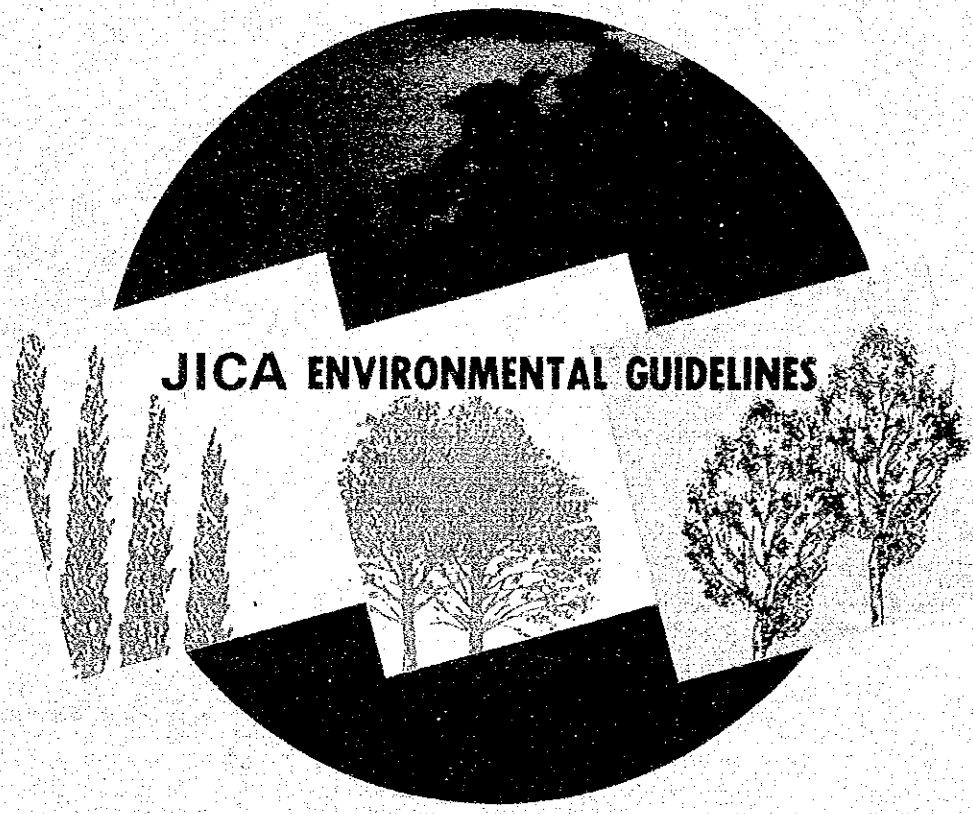
ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

X REGIONAL DEVELOPMENT



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ENVIRONMENTAL GUIDELINES FOR INFRASTRUCTURE PROJECTS

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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 "Regional Development".

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

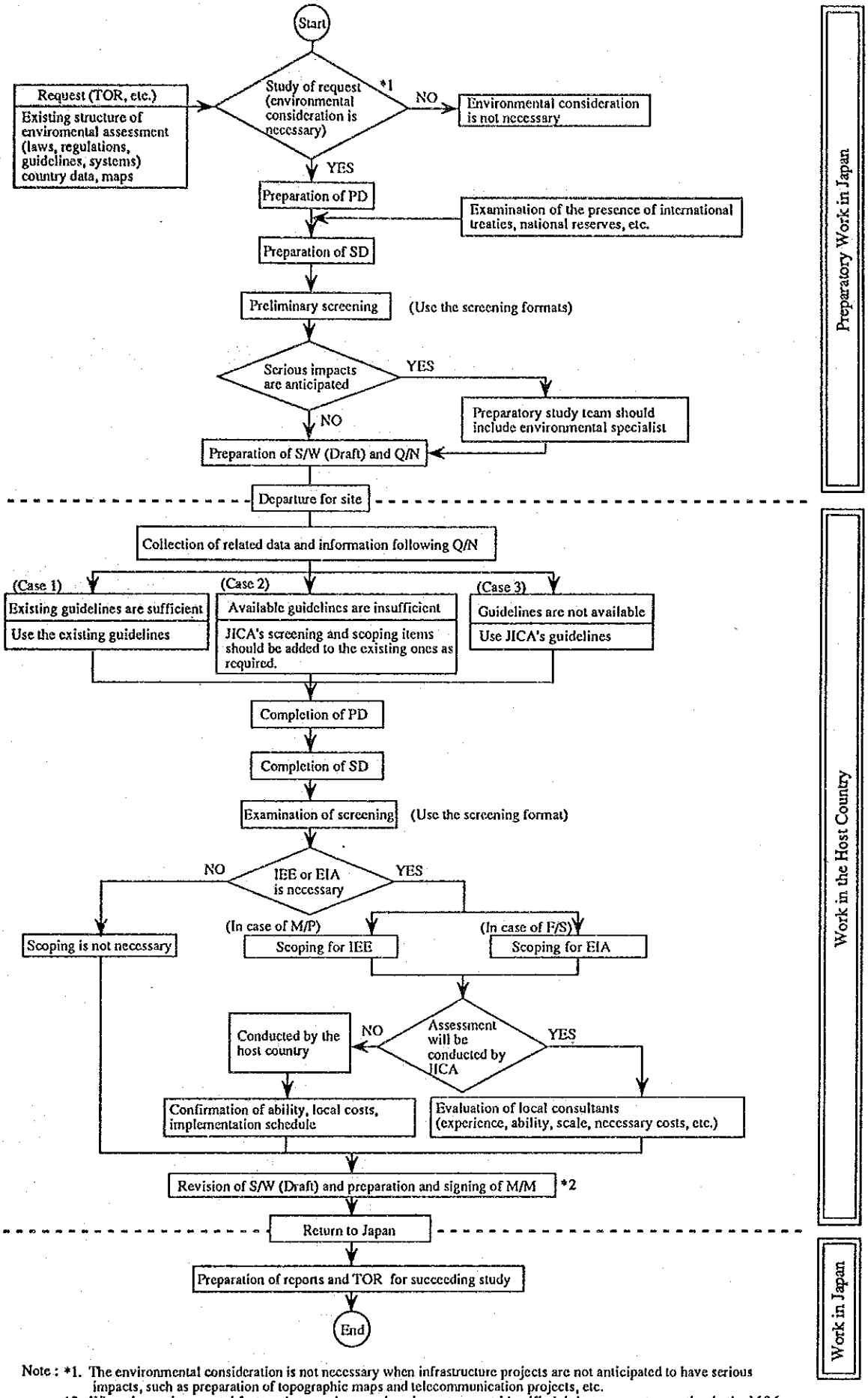
Evaluate the magnitude of impact on each environmental item, using the checklist method, to specify the items that are to be studied in IEE for M/P or EIA for F/S. In this process, making use of the explanation of items in the guidelines, try to grasp the features of possible environmental impacts. The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

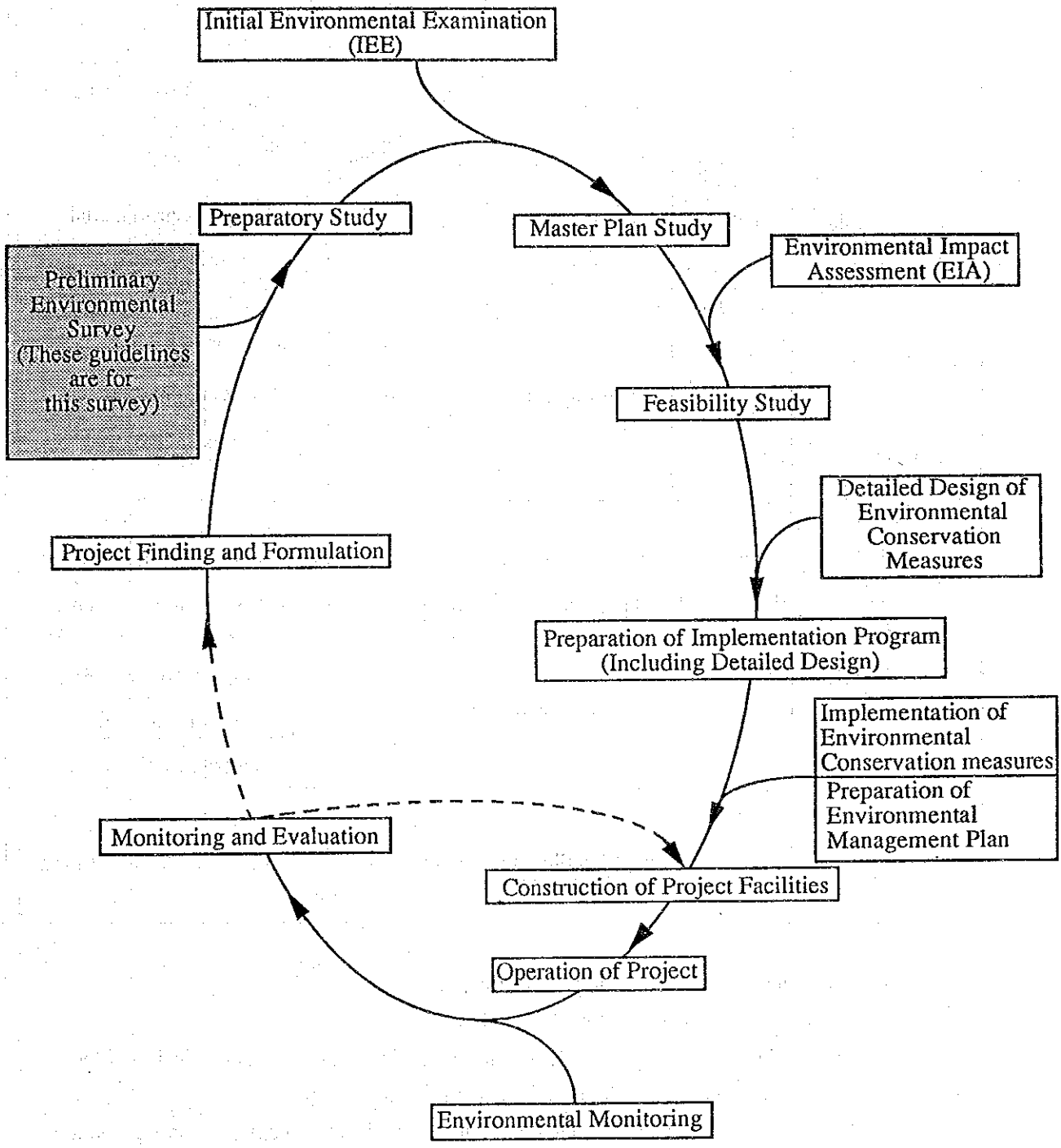

Table 1-1 Project Implementation Stages and Corresponding Environmental Consideration Stages

<table>
<tr><td colspan="4">Project Implementation Stages</td><td>Environmental Consideration Stages</td></tr>
<tr><td rowspan="3">Implementation by JICA</td><td colspan="3">Preparatory Study</td><td>Preliminary Environmental Survey</td></tr>
<tr><td rowspan="2">Full-scale Study</td><td>Master Plan Study</td><td rowspan="2">Feasibility Study</td><td>Initial Environmental Examination (IEE)</td></tr>
<tr><td>Feasibility Study</td><td>Environmental Impact Assessment (EIA)</td></tr>
<tr><td rowspan="3">Implementation by Executing Agency</td><td colspan="3">Preparation of Project Implementation Plan (Including Detailed Design)</td><td>Examination of Environmental Conservation Measures</td></tr>
<tr><td colspan="3">Project Construction</td><td>Implementation of Environmental Conservation Measures</td></tr>
<tr><td colspan="3">Project Facility Operation</td><td>Environmental Monitoring</td></tr>
</table>

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 ↓ Explanation of and Discussion on DF/R ↓ Preparation of F/R		(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 Regional Development Plans

1.2.1 Definition of Regional Development Plans in the Guidelines

Regional development plans in the guidelines are the regional development plans, such as master plans of industries, facilities, land use, and environmental protection, for achieving medium to long-term economic development in the region.

1.2.2 Typical Possible Impacts and the Points of Environmental Consideration

Regional development plans generally cover regions having areas ranging from several thousand km^2 to fifty or sixty thousand km^2. The areas to be covered by the plans usually have diverse and wide varieties of natural and social environments.

In order to make regional development plans, it is necessary to set up the economic and population frameworks necessary for the medium to long-term economic development. Then, to achieve the objectives set by the frameworks, various development plans, such as infrastructure development plans, land-use plans, environmental protection plans, are established.

It is very important to fully understand the distribution and overlapping boundaries of the development potentials and constraints of the regions when preparing the regional development plans.

As for the social environment, it is necessary to consider the indirect impacts on the economic activities, transportation and public facilities, water rights, rights of common, and public health, in addition to the direct impacts on the residents, such as resettlement, splitting of communities, and the generation of hazards.

For the natural environment, it is necessary to fully understand the distribution of the area's natural conditions that may affect the establishment of the land-use plans or facility construction plans. The natural conditions include the ecological system, valuable fauna and flora, water resources, climatic conditions, topographical and geological conditions, flooding, soil erosion, etc. At the same time, it is important to take measures for preventing negative environmental impacts that may be caused by the new development projects.

Since pollution has a serious impact on public health, it is necessary to establish measures for controlling air pollution, water pollution, noise and vibration.

CHAPTER 2

PROJECT DESCRIPTION AND SITE DESCRIPTION

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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 Regional Development Plans

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 (Regional Development Plan)

Item	Description
Project Name	
Background	
Objectives	
Location	
Executing Agency	
Beneficiaries	
Project Components	
Major Cities	
Major Fields	Industry/Agriculture & Forestry/Fishery/Tourism
Major Industrial Facilities	Resource Development/Power Generation, Oil Storage Facility/ Oil Refinery/Pipeline/Others ( )
Major Infrastructures	Ports & Harbors/Airports/Roads/Railways/Rivers/Dams/Water Supply/Sewerage/Solid Waste Management Facilities/ 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 (Regional Development Plan)

Item		Description
Project Name		
Social Environment	Inhabitants: (residents/indigenous people/their views on the project, etc.)	
	Economic Activities: (industry/agriculture, forestry, fishery/tourism, others)	
	Traffic, Public Facilities, Land-use: (transportation network/drinking water/urban area, etc.)	
Natural Environment	Topography, Geology, Landscape: (mountain area/wetland/soil condition, etc.)	
	Lakes, River System, Coast, Climate: (water quality & quantity, rainfall, etc.)	
	Fauna and Flora and Their Habitats: (rare species/mangroves /coral reefs, 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 Regional Development Plans

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 (Regional Development Plan)

No.	Environmental Item	Description	Evaluation	Remarks (Reason)
Social Environment				
1.	Resettlement	Resettlement due to land occupancy (transfer of rights of residence/land ownership)	[Y][N][?]	
2.	Economic Activities	Loss of bases of economic activities, such as land, and change of economic structure	[Y][N][?]	
3.	Traffic and Public Facilities	Impacts on schools, hospitals and present traffic conditions, such as the increase of traffic congestion and accidents	[Y][N][?]	
4.	Split of Communities	Community split due to interruption of area traffic	[Y][N][?]	
5.	Cultural Property	Damage to or loss of the 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, surplus soil and general waste	[Y][N][?]	
9.	Hazards (Risk)	Increase in danger of landslides, cave-ins, etc.	[Y][N][?]	
Natural Environment				
10.	Topography and Geology	Changes of valuable topography and geology due to excavation or filling work	[Y][N][?]	
11.	Soil Erosion	Topsoil erosion by rainfall after reclamation and deforestation	[Y][N][?]	
12.	Groundwater	Lowering of the groundwater table due to over-drafting and turbid water caused by construction work	[Y][N][?]	
13.	Hydrological Situation	Changes of river discharge and riverbed condition due to landfill and drainage inflow	[Y][N][?]	
14.	Coastal Zone	Coastal erosion and change of vegetation due to coastal reclamation and coastal changes	[Y][N][?]	
15.	Fauna and Flora	Obstruction of breeding and extinction of species due to changes of habitat conditions	[Y][N][?]	
16.	Meteorology	Changes of temperature, precipitation, wind, etc. due to large-scale land reclamation and building construction	[Y][N][?]	
17.	Landscape	Change of topography and vegetation due to reclamation. Deterioration of aesthetic harmony by structures	[Y][N][?]	
Pollution				
18.	Air Pollution	Pollution caused by exhaust gas or toxic gas from vehicles and factories.	[Y][N][?]	
19.	Water Pollution	Pollution caused by inflow of silt, sand and effluent from factories, etc.	[Y][N][?]	
20.	Soil Contamination	Contamination caused by discharge or diffusion of sewage or toxic substances	[Y][N][?]	
21.	Noise and Vibration	Noise and vibration generated by vehicles, airplanes and factory operations	[Y][N][?]	
22.	Land Subsidence	Deformation of the land and land subsidence due to lowering of groundwater table	[Y][N][?]	
23.	Offensive Odor	Generation of exhaust gas and offensive odor by facility construction and 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 Regional Development Plans

The checklist for scoping of regional development plans 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 whole study 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 / Sectors / Environment Items	Sectoral Development									Comprehensive Development			
			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 (Regional Development Plan)

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 (Regional Development)

Major Facilities / Activities		Resources, Industry, Energy, Urban, Tourism, Transport, Road, Railway, Port/Harbor, Airport Development						
Activities which may cause impacts / Environmental Items			Before Operation		After Operation			
		Overall Evaluation	Reclamation and Spatial Occupancy	Operation of Construction Equipment and Vehicles	Spatial Occupancy	Operation of Vehicles, Ships and Airplanes	Operation and Maintenance of Associated Facilities	Accumulation of People and Goods
Social Environment	1 Resettlement	○	○					
	2 Economic Activity	○	○		○			○
	3 Traffic and Public Facility	○			○	○		○
	4 Split of Communities	○			○			
	5 Cultural Property	○	○					○
	6 Water Rights/Rights of Common	○	○		○		○	
	7 Public Health Condition	○				○		○
	8 Waste	○	○				○	○
	9 Hazards	○	○			○	○	
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 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 (Regional Development Plan)

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 (Regional Development Plan)

Item	1. Resettlement
Description	Resettlement due to land occupancy (transfer of rights of residence/land ownership)

Causes of Impacts

1. Land acquisition for road, railroad, airport, port and harbor, industrial complex, or housing development

Possible Environmental Impacts

1. Loss of living foundation of the inhabitant to be relocated. Social and cultural inadaptability to the new resettlement area may occur.
2. Friction between permanent residents and relocated people (new settlers) due to social and economic burden on the old 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

1. Resettlement may be difficult for those who live on special environmental resources which are peculiar to the area.
2. Their resettlement may be more difficult when the residents are currently well-off.
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

1. Selection of resettlement area 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 of the resettlement area
4. Sufficient compensation
5. Job training and guidance

Related Subjects for Study

1. Number of inhabitants to be relocated and their economic situations
2. Conditions of resettlement area
3. Past cases of resettlement

Table 4-5 Explanation of Item 2 (Regional Development Plan)

Item	2. Economic Activities
Description	Loss of bases of economic activities, such as land, and change of economic structure

Causes of Impacts

1. Change of economic activities due to land acquisition or reclamation for facility construction. For example, transfer from farmland to industrial land or to housing area may result in the qualitative changes of the present economic activities.

Possible Environmental Impacts

1. Activation of local economy and creation of new businesses by the settlement of people and their production activities. On the other hand, the inflow of many people due to creation of employment opportunities may influence the local economy.

Useful Factors for Evaluation

1. When important local industries in the project area have to be relocated, the relocation would have great effects.
2. In self-sufficient areas, the inflow of people and commodities would have a great impact on the local economy.
3. The creation of new employment opportunities may make it difficult for existing industries with low productivities to survive.

Measures

1. Revitalization of local industries

Related Subjects for Study

1. Local economy and local industries
2. Future development plans for surrounding areas

Table 4-5 Explanation of Item 3 (Regional Development Plan)

Item	3. Traffic and Public Facilities
Description	Impact on schools, hospitals and present traffic conditions, such as the increase of traffic congestion and accidents

Causes of Impacts

1. Operation of large vehicles for construction work
2. Operation of vehicles, ships, airplanes, etc. after operation
3. Inflow of people as a result of area activation

Possible Environmental Impacts

1. Worsening of local traffic congestion caused by an increase in the load on the existing transportation facilities
2. In the airports, noise problems during the landing and takeoff. On the roads and/or railroads, noise and vibration problems caused by vehicles and trains which pass through city areas.
3. Shortages of school and hospital facilities caused by an increase in population

Useful Factors for Evaluation

1. The traffic and transportation facility conditions in the area should be taken into consideration.
2. Careful consideration should be made when there are public facilities, such as schools, hospitals and religious sites, in the project area.

Measures

1. Examination of the contents of the plan
2. Improvement of the transportation facilities
3. Improvement of the public facilities

Related Subjects for Study

1. Land use and traffic conditions
2. Future land use and transportation plans

Table 4-5 Explanation of Item 4 (Regional Development Plan)

Item	4. Split of Communities
Description	Community split due to interruption of area traffic

Causes of Impacts

1. Interruption of existing regional transportation, pedestrian traffic, and distribution of goods due to construction of new roads and railroads

Possible Environmental Impacts

1. Inconvenience in the daily life of the residents and negative effects on the economic activities
2. Change of the existing community life by the loss of places for group work or religious ceremonies due to the large facility construction

Useful Factors for Evaluation

1. Measures should be taken if some areas are expected to be geographically isolated.
2. Special attention should be paid if there are such communities that have long existing customs or traditions and are tightly united in the social activities.
3. Careful consideration should be given if the access to the public facilities, such as hospitals, schools and community centers, would be interrupted.

Measures

1. Securing alternative routes
2. Creation of new communication centers
3. Sufficient compensation

Related Subjects for Study

1. Social structure in the region
2. Transportation system, distribution of goods, and regional economy
3. Higher level regional development plan

Table 4-5 Explanation of Item 5 (Regional Development Plan)

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

1. Reclamation for facility construction
2. Damage to or loss of historical buildings due to urban development
3. Increase in traffic

Possible Environmental Impacts

1. Loss of opportunities for academic research due to the loss of or damage to irreplaceable archaeological and cultural assets
2. Damage to the tourism based on the archaeological and cultural assets
3. Increase in possibility of theft of valuable cultural assets due to the improvement of access
4. Disappearance of the unique rural culture due to the inflow of foreign culture

Useful Factors for Evaluation

1. Special attention should be paid if the cultural assets are peculiar to the area or area recognized as 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, even if they are small.

Measures

1. Reexamination of the traffic routes and contents of the 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

1. Laws and regulations related to the preservation of archaeological remains and cultural assets
2. Local history and folklore
3. Preservation or relocation plans and measures

Table 4-5 Explanation of Item 6 (Regional Development Plan)

Item	6. Water Rights and Rights of Common
Description	Obstruction of fishing rights, water rights, rights of common

Causes of Impacts

1. Land acquisition or reclamation work for facility construction
2. Decrease in natural resources due to development

Possible Environmental Impacts

1. Change of lifestyle of the residents in the rural areas due to the restriction or loss of hunting or collecting rights
2. Stronger impacts on socially weaker people, such as minorities or tenant farmers

Useful Factors for Evaluation

Special attention should be paid to:

1. old villages which have common forests or land,
2. fishery activities which have large fishing grounds in the project area,
3. such areas in which the residents have difficulties in obtaining water for living due to the natural conditions or to the specific characteristics of the community.

Measures

1. Provision of new common land
2. Meetings with the inhabitants and provision of necessary information
3. Sufficient compensation

Related Subjects for Study

1. Land use
2. Type of land ownership (by laws or custom)

Table 4-5 Explanation of Item 7 (Regional Development Plan)

Item	7. Public Health Condition
Description	Deterioration of public health and sanitary conditions such as generation of garbage and the increase of vermin

Causes of Impacts

1. Inflow of people looking for employment opportunities in the area following the development of urban or industrial facilities.

Possible Environmental Impacts

1. Deterioration of public health, such as the outbreak of epidemics caused by the increase of vermin and the use of contaminated water, as the result of the generation of untreated water and uncollected garbage following the concentration of population which surpasses the capacities of waste disposal and sewage treatment
2. It may become more serious in squatter areas expand.

Useful Factors for Evaluation

1. Special attention should be paid if epidemics have been experienced around the area in the past .
2. Special attention should be paid to the squatters in the area.

Measures

1. Examination of the location and capacities of the final disposal plants or garbage incineration facilities
2. Improvement of water supply and sewerage systems
3. Prevention of vermin by spraying chemicals
4. Improvement of health education for the residents to prevent diseases
5. Improvement of living standards by providing vocational training and employment guidance

Related Subjects for Study

1. Public health conditions in the area
2. Living and breeding conditions of harmful animals, such as rats and crows, and of harmful insects, such as mosquitoes and flies, etc.
3. Meteorological data, such as rainfall and humidity, etc.

Table 4-5 Explanation of Item 8 (Regional Development Plan)

Item	8. Waste
Description	Generation of construction waste, waste dumps, sludge, and general waste

Causes of Impacts

1. Generation of construction waste following the construction of roads, railroads, ports and harbors, airports, etc.
2. Generation of general and industrial waste following the operation of the facilities and the increase of economic activities

Possible Environmental Impacts

1. The expansion of solid waste treatment facilities may be required. When the volume of waste exceeds the capacity, the waste may be illegally dumped on beaches or into rivers, lakes, etc.
2. The illegally dumped waste may cause soil and water contamination, leading to the occurrence of health and pollution problems.
3. Uncollected waste may create aesthetic problems. It may also cause the growth of pathogenic insects and animals which might result in spread of diseases.

Useful Factors for Evaluation

1. The amount of waste dumps can be estimated from the scale of excavation work.
2. Large amount of construction waste may be produced when building structures are demolished.

Measures

1. Establishment of adequate waste collection system and improvement of disposal facilities
2. Securing of disposal sites for waste dumps and construction waste
3. Careful construction planning and management
4. Publicity and promotional activities to reduce household garbage and industrial waste

Related Subjects for Study

1. Physical and chemical characteristics of the waste
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 9 (Regional Development Plan)

Item	9. Hazards (Risk)
Description	Increase in danger from landslides, cave-ins, etc.

Causes of Impacts

1. Large-scale cut, filling and excavation work for construction
2. Installation of hazardous material storage and handling facilities

Possible Environmental Impacts

1. Landslides or failure of cut or filled slopes which may cause damage to residents' land and houses, and possibly threaten their lives.
2. Occurrence of a large-scale disaster if hazardous material storage facilities are destroyed by a natural disaster.

Useful Factors for Evaluation

1. Special attention should be paid to such areas that often suffer from natural disasters.
2. Special attention should be paid if there are hazardous material storage or handling facilities in the area.
3. Landslides may occur on steep slopes composed of soft soil with high porosity.

Measures

1. Examination of the project site
2. Examination of the construction plan
3. Appropriate management of hazardous materials
4. Provision of safety education to facility employees

Related Subjects for Study

1. Topographical, geological, and meteorological surveys
2. Case studies of past hazards

Table 4-5 Explanation of Item 10 (Regional Development Plan)

Item	10. Topography and Geology
Description	Change of valuable topography and geology due to excavation or filling work

Causes of Impacts

1. Large-scale cut, filling work and development of artificial slopes for road and railway construction in sloping areas
2. Dredging and filling work for reclamation in coastal zones

Possible Environmental Impacts

1. Change of geological structure due to reclamation
2. Change of the coastlines due to coastal erosion or sand accumulation, change or extinction of vegetation, deterioration of port and harbor functions, or the damage on the fishing industry, following the charge of the geographical structure in the coastal areas
3. In inland areas, occurrence of slope failures and soil erosion which may result in river pollution and flooding

Useful Factors for Evaluation

1. Special consideration is required when there is scientifically valuable topography or geology.
2. Special attention should be paid to such areas that have high intensity rainfalls.
3. In particular, special attention should be paid to such areas where coastal erosion has already progressed.

Measures

1. Examination of the project site
2. Examination of the construction schedule and methods
3. Regulation of land use in the surrounding areas

Related Subjects for Study

1. Topographical and geological surveys
2. Landslide area
3. Land use
4. Conditions of littoral current, waves, and drift sand

Table 4-5 Explanation of Item 11 (Regional Development Plan)

Item	11. Soil Erosion
Description	Topsoil erosion by rainfall after land reclamation and deforestation

Causes of Impacts

1. Large-scale exposure of topsoil following the reclamation such as housing and industrial zone development in sloping areas.
2. Topsoil exposure following the vegetation removal caused by the road construction and forest resource development.

Possible Environmental Impacts

1. Water suspension caused by washing out of the topsoil by rain
2. Effect on the transparency of sea water in the coastal zone by washed out topsoil. This may spoil tourism and other recreational values.
3. Malfunction of water intake facilities and interruption of river transportation caused by the rise of the riverbed elevation

Useful Factors for Evaluation

1. Serious soil erosion may occur in a steep slope area having sandy soil.
2. It tends to occur in such areas that have heavy or intense rainfall or strong wind.
3. It tends to occur in the case of low vegetation coverage.

Measures

1. Soil erosion control, such as reforestation and slope protection work, etc.
2. Reexamination of routes, alignment and contents of the plan

Related Subjects for Study

1. Soil, topographical, geological, and meteorological surveys
2. Land use

Table 4-5 Explanation of Item 12 (Regional Development Plan)

Item	12. Groundwater
Description	Lowering of the groundwater table due to overdrafting and turbid water caused by construction work

Causes of Impacts

1. Large-scale paving of ground surface in large-scale urban development
2. Change of the area's runoff coefficient, and lowering of the groundwater recharging function caused by forest resource development
3. Use of a large quantity of groundwater in response to an increase in demand for water supplies according to population increase and industrial development
4. Groundwater suspension caused by the aquifer cut in a large-scale reclamation with excavation

Possible Environmental Impacts

1. Effects on the groundwater use in the area by the lowering of the groundwater table and the exhaustion of wells
2. Occurrence of land subsidence in the alluvial and clayey soil areas, due to the lowering of the groundwater table
3. Deterioration of water quality and its effect on groundwater use due to turbid water and sea water intrusion caused by construction work
4. Lowering of groundwater table in the surrounding area caused by the pumping out of groundwater which flows into the construction site

Useful Factors for Evaluation

1. Shallow wells (using unconfined groundwater) may receive more impacts.
2. Special attention should be paid when the lowering of the groundwater table and land subsidence have already progressed in the project area.
3. Special attention should be paid to seawater intrusion when the project area is close to the sea.

Measures

1. Groundwater use planning
2. Development of alternative water sources
3. Reexamination of contents of the plan

Related Subjects for Study

1. Hydrogeological survey (groundwater capacity)
2. Pumping tests
3. Water utilization

Table 4-5 Explanation of Item 13 (Regional Development Plan)

Item	13. Hydrological Situation
Description	Changes of river discharge and riverbed condition due to landfill and drainage inflow

Causes of Impacts

1. Change of runoff coefficient caused by the urban development or decrease of vegetation due to forest resources development or land development work, and the effects on lake and river systems by increased drainage due to increased amount of water use

Possible Environmental Impacts

1. An increase in peak discharge of flood, a decrease in flood discharge capacity due to the cross sectional change of the river, and the shortening of the flood peak reaching time. They will increase flood damage.
2. Inundation of the lake shore due to the rise of the lake water level, which may affect the inhabitants' living, and the fishery and tourism industries

Useful Factors for Evaluation

1. Housing and public facilities facing lakes and rivers tend to receive more serious effects.
2. Special consideration is required for such areas that use the lakes and rivers for tourism or fishery.
3. Special attention should be paid to the condition of valuable aquatic life.

Measures

1. Examination of the contents of the 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

1. Water supply and sewerage improvement plan
2. Water use and watershed use in the surrounding area
3. Study of valuable aquatic life

Table 4-5 Explanation of Item 14 (Regional Development Plan)

Item	14. Coastal Zone
Description	Coastal erosion and change of vegetation due to coastal reclamation and coastal changes

Causes of Impacts

1. Change of the littoral current and coastline as a result of reclamation work in the coastal zone or the construction of port and harbor facilities (including jetties)
2. Change of sediment transportation and flow conditions due to the river development

Possible Environmental Impacts

1. Loss of coastal vegetation, such as mangroves, and the change of water depths and receded coastlines caused by coastal erosion and sand deposition zones
2. Effect on marine resources by the warm water discharge in the case of thermal power plant construction. Fishery and tourism may be affected.

Useful Factors for Evaluation

The following conditions will be conducive to significant environmental impacts:

1. There is valuable natural environment, such as mangrove forests 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.

Measures

1. Examination of the contents of the plan
2. Construction of breakwaters
3. Provision of beach nourishment
4. Compensation for fishery

Related Subjects for Study

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 (Regional Development Plan)

Item	15. Fauna and Flora
Description	Obstruction of breeding and extinction of species due to changes of habitat conditions

Causes of Impacts

1. Reclamation for facility construction, certain scale of deforestation for forest resources development, and landfill in the coastal zone
2. Inflow of people, generation of noise, vibration, and air and water pollution as a result of area activation

Possible Environmental Impacts

1. Animal migration and loss of plant species following the changes or loss of animal and plant habitats. As a result, agriculture, forestry and fishery industries would be affected.
2. In some cases, the extinction of species which spoils the biodiversity

Useful Factors for Evaluation

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

1. Protection measures for fauna and flora
2. Sufficient compensation
3. Careful construction planning and management
4. Relocation of fauna and flora

Related Subjects for Study

1. Condition of ecosystem
2. Food chain
3. Residents' livelihood

Table 4-5 Explanation of Item 16 (Regional Development Plan)

Item	16. Meteorology
Description	Changes of temperature, precipitation, wind, etc. due to large-scale land reclamation and building construction

Causes of Impacts

1. Change of topography and large-scale clear-cutting for facility construction
2. Appearance of high-rise buildings, elevated bridges and large-scale pavement

Possible Environmental Impacts

1. Change of hydrological condition and micro-climate, such as temperature, precipitation, wind, and humidity
2. Effect on farming caused by temperature and precipitation changes when weather-sensitive crops are planted
3. Effect on the people, including pedestrians and residents, in the area when there is a large change in the wind condition

Useful Factors for Evaluation

Under the following conditions, the environmental impacts will be significant:

1. The plan requires large-scale clear-cutting or topographical changes.
2. There is major agricultural industry in the area.
3. There is water-sensitive vegetation.
4. The plan includes the construction of high-rise buildings.

Measures

1. Examination of the contents of the plan
2. Compensation for the damage

Related Subjects for Study

1. Meteorological study (temperature, precipitation, wind, evapotranspiration, etc.)
2. Condition of agriculture and forestry
3. Vegetation

Table 4-5 Explanation of Item 17 (Regional Development Plan)

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

1. Change of the existing landscape as a result of deforestation or land reclamation for resource development or facility construction
2. Change of the landscape caused by the appearance of high-rise buildings as a result of urban development
3. Appearance of new artificial landscape as a result of the construction of large-scale bridges, power generating facilities, or port and harbor facilities

Possible Environmental Impacts

1. Appearance of the continuous artificial landscape in the hilly areas created by the slope-protection or filling work for road and railroad construction
2. Impacts will be significant if the landscape has special values for tourism or religion.
3. Sudden changes of landscape would have an adverse impact on the residents' feeling.

Useful Factors for Evaluation

1. Special attention should be paid to landscape that has cultural values from international viewpoints.
2. The particular meanings or roles of the landscape (religious object, tourist attraction, etc.) in the area should be studied.

Measures

1. Reexamination of road or railroad routes, alignment, and planning contents.
2. Landscape architecture
3. Forestation using indigenous trees

Related Subjects for Study

1. Location of cultural assets
2. Landscape study from the viewpoints of local history and ethnology
3. Livelihood of the inhabitants

Table 4-5 Explanation of Item 18 (Regional Development Plan)

Item	18. Air Pollution
Description	Pollution caused by exhaust gas or toxic gas from vehicles and factories

Causes of Impacts

1. Exhaust gas and dust produced by construction equipment and vehicles used for land reclamation and facility construction
2. Soot and smoke from thermal power plants
3. Exhaust gas and dust from road, railroad, and airport operations

Possible Environmental Impacts

1. Negative effects on the public health of inhabitants, and on fauna and flora in the surrounding areas by the exhaust gas and dust
2. Generation of exhaust gas that brings about various problems, following the increase in traffic as a result of the area activation
3. Contribution to the global environmental problems if a large amount of exhaust gas is produced. Sulphur oxides in the gas would cause acid rain and carbon dioxide would contribute to the global warming.
4. Deterioration of landscape and water pollution caused by dust

Useful Factors for Evaluation

1. Special attention should be paid if large pollution sources, such as thermal power plants, are planned.
2. If the climate is separated into dry and rainy seasons, the impacts may be greater in the dry season.

Measures

1. Dust control by sprinkling water or chemicals during construction
2. Reexamination of construction methods
3. Treatment of exhaust gas emitted by various facilities

Related Subjects for Study

1. Urban planning and regional planning
2. Distribution of residents and public facilities
3. Distribution of fauna and flora
4. Air pollution control standards

Table 4-5 Explanation of Item 19 (Regional Development Plan)

Item	19. Water Pollution
Description	Pollution caused by inflow of silt, sand and effluent from factories into rivers and groundwater

Causes of Impacts

1. The washing out of topsoil by rain following the deforestation and slope protection work for land reclamation, which will create turbid water
2. Landfill work in the coastal zone, which will cause temporary turbidity in the sea
3. Oil spills as a result of marine operation or accidents
4. Sewage discharge following urban development

Possible Environmental Impacts

1. Negative impacts on the growth of aquatic life caused by the turbid water in the rivers, lakes, and sea
2. Deterioration of the water quality in the rivers and lakes brought about by the drainage produced by the regular operation of the transportation system, facility operation and maintenance work, and the settlement of people.
3. Effects on the water use by inhabitants, fishery, fish cultivation, and recreational use

Useful Factors for Evaluation

1. Special attention should be paid to the water-use or water basin-use industries in the area or in the downstream region (in case of a river related plan).
2. Special attention should be paid to the valuable aquatic life in the area or its downstream region.
3. Water pollution problems may be serious when the planning area includes enclosed water areas such, as lakes.

Measures

1. Adequate sewage treatment and waste management planning
2. Appropriate construction management
3. Compensation to the inhabitants and industries
4. Creation of habitats for valuable aquatic life

Related Subjects for Study

1. Condition of the industries that use water and water basins in the area
2. Present water quality condition

Table 4-5 Explanation of Item 21 (Regional Development Plan)

Item	21. Noise and Vibration
Description	Noise and vibration generated by vehicles, airplanes and factory operations

Causes of Impacts

1. Operation of heavy construction equipment and vehicles for reclamation and landfill
2. Blasting work for reclamation or slope cut work
3. Operation of railways, vehicles and aircraft
4. Operation of factory facilities

Possible Environmental Impacts

1. Noise pollution in the vicinity of the noise source
2. Health problems, such as sleeplessness and poor appetites, when the noise continues over a long period of time.
3. Negative effects on the breeding and milk production of dairy cattle when they are raised nearby
4. Dispersion of wild animals
5. Cracks in buildings by vibration

Useful Factors for Evaluation

Serious impacts may occur under the following conditions:

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 includes soft ground such as landfill, clayey soil layer, etc.

Measures

1. Reexamination of the contents of the plan
2. Examination of operation hours
3. Examination of construction schedule and working hours, and careful construction planning and management
4. Installation of acoustic walls and buffer zones
5. Compensation for the impacts on the livestock

Related Subjects for Study

1. Land use, location 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 (Regional Development Plan)

Item	23. Offensive Odor
Description	Generation of exhaust gas and offensive odor by facility construction and operation

Causes of Impacts

1. Operation of industrial complexes, thermal power plants, sewage treatment plants, and waste disposal plants

Possible Environmental Impacts

1. Complaints from such public facilities as schools, hospitals, etc.
2. Health problems of the residents and livestock when strong hazardous materials are contained

Useful Factors for Evaluation

1. Special attention should be paid if there are factories which handle hazardous materials.
2. Land use conditions in the area should be taken into consideration.
3. Wind direction and speed will influence the areas to be affected.

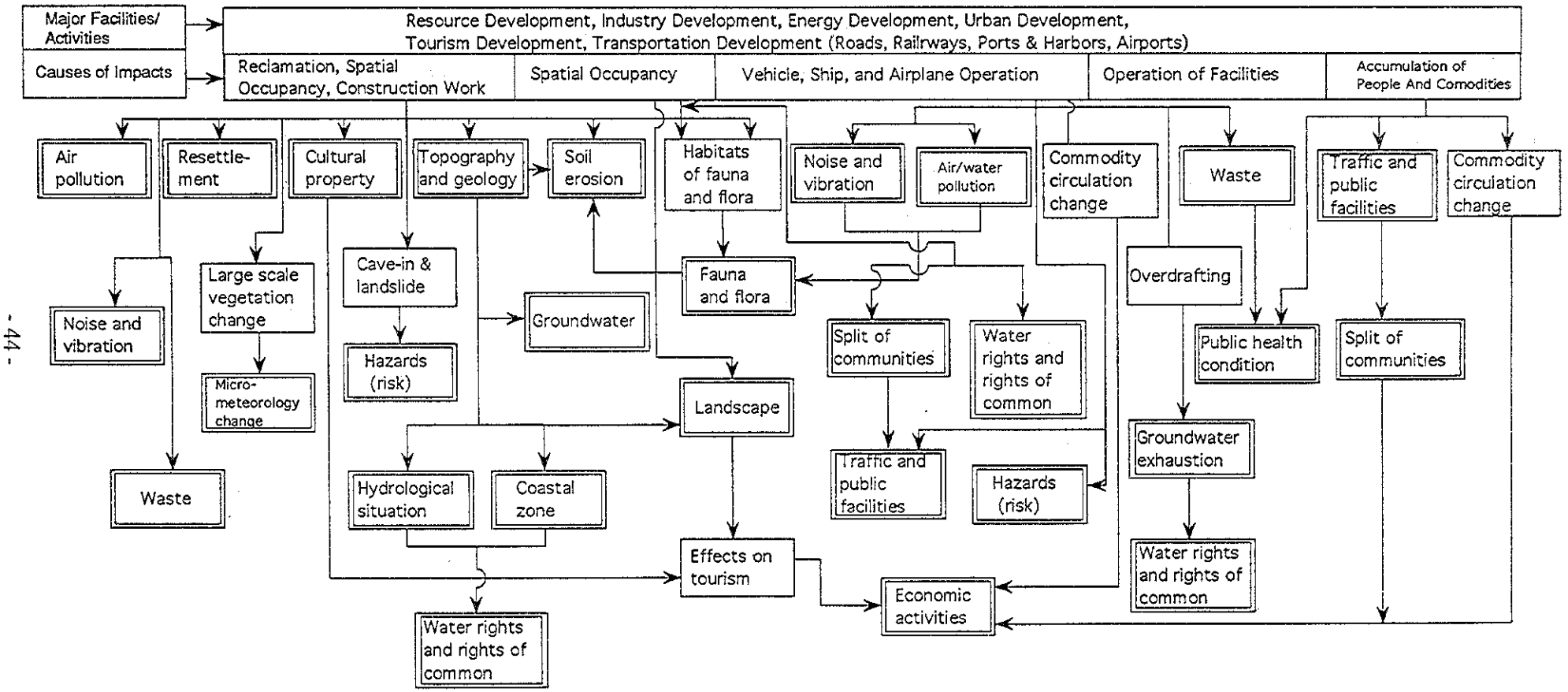
Measures

1. Reexamination of the facility construction site and the contents of the plan
2. Special care to the land use in surrounding area
3. Careful construction planning and management
4. Appropriate management of hazardous materials

Related Subjects for Study

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 Flow Chart of Environmental Impacts of Regional Development Plan



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