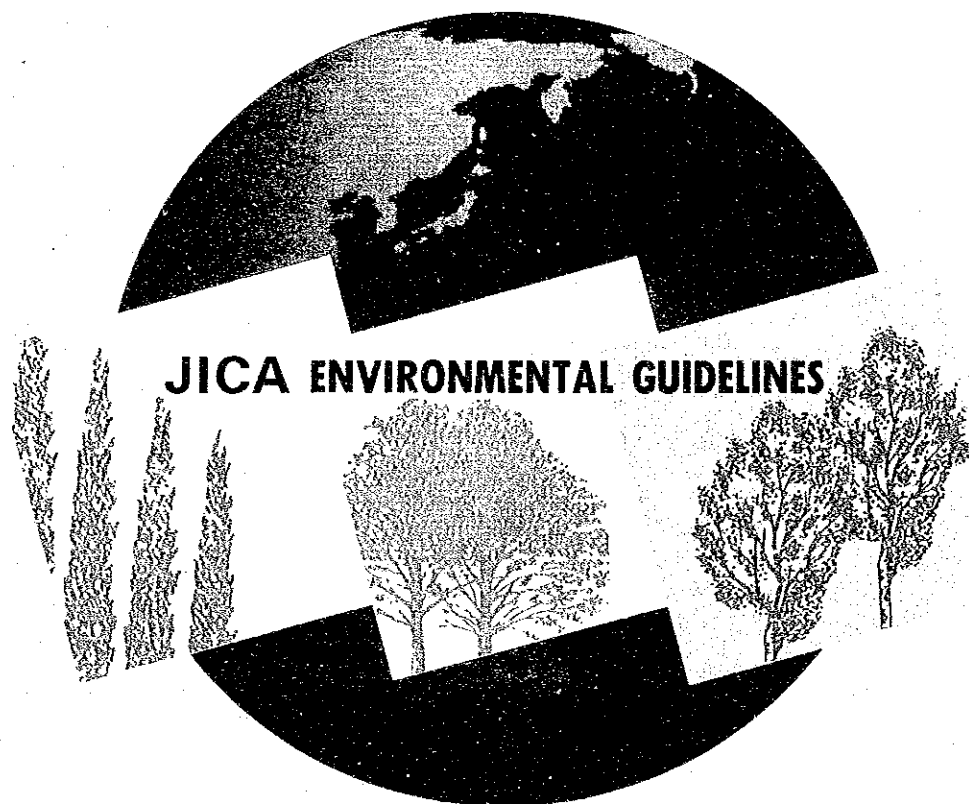


ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

VII SEWERAGE



SEPTEMBER 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

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ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

VIII SEWERAGE

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 listed below. This volume deals with environmental consideration for "Sewerage".

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

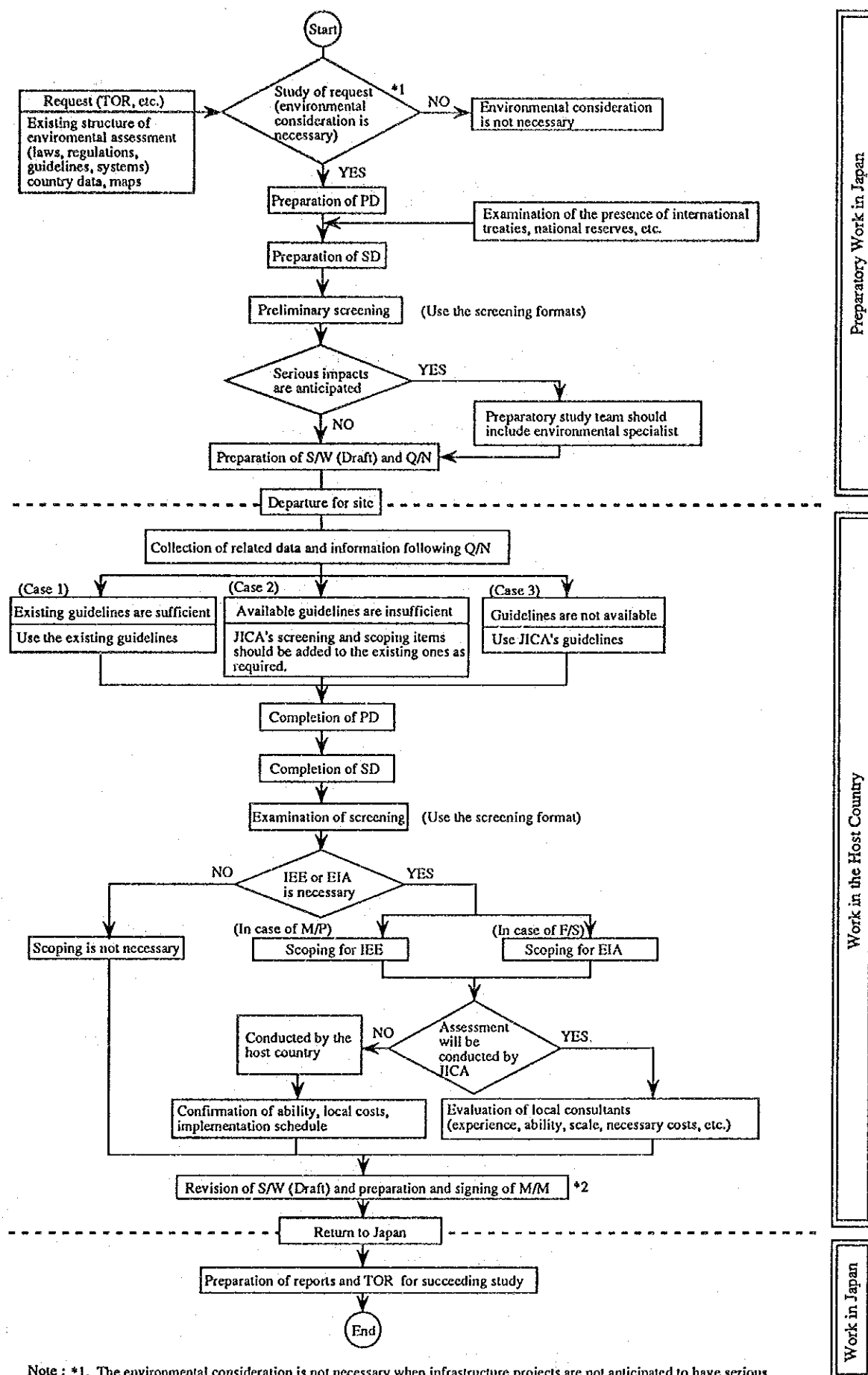
Evaluate the magnitude of impact on each environmental item, using the checklist method, to specify the items that are to be studied in IEE for M/P or EIA for F/S. In this process, making use of the explanation of items in the guidelines, try to grasp the features of possible environmental impacts. The 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

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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

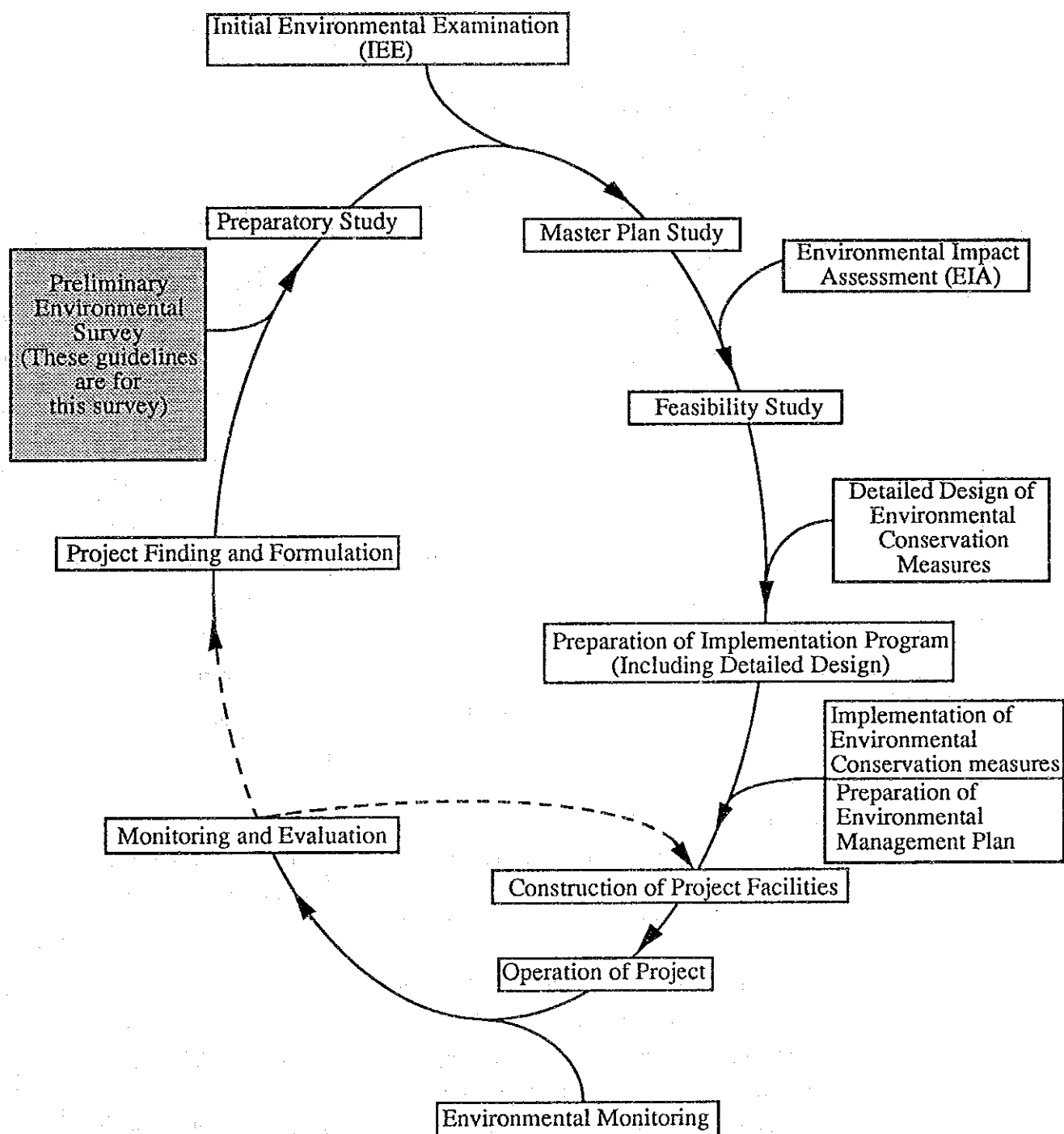


Table 1-1 Project Implementation Stages and Corresponding Environmental Consideration Stages

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 Sewerage Projects

1.2.1 Definition of Sewerage Projects in the Guidelines

Sewerage projects in the guidelines are a series of plans related to the construction and management of sewer pipes, pumping stations, sewage treatment plants, sludge treatment plants, and sludge disposal areas for treating domestic, industrial, and public sewage.

1.2.2 Typical Possible Impacts and the Points of Environmental Consideration

The objectives of sewerage projects are the improvement of public health and sanitation conditions and area residents' living conditions. The plan gives a strong positive impact on the living environment.

Even if the plan is inappropriately implemented, the environmental impacts that will be caused would be less serious than those caused by other infrastructure development projects.

The relatively unique effect that may be caused by a sewerage project is offensive odor which is described below.

Offensive Odor

If a sewerage system is an open channel type, offensive odors will be emanated. In the case of a piped sewerage system, offensive odors may be generated when leaking, pump failure, or debris clogging occurs. At sludge treatment plants and sewerage treatment plants, some processing methods also cause offensive odors.

Since the residents and the users of public facilities, such as hospitals and schools, often complain of offensive odors, careful attention should be paid to them when conducting environmental consideration.

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 Sewerage 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 (Sewerage)

Item	Description
Project Name	
Background	
Objectives	
Location	
Executing Agency	
Beneficiaries	
Project Components	
Type of Project	Construction / Improvement
Project Site	Area: ha, Population: Sewage Volume: m ³ /day
Sewer System	Separate or Combined
Sewage Treatment Plant	Method: , Capacity: m ³ /day
Sludge Disposal Method	Drying / Incineration, Burying / Recycling / Others ()
Channel Length etc.	Open / Culvert, Length: km Pumping Station: places
Outlet	Outlet : River / Lake / Wetland / Sea: Drainage Quality:
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 (Sewerage)

Item		Description
Project Name		
Social Environment	Inhabitants: (residents/indigenous people/their views on the project, etc.)	
	Land Use: (urban area, rural area, historic sites, scenic spots, hospitals, etc.)	
	Economy and Transportation: (commerce, agriculture/fishery, industrial zone, bus terminal, etc.)	
Natural Environment	Topography and Geology: (steep slopes, soft ground, wetlands/faults, etc.)	
	Coastal and Marine Area: (erosion, sedimentation, current, tide, etc.)	
	Valuable 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 Sewerage 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 (Sewerage)

No.	Environmental Item	Description	Evaluation	Remarks (Reason)
Social Environment				
1.	Resettlement	Resettlement due to land occupancy (transfer of rights of residence and land ownership)	[Y][N][?]	
2.	Economic Activities	Loss of production base 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 jam and accidents	[Y][N][?]	
4.	Split of Communities	Separation of regional communities by hindrance of regional traffic	[Y][N][?]	
5.	Cultural Property	Loss or decrease of the value of cultural assets such as temples, shrines and archaeological assets etc.	[Y][N][?]	
6.	Water Rights and Rights of Common	Obstruction of fishing rights, water rights and rights of common.	[Y][N][?]	
7.	Public Health Condition	Worsening of health and sanitary conditions due to the generation of garbage, and pathogenic insects	[Y][N][?]	
8.	Waste	Generation of construction waste, debris, sludge, and general waste	[Y][N][?]	
9.	Hazards (Risk)	Increase in risk of cave-ins, ground failure and accidents	[Y][N][?]	
Natural Environment				
10.	Topography and Geology	Change of valuable topography and geology due to excavation and earthfill	[Y][N][?]	
11.	Soil Erosion	Topsoil erosion by rainfall after land reclamation and deforestation	[Y][N][?]	
12.	Groundwater	Exhaustion of groundwater caused by over-draft, and water pollution by leachate	[Y][N][?]	
13.	Hydrological Situation	Change of discharge and water quality due to reclamation and drainage	[Y][N][?]	
14.	Coastal Zone	Coastal erosion and change of coastal vegetation due to change of littoral drift and reclamation	[Y][N][?]	
15.	Fauna and Flora	Obstruction of breeding and extinction of species due to the changes of habitat conditions	[Y][N][?]	
16.	Meteorology	Change of micro-climate, such as temperature, wind, etc., due to large scale reclamation and 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 or toxic gases from vehicles and factories	[Y][N][?]	
19.	Water Pollution	Pollution caused by inflow of debris and effluent from factories into rivers and groundwater	[Y][N][?]	
20.	Soil Contamination	Contamination caused by discharge or diffusion of waste water drainage or toxic materials	[Y][N][?]	
21.	Noise and Vibration	Noise and vibration generated by vehicles and facility operation	[Y][N][?]	
22.	Land Subsidence	Land deformation caused by the draw-down of water table	[Y][N][?]	
23.	Offensive Odor	Generation of offensive odor by sewage treatment plant operation	[Y][N][?]	
Overall Evaluation: Either IEE 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 Sewerage Projects

The checklist for scoping of sewerage 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 the project site and its vicinities, and the related water area.

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 (Sewerage)

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 (Sewerage)

Major Facilities / Activities Activities which may cause impacts Environmental Items		Sewer pipes / Treatment plants / Pumping stations / Sludge treatment plants / Sludge disposal sites				
		Overall Eva- luation	Before Operation		After Operation	
			Reclamation and Spatial Occupancy	Operation of Construction Equipment and Vehicles	Spatial Occupancy	Operation of Facilities
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 (Sewerage)

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 (Sewerage)

Item	1. Resettlement
Description	Resettlement due to land occupancy (transfer of rights of residence/land ownership)
Causes of Impacts	<ol style="list-style-type: none"> 1. Land acquisition for sewage treatment plants, sludge treatment plants, disposal areas, and pumping station sites
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Loss of living foundation of the residents to be relocated, social and cultural unsuitability to the new resettlement area 2. Friction between permanent residents and relocated people (new settlers) due to social and economic burden on the permanent residents 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. It may be necessary to relocate the residents when there is insufficient space for facility construction 2. In some cases, the inhabitants to be relocated are squatters. 3. Careful attention should be paid to the resettlement where racial problems exist. 4. The resettlement may be more difficult when there is no favorable resettlement area nearby.
Measures	<ol style="list-style-type: none"> 1. Selection of resettlement areas by taking into account the wishes of the residents 2. Meetings with the inhabitants and provision of necessary information 3. Improvement of the living and economic situations in the resettlement area 4. Sufficient compensation 5. Job training and guidance
Related Subjects for Study	<ol style="list-style-type: none"> 1. Number of inhabitants to be relocated and their economic conditions 2. Conditions of the resettlement area 3. Past cases of resettlement

Table 4-5 Explanation of Item 8 (Sewerage)

Item	8 Waste
Description	Generation of construction waste, debris, sludge, and general waste
Causes of Impacts	<ol style="list-style-type: none"> 1. Sludge generation at sewage treatment plants 2. Generation of construction waste materials and debris during the construction of sewage treatment plants and sludge treatment and disposal facilities
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. When an adequate sludge treatment method is not used or when there is no sludge disposal area, generated sludge may be dumped as waste. 2. As a result of reclamation and facility construction of sewage treatment plants, construction waste and dirt would be generated. If they are left at the site, they will probably deteriorate the landscape and might affect the vegetation and cause soil and water pollution.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. A large amount of construction waste would be generated when existing structures are demolished. 2. A large amount of sludge could be generated due to the generation of sewage which exceeds the planning volume following the area development.
Measures	<ol style="list-style-type: none"> 1. Securing of sludge disposal sites 2. Utilization of sludge as construction material and fertilizer 3. Careful construction plan and management 4. Examination of adequate scale of facilities by taking into account the development plan of the area.
Related Subjects for Study	<ol style="list-style-type: none"> 1. Volume of sludge generation 2. Land ownership and land use conditions for obtaining disposal sites 3. Laws and regulations related to solid waste management

Table 4-5 Explanation of Item 15 (Sewerage)

Item	15. Fauna and Flora
Description	Obstruction of breeding and extinction of species due to changes of habitat conditions
Causes of Impacts	<ol style="list-style-type: none"> 1. Construction of sewage treatment plants, pumping stations, sludge treatment plants, and sludge disposal sites 2. Discharge of drainage from facilities 3. Inflow of untreated sewage which exceeds the capacity of the treatment plant during a flood (in case of combined sewers)
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. As the construction of sewage treatment facilities requires a large site, fauna and flora would often be removed. 2. When sewage treatment level is low, effluent from the plant may locally deteriorate the water quality and have an impact on aquatic life. 3. The construction of a sewerage system may change the river discharge and, as a result, may affect aquatic life. 4. A combined sewer overflow during a flood would change the river discharge and water quality and, as a result, may affect aquatic life.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Special attention is required when there are vulnerable ecological systems, such as virgin forests, marshes, and mangroves, in the area. 2. Careful consideration should be given to the unique species in the area. 3. If there are many residents who live by hunting animals or utilizing valuable animals, the problems will be more serious. 4. Special attention should be paid to endangered and/or rare species in the area that are listed in the Red Data Books of the International Union for Conservation of Nature and Natural Resources (IUCN). 5. Special attention should be paid to bilateral and/or multilateral conventions on wildlife.
Measures	<ol style="list-style-type: none"> 1. Reexamination of sewage treatment level and other contents 2. Reexamination of facility location 3. Protection measures for fauna and flora
Related Subjects for Study	<ol style="list-style-type: none"> 1. Fauna and flora 2. Aquatic life 3. Precipitation study

Table 4-5 Explanation of Item 17 (Sewerage)

Item	17. Landscape
Description	Change of topography and vegetation due to the land reclamation. Deterioration of aesthetic harmony by the appearance of structures
Causes of Impacts	<ol style="list-style-type: none"> 1. Change of topography and vegetation caused by the construction of sewage treatment plants, pumping stations, sludge treatment plants, and sludge disposal sites, and the appearance of facilities
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Construction of sewage treatment plants, pumping stations, sludge treatment plants, sludge disposal facilities, and the associated structures may destroy valuable landscape or the harmony of landscape. 2. When the present landscape is related to religion or tourism, friction with the residents may arise.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Special consideration is required when existing landscape has cultural or religious values. 2. Large impacts may arise when the present landscape is utilized as a tourist attraction. 3. Different solutions should be made for the two cases; one is that the project facilities themselves are landscape problems and the other is that the project facilities hide the present landscape.
Measures	<ol style="list-style-type: none"> 1. Reexamination of facility site 2. Preservation of greenery 3. Examination of architecture plan
Related Subjects for Study	<ol style="list-style-type: none"> 1. Present land use conditions 2. Tourism in the project area 3. Parks and environmental conservation areas

Table 4-5 Explanation of Item 18 (Sewerage)

Item	18. Air Pollution
Description	Pollution caused by exhaust gas or toxic gas from vehicles and factories
Causes of Impacts	<ol style="list-style-type: none"> 1. Sludge burning in case of incineration type sludge treatment plant 2. Treatment of sewage that is mixed with industrial sewage 3. Carrying out of sludge 4. Exhaust gas and dust produced by construction vehicles and machinery operations
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Like garbage incineration, sludge incineration would produce dust and harmful gases with NO_x and SO_x which may affect the health and lives of inhabitants and fauna and flora in the area. 2. When industrial sewage is not adequately treated, hazardous materials may flow into a sewerage system where it is finally accumulated as sludge. Then, when the sludge is incinerated, harmful gases may be produced. Volatile materials in sludge may evaporate and produce harmful gases. 3. When transporting the sludge to the treatment plant by trucks, dust would be produced by the trucks. 4. The operation of construction machinery and earth work would produce dust and exhaust gas, and they might cause air pollution.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Large impacts would occur in densely populated areas. 2. Special attention should be paid if industrial sewage flows into the sewerage system. 3. Special consideration should be given to prevent dust when sludge is disposed of by land disposal.
Measures	<ol style="list-style-type: none"> 1. Examination of sludge disposal methods, such as compost making, other than the incineration method. 2. Examination of facility location 3. Installation of dust and exhaust gas treatment facilities using the absorption method. 4. Sewage quality management at each factory. 5. Establishment of dust control measures for sludge transporting trucks.
Related Subjects for Study	<ol style="list-style-type: none"> 1. Weather conditions (wind directions and speed, in particular) 2. Study of hazardous material handling and storage methods at factories located in the sewage collecting area 3. Topography and land use conditions 4. Air pollution control standards

Table 4-5 Explanation of Item 19 (Sewerage)

Item	19. Water Pollution
Description	Pollution caused by inflow of debris and sewage from factories into rivers and groundwater
Causes of Impacts	<ol style="list-style-type: none"> 1. Drainage of insufficiently treated water from sewage treatment plants 2. Inflow of excessive sewage into combined sewers during a flood 3. Inflow of inadequately treated industrial sewage 4. Overflow caused by pump failures or pipe clogging 5. Occurrence of turbid water during construction work
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. When sewage treatment level is low, the effluent may locally deteriorate the water quality. 2. When industrial sewage contains hazardous materials, they may damage the sewage treatment plant and the effluent may cause water pollution. 3. Overflow caused by pump failure or excessive inflow into combined sewers during a flood may change river discharge and water quality. 4. Turbid water caused by construction work may affect aquatic life temporarily.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. When the treatment level is low and the discharge of the river is small, the effluent may cause local water pollution or sanitation problems, such as offensive odors. 2. Impacts would be more serious in closed water areas, such as lakes. 3. Special attention should be paid to the pollution caused by the inflow of sewage from factories.
Measures	<ol style="list-style-type: none"> 1. Upgrading the sewage treatment level to remove phosphate and nitrogenous compounds 2. Discharge of effluents at large river discharge points 3. Examination of separate sewer system installation 4. Preliminary treatment of industrial sewage 5. Periodic inspections of sewerage system and provision of emergency power source
Related Subjects for Study	<ol style="list-style-type: none"> 1. Water quality and flow conditions of the rivers and lakes, and domestic water use situations. 2. Rainfall pattern. 3. Hazardous material handling methods and storage conditions at factories.

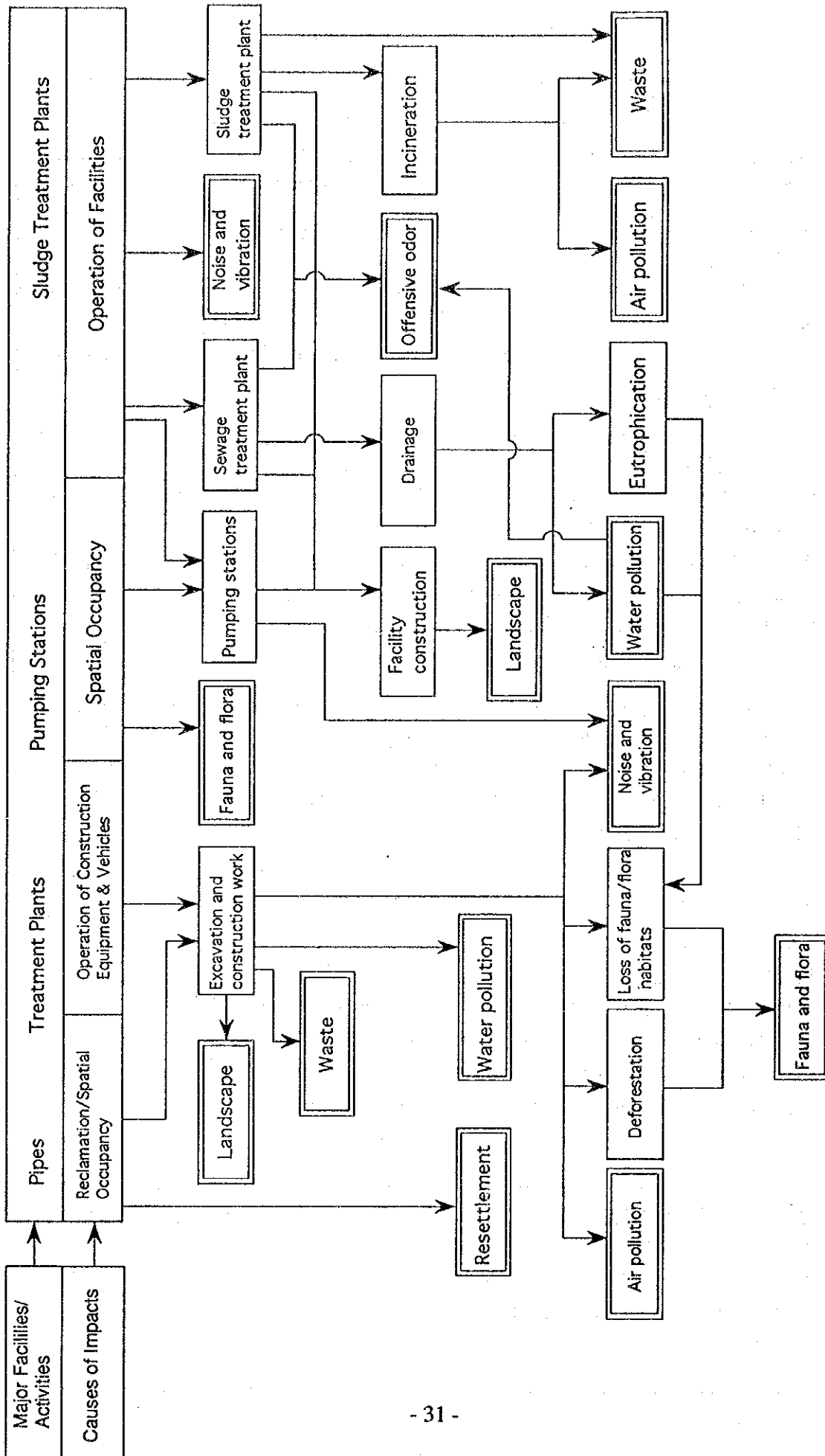
Table 4-5 Explanation of Item 21 (Sewerage)

Item	21. Noise and Vibration
Description	Noise and vibration generated by vehicles and facility operation.
Causes of Impacts	<ol style="list-style-type: none"> 1. Operation of vehicles and machinery used during the construction of sewage treatment plants, sludge treatment plants, and sludge disposal facilities. 2. Operation of sewage treatment plants and pumping stations.
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Noise interference at hospitals and schools. Interruption of sleep by traffic noise at night 2. Interference with cattle breeding and the dispersion of wildlife in the countryside. 3. Vibration may cause cracks in buildings located on soft ground.
Useful Factors for Evaluation	<p>Serious impacts may occur under the following conditions:</p> <ol style="list-style-type: none"> 1. Densely populated areas or such facilities that require a quiet atmosphere are located nearby. 2. There are cattle related industries in the area. 3. There are valuable wildlife habitats in the area. 4. The planning area is located on soft ground, such as reclaimed land, clayey soil layer, etc.
Measures	<ol style="list-style-type: none"> 1. Installation of low noise and low vibration equipment 2. Installation of acoustic walls and buffer zones 3. Adjustment of construction work hours
Related Subjects for Study	<ol style="list-style-type: none"> 1. Geological survey 2. Land use, locations and conditions of public facilities, and inhabitants' living conditions 3. Living conditions of valuable wildlife

Table 4-5 Explanation of Item 23 (Sewerage)

Item	23. Offensive Odor
Description	Generation of offensive odor by sewage treatment plant operation
Causes of Impacts	<ol style="list-style-type: none"> 1. Operation of sewage treatment plants, sludge treatment plants, and sludge disposal facilities 2. Sewage outflow caused by pump failures or sewage pipe clogging or use of open channel type sewerage systems
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. When an open channel type sewerage system is adopted, the sewage would generate offensive odors. 2. When a piped sewerage system is adopted, pump failures or pipe clogging may cause sewage overflow and, as a result, offensive odors will be produced. 3. Certain sewage treatment methods may cause offensive odors. 4. Certain sludge treatment methods may cause offensive odors.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. The effects of offensive odor would be more serious in densely populated areas. 2. Illegal tapping of sewerage pipes may cause sewage overflow. 3. Measures should be taken when the power source for sewage pumps is frequently interrupted.
Measures	<ol style="list-style-type: none"> 1. Conversion to a piped sewerage system and conduct periodic inspections 2. Installation of odor removal equipment at sewage treatment plants 3. Separation of sewage treatment plants by providing green buffer zones 4. Examination of treatment methods and capacities
Related Subjects for Study	<ol style="list-style-type: none"> 1. Land use conditions 2. Land use plan 3. Past complaints regarding offensive odors

Appendix Flow Chart of Environmental Impacts of Sewerage Development Projects



Note :  indicates the environmental items shown in Table 4-3



1