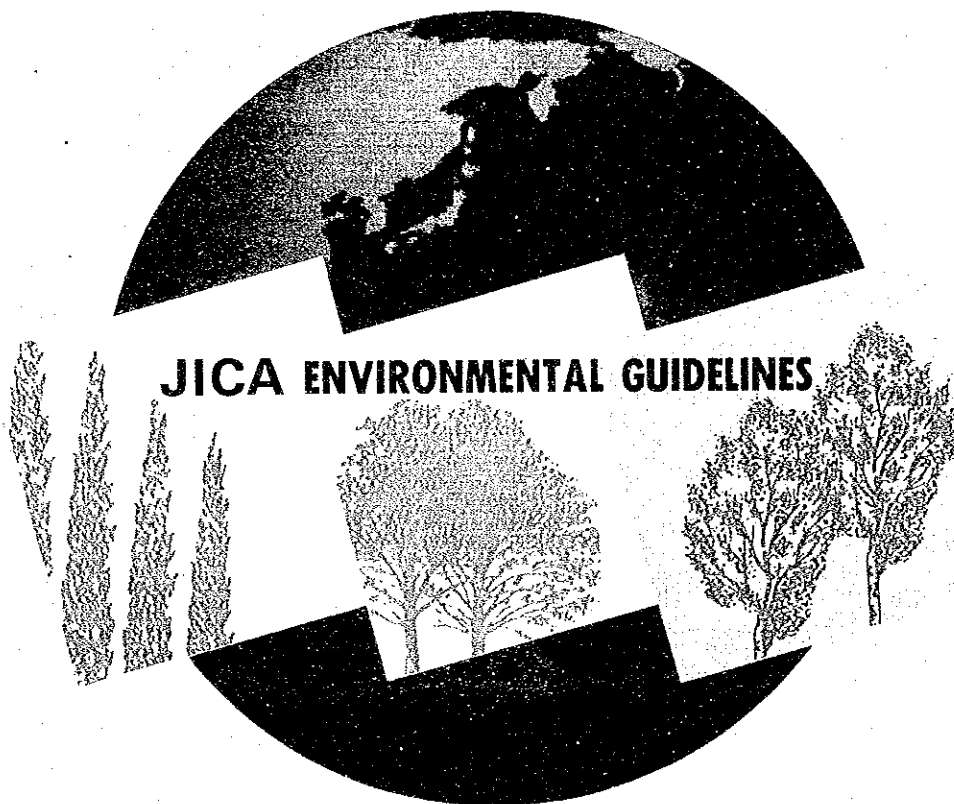


ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

II PORTS AND HARBORS



SEPTEMBER 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

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ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

II PORTS AND HARBORS

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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 "Ports and Harbors".

Sector I	Ports and Harbors
Sector II	Airports
Sector III	Roads
Sector IV	Railways
Sector V	River and Erosion Control
Sector VI	Solid Wastes 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

TABLE OF CONTENTS

Terminology	(iv)
Abbreviations	(vii)
Use of the Guidelines	1
Chapter 1 Outline of Environmental Consideration	4
1.1 Basic Concept	4
1.2 Environmental Consideration for Port and Harbor Projects	9
1.2.1 Definition of Port and Harbor Projects in the Guidelines	9
1.2.2 Typical Possible Impacts and the Points of Environmental Consideration	9
Chapter 2 Project Description and Site Description	11
2.1 Basic Concept	11
2.2 Project Description and Site Description of Port and Harbor Projects	11
Chapter 3 Screening	14
3.1 Basic Concept	14
3.2 Screening Methods	14
3.2.1 Outline	14
3.2.2 Screening of Port and Harbor Projects	15
Chapter 4 Scoping	17
4.1 Basic Concept	17
4.2 Scoping Methods	17
4.2.1 Outline	17
4.2.2 Scoping of Port and Harbor Projects	18

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

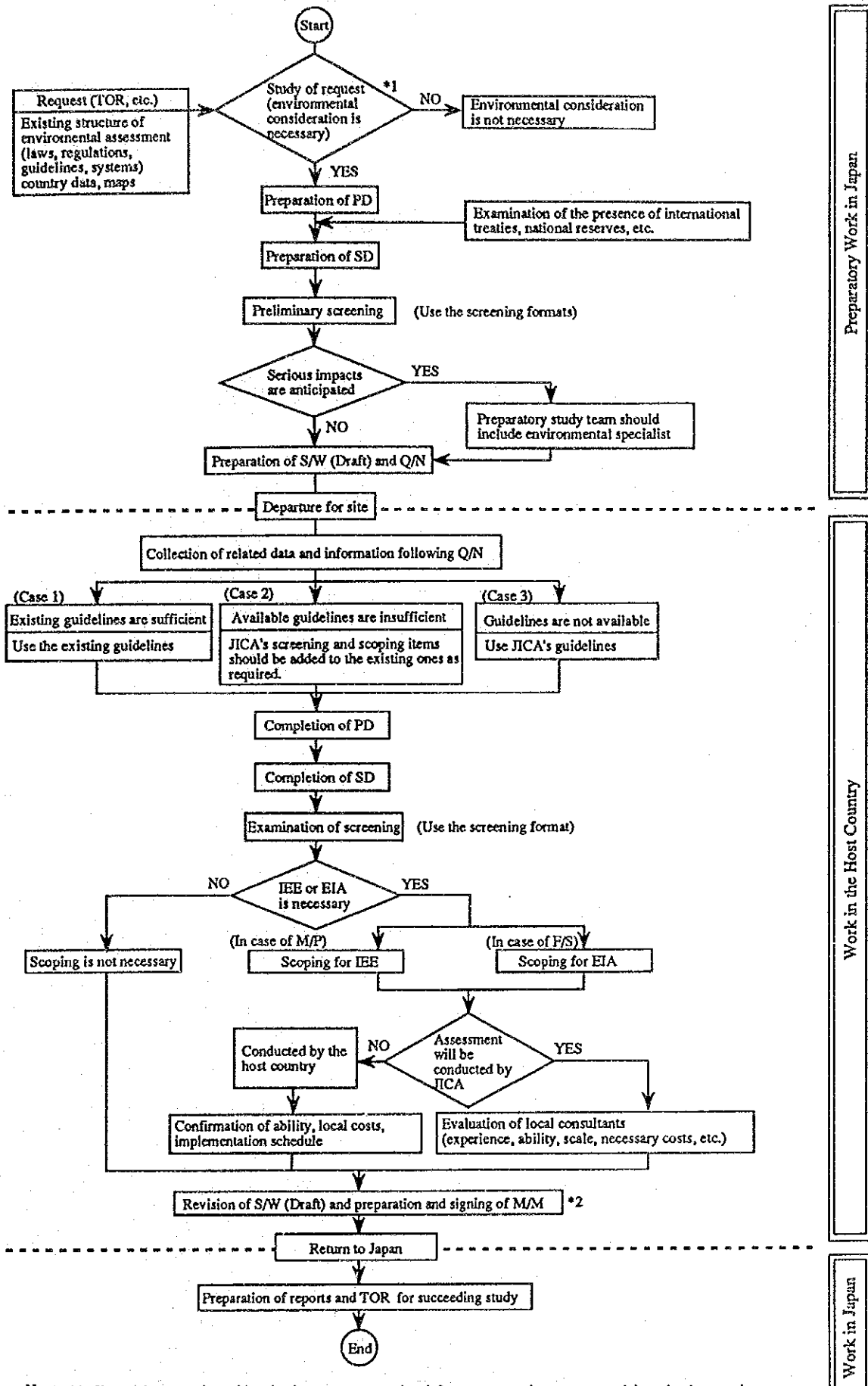
Evaluate the magnitude of impact on each environmental item, using the checklist method, to specify the items that are to be studied in IEE for M/P or EIA for F/S. In this process, making use of the explanation of items in the guidelines, try to grasp the features of possible environmental impacts. The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

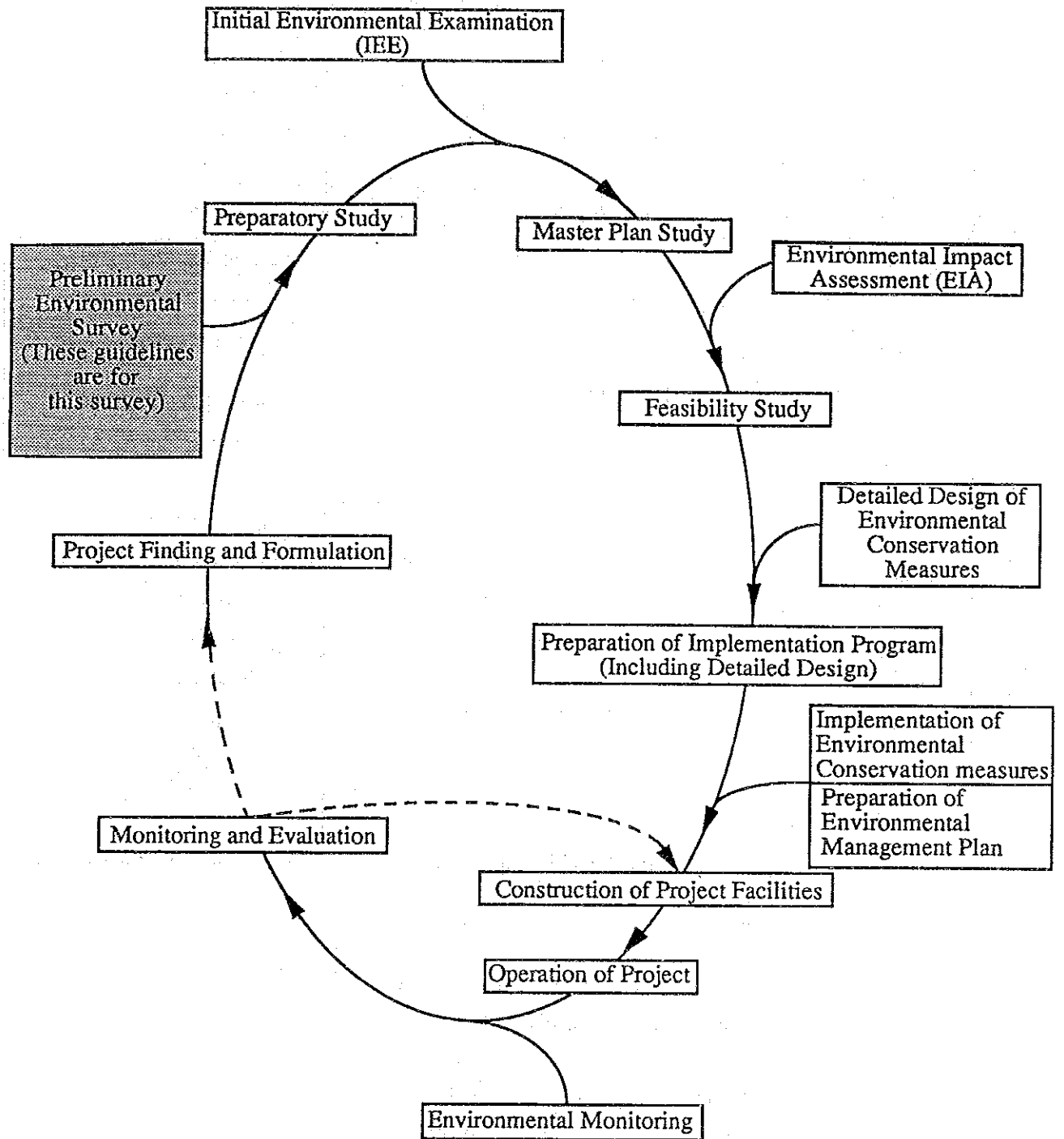


Table 1-1 Project Implementation Stages and Corresponding Environmental Consideration Stages

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)			Examination of Environmental Conservation Measures
	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	Preparatory Study	(Screening) Review of preliminary screening (Scoping) Decision of important items for IEE or EIA Decision of work boundaries	
	Discussion and Agreement on S/W ↓ Preparation of Preparatory Study Report	↓	(Preparation of M/M, S/W) Examine the description of agreed items on screening and scoping. (Reporting) Clarification of background and agreed items.
Selection of Consultants	Preparation of Project Specification ↓ Selection of Consultants		(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.
Full-scale Study	Preparation of and Discussion on IC/R ↓ Implementation of IEE or EIA		(IEE or EIA) Discussion and decision on IEE/EIA items and methods based on the results of scoping.
	Explanation of and Discussion on DF/R ↓ Preparation of F/R		(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 Port and Harbor Projects

1.2.1 Definition of Port and Harbor Projects in the Guidelines

Port and harbor projects in the guidelines deal with the construction and operation of port and harbor facilities, such as facilities in the sea (sea route, anchorage), fringe facilities (breakwater, training dike, jetty), moorings, disposal facilities, storage facilities and coastal transport facilities, etc.. Land use plans for the hinterland of the port/harbor, e.g., industrial park or recreational facilities, are not included in the guidelines.

1.2.2 Typical Possible Impacts and the Points of Environmental Consideration

Typical impacts of port and harbor projects needing particular environmental consideration are as follows:

Resettlement

Inhabitants would be resettled due to land acquisition for port and harbor construction. Loss of livelihood of inhabitants, difficulty in social and cultural adaptation to the relocation site may take place.

Conditions of inhabitants to be resettled and relocation site should be investigated thoroughly.

Water Rights and Rights of Common

The conditions of fishing rights which existed before would be changed by the appearance of port and harbor facilities and the generation of turbid water at the construction stage. As a result, coastal fisheries would be affected and local economic activities may be changed.

Conditions of fishing rights and local industries should be considered thoroughly.

Coastal Zone

Conditions of the shoreline and seabed would be changed by excavation and dredging for port facility construction. The supply of sand and silt to the surrounding sea area would be changed by the alteration of tide and current.

The above impacts may lead to effects on natural environments, such as mangrove forests and coral reefs, as well as fishery due to the change of fishing spots, and territorial integrity and tourism by the change of shoreline.

Impacts on natural environment and economic activities of surrounding area should be considered.

Fauna and Flora

Impacts of facility construction on mangroves, coral reefs, etc. in the coastal zone and on animals inhabiting the area may occur.

The above consequences may lead to a decrease in biodiversity and bring about a decrease of useful species and the extinction of valuable species.

The value of plants and animals and features of the ecosystem of the area 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 Port and Harbor 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 (Ports and Harbors)

Item	Description
Project Name	
Background	
Objectives	
Location	
Executing Agency	
Beneficiaries	
Project Components	
Type of Project	Construction / Improvement
Type of Port	External/Internal, Fishing/Commercial/Executive/Others() Cargo/Ferry
Demand/Vessels	Cargo: ton (In year of) Passengers: person (In year of)
Moorings	Jetty / Wharf, Water depth m / Length m
Fringe Facilities	Seawall m / Breakwater m
Water Facilities	Sea route m / Depth of Water m
Dredging / Reclamation	m ³
Related Development	EPZ / Industrial Estate / Others ()
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 (Ports and Harbors)

Item		Description
Project Name		
Social Environment	Inhabitants: (residents/indigenous people/their views on the project, etc.)	
	Land Use: (fishing grounds /fish market /coastal industrial zone /historical assets, etc.)	
	Economy / Recreation: (agriculture /fishery /commerce /resort facilities)	
Natural Environment	Topography and Geology: (steep slopes /soft ground /wetlands/faults, etc.)	
	Coast and Marine Zone: (erosion / sedimentation / current /tide /water depth)	
	Fauna and Flora and their habitats: (mangroves /coral reefs /aquatic life, 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 Port and Harbor 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 (Ports and Harbors)

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 fishing ground, 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 waste, debris, waste oil and general waste	[Y][N][?]	
9.	Hazards (Risk)	Increase in danger from landslide, accidents, 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	Depression caused by extraction during excavation and contamination by leachate	[Y][N][?]	
13.	Hydrological Situation	Changes of river discharge and riverbed condition due to land fill and drainage inflow	[Y][N][?]	
14.	Coastal Zone	Coastal erosion and erosion due to coastal reclamation and changes of marine conditions	[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 ships	[Y][N][?]	
19.	Water Pollution	Pollution caused by inflow of silt, sand and effluent from factories and etc.	[Y][N][?]	
20.	Soil Contamination	Soil contamination by dust from stockpiles of materials and herbicides	[Y][N][?]	
21.	Noise and Vibration	Noise and vibration generated by vehicles and ships	[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 by facility 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 Port and Harbor Projects

The checklist for scoping of port and harbor 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 entire area where the impacts of the construction and operation of the facilities are expected to reach.

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		Sectoral Development									Comprehensive Development			
		Sectors												
Environment Items		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 (Ports and Harbors)

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 (Ports and Harbors)

Major Facilities / Activities Activities which may cause impacts Environmental Items		Port and Harbor Facilities / Supplemental Facilities						
		Overall Evaluation	Before Operation		After Operation			
			Reclamation and Spatial Occupancy	Operation of Construction Equipment / Vehicles / Ships	Spatial Occupancy	Operation of Vehicles	Operation of Ships	Operation of Port 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 Form (Ports and Harbors)

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 (Ports and Harbors)

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 port and harbor development
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 may occur. 2. Friction between permanent residents and relocated people (new settlers) due to social and economic burden on 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. Resettlement may be difficult for those who live on special environmental resources which are peculiar to the area. 2. The resettlement may be more difficult when the residents are currently well-off. 3. Careful attention should be paid to 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 area by taking into account of the wishes of the residents 2. Meetings with the inhabitants and provisions 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. Population 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 2 (Ports and Harbors)

Item	2. Economic Activities
Description	Loss of bases of economic activities, such as land and fishing grounds, and change of economic structure
Causes of Impacts	<ol style="list-style-type: none"> 1. Loss of fishing grounds and fish cultivation fields, restriction on fishery ship operation 2. Land reclamation and change in land use 3. Increase of employment opportunity for construction and facility operation , inflow of labor from other areas 4. Diminution or extinction of mangrove forests and coral reefs owing to water pollution from construction and facility operation
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Decrease in fish catch and production resulting from the loss of fishery grounds and fish farms and reduction of the operation 2. Effects on the local economy because of the change of the population distribution due to alternation of land use, the change of commercial and industrial activities and employment opportunities, friction between inhabitants and foreign laborers 3. Decrease in fishery production which utilizes mangrove forests and coral reefs, because of the diminution of these resources 4. Degradation of recreational value which affects tourism
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Impacts on the local economy and labor, caused by the recession of fishery, would be significant when there are fishing grounds and farms in and around the project site. 2. Creation of new employment opportunities in the area would make it difficult for local industries with low value-addition to exist. 3. In areas with high self-sufficiency, the inflow of people and commodities would have a great impact on the local economy. 4. Careful consideration is required if the fishery relies on vulnerable environment, such as mangrove forests and coral reefs.
Measures	<ol style="list-style-type: none"> 1. Reexamination of project site 2. Sufficient compensation 3. Securing employment and substitution land
Related Subjects for Study	<ol style="list-style-type: none"> 1. Fishery activities 2. Local economy and city planning 3. Future development plans for surrounding areas

Table 4-5 Explanation of Item 3 (Ports and Harbors)

Item	3. Traffic and Public Facilities
Description	Impacts 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 ship operation, improvement of access transport facilities and an increase in traffic 2. Relocation of existing fishing port
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Conflict between inhabitants owing to the newly developed transport and public facilities following the relocation of the fishing port 2. Congestion of maritime navigation due to activated ship operations 3. Traffic congestion, noise and vibration caused by the new seaside transportation
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Areas where transportation, except maritime navigation, is underdeveloped would be greatly affected. 2. Impacts would be significant if the increase of traffic due to the project is large.
Measures	<ol style="list-style-type: none"> 1. Rearrangement of the maritime transport system, e.g., route selection considering ship congestion 2. Installation of terrestrial and maritime safety facilities 3. Installation of noise and vibration protection facilities for schools and hospitals, or relocation of such facilities
Related Subjects for Study	<ol style="list-style-type: none"> 1. Present traffic conditions 2. Future land use and transportation plans 3. Higher level regional development plan

Table 4-5 Explanation of Item 5 (Ports and Harbors)

Item	5. Cultural Property
Description	Damage to or loss of the value of churches, temples, shrines, archaeological remains or other cultural assets
Causes of Impacts	<ol style="list-style-type: none"> 1. Reclamation for facility construction 2. Increase in human traffic caused by the activation of maritime transport
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Loss of opportunities for academic research, tourism and other tertiary industry due to the loss of or damage to irreplaceable archaeological and cultural assets 2. Aggravation of inhabitants' feelings caused by the loss of valuable cultural assets in the area
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Special attention should be paid if the cultural assets are peculiar to the area or internationally recognized culturally or historically important from global viewpoints. 2. Countries with longer histories are likely to have more archaeological and cultural assets to preserve. 3. Special attention should be paid to the cultural assets specified by laws or regulations. 4. Careful attention should be paid to buildings and other facilities in unique communities.
Measures	<ol style="list-style-type: none"> 1. Reexamination of the project site and contents of the project plan 2. Preservation or relocation of the archaeological or cultural assets 3. Meetings with the inhabitants and provisions of necessary information
Related Subjects for Study	<ol style="list-style-type: none"> 1. Laws and regulations related to the preservation of archaeological ruins and cultural assets 2. Local history and folklore

Table 4-5 Explanation of Item 6 (Ports and Harbors)

Item	6. Water Rights and Rights of Common
Description	Obstruction of fishing rights in rivers and the sea, rights of common
Causes of Impacts	<ol style="list-style-type: none"> 1. Occupancy of fishing grounds for port facilities and ship routes 2. Turbid water during construction and the disturbance of sediment by maintenance dredging 3. Water pollution caused by operation of port facilities and ships
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Decrease in fish catch resulting from effects of deteriorated water quality and turbid water on the growth of aquatic life 2. Impacts on the fishery through the restriction of fishing rights for occupancy of the fishing grounds 3. Impacts on the existing water use, such as bathing and irrigation
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Impacts would be significant when the coastal area has important use for inhabitants and industries. 2. Water rights and fishing rights are sometimes recognized by custom even when they are not established by law. 3. Water rights can be recognized practically when there are navigation facilities and other water use facilities.
Measures	<ol style="list-style-type: none"> 1. Reexamination of project site and contents of the project contents 2. Adoption of turbid water prevention method 3. Compensation for fishery
Related Subjects for Study	<ol style="list-style-type: none"> 1. Use of water area, local economy and social survey 2. Study on fishery 3. Fishing rights and rights of common

Table 4-5 Explanation of Item 8 (Ports and Harbors)

Item	8. Waste
Description	Generation of construction waste, debris, and waste from ships and terrestrial facilities
Causes of Impacts	<ol style="list-style-type: none"> 1. Waste oil and general waste from ships 2. Waste from the goods dealt in the storage and mooring facilities 3. Construction waste and debris
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Aquatic life and birds would be affected by polluted water when the waste flows into the sea. 2. In case there is no waste disposal plant, disposed waste may aggravate aesthetics and cause problems on sanitary conditions. 3. Degradation of value of fishery products polluted by odor from spilled oil
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. In case the port deals with oil, timber, and minerals, the impact would be significant. 2. The impact would be significant in the area abounding with aquatic life and birds. 3. The amount of debris can be estimated from the scale of excavation work.
Measures	<ol style="list-style-type: none"> 1. Installation of waste oil treatment plant 2. Securing of adequate disposal sites 3. Effective planning for waste reduction 4. Careful construction plan and management
Related Subjects for Study	<ol style="list-style-type: none"> 1. Physical and chemical characteristics and volume of waste 2. Land ownership and land use conditions for obtaining disposal sites

Table 4-5 Explanation of Item 9 (Ports and Harbors)

Item	9. Hazards (Risk)
Description	Increase in danger from landslides, cave-ins, etc.
Causes of Impacts	<ol style="list-style-type: none"> 1. Dredging of the route during construction and maintenance 2. Multiple effects of natural disasters which exceed the designed safety capacity of fuel storage tanks and other storage facilities for hazardous materials or port facilities
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Accidental cutting of underwater pipelines and cables during the dredging work 2. Marine pollution due to accidents involving hazardous substances and the destruction of port facilities by natural disasters 3. Loss of human life and damage to inhabitants' livelihood (production activities, houses, food collection, etc.)
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. The impacts of disasters will be significant if the project includes facilities having a high possibility of exploding or releasing hazardous substances. 2. In particular, careful consideration is needed if a disaster is expected to affect a large area and the recovery would be difficult.
Measures	<ol style="list-style-type: none"> 1. Reexamination of the project contents 2. Site selection considering the potential of natural disasters, such as earthquakes and typhoons 3. Installation of a safety system that would minimize the damage to the storage facilities of hazardous materials 4. Provision of safety education to facility workers
Related Subjects for Study	<ol style="list-style-type: none"> 1. Location of underwater facilities 2. Meteorological and marine conditions 3. Laws and regulations on handling and storing hazardous materials 4. Case studies of past natural disasters

Table 4-5 Explanation of Item 10 (Ports and Harbors)

Item	10. Topography and Geology
Description	Changes of valuable topography and geology due to excavation or filling work
Causes of Impacts	<ol style="list-style-type: none"> 1. Cut and fill, dredging and land reclamation for construction of related facilities 2. Change of the current conditions and coastal topography by the construction of jetties and other related facilities
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Change of geological structure due to reclamation 2. Change of the coast lines due to coastal erosion or sedimentation, extinction of tidal land 3. Alternation and extinction of coastal vegetation, such as mangrove forests, due to land reclamation and dredging
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Special consideration is required when there is scientifically valuable topography or geology. 2. Impacts would be large in an area where the coastal zone has high utility value. 3. Special attention should be paid to areas where coastal erosion has already progressed.
Measures	<ol style="list-style-type: none"> 1. Examination of the project content 2. Coastal erosion protection 3. Artificial nourishment
Related Subjects for Study	<ol style="list-style-type: none"> 1. Topographical and geological surveys 2. Littoral draft and tidal current 3. Change of coastline

Table 4-5 Explanation of Item 13 (Ports and Harbors)

Item	13. Hydrological Situation
Description	Changes of river discharge and riverbed condition due to landfill and drainage inflow
Causes of Impacts	<ol style="list-style-type: none"> 1. Inflow of turbid water from reclamation work and construction when project sites are located near lakes, rivers or riversides 2. Inflow of drainage into lakes and rivers during facility operations
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Impacts on the ecosystem of the site due to the change of lake and river regime by inflow of turbid water during construction and drainage after operation 2. Impacts on coastal topography by the alteration of river regime
Useful Factors for Evaluation	<p>Special consideration is needed under the following conditions:</p> <ol style="list-style-type: none"> 1. Fishery and fishing cultivation are prospering in the area. 2. Villages and other public facilities are located along the lakes or rivers. 3. The lakes and rivers are used as tourism resources.
Measures	<ol style="list-style-type: none"> 1. Examination of the contents of the project plan 2. Examination of the conformity to the river basin development plan 3. Compensation for fishery 4. Creation of new habitats for valuable aquatic life
Related Subjects for Study	<ol style="list-style-type: none"> 1. Hydrological survey 2. Water use and watershed use in the surrounding area 3. Study of valuable aquatic life

Table 4-5 Explanation of Item 14 (Ports and Harbors)

Item	14. Coastal Zone
Description	Coastal erosion and change of vegetation due to coastal reclamation and coastal changes
Causes of Impacts	<ol style="list-style-type: none"> 1. Excavation and maintenance dredging for facility construction 2. Increase or decrease in sediment supply to the surrounding area caused by changes in the current and tide 3. Generation of waves by ship operation
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Decrease or extinction of mangrove forests and coral reefs due to the alternation of the coastal topography, coastal erosion caused by a change of littoral drift pattern and the extinction of tidal land which may affect the fishery and tourism industries 2. Increase of coastal disasters due to the depression of the wave dissipation effect of the natural coast 3. Effect on coastal erosion and coastal vegetation over a long period of exposure to ship waves 4. In the case of riverside ports, the same type of impacts would be created by changes to the sediment supply from the river.
Useful Factors for Evaluation	<p>The following conditions will be conducive to significant environmental impacts:</p> <ol style="list-style-type: none"> 1. There is valuable natural environment, such as mangrove and coral reefs, around the area. 2. There are favorable industrial conditions, such as good fishing grounds, around the area. 3. There is tourism that uses the coastal zone as a tourist attraction. 4. The area tends to suffer from natural disasters, such as high waves. 5. The coast has a high erosion potential because of its topographical and geological features.
Measures	<ol style="list-style-type: none"> 1. Examination of contents of the project plan 2. Construction of breakwaters 3. Provision of beach nourishment 4. Compensation for fishery
Related Subjects for Study	<ol style="list-style-type: none"> 1. Valuable natural environment, such as mangroves and coral reefs 2. Fisheries 3. Industries that utilize the coastal zone 4. Disasters, such as high waves

Table 4-5 Explanation of Item 15 (Ports and Harbors)

Item	15. Fauna and Flora
Description	Obstruction of breeding and the extinction of species due to changes in habitat conditions
Causes of Impacts	<ol style="list-style-type: none"> 1. Spatial occupation and alternation of topography and vegetation for facilities construction 2. Inflow of waste and drainage resulting from ship and facility operations 3. Disturbance of sediment caused by dredging during construction and maintenance
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Decrease in biomass of seaweed, fish, benthos and birds because of the diminution or extinction of habitats, the deterioration of habitat conditions caused by vegetation and substrate changes, water pollution and water temperature changes 2. In some cases, the extinction of species which spoil the biodiversity 3. Health hazard to food chain if the water is polluted by heavy metals and herbicides
Useful Factors for Evaluation	<p>Special attention should be paid to the following conditions:</p> <ol style="list-style-type: none"> 1. There are vulnerable ecological systems, such as virgin forests, tidal land and mangroves in the area. 2. The area has unique species. 3. The country has bilateral and/or multilateral conventions on wildlife. 4. The area is endangered and/or there are rare species listed in the Red Data Books of the International Union for Conservation of Nature and Natural Resources (IUCN).
Measures	<ol style="list-style-type: none"> 1. Reexamination of project contents 2. Construction method to minimize turbidity 3. Relocation of coral and fish 4. Adequate drainage and waste treatment plan 5. Monitoring before and after operation
Related Subjects for Study	<ol style="list-style-type: none"> 1. Present condition of fauna and flora 2. Ecological survey on plants and animals 3. Chemical analysis of fishery products 4. Chemical analysis of sediments 5. Water quality standard for drainage

Table 4-5 Explanation of Item 17 (Ports and Harbors)

Item	17. Landscape
Description	Change of topography and vegetation due to land reclamation. Deterioration of aesthetic harmony by the appearance of structures
Causes of Impacts	<ol style="list-style-type: none"> 1. Appearance of port facilities and operation of large ships 2. Air pollution (especially by dust) and water pollution
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Appearance of the continuous artificial landscape which would change the features of regional landscape and view of the surrounding area 2. Deterioration of aesthetics by air and water pollution which would affect tourism
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Special attention should be paid to landscape that has cultural values from an international viewpoint. 2. Recreational area would be significantly affected.
Measures	<ol style="list-style-type: none"> 1. Laws and regulations of the host country 2. Planning with consideration of location, scale, configuration, material and color 3. Forestation using indigenous trees
Related Subjects for Study	<ol style="list-style-type: none"> 1. Location of recreational facilities 2. Tourism 3. Distribution of natural and cultural landscape

Table 4-5 Explanation of Item 18 (Ports and Harbors)

Item	18. Air Pollution
Description	Pollution caused by exhaust gas or toxic gas from vehicles and ships
Causes of Impacts	<ol style="list-style-type: none"> 1. Use of in-water facilities and ship anchorage facilities 2. Use of disposal and storage facilities 3. Operation of construction equipment and ships 4. Exhaust gas from cars entering the port area
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Air pollution caused by emissions from ships and dust from facilities that would create health hazards for inhabitants and aggravate living conditions when there are villages in the vicinity 2. Impacts on habitats of plants and animals which are sensitive to air pollution 3. Effect of dust on the health of port laborers and the inhabitants in the vicinity. If the dust flows into the water area, it may pollute the water and sediment.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Special attention should be paid to facilities needing clean air, such as hospitals and rest houses. 2. Impacts would be significant when the roads around the facilities are unpaved and have heavy traffic.
Measures	<ol style="list-style-type: none"> 1. Effective port management to minimize ship in-port hours 2. Use of A rank oil in the port area 3. Dust prevention for storage facilities, such as the installation of buffer zones, enclosures, water sprinklers and coverage by sheets 4. Use of dust-free machines at disposal facilities 5. Adequate construction management
Related Subjects for Study	<ol style="list-style-type: none"> 1. Meteorological data, e.g., wind direction and speed, temperature gradient 2. Topographical information related to valleys and undulations 3. Past cases of air pollution 4. Air pollution control standards

Table 4-5 Explanation of Item 19 (Ports and Harbors)

Item	19. Water Pollution
Description	Pollution caused by the inflow of sand and silt or drainage from factories and turbid water
Causes of Impacts	<ol style="list-style-type: none"> 1. Stagnant water by port facilities 2. Dust from disposal and storage facilities, inflow by runoff with rainwater 3. Oil spills and discharge of waste from ships 4. Disturbance of sediments by dredging during construction and maintenance 5. Saltwater intrusion and infiltration into groundwater resulting from underwater excavation near the river mouth
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Large load of nutrients , e.g., nitrate and phosphate, which would cause eutrophication, red tide and blue tide , offensive odor, and affect on aquatic life 2. Pollution by heavy metals and pesticides when the port deals in minerals and pesticides 3. Increase of pollution by disturbing contaminated sediment 4. Effect on groundwater and farmland by saltwater intrusion and infiltration into groundwater
Useful Factors for Evaluation	<p>Impacts would be significant under the following conditions:</p> <ol style="list-style-type: none"> 1. The water is utilized in the area and downstream (in case of riverside port)of the area. 2. Water-use industries exist in the area and downstream (in case of riverside port)of the area. 3. Valuable aquatic life exists in the area and downstream (in case of riverside port)of the area. 4. There are stagnant water areas, such as inside of a bay or shallow coastal zone.
Measures	<ol style="list-style-type: none"> 1. Reexamination of the project contents 2. Dredging of sludge, installation of drainage treatment facility 3. Dust prevention, pollution prevention 4. Leakage prevention 5. Compensation for water users 6. Treatment of waste oil
Related Subjects for Study	<ol style="list-style-type: none"> 1. Regulation on drainage treatment and quality 2. Condition of the industries that use water and water basins in the area 3. Valuable aquatic life 4. Tidal current in the bay or river discharge

Table 4-5 Explanation of Item 20 (Ports and Harbors)

Item	20. Soil Contamination
Description	Contamination of soil by dust from disposal and agro-chemicals
Cause of Impacts	1. Dispersion of disposal (heavy metals, pesticides and toxic substances) from port facilities
Possible Environmental Impacts	1. Increase of impact through a process whereby, under certain conditions, the heavy metals in dust and the toxic chemicals in herbicides are accumulated in the soil and absorbed by plants and eventually enter the water system
Useful Factors for Evaluation	Careful consideration is required if the site includes: 1. arable land along the route, 2. source of drinking water in the vicinity, 3. use of groundwater in the area.
Measures	1. Dust prevention by sprinkling water on the disposal 2. Restriction of land use in the proximity
Related Subjects for Study	1. Land use 2. Water use

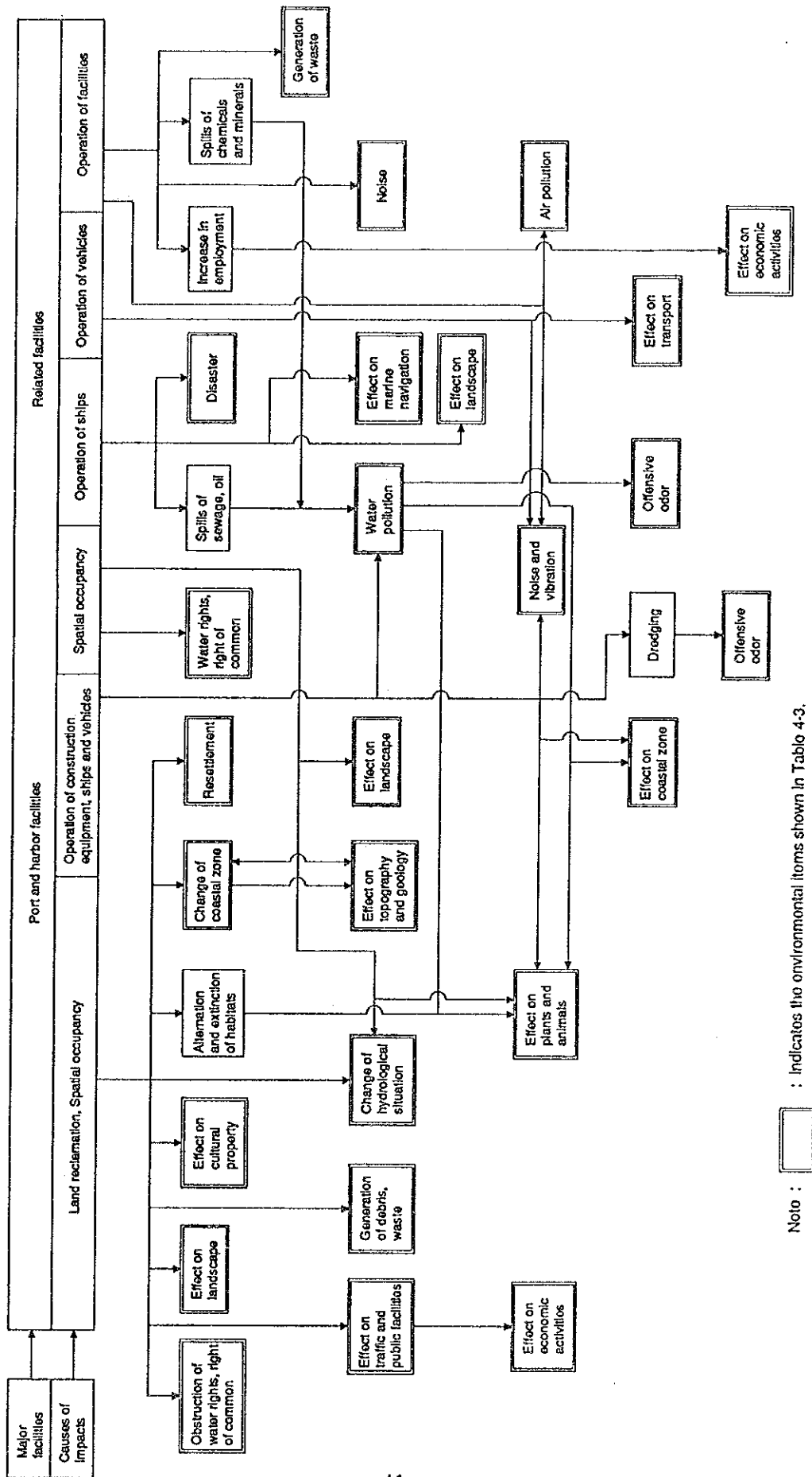
Table 4-5 Explanation of Item 21 (Ports and Harbors)

Item	21. Noise and Vibration
Description	Noise and vibration generated by vehicles and ships
Causes of Impacts	<ol style="list-style-type: none"> 1. Operation of construction equipment and vehicles, and detonations 2. Mooring operations and ships 3. Increased number of vehicles entering in the port area
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Effects of noise in school and hospital areas, disturbance of sleep caused by night ship operations 2. Impacts on the breeding and milk production of dairy cattle, dispersion of wild animals 3. Cracks in buildings caused by vibrations
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 facilities requiring 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. 5. Fishery ground exists nearby.
Measures	<ol style="list-style-type: none"> 1. Reexamination of contents of the project plan 2. Examination of operation hours and methods 3. Installation of acoustic walls 4. Compensation for the impacts
Related Subjects for Study	<ol style="list-style-type: none"> 1. Land use, locations and conditions of public facilities, and inhabitants' living conditions 2. Living conditions of valuable wildlife 3. Geological survey

Table 4-5 Explanation of Item 23 (Ports and Harbors)

Item	23. Offensive Odor
Description	Generation of exhaust gas and offensive odor materials by port facility construction and operations
Causes of Impacts	<ol style="list-style-type: none"> 1. Mooring operation and storage facilities 2. Dredging and sludge removal during construction 3. Water pollution resulted from the use of port facilities
Possible Environmental Impacts	<ol style="list-style-type: none"> 1. Complaints from users of public facilities, such as schools, hospitals, etc. 2. Effect on the lives of inhabitants because of odor from port facilities and dredged sludge 3. Deterioration of water quality which would accompany odor 4. Water polluted by waste oil would impart on odor to fish products thereby lowering their value.
Useful Factors for Evaluation	<ol style="list-style-type: none"> 1. Impacts would be large in densely populated areas and at schools and hospitals. 2. Areas with stagnant water have a high potential for odor pollution. 3. Impacts would be significant if the fishery business is vigorously carried out.
Measures	<ol style="list-style-type: none"> 1. Reexamination of contents of the project plan 2. Careful consideration for the land use of surrounding area 3. Careful construction planning and management 4. Confine of storage facilities, installation of deodorant equipment 5. Adequate treatment of sludge
Related Subjects for Study	<ol style="list-style-type: none"> 1. Meteorological conditions, such as wind direction and speed, temperature gradients at high altitudes, precipitation, etc. 2. Topographical information related to valleys and undulations 3. Past complaints regarding offensive odors

Appendix Flowchart of the Environmental Impacts of Port and Harbor Projects



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

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081