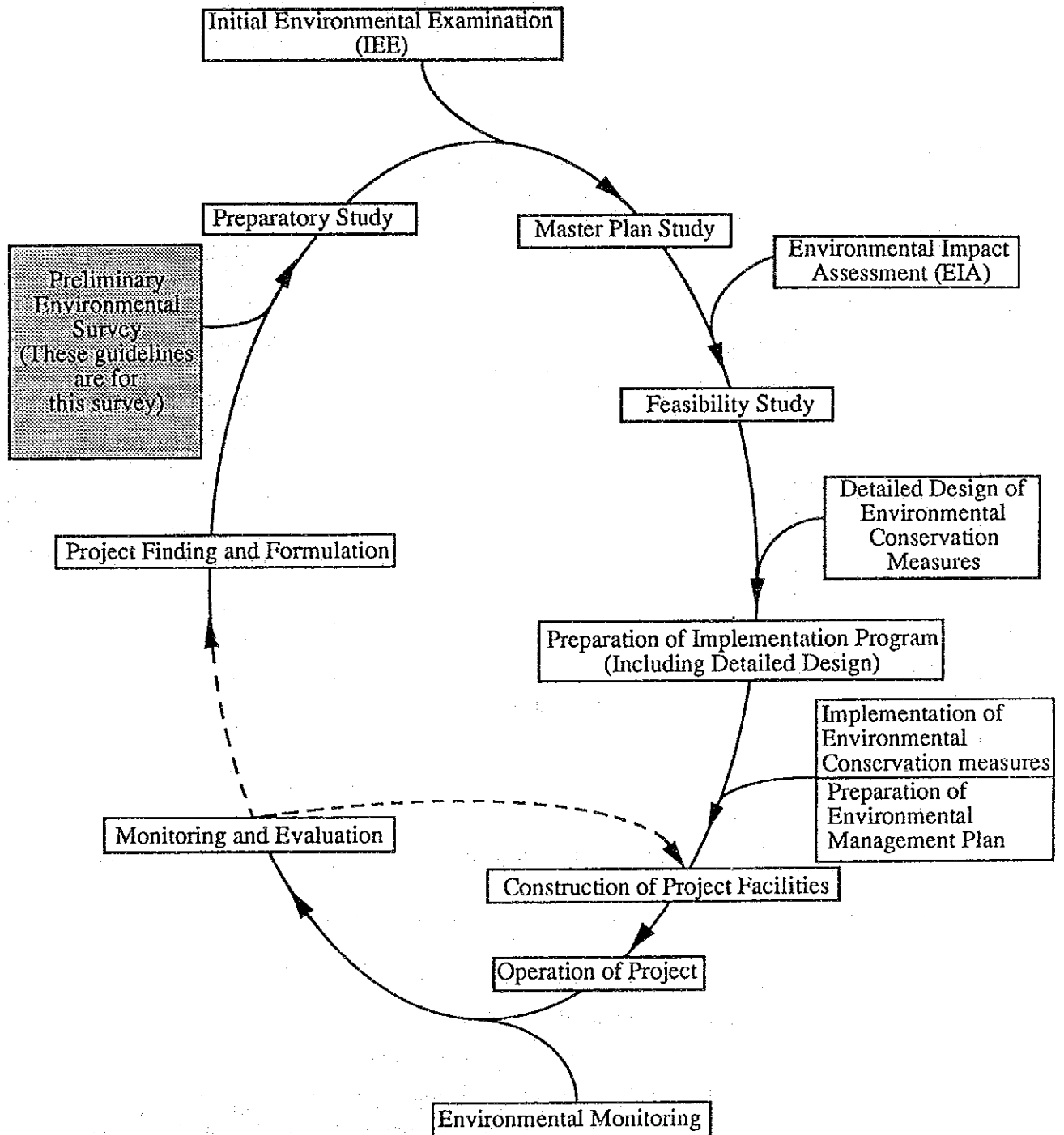


Table 1-1 Project Implementation Stages and Corresponding Environmental Consideration Stages

Project Implementation Stages				Environmental Consideration Stages
Implementation by JICA	Preparatory Study			Preliminary Environmental Survey
	Full-scale Study	Master Plan Study	Feasibility Study	Initial Environmental Examination (IEE)
		Feasibility Study		Environmental Impact Assessment (EIA)
	Implementation by Executing Agency	Preparation of Project Implementation Plan (Including Detailed Design)		
Project Construction			Implementation of Environmental Conservation Measures	
Project Facility Operation			Environmental Monitoring	

- Notes: 1. This table does not indicate strict correspondence.
2. Some projects do not require IEE or EIA.
3. Preparation of the project implementation plan includes the detailed design of the environmental conservation facilities and their construction.
4. The item enclosed in a separate box indicates the major boundary for the guidelines.

Table-1.2 Incorporation of Environmental Consideration into JICA's Development Studies

	Study Flow	Contents and Timing Investigation	Examination Items
Project Finding	Request/Project Finding ↓ Acceptance of TOR ↓ Study on TOR	(Preliminary Screening) Judgment on necessity of IEE or EIA ↓	The project judged to cause serious environmental impact shall be rejected.
	Preparatory Study ↓ Discussion and Agreement on S/W ↓ Preparation of Preparatory Study Report ↓	(Screening) Review of preliminary screening (Scoping) Decision of important items for IEE or EIA Decision of work boundaries ↓	
Selection of Consultants	Preparation of Project Specification ↓ Selection of Consultants ↓		(Preparation of M/M, S/W) Examine the description of agreed items on screening and scoping. (Reporting) Clarification of background and agreed items.
Full-scale Study	Preparation of and Discussion on IC/R ↓ Implementation of IEE or EIA ↓ Explanation of and Discussion on DF/R ↓ Preparation of F/R ↓		(Project Specification) Define the boundary and work volume of IEE or EIA to be conducted by consultants (Selection of consultants) Evaluate the appropriateness of the proposal for the project specification. (IEE or EIA) Discussion and decision on IEE/EIA items and methods based on the results of scoping.
			(Supervision of survey) Check whether IEE or EIA is conducted properly. (Final reporting) Clarification of IEE or EIA results and recommendations.

Source: JICA, "Sectoral Study for Development Assistance-Environment", 1988.

Note: The shaded part is mainly covered by the guidelines.

1.2 Environmental Consideration for Solid Waste Management Projects

1.2.1 Definition of Solid Waste Management in the Guidelines

Solid waste management projects in this series deal with solid waste from houses and offices by daily activities and excludes radioactive waste, industrial waste and medical waste. The principle of solid waste management is to collect, transport and dispose, in a sanitary manner, all waste discharged in the area. Reduction of waste volume and stabilization of waste through adequate processing is needed especially in urban areas. Transfer facilities are installed when effective transport of waste is requested. (See Fig. 1)

Development assistance for solid waste management in developing countries is mainly composed of the improvement of collection and transportation methods, and of sanitary landfill techniques. Since incineration would be required due to shortage of land accompanied by urbanization, this series includes the impact of incineration plants.

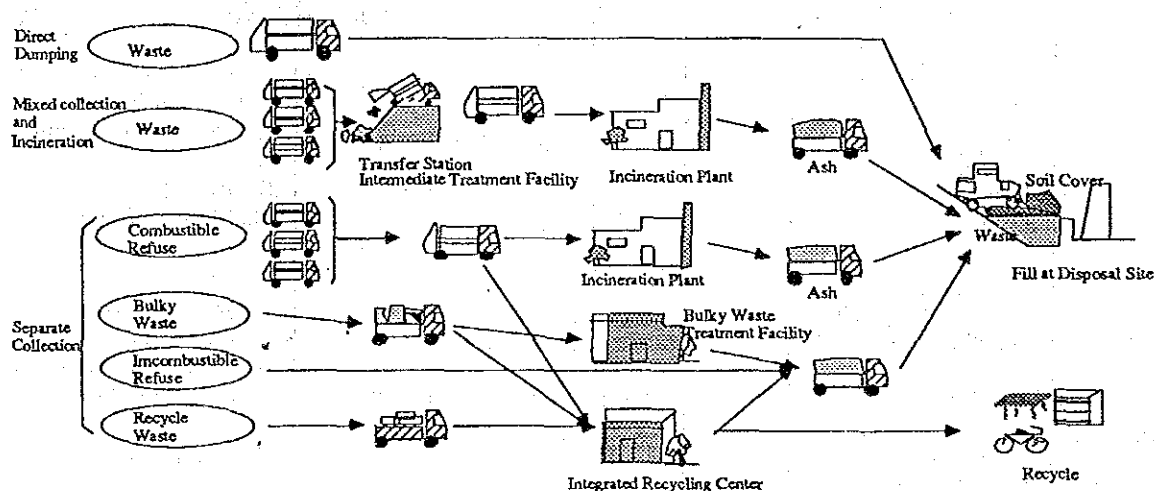


Fig. 1 Solid Waste Management System

1.2.2 Typical Possible Impacts and the Points of Environmental Consideration

Solid waste management projects aim at improving the level of public health condition and living conditions, thus they have positive impacts on the quality of life. However, when waste is treated inadequately, the following points should be considered thoroughly because they might have a negative effect on the environment :

Air Pollution

Air pollution would be caused by dust from the final disposal sites when the waste is dumped and rolled or by smoke from occasional fires.

Smoke from stacks of incineration plants may bring air pollution if exhaust gas is treated inadequately.

Investigation is needed on types and amount of waste to predict the effect of air pollution. In addition, attention should be paid to hospitals and other facilities in the vicinity because they require clean air.

Water Pollution

Rainwater and leachate leakage from the final disposal sites flow into rivers and lakes in the vicinity and cause water pollution.

Groundwater might be contaminated by leachate containing organic substances when it leaks out from the site and infiltrates into the soil.

Polluted rivers and lakes would negatively affect the water use for living, other activities, including fishery, aesthetics and recreation, and obstruct growth of aquatic life.

Industries and natural environment around the site should be considered thoroughly.

Offensive Odor

Putrefied odors may be created from garbage if not covered adequately by soil at the final disposal site. Leachate from dumping sites, drainage from incineration plants and waste drainage from collection vehicles would generate odor. Exhaust gas from incineration plants can be a problem depending on wind direction and emission volume. Exhaust from heavy construction equipment which uses heavy oil would cause odor.

Since hospitals, schools and other public facilities tend to be affected by offensive odor, they should be considered thoroughly.

CHAPTER 2

PROJECT DESCRIPTION AND SITE DESCRIPTION

CHAPTER 2

PROJECT DESCRIPTION AND SITE DESCRIPTION

2.1 Basic Concept

To conduct screening and scoping of the potential environmental impacts that may be caused by a development plan or project, it is essential to fully understand the "project description" and "site description" at the earliest stage.

Project description includes the contents and features of the project, such as its background, objectives, location, executing agency, number of beneficiaries, scale, structure, construction method, operation and maintenance, etc..

Site description includes the present conditions of the natural and social environment and pollution in and around the project area.

In particular, if the project site includes such areas as follow, they should receive special attention:

- a) Areas requiring soil conservation (high risk areas of erosion, salinization, etc.).
- b) Arid and semiarid areas subject to desertification.
- c) Tropical forests.
- d) Water sources.
- e) Habitats of value for the protection and conservation and/or sustainable use of fish and wildlife resources (wetlands, mangrove, swamps, coral reefs, etc.)
- f) Areas of unique interest (historical, archaeological, cultural, aesthetic and scientific).
- g) Areas of concentrations of population or industrial activities where further industrial development or urban expansion could create significant environmental problems.
- h) Areas of particular social interest to specific vulnerable population groups (e.g., nomadic people or other people with traditional life styles).

It should be borne in mind that the above items must be thoroughly studied in each project step.

2.2 Project Description and Site Description of Solid Waste Management Projects

The project description and the site description should be clarified in the formats shown in Tables 2-1 and 2-2 for screening and scoping.

However, at the project finding and preparatory study stages, sufficient information for the project description and site description may not be available. Thus, during the preparatory work prior to the preparatory study in the host country, the formats of Tables 2-1 and 2-2 should be filled in as complete as possible using all available information. The additional necessary information should be supplemented during the field surveys.

Table 2-1 Format for Project Description (Solid Waste Management)

Item	Description
Project Name	
Background	
Objectives	
Location	
Executing Agency	
Beneficiaries	
Project Components	
Type of Project	Construction / Improvement
Population in the Project Area	In year of _____, _____ persons
Amount of Waste Discharged at Present	In year of _____, _____ tones/day
Type of Waste	Domestic / Commercial / Office / Roadside / Rivers / Resort
Scheduled Year / Amount	In year of _____, _____ tones/day
Disposal Method	Sanitary Landfill / Incineration / Compost
Others	

Note: The format should be filled in on the basis of the available existing data and information.

Table 2-2 Format for Site Description (Solid Waste Management)

Item		Description
Project Name		
Social Environment	Inhabitants: (residents/indigenous people/their views on the project, etc.)	
	Land Use: (urban area / farmlands / historic site / scenic spot / hospitals, etc.)	
	Economy / Transport: (commerce, agriculture, forestry / bus terminals, etc.)	
Natural Environment	Topography, Geology: (steep slopes / soft ground / wetlands / faults, etc.)	
	Fauna and Flora and Their Habitats: (national parks / habitats of rare species, etc.)	
Pollution	Complaints: (pollution of the upmost concern, etc.)	
	Measures taken: (institutional measures/ compensation, etc.)	
Others		

Note: The format should be filled in on the basis of the available existing data and information.

CHAPTER 3

SCREENING

CHAPTER 3

SCREENING

3.1 Basic Concept

JICA's 1988 report, "Sectoral Study for Development Assistance-Environment," defines screening as "a process of judgement on whether a development project requires an environmental impact study or not." That is to say, screening is the first judgement in the process of environmental consideration and should commence at the initial stage of the project, such as project finding.

Screening in the guidelines is also based on the above definition. However, the evaluation of whether or not the IEE/EIA is required for a project should be based on appropriate ideas and views for harmonizing the sustainable development with the residents' livelihood and surrounding environment by taking into consideration the project features and its environment, but not on the quantitative standards.

3.2 Screening Methods

3.2.1 Outline

As for the procedures for screening in addition to the provisions detailed in the annex to the 1985 OECD council recommendations, JICA's report, "Sectoral Study for Development Assistance-Environment", describes the following cross-sectional viewpoints:

- Can the project adversely affect the sustainability of production which depends mainly on natural resources ?
- Will the project significantly affect people's health ?
- Will the project lead to a deterioration or loss of valuable living resources and their habitats ?
- Will the project have an unreasonable impact on the livelihoods and subsistence of the people concerned ?

Based on the above viewpoints, the screening method should be examined in detail.

If there are laws or regulations concerning the environmental impact assessment for the project in the host country, it is necessary to discuss with the officials concerned of the country to make better environment considerations in accordance with the laws and regulations by referring to the guidelines.

On the other hand, if there are no such laws or regulations in the host country, it may be possible to formulate a standard with respect to the project scale and the land-use conditions for evaluating whether the development project requires an environmental

impact assessment or not. However, setting up a quantitative standard for judgement is not only difficult but its effectiveness is also doubtful because Japanese development assistance is provided to various countries and their environmental characteristics are vastly different.

It is considered to be more effective, therefore, to formulate certain ideas and viewpoints with qualitative expressions for evaluating screening.

3.2.2 Screening of Solid Waste Management Projects

Based on the above consideration, the following concepts are established in the preliminary environmental survey :

- The development project should be planned in such a way as to provide society with sufficient benefits while securing the areas' sustainable development and growth without being detrimental to the lives and existence of the residents.
- The development project should be planned in such a way as to maintain harmony with the natural environment, while avoiding significant damage to the existing environment, and preserve valuable natural environmental assets.

The examination of screening should be conducted from practical viewpoints for each environmental item based on the above concepts. The results of the examination should be clarified by using the screening format as shown in Table 3-1 and should be included in the preparatory study report.

The evaluation result of each environmental item should be noted on the format whether or not environmental impacts exist. As the overall evaluation, the conclusion and the reason for evaluating whether or not IEE/EIA is required should be described briefly on the format.

The guidelines should be applied for all environmental impacts that may be caused by the project implementation not only in the project area but also in any area that may be directly or indirectly affected during the construction and after the operation of project facilities.

Table 3-1 Format for Screening (Solid Waste Management)

No.	Environmental Item	Description	Evaluation	Remarks (Reason)
Social Environment				
1.	Resettlement	Resettlement due to land occupancy (transfer of rights of residence/land ownership)	[Y][N][?]	
2.	Economic Activities	Loss of bases of economic activities, such as land, and change of economic structure	[Y][N][?]	
3.	Traffic and Public Facilities	Impacts on schools, hospitals and present traffic conditions, such as the increase of traffic congestion and accidents	[Y][N][?]	
4.	Split of Communities	Community split due to interruption of area traffic	[Y][N][?]	
5.	Cultural Property	Damage to or loss of value of churches, temples, shrines, archaeological remains or other cultural assets	[Y][N][?]	
6.	Water Rights and Rights of Common	Obstruction of fishing rights, water rights, rights of common	[Y][N][?]	
7.	Public Health Condition	Deterioration of public health and sanitary conditions due to generation of garbage and the increase of vermin	[Y][N][?]	
8.	Waste	Generation of construction wastes, debris and ash	[Y][N][?]	
9.	Hazards (Risk)	Increase in danger of landslides, cave-ins, etc.	[Y][N][?]	
Natural Environment				
10.	Topography and Geology	Changes of valuable topography and geology due to excavation or filling work	[Y][N][?]	
11.	Soil Erosion	Topsoil erosion by rainfall after reclamation and deforestation	[Y][N][?]	
12.	Groundwater	Pollution by leachate	[Y][N][?]	
13.	Hydrological Situation	Changes of river discharge and riverbed condition due to landfill and drainage inflow	[Y][N][?]	
14.	Coastal Zone	Coastal erosion and change of vegetation due to coastal reclamation and coastal changes	[Y][N][?]	
15.	Fauna and Flora	Obstruction of breeding and extinction of species due to changes of habitat conditions	[Y][N][?]	
16.	Meteorology	Changes of temperature, precipitation, wind, etc. due to large-scale land reclamation and building construction	[Y][N][?]	
17.	Landscape	Change of topography and vegetation due to reclamation, deterioration of aesthetic harmony by structures	[Y][N][?]	
Pollution				
18.	Air Pollution	Pollution caused by exhaust gas or toxic gas from vehicles and factories	[Y][N][?]	
19.	Water Pollution	Pollution caused by inflow of silt, sand and drainage from treatment plants into rivers and groundwater	[Y][N][?]	
20.	Soil Contamination	Contamination of soil by leakage and diffusion of ash and incombustible refuse	[Y][N][?]	
21.	Noise and Vibration	Noise and vibration generated by collection cars and treatment plants	[Y][N][?]	
22.	Land Subsidence	Deformation of land and land subsidence due to lowering of groundwater table	[Y][N][?]	
23.	Offensive Odor	Generation of exhaust gas and offensive odor from treatment plants and dumped waste	[Y][N][?]	
Overall Evaluation: Either IBE or EIA is necessary for the project implementation?			[Y][N]	

CHAPTER 4

SCOPING

CHAPTER 4

SCOPING

4.1 Basic Concept

In JICA's 1988 report, "Sectoral Study for Development Assistance-Environment," scoping is defined as "a process of identification of the critical environmental impacts out of the possible environmental impacts of a development project. Through the scoping process, the priority fields or items of an environmental impact assessment are also identified". Further, it recommends that scoping should be carried out through discussions with the government of the host country. These discussions are to be based on discussion items prepared in advance, and by taking into account the aforementioned cross-sectional judgement provisions.

With the above definition and the methods used by various agencies, the guidelines provide material for conducting adequate scoping. The guidelines would enable even those who are not IEE and EIA specialists to understand the overall picture of the development project to conduct the sufficient scoping work during the short-term preparatory study period.

4.2 Scoping Methods

4.2.1 Outline

There are several technical methods for environmental impact assessment and its scoping. Each of them is selected in accordance with the project type, the project planning level, the features of the environmental conditions, etc. The most common methods are the checklist method, the matrix method, the overlay method, and the network method. In particular, the checklist and the matrix methods are commonly used by most agencies.

For "identification of the critical environmental impacts out of the possible impacts of a development project," as required by the definition of scoping in the "Sectoral Study for Development Assistance-Environment," it is necessary to include all environmental items which can be predicted to arise along with implementation of the project. To accomplish this, the checklist method seems to be the easiest to understand and the most useful.

Based on the above consideration, the checklist method is proposed for scoping in the guidelines.

To clarify important fields and items among those listed on the checklist, it is necessary to understand the causal relationships between the environmental items and the project related activities during the construction and the operation periods. Thus, to make it easier to understand scoping, the guidelines show typical causal relationships between development activities and environmental items by using the matrix as well as the checklist.

For reference purposes, a comprehensive matrix covering 13 sectors of social and economic infrastructure development projects is shown in Table 4-1.

4.2.2 Scoping of Solid Waste Management Projects

The checklist for scoping of solid waste management projects is shown in Table 4-2. The matrix for understanding the causal relationship between the development activities and the environmental items is shown in Table 4-3.

To use the checklist for scoping, the following conditions and procedures should be taken into account:

(1) Application conditions

1) Periods covered by scoping

Scoping should cover both the construction and operation periods.

2) Spatial extent of scoping

Scoping should cover not only the project site for final disposal sites and incineration plants but also the entire area where the impacts would affect directly or indirectly, including the routes of waste collection vehicles, and where the effluent is discharged.

3) Types of Environmental Impacts

Environmental impacts subject to scoping are those having negative impacts on the existing environment.

(2) Evaluation method of important fields and items

The evaluation of each item should be rated according to the following categories:

- A (serious impact is expected);
- B (some impact is expected);
- C (extent of impact is unknown but further examination is required because it might become clear as the study progresses);
- D (no impact is foreseeable and IEE/EIA is not required).

Important fields and items for IEE/EIA should be identified with reference to "possible environmental impacts," "useful factors for evaluation," "measures," and "related subjects for study" as listed in Table 4-5.

The opinions and views of the host country should also be taken into consideration for the evaluation.

(3) Overall Evaluation

The evaluation results of each environmental item and the reasons for the evaluation should be clearly described on the checklist. The items evaluated as A, B, or C should be examined based on the screening concept to determine whether or not IEE/EIA is required, and the policies for further study of those items should be outlined. If it is possible to alleviate or avoid some environmental impacts by taking adequate measures, the contents should be described.

If, as the result of the evaluation, there are items which are evaluated as "C" or higher, some studies should be conducted for these items.

For the overall evaluation, opinions and views of the host country should be taken into consideration.

The overall evaluation form is shown in Table 4-4.

Table 4-1 Comprehensive Matrix

Project Type Environment Items		Sectoral Development									Comprehensive Development				
		Sectors	1. Ports and Harbors	2. Airports	3. Roads	4. Railways	5. River and Erosion Control	6. Solid Waste Management	7. Sewerage	8. Groundwater Development	9. Water Supply	10. Regional Development	11. Tourism Development	12. Transportation Development	13. Urban Transportation Development
Social Environment	1	Resettlement	⊙	⊙	⊙	⊙	⊙	○	○		○	○	○	○	○
	2	Economic Activities	○	○	○	○					○	○	○	○	○
	3	Traffic and Public Facilities	○	○	○	○	○	○			○	○	○	○	○
	4	Split of Communities		○	○	○	○				○	○	○	○	○
	5	Cultural Property	○	○	○	○	○				○	○	○	○	○
	6	Water Rights/Rights of Common	⊙	○	○	○	⊙			○	○	○	○		
	7	Public Health Condition				○		○			○	○	○		
	8	Waste	○	○	○	○	○	○	○		○	○	○	○	○
	9	Hazards (Risk)	○	○	○	○					○	○	○	○	○
Natural Environment	10	Topography and Soil Condition	○	○	○	○	○				○	○	○		
	11	Soil Erosion		○	○	○					○	○	○		
	12	Groundwater			○	○		○		⊙	○				
	13	Hydrological Situation	○	○	○	○	⊙	○			○	○	○	○	○
	14	Coastal Zone	⊙	○	○	○	○	○			○	○	○		
	15	Fauna and Flora	⊙	⊙	⊙	⊙	⊙	○	○		○	○	○	○	○
	16	Meteorology									○		○		
	17	Landscape	○	○	○	○	○	○	○		○	○	○	○	○
Pollution	18	Air Pollution	○	○	⊙			⊙	○		○		○		○
	19	Water Pollution	○	○	○	○	○	⊙	○	○	○	○	○	○	
	20	Soil Contamination	○		○			○					○		○
	21	Noise and Vibration	○	⊙	⊙	⊙	○	○	○	○	○	○	○	○	○
	22	Ground Subsidence								⊙					
	23	Offensive Odor	○					⊙	○			○		○	

Note:⊙ : The environmental items to which special attention has to be paid

They might cause serious impacts that may affect the project formulation depending on the magnitude of the impacts and the possibility of the measures.

○ : The environmental items which may have a significant impact depending on the scale of project and site conditions

No mark : The environmental items requiring no impact assessment since the anticipated impacts are, in general, not significant.

In case of the comprehensive development projects, all the items are classified in ○, because their studies are usually at the master planning stage and the extent of impacts are not clear.

Table 4-2 Checklist for Scoping (Solid Waste Management)

No.	Environmental Item	Evaluation	Reason
Social Environment			
1.	Resettlement		
2.	Economic Activities		
3.	Traffic/Public Facilities		
4.	Split of Communities		
5.	Cultural Property		
6.	Water Rights and Rights of Common		
7.	Public Health Condition		
8.	Waste		
9.	Hazards (Risk)		
Natural Environment			
10.	Topography and Geology		
11.	Soil Erosion		
12.	Groundwater		
13.	Hydrological Situation		
14.	Coastal Zone		
15.	Fauna and Flora		
16.	Meteorology		
17.	Landscape		
Pollution			
18.	Air Pollution		
19.	Water Pollution		
20.	Soil Contamination		
21.	Noise and Vibration		
22.	Land Subsidence		
23.	Offensive Odor		

Note 1: Evaluation categories :

A: Serious impact is expected.

B: Some impact is expected.

C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.).

D: No impact is expected. IEE/EIA is not necessary.

Note 2: The evaluation should be made with reference to the "explanation of item" (Table 4-5)

Table 4-3 Matrix for Scoping (Solid Waste Management)

Major Facilities / Activities Activities which may cause impacts Environmental Items		Final disposal sites / Incineration plants / Transfer stations / Collection vehicles						
		Overall	Before Operation		After Operation			
			Reclamation and Spatial Occupancy	Operation of Construction Equipment and Vehicles	Spatial Occupancy	Operation of Vehicles	Operation and Maintenance of Facilities	Accumulation of People and Goods
Social Environment	1 Resettlement	○	○					
	2 Economic Activity							
	3 Traffic and Public Facility	○				○		
	4 Split of Communities							
	5 Cultural Property							
	6 Water Rights/Rights of Common							
	7 Public Health Condition	○					○	○
	8 Waste	○	○					○
	9 Hazards (Risk)							
Natural Environment	10 Topography and Geology							
	11 Soil Erosion							
	12 Groundwater	○	○				○	
	13 Hydrological Situation	○	○				○	
	14 Coastal Zone	○	○					
	15 Fauna and Flora	○	○	○	○	○		○
	16 Meteorology							
	17 Landscape	○	○		○			
Pollution	18 Air Pollution	◎		○		○	◎	
	19 Water Pollution	◎	○				◎	○
	20 Soil Contamination	○					○	○
	21 Noise and Vibration	○		○		○	○	
	22 Land Subsidence							
	23 Offensive Odor	◎				○	◎	○

Note:◎ : The environmental items to which special attention has to be paid. They might cause serious impacts that may affect the project formulation depending on the magnitude of the impacts and the possibility of the measures.

○ : The environmental items which may have a significant impact depending on the scale of the project and site conditions

No mark : The environmental items requiring no impact assessment since the anticipated impacts are, in general, not significant.

Table 4-4 Overall Evaluation Form (Solid Waste Management)

Environmental Item	Evaluation	Study Plan	Remarks

Note: Evaluation categories :

A: Serious impact is expected.

B: Some impact is expected.

C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.).

D: No impact is expected. IEE/EIA is not necessary.

Table 4-5 Explanation of Item 1 (Solid Waste Management)

Item	1. Resettlement
Description	Resettlement due to occupancy of land (transfer of rights of residence and/or land ownership)
Causes of Impacts	1. Acquisition of land for disposal site
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Loss of living foundation of inhabitants to be resettled. Social and cultural inadaptability to the new resettlement area may occur. 2. Friction between the permanent residents and resettlers over social and economic burdens 3. Deterioration of living standard after resettlement due to the poor compensation system in some countries or the status of illegal occupants
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. If the following conditions are involved, resettlement will be difficult: <ol style="list-style-type: none"> a) the lives of inhabitants depend upon the particular environment of the site, b) the inhabitants are currently well-off, c) desirable resettlement site is not available in the vicinity. 2. Careful handling is needed if racial or tribal problems exist.
Measures	<ol style="list-style-type: none"> 1. Resettlement site selection considering the wishes of the inhabitants 2. Adequate information release and dialogues 3. Proper management of living and economic condition in the resettlement site 4. Compensation 5. Job training and guidance
Related Subjects for Study	<ol style="list-style-type: none"> 1. Population of the inhabitants to be resettled and their economic condition 2. Conditions of the resettlement site 3. Past cases of resettlement

Table 4-5 Explanation of Item 3 (Solid Waste Management)

Item	3. Traffic and Public Facilities
Description	Impact on schools, hospitals and present traffic conditions, such as the increase of traffic congestion and accidents
Causes of Impacts	<ol style="list-style-type: none"> 1. Increase in traffic volume around the disposal site and incineration plant due to the concentration of collection vehicles. Traffic congestion, increase of accidents and other impacts on neighboring facilities may occur depending on the road and traffic conditions.
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Traffic congestion on narrow roads and an increased risk of accidents caused by traffic concentration around the facilities 2. Careful attention should be paid to safety when school routes are used. 3. Air pollution by exhaust and idling noise during slow traffic may become a problem if long lines of collection vehicles form in front of the facilities.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Conditions of roads and traffic around the facilities 2. Distribution of schools and kindergartens and school routes 3. Location of public facilities (e.g., hospitals)
Measures	<ol style="list-style-type: none"> 1. Improvement of roads around the facilities 2. Installation of turnouts in front of the facilities 3. Proper arrangement of collection vehicles and routes to average peak hours 4. Rearrangement of traffic system 5. Installation of traffic safety facilities
Related Subjects for Study	<ol style="list-style-type: none"> 1. Land use and traffic conditions 2. Future land use and transportation plans 3. Higher level regional development plan

Table 4-5 Explanation of Item 7 (Solid Waste Management)

Item	7. Public Health Condition
Description	Deterioration of public health and sanitary conditions, such as the generation of garbage and the increase of vermin
Causes of Impacts	<ol style="list-style-type: none"> 1. Generation of pathogenic insects and toxic gas by inadequate facility designing and management 2. The generation and increase of uncollected waste due to inadequate collection plans may lead to the increase of vermin. 3. Emission of smoke by incineration plants
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. At the final disposal sites, animals and insects which gather on garbage would become vectors of disease. 2. Hazards to respiratory organs by toxic substances contained in smoke from incineration plants without treatment facilities 3. Health hazard of workers may occur if collection and disposal works are conducted inadequately.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Particular attention should be paid if epidemics have been experienced around the area in the past. 2. Investigation is required on stream flow and water quality to predict the impacts if sewage is discharged into streams.
Measures	<ol style="list-style-type: none"> 1. Reexamination of location of final disposal sites and incineration plants 2. Installation of treatment facilities for effluent and exhaust 3. Prevention of vermin by pesticides 4. Examination of collection methods and frequency 5. Public education on sanitation for the inhabitants and workers to avoid infection
Related Subjects for Study	<ol style="list-style-type: none"> 1. Public health condition of the area 2. Habitation and propagation of small mammals (e.g., rats), and insects (e.g., flies) 3. Meteorological data (e.g., precipitation, humidity, etc.) 4. Topography and geology of the area, especially in the wetlands

Table 4-5 Explanation of Item 8 (Solid Waste Management)

Item	8. Waste
Description	Generation of construction and demolition waste, debris and ash.
Causes of Impacts	<ol style="list-style-type: none"> 1. Generation of debris and construction waste due to construction of final disposal sites and incineration plants 2. Generation of waste in excess of the collection and transportation ability 3. Generation of ash and unsuitable waste for incineration during the operation of incineration plants
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. The ambient environment would be aggravated by illegal waste disposal if disposal site does not exist or appropriate disposal costs too much. 2. Water pollution, land degradation and an outbreak of harmful animals which feed on garbage caused by dumping waste into rivers and coastal waters. 3. Large birds in the vicinity of airports may pose a damage to aircraft.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Amount of debris could be estimated from the excavation scale. 2. A large amount of construction waste would be created if the demolition of an existing structure is involved. 3. Uncollected waste may be left due to insufficient transport capacity, especially when the disposal sites are located some distance from the waste sources.
Measures	<ol style="list-style-type: none"> 1. Securing of disposal sites with sufficient capacity 2. Effective planning for volume reduction of waste 3. Careful construction planning and management 4. Publicity and promotional activities to reduce household garbage and industrial waste 5. Proper collection points and frequency
Related Subjects for Study	<ol style="list-style-type: none"> 1. Volume and physical and chemical characteristics of waste 2. Land use and ownership pattern to find suitable disposal sites 3. Action patterns of inhabitants

Table 4-5 Explanation of Item 12 (Solid Waste Management)

Item	12. Groundwater
Description	Pollution by leachate
Causes of Impacts	<ol style="list-style-type: none"> 1. Penetration of leachate from disposal sites 2. Leakage of hazardous substances from ash during rain 3. Large-scale excavation for construction of final disposal sites and incineration plants
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Groundwater polluted by penetration of leachate and hazardous substances would affect the health of inhabitants who use the water for drinking. 2. Depression of groundwater level and land subsidence due to the extraction of groundwater in excavations below the water table
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Impact would be greater in an area where the topsoil has high permeability. 2. Impact will be significant if groundwater is utilized around and downstream of the site.
Measures	<ol style="list-style-type: none"> 1. Careful site selection by taking topography and groundwater conditions into consideration 2. Seepage control work (e.g., use of the impermeable layer, installation of seepage control sheets) 3. Substitutional water supply 4. Installation of waste water treatment plants
Related Subjects for Study	<ol style="list-style-type: none"> 1. Condition of groundwater 2. Topographical and geological survey 3. Water use around and downstream of the site, especially in consideration of women

Table 4-5 Explanation of Item 13 (Solid Waste Management)

Item	13. Hydrological Situation
Description	Change of river discharge and riverbed condition due to inflow of drainage and landfill
Causes of Impacts	<ol style="list-style-type: none"> 1. Inflow of drainage into rivers and lakes from disposal sites 2. Change of water bodies by the construction of facilities when the sites use riparian land or lakesides.
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Change in regime of rivers and lakes by alternation of water bodies and water pollution by effluent would damage plants and animals. Fishermen's source of income may also be affected. 2. Navigation could be interfered with by the alternation of water bodies.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Impacts could be significant if fishery and other economic activities around the rivers and lakes are vigorous. 2. Attention should be paid to the habitats of valuable aquatic life.
Measures	<ol style="list-style-type: none"> 1. Alternate site selection 2. Installation of waste water treatment facilities
Related Subjects for Study	<ol style="list-style-type: none"> 1. Water use in rivers and lakes 2. Aquatic life

Table 4-5 Explanation of Item 14 (Solid Waste Management)

Item	14. Coastal Zone
Description	Reclamation of coast, change of coastal topography and vegetation
Causes of Impacts	<ol style="list-style-type: none"> 1. Alteration of coast for construction of facilities when the site is located near the sea. 2. The impacts may extend to the coastal areas downstream of disposal sites or incineration plants when they are located along rivers.
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Loss or degradation of recreational land, such as beaches and tourism spots, by land reclamation and facilities constructed in the vicinity 2. Damage to or loss of mangrove forests and coral reefs, etc., in coastal area 3. Effect on economic activities when there is fishery
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Impact would be significant if the project site has: <ol style="list-style-type: none"> a) precious and rich natural environment, b) high utility value of the coast. 2. It may take some time for the impacts to appear when the facilities are constructed upstream of rivers.
Measures	<ol style="list-style-type: none"> 1. Proper configuration of land reclamation to alleviate the effect on tide and tidal wave
Related Subjects for Study	<ol style="list-style-type: none"> 1. Use of coastal zone 2. Fauna and flora of coastal zone

Table 4-5 Explanation of Item 15 (Solid Waste Management)

Item	15. Fauna and Flora
Description	Disturbance of breeding and extinction of species due to change of habitat conditions
Causes of Impacts	<ol style="list-style-type: none"> 1. Removal of vegetation and disturbance of animal habitats for the construction of disposal sites and incineration plants 2. Outbreak of pathogenic insects and birds at disposal sites 3. Effects on plants by smoke from incineration plants, and water pollution by leachate from disposal sites 4. Noise and vibration caused by the operation of construction equipment and collection vehicles
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Extinction of valuable and precious species which may affect biodiversity 2. Outbreak of flies, birds and rats which may obstruct the breeding of other species and would affect public health condition
Useful Factors for Evaluation	<p>Particular attention should be paid under the following conditions:</p> <ol style="list-style-type: none"> 1. The site includes vulnerable ecosystem, such as primary forests, swamps and mangrove forests. 2. There are species peculiar to the region. 3. There are endangered or rare species listed in the Red Data Books by International Union for Conservation of Nature and Natural Resources (IUCN). 4. There are bilateral and/or multilateral conventions on wildlife.
Measures	<ol style="list-style-type: none"> 1. Reexamination of the project contents 2. Relocation of plants and animals 3. Careful construction planning
Related Subjects for Study	<ol style="list-style-type: none"> 1. Fauna and flora 2. Ecological system 3. Food chain

Table 4-5 Explanation of Item 17 (Solid Waste Management)

Item	17. Landscape
Description	Alteration of topography and vegetation by land reclamation. Deterioration of aesthetic harmony by appearance of structures
Cause of Impacts	<ol style="list-style-type: none"> 1. Change of topography and vegetation for the construction of final disposal sites and incineration plants 2. Appearance of facilities and structures of disposal sites and incineration plants
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Valuable scenery in the region would be destroyed or deteriorated by land reclamation, vegetation change and construction of incineration plants. 2. Tourism could be affected in the area where the landscape is the important resource. 3. Inhabitants' feelings may be aggravated if the landscape is related to their religion.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Feeling of inhabitants about shapes and colors of facilities depend on their consciousness of the landscape. 2. Measures may differ depending on whether the facility itself becomes a problem or it obstructs the background. 3. Careful considerations should be given to the role of the landscape in religion and tourism, etc., in the area. 4. Evaluation of the host country should be taken into consideration.
Measures	<ol style="list-style-type: none"> 1. Reexamination of the site selection and designing (e.g., configuration, color, etc.) of disposal site and incineration plants 2. Meetings with the inhabitants and provisions of necessary information
Related Subjects for Study	<ol style="list-style-type: none"> 1. Distribution of tourism spots and historical sites 2. Local history and folklore 3. Protection or relocation planning

Table 4-5 Explanation of Item 18 (Solid Waste Management)

Item	18. Air Pollution
Description	Pollution by exhaust gas and toxic gas from vehicles and factories
Causes of Impacts	<ol style="list-style-type: none"> 1. Generation of dust and toxic gas from final disposal sites due to the disposal and rolling of waste 2. Emission of smoke from waste by occasional fires 3. Emission of smoke from incineration plants 4. Generation of dust and exhaust gas from construction vehicles and equipment
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Health hazards, such as asthma, due to toxic gas from final disposal sites and incineration plants if the volume of harmful gas is great 2. Obstruction to growth of plants by toxic gas and dust falling onto their leaves 3. Animals may escape harm, but nests of birds could be affected by dense gas.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Attention should be paid to the facilities which need clean air (e.g., hospitals and rest homes). 2. Inhabitants would be affected by dust and exhaust gas when facility access roads are unpaved and have heavy traffic. 3. Extinction of natural fires would take long time, especially if they begin to burn deep underground.
Measures	<ol style="list-style-type: none"> 1. Reexamination of location, capacity, stack height, etc. 2. Planning in consideration of land use around the area 3. Careful construction planning and management 4. Frequent covering or watering of open dump to prevent natural burning
Related Subjects for Study	<ol style="list-style-type: none"> 1. Meteorological data (e.g., wind direction and speed, air temperature distribution) 2. Topography , especially ups and downs of basins and valleys 3. Case study on damage by air pollution in the past 4. Air quality standard and regulations

Table 4-5 Explanation of Item 19 (Solid Waste Management)

Item	19. Water Pollution
Description	Pollution by inflow of silt, sand and effluent from treatment plants into rivers and groundwater
Causes of Impacts	<ol style="list-style-type: none"> 1. Inflow of sand and silt due to the construction of final disposal sites and incineration plants 2. Inflow of leachate and untreated drainage into water bodies
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Water use, fishery, landscape and recreation in downstream would be affected by pollution of rivers and lakes 2. Obstruction to growth of aquatic life due to water quality aggravation by inflow of polluted water which may affect fishery, tourism and water use of inhabitants. 3. Health problems may occur if drinking water is contaminated.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. If large-scale disposal sites are located in wetlands, the discharge will be large. Thus, careful study is required on the waste water treatment capacity. 2. Careful consideration is required to avoid leakage of toxic substances, especially when there are intakes of drinking water downstream.
Measures	<ol style="list-style-type: none"> 1. Installation of waste water treatment plants with sufficient capacity 2. Collection of waste water through ditches and pipes 3. Careful construction planning and management
Related Subjects for Study	<ol style="list-style-type: none"> 1. Topography and hydrological regime 2. Precipitation and hydrological survey 3. Water use

Table 4-5 Explanation of Item 20 (Solid Waste Management)

Item	20. Soil Contamination
Description	Soil contamination due to leakage and diffusion of ash and incombustible refuse
Causes of Impacts	<ol style="list-style-type: none"> 1. Dumping of ash, incombustible refuse and dust from dust collectors 2. Application of compost contaminated by heavy metals, etc., to farmlands
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Contamination of disposal sites. Toxic substances would leak with rainwater and affect water use and the downstream water value (e.g., drinking, agriculture and fishery). 2. Contaminants in farmland would be absorbed by crops and affect human health.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Contamination risk would be high if ash and industrial waste would be dumped. 2. Impacts would be significant when downstream water use is vigorous. 3. Investigation is needed if the compost is to be used as fertilizer.
Measures	<ol style="list-style-type: none"> 1. Prevention of toxic substances from intrusion by applying impermeable sheet or installing clay as impermeable layer 2. Prevention of leakage and intrusion by heat and light treatment, confinement in cans, concrete, etc. 3. No use of contaminated compost as fertilizer
Related Subjects for Study	<ol style="list-style-type: none"> 1. Topographical and geological survey 2. Water use

Table 4-5 Explanation of Item 21 (Solid Waste Management)

Item	21. Noise and Vibration
Description	Generation of noise and vibration by operation of collection cars and treatment plants
Causes of Impacts	<ol style="list-style-type: none"> 1. Use of construction equipment and vehicles for construction, such as bulldozers and dump trucks 2. Concentration of collection vehicles around the incineration plants and transfer facilities
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Hospitals and schools along the route would be affected by noise. Daily life of inhabitants would also be affected. 2. Cracks in buildings on soft ground caused by vibrations 3. Obstruction to breeding of cattle and habitats of wildlife in the suburbs
Useful Factors for Evaluation	<p>Careful consideration would be needed if the area have following conditions:</p> <ol style="list-style-type: none"> 1. There are facilities which require particular calmness, such as hospitals and rest homes. 2. There is soft ground. Effect of vibration would be significant. 3. There is cattle feeding. 4. There are valuable wildlife habitats.
Measures	<ol style="list-style-type: none"> 1. Reexamination of the project contents 2. Installation of acoustic walls and buffer zone 3. Examination of construction hours, especially on weekends and at night 4. Use of low-noise and vibration construction equipment.
Related Subjects for Study	<ol style="list-style-type: none"> 1. Land use in the site and the vicinity 2. Distribution of schools, hospitals and inhabitants. Living condition of inhabitants. 3. Topographical and geological survey

Table 4-5 Explanation of Item 23 (Solid Waste Management)

Item	23. Offensive Odor
Description	Generation of offensive odor of exhaust gas from treatment plants and dumped waste
Causes of Impacts	<ol style="list-style-type: none"> 1. Putrid smell from household garbage in final disposal sites, in case of open dumping without soil covering 2. Leachate from disposal sites, drainage from incineration plants and refuse drainage from collection vehicles 3. Emission gas from incineration plants
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Users of public facilities, such as hospitals and schools, as well as inhabitants, around the final disposal sites and incineration plants may complain about the odor. 2. Land use demand in the vicinity would decrease thereby decreasing the land value. 3. Emission gas from incineration plants could generate offensive odors, depending on wind direction and speed, and affect inhabitants.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Impacts would be significant in densely populated areas. 2. Affected areas would vary depending on wind and climate conditions.
Measures	<ol style="list-style-type: none"> 1. Reexamination of the location and project contents 2. Consideration on land use around the facilities 3. Careful construction planning and maintenance 4. Frequent soil cover of refuse
Related Subjects for Study	<ol style="list-style-type: none"> 1. Meteorological data (e.g., wind direction and speed, air temperature distribution, precipitation, etc.) 2. Topography , especially ups and downs of land 3. Past complaints regarding offensive odors

Appendix: Flowchart of the Environmental Impacts of Solid Waste Management Projects

