

minute sand, the negative impact would be more serious. This kind of discharging methodology introduces water contamination to a large extent, especially in the case of the dredged spoils including soft mud such as fluff.

The current dredging activities in the Orinoco River adopts the side casting method, in which the dredged materials are being disposed inside the Channel. Therefore, the accumulation of deposit is just being transferred from one place to another within the Channel. The dredging activities in the River have been carried out since a long time before, hence the direct impact to aquatic life is considered as minor. While it is conceived that the method might have been one of the reason of water contamination in the Channel.

3) **Water contamination in Tucupita Municipality**

There is a serious problem on water contamination in Tucupita Municipality. The wastewater has been discharged to the Manamo River without any treatment due to absence of the related facilities. The problem is caused by the increase of wastewater with population growth and decrease of ability of the self-cleansing action of river due to decreasing volume of the water of Manamo River.

In order to improve this situation, the study for improvement of drainage system was carried out in 1992. However, the plan has not been executed yet.

6.7.4 Initial Environmental Examination (IEE)

(1) Objectives and procedure of IEE

The IEE has been carried out with the viewpoint of understanding the environmental conditions before implementation of the Project and estimating the negative and detrimental impacts due to Project implementation including preconstruction works. The purposes and procedure of this environmental examination are outlined as below;

- 1) To reveal the present conditions of the environments in the Area.
- 2) To focus the elements which have relevance to the Project and the environmental conditions in the Area
- 3) To consider the relationship between the Project action and Environmental Conditions and to prepare Actions-Environmental Conditions Matrix referring Leopold Matrix

- 4) To re-organize and to identify the environmental elements likely to be affected by the Project, which shall be studied at F/S stage, in order to consider the mitigation measures against such adverse effects due to Project implementation.

In this section, the environmental impact is preliminarily predicted in the Initial Environmental Examination (IEE) of implementation of the project. The IEE aimed at determining the necessity of detailed environmental investigation and studying for mitigation measures (Environmental Impact Assessment: EIA) at F/S stage.

(2) The position of the Environmental Impact Assessment (EIA)

In the Scheme of JICA projects, the EIA will be carried out at the Phase-II of the study, which is Feasibility Study, to examine the impacts of the project implementation.

In Venezuela, all the promoters who intend to establish any project have to submit Intention Document to DGSCA of MARN. The document refers to the project description, objectives, impacts to be expected after implementation of the project. The DGSCA shall establish the methodology among the following three methodologies depending on the magnitude of the projects. They are "Environmental Impact Study", "Specific Environmental Evaluation" and "Presenting additional information for evaluation of the impacts caused by the project".

The promoter will acquire the authorization of land use and natural resource use through the examination of the study report by the DGSCA.

The most essential thing here is that the JICA study team is not a promoter. The objective of this study is to examine the feasibility of the priority project in the Master Plan. The EIA at the phase of Feasibility Study could be understood as a preliminary environmental examination for planning. Therefore, the EIA in this study will not involve the procedure of EIA in Venezuela.

It is unknown yet which methodology will be applied for the project by the DGSCA of MARN when a promoter submits the intention document in the future. When the evaluation of impact of the project is carried out, the promoter will make the best use of the results of this study and sometimes might conduct more detailed investigation. Therefore the contents of the Terms of References of the EIA will be reviewed by the DGSCA before carrying out the field survey at the phase-II. The DGSCA, PROA and JICA Study Team have agreed on the views mentioned above at the meeting held on December 17th 1998.

(3) Project Components and Activities

In the M/P study the alternative B-2 was only adopted and recommended as effective structural measure to reduce maintenance dredging works for the section of Guarguapo-Barrancas –Ya-

Ya. The work component of proposed channel improvement consist of closing dike and bank protection as shown in the table below. (Refer to Section 6.2, 6.3 and 6.4)

Table 6.7.1 Work Component of Proposed Channel Improvement

Items	Description	
Closing Dike	Mound type dike composed of rubble stones or blocks in Tortola channel	L=2,200m
Bank protection	Revetment at Barrancas Town to protect bank from erosion, as a consequent of the discharge increase in the navigation channel	L=2,000m

(4) Environmental Parameters

The environmental parameters for the IEE are confirmed through the examination of the above project activities proposed in this Master Plan Study. The environmental parameters on which the potential negative impacts arise from the projects are;

- Social environment
 - Impacts to the indigenous people living in surrounding area
 - Impact to the local transportation
 - Impacts on inland fisheries
 - Impact to the tourism due to disturbance of the sightseeing course by the dredge
- Natural environment
 - Erosion and deposition due to changes in water flow condition
 - Deterioration of the water quality of the river through sediment dredging and construction works
 - Impact to aquatic life (Loss of habitat in the river)

(5) Potential Impacts

Many positive impacts (benefits) arising from the project implementation are identified; such as minimizing the dredging activities and guaranteeing the navigation safety. However, a few environmental components could be affected by the planned development of the M/P study as given in Table 6.7.2 which shows the IEE Matrix (Project Activities –Environmental Parameters Matrix), mainly considering the negative impacts due to the project.

A brief description of relevant environmental impacts is given as below, regarding their possible causes and interaction with the environmental system.

- Social aspects

Closing the existing channel will lead to water stagnation at downstream of the river. Consequently, the villagers living along the river would no longer be able to continue the fisheries because of the loss of their fishery. They might have to abandon their agricultural land as well. Therefore, the complete closing of channel should be avoided as much as possible or considered the structure of the closing dike which could ensure the certain water movement in the river, for example, constructing permeable type structure or providing overflow gates on the closing dike.

- Local transportation

The residents living around the project site use the river for daily transportation. They move from village to village and transport their products to the markets with small boats. Navigation system to be introduced to the Master Plan will adopt a conventional route same as existing one. Therefore, the impact on local transportation is considered as insignificant.

- Economic activities especially in inland fishery

The loss of fishery due to stagnation at downstream of the closed distributary channel will directly affect the lives of the residents living around the project site whose main subsistence is fishing. The place of the closing dike should be selected with a careful consideration on the location of the villages.

- Tourism

In the State of Amacuro Delta, the tourism activity has high economic potential. Fluvial transportation is essential for the tourism. At present time, there is no conflict on use of the river between tourism and public transportation including dredging. Therefore, the impact on tourism is considered as insignificant.

- Public health

The slope of the river bed at the section of existing distributary channel closing is almost flat. Therefore, the area at the downstream of the closing dike will become a stagnated area. This could be a breeding area for mosquito larvae. Consequently, water-borne diseases such as malaria and dengue fever might occur. However, there are many

“natural” stagnant ponds in the vicinity. Still no significant past incidence of disease was known. Accordingly, potential public health hazard due to spread of disease is considered as not significant.

Although it is not clear whether a camp will be established or not in the construction period, if it will be established, the risk of increased disease should be considered. These diseases may have an adverse impact on the project schedule, on the cost of the project, on the long-term health and income of the workers, and on the local population. Typical diseases and illness may be water borne, either through a vector associated with water, (as in the case of malaria and dengue fever), or directly through disease organisms in the water supply to the camp as in the case of amoebic dysentery. However, these impacts can be reduced by adequate mitigation such as proper sewerage system, adequate medical treatment facilities for workers etc. Therefore, the impact on public health in this case is evaluated as insignificant.

- Degradation of aquatic life

In the construction period, the impact to wildlife is mainly on aquatic life such as fish. The construction activities consist of piling blocks, which have very little possibilities to cause water contamination. Therefore, the impact to water contamination caused by construction activities is evaluated as insignificant.

Meanwhile, in the case of closing channel, lack of oxygen of water body will lead to putrefaction of organic matter in the water. Consequently it may cause serious deterioration of water quality of the area.

Migratory aquatic animals such as fish is supposed to move to other places, however those with rather low migratory ability such as shellfish will be affected by the stagnation. Therefore, the impact to water contamination caused by closing existing channel is evaluated as significant and duly considered in the planning and design of the dike.

- Soil erosion

The change of the velocity of water flow with closing the existing branch channel might cause soil erosion on the riverbanks of other branch channels. However, the adequate measures such as the protection by rubble stone and/or concrete wall could solve this problem. Therefore, the impact on erosion is considered as moderate.

- Water contamination

There is no excavation works on construction of closing channels. Therefore, the impact to water contamination is considered as insignificant. The dredging activities cause temporary water contamination.

In case of closing the existing channel, it may lead to serious water contamination at downstream as already explained above. Therefore, the impact to water contamination is evaluated as significant and duly considered in the planning and design of the dike.

(6) Overall Evaluation

Overall negative environmental impacts by the channel improvement project is considered as significant. The reason for this conclusion of the environmental evaluation is as follows;

With regard to impacts on environment, there is no sensitive area such as national parks in the project sites. The impact to local navigation and tourism due to dredging activities is also evaluated as insignificant, because the activities have already been carried out for long periods and no new route for the dredging is included in the Master Plan.

However, closing channels will be evaluated as significant to the social impacts, because of the loss of aquatic animals such as fish. It affects the life of the people living in the downstream area of the closing dike directly. It might cause involuntarily resettlement because of the loss of their main subsistence fishery.

In addition, the deterioration of water quality due to closing channels is considered as significant. It might affect aquatic life consequently. Moreover, the change of water flow condition derived from closing channel might lead to erosion of the riverbank at Barrancas city.

Therefore, the planning and design of closing the dike should consider securing the water movement at downstream of the closed channel and protection of riverbank from erosion at the Barrancas river section in the feasibility study.

The environmental evaluation and mitigation measures are summarized in Table 6.7.3.

Table 6.7.2 IEE Matrix

Categories of environmental impact \ Activities which may cause Impacts	Construction Period		Existence of the facility	Operational Stage	
	Dredging existing route	Closing the existant channel	Closing channel	Dredging	Maintenance of the facility
1.Social Environment					
Social Aspects					
Community severance					
Substantial changes in way of life		○	○		
Conflict among communities or people					
Land use					
Landscape					
Water supply system					
Transportation and Traffic					
Land transportation					
Local navigation	○	○	○	○	
Economic activities					
Relocation of bases of economic activities		○	○		
Occupational change, loss of labor opportunity		○	○		
Increase in income disparities					
Fishery		○	○		
Tourism		○	○		
Public health					
Outbreak of endemic diseases		○			
Prevalence of epidemic diseases		○			
Increase in domestic and other human waste		○			
Cultural Issues					
Impairment of historic remains and cultural assets					
2.Natural environment					
Biological and Ecological Issues					
Deterioration or degradation of vegetation					
Degradation of flora/fauna/ecosystem		○	○		
Degradation of aquatic life		○	○		
Proliferation of exotic and/or hazardous species					
Soil and land resources					
Soil erosion		○	○		
Hydrology and Air and Water Quality Issues					
<Hydrology>					
Changes in water flow conditions					
Riverbed degradation					
<Water Quality and temperature>					
Water contamination and deterioration of water quality	○	○	○	○	○
<Atmosphere>					
Air pollution					
Noise and Vibration					

Note: ○: The environmental items which may have a potential impact

Table 6.7.3 Overall Environmental Evaluation and Mitigation Measures

No.	Items	Precondition	Impact without measures	Mitigation measures	Evaluation
1)	Substantial changes in way of life	In case of closing channels, people living the downstream might have to move to another area involuntarily	+++	Site selection for the closing channels should be considered the presence of residential area	++
2)	Local navigation	The project route might cross the public local navigation route	++	New dredging route is not included in the M/P	+
3)	Fishery	Closing channels causes degradation of fishery	++++	Proper design of embankment structure	++
4)	Tourism	The project route might cross the tourism navigation route	++	New dredging route is not included in the M/P	+
5)	Public health	Risk of water-borne diseases occurred from labor camp and stagnant area	++	Ensuring proper sewage treatment and disposal etc.	+
6)	Degradation of vegetation flora/fauna/ecosystem	Degradation of vegetation flora/fauna/ecosystem by water contamination with closing channels	+++	Proper design of embankment structure	++
7)	Degradation of aquatic life	Degradation of aquatic life by water contamination with closing channels	++++	Proper design of embankment structure	++
8)	Soil erosion	Caused by increment of water velocity with closing channels and construction of groins	+++	River bank protection at Barrancas city	++
9)	Water contamination	Dredging and closing channels cause water contamination	++++	Proper design of embankment structure	++

Note:

++++ : Significant

+++ : Moderate

++ : Minor

+ : Insignificant

- : None