ENVIRONMENTAL ASSESSMENT

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8. ENVIRONMENTAL ASSESSMENT

8.1 INTRODUCTION

For the Modification of Environmental License of the project, in compliance with the Terms of Reference established by Resolution 0112 of 2015[1] for large maritime ports, the environmental impact assessment was carried out analyzing two scenarios: *No Project or current situation and With Project*. This assesment was based on the assignment of values to different criteria according to the methodological guide for the environmental impact assessment, in which the current environmental conditions and impacts derived from the activities of the area and the environmental problems existing in the area were determined, the area of influence of the project, product of the main activities.

The environmental impact assessment was carried out in phases: 1) The environmental impacts of the activities that have the greatest impact on the area of influence were identified and evaluated (scenario without project - Ex Ante) and 2), based on the activities for the modification of the environmental license defined in the project description and starting from the impacts previously identified in the environmental impact study and in accordance with the analyzes carried out in the characterization of the project´s area of influence for the abiotic, biotic and socioeconomic environment, were identified the impacts and their affectation was analyzed, called scenario with project (Ex - Post).

The assessment of the importance of both positive and negative environmental impacts identified in the two scenarios: Without Project and With Project, was carried out jointly with the interdisciplinary group of professionals who participated in the preparation of the environmental impact study for the Modification of the Environmental License for the construction and operation Project of a solid bulk port terminal in the municipality of Turbo, which will be modified by a multipurpose port terminal called "Puerto Bahía Colombia de Urabá"; this was done in order to reduce the possible personal biases of the professionals and thus increase the validity of the same and

[1] COLOMBIA. MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT. Resolution 0112 (January, 28, 2015). Whereby the terms of reference for the preparation of the Environmental Impact Study - EIA, required for the processing of the environmental license of construction projects or expansion and operation of deep seaports are adopted and other determinations are made. Bogotá D.C, 2015.

decrease subjectivity, since the criteria vary according to the profession and the degree of development of the theories of each discipline.

8.2 IDENTIFICATION AND ASSESTMENT OF IMPACTS FOR THE SCENARIO WITHOUT PROJECT

The identification and assestment of impacts for the Sin Proyecto scenario consisted in qualifying the current state of each of the abiotic, biotic and socioeconomic environment, considering the most relevant activities carried out in the area of influence of the project..

8.2.1 Identification and description of impacting actions - Scenario Without Project

According to the information collected, both primary and secondary and the field technical visit required for the characterization of the abiotic, biotic and socioeconomic environment of the area of influence and environmental zoning; the group of specialists identified the following actions to take into account for the environmental assessment, as the most relevant in the study area without a project.

- *Transit of vessels (fishermen and banana convoys))*

The natural formation of Bahía Colombia in the Gulf of Urabá and its strategic location allowed the establishment of the anchorages, for the development of economic activities such as embarking on export-type banana production and artisanal fishing, converting Bahía Colombia, the New Colonia Canal and the León River in a scenario for the development of maritime transport activities of greater and lesser depth such as ships, banana convoys and boats.

- *Maintenance dredging - Nueva Colonia Canal and León River*

At the moment, the maintenance dredging in the Nueva Colonia Canal and the Leon river is realized, with the intention of maintaining the navigability of the channels for the maritime and fluvial transit of the banana convoys towards Bay Colombia, place where the anchorages are authorized by the DIMAR to carry out the activity of boarding the convoys to the ships.

- *Traffic of vehicles*

In the area there is a high traffic flow, mainly in the district of Nueva Colonia, as it is a sector where export-oriented banana companies such as Banacol and Uniban are located, of which the frequency of vehicular flow of heavy loads and vehicles was evidenced and light vehicles for the mobilization of the population.

- *Artisanal fishing*

Artisanal fishing is defined as an activity developed through traditional techniques without technological tools that allow unproductive fishing for the fishing sector; artisanal fisheries, although they manage resource surpluses, generally these are not of the best quality and therefore their marketing chains are not very broad. Generally the resources obtained from the fishing activities are destined to self-consumption and retail sale in landing areas.

- *Agriculture with agrochemicals use*

The main economic activity in the Gulf of Urabá, is banana and plantain export agriculture, which uses for the production of fungicides, pesticides, fertilizers or other chemicals, in order to increase production and eliminate pests that may affect crops.

- *Vegetation felling*

Within the area are timber species, considered economically important due to the physical characteristics of the wood they produce, for this reason it has been over exploited forest cover to reduce the population of these species. Such is the case of the cativales which are almost pure populations of the cativo species (Prioria copaifera) that has been exploited in a discriminated manner until almost ending with these communities. The same applies to the mangrove cover, which, despite being declared a regional closure by CORPOURABA through Resolution 76395B of August 4, 1995 and being protected by the Forest Reserve of the Suriquí and León rivers, is carried out discriminatory felling.

- *Establishment of forest plantations*

Forest plantations are an important option for the use of land. In recent years, the change in land use has changed from agricultural to livestock production. This is because the region presents the soil, climate and location conditions for the production of timber species with high commercial value; as is the case of Teak (Tectona grandis) and Melina (Gmelina arborea*)*.

- *Solid waste generation*

In the study area, inadequate solid waste management activities were presented, which are buried and deposited in open fields in areas adjacent to the houses, uncontrolled burning of outdoor waste and floating materials in the area of the pier located in the head of the corregimiento of Nueva Colonia.

Banana export The export of bananas, is the most representative economic activity in the region, this activity generates money in foreign currency for the export of products to several countries of the world, the payment of freights, tariffs and other taxes associated with production, export and marketing of the product characterized by the technification of production in large areas cultivated and managed by people other than the owners, high yields and low added value.

- *Human settlements*

The human settlements refer to the formal and informal habitation of a space. In the present case, the human settlements identified in the area of influence of the project are characterized as nucleated and agglomerated settlements, especially in the top region of the Nueva Colonia district, in which high levels of Unsatisfied Basic Needs (NBI) are identified due to the provision of domiciliary and social public services in inadequate conditions. For the population identified in the El Canal settlement, there are high levels of informality and inadequate housing conditions, as a consequence of the scarce housing possibilities as well as the absence of basic services such as access to potable water and water services and basic sanitation.

8.2.2 Identification of the environment and environmental components susceptible to receiving changes or impacts - Scenario Without Project

The environmental means and components susceptible to receive changes or impacts were identified for each abiotic, biotic and socioeconomic environment in the No Project study area. Table 8.1 shows the environmental factors of change for the study area Without Project, which may be representative for each component and indicative of affecting the quality and quantity in the environment, in order to estimate the state current of natural systems.

Table No. 8.1 Components and their change factors- Impact Without project

ENVIRONMENT	COMPONENT	IMPENVIRONMENTAL IMPACT / CHANGE FACTORACTO AMBIENTAL / FACTOR DE CAMBIO
ABIOTIC	CONTINENTAL WATERS	Changes in the physicochemical and microbiological characteristics of continental water
		Change in resource availability
	ATMOSPHERIC	Alteration of air quality caused by gases and particulate matter
		Alteration of noise levels
		Alteration of the physicochemical properties of the soil

	SOILS, GEOLOGY AND GEOMORPHOLOGY	Alteration in the morphology of continental floors
		Resuspension and redistribution of sediments (Continental)
	LANDSCAPE	Landscape alteration
	OCEANOGRAPHY	Changes in the physicochemical and microbiological characteristics of seawater
BIOTIC	ECOSYSTEMS	Alteration of continental aquatic habitats
		Alteration of marine aquatic habitats
		Alteration of terrestrial habitats
		Formation of new habitats
	FAUNA AND FLORA	Variation of vegetation cover
		Change in the dynamics of wildlife communities
		Modification in the structure (distribution, abundance and composition) of marine planktonic communities
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities
		Modification in the structure (distribution, abundance and composition) of the ichthyological communities
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.
Socioeconomic and cultural	CULTURAL	Alteración de patrones culturales
	ECONOMIC	Currency generation
		Modification of the income level of the population
		Change in labor supply
		Alteration of the property Value
		Modification of productive activities
	ESPATIAL	Alteration of existing infrastructure
		ariation in the coverage and quality of public services
		Alteration in the transit of vessels
		Variation in the volume of vehicular traffic
	POLITICAL - ORGANIZATIONAL	Institutional and community strengthening
		Generating expectations in the community

Source: Elaborado por Aqua & Terra Consultores Asociados S.A.S, 2014

8.2.3 Definition of environmental impacts - Scenario without project

The description and / or definition of the environmental impacts identified for each of the abiotic, biotic and socioeconomic media with their respective environmental components applicable to the activities without a project in the area of influence is described below.

- *Abiotic environment*

For the present evaluation the abiotic environment is comprised of the components of: continental waters, atmospheric, soils, geology, geomorphology, landscape and oceanography. For each component, alterations in the quality represented in impacts were identified, which are described below.

- Continental waters component

Changes in the physicochemical and microbiological characteristics of continental water: It is an alteration or modification of the physical, chemical or bacteriological characteristics of the continental water due to the inadequate management of the activities of the region that do not have wastewater treatment and solid waste. Some of the characteristics that can be modified are turbidity, solids, color, pH, hardness, oxygen, presence of heavy metals, salinity, fecal coliforms, total coliforms or other pathogenic elements.

Change in resource availability: It is a variation of the amount of the resource available to allocate it to other uses, which is generated by the consumption that takes place in the study area in the activities of the region.

- Atmospheric component

Alteration of air quality caused by gases and particulate matter: Are increases or decreases in the concentration of traditional gaseous pollutant compounds such as carbon dioxide (SOx), carbon monoxide (CO), nitrogen oxides (NOx) or others. These can be emitted by anthropic or natural activities. Additionally, the emission of dispersed particles in the air of different sizes can remain in the air different times, according to their weight.

Alteration of noise levels: They are variations in the sound pressure levels generated by external elements such as vehicles, equipment, machinery present in a certain area.

- Soil, geology and geomorphology component

Alteration of the physicochemical properties of the soil: corresponds to a physical-chemical alteration of the organic layer of the soil and its main horizons, which may originate naturally or through anthropogenic activities, in which agricultural activities are associated with the use of agrochemicals and inadequate management of solid waste, consequently, these activities will produce a loss of soil quality.

Alteration in the morphology of continental floors: It consists of a removal of the substrate from the continental floor by dredging the material in the channels of the Nueva Colonia canal and the León River, generated by anthropic activities.

Resuspension and redistribution of sediments (continental): Due to the maintenance dredging activity in the Nueva Colonia canal and the León river, the bottom sediments are resuspended and redistributed in the aforementioned channels, altering the physicochemical characteristics of the water column.

- Landscape component

Landscape alteration: It can be defined as the changes for the presence of elements outside the original natural and / or artificial landscape, which cause a change in the visual perception of the observer, by the dimensions of the works which can be identified at great distances, becoming a dominant factor in the landscape.

- Oceanography component

Changes in the physicochemical and microbiological characteristics of seawater: It is an alteration or modification of the physical, chemical or bacteriological characteristics of seawater due to the activities of the region that do not have wastewater and solid waste management. Some of the physical characteristics that can be modified are: turbidity, solids, color, among others; and chemical as: pH, hardness, oxygen, presence of heavy metals, salinity, among others; and the microbiological characteristics such as: the concentration of fecal coliforms, total coliforms or other pathogenic elements.

- *Biotic Environment*

For the present assestment the biotic environment is comprised of several components such as ecosystems and fauna and flora, for each component alterations in quality represented in impacts were identified, which are described below.

- Ecosystems component

Alteration of continental aquatic habitats: This impact refers to modifications or alterations that may occur in the lotic system of the León River, related to anthropic activities or natural causes that affect the hydrobiological community of the river, such as the modification of refuge areas for fish and macroinvertebrates and changes in substrate availability for the development of periphyton. It also refers to changes in water quality, such as temperature increase or decrease, turbidity, pH, electrical conductivity, among other factors that influence the natural dynamics of fish, macroinvertebrates and periphyton.

Alteration of marine aquatic habitats: This impact refers to modifications or alterations that may occur in the marine environment, related to anthropogenic activities or natural causes that may affect the planktonic, benthic and fish communities, such as the modification of refuge areas for fish and benthos. It also refers to changes in water quality, such as temperature increase or decrease, turbidity, pH, electrical conductivity, among other factors that influence the natural dynamics of fish, benthos and plankton.

Alteration of terrestrial habitats: This impact refers to modifications or alterations that may occur in the terrestrial environment, related to anthropic activities or natural causes that may affect the floristic and faunal communities, such as the modification of refuge areas for reptiles, amphibians, birds and mammals, changes in the availability of the substrate for the development of the flora. It also refers to changes in coverage, availability of food and perches, among other factors that influence the natural dynamics of flora, birds and mammals.

Formation of new habitats: This impact refers to the disposition of the maintenance dredging material of the León River, which may be generating habitats and substrates temporarily or permanently with the capacity to support different floristic and faunal communities.

- Fauna and Flora Component

Variation of vegetation cover: Corresponds to the loss or removal of forest vegetation cover and associated floristic species, product of human activities directly or indirectly, or by natural phenomena.

Change in the dynamics of wildlife communities: Corresponds to the decrease or increase in the number of individuals or species, product of the removal and / or displacement generated by the development of anthropic activities of cultural or

indigenous character of the communities present in the areas. It also refers to changes in the population structure of the flora and fauna communities present.

Modification in the structure (distribution, abundance and composition) of marine planktonic communities: This impact refers to changes in water quality in the column, causing temporary alterations in the planktonic community, either by increasing or decreasing nutrients, salinity, light penetration and temperature.

Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities: Corresponds to the decrease or increase in the number of individuals or species, product of anthropic activities either by communities or external factors (civil works) on the river bed and its banks.

Modification in the structure (distribution, abundance and composition) of the continental fish communities: Corresponds to the decrease or increase in the number of individuals or species, product of anthropic activities either by communities or external factors (civil works) on the column, river bed and its banks.

Modification in the structure (distribution, abundance and composition) of the periphytic communities: Corresponds to the decrease or increase in the number of individuals or species, product of anthropic activities either by communities or external factors (civil works) on the river bank and availability of substrates for the settlement of this community.

- *Socioeconomic Environment*

For the present assestment, the socio-economic environment is comprised of several components such as cultural, economic, demographic, spatial and political-organizational, for each component quality alterations were identified which are represented in impacts, which are described below.

- Cultural component

Alteration of cultural patterns: It refers to the change in the population´s lifestyle that lives in the urban and nearby rural settlements, due to the constant arrival of personnel from different parts of the country in search of employment opportunities for the development of activities associated with the cultivation of bananas, plantain, forest plantations, among others.

- Economic Component

Currency generation: It is understood as the money (in foreign currency) generated by the port operation, both in the payment of freights, as well as in tariffs and other taxes associated with the transportation of cargo outside of the country.

Modification of the income level of the population: It is the increase or decrease in labor supply and demand for the development of economic activities of various kinds.

Change in labor supply: It is understood as the increase or decrease in the work profiles required, for the provision of direct and indirect jobs, especially those related to the activities of production, transportation, export and marketing of the most representative products of the area such as bananas and plantain.

Alteration of the property value: It is understood as the increase or decrease in the property value generated by the speculation in the demand of the real estate market in the area for the provision of direct and indirect services such as storage services, housing services for foreign personnel, demand for commercial establishments among others.

Modification of productive activities: It is understood as the variation in the economic activities of people who develop trades informally such as fishing and agriculture in the area.

- Spatial componentl

Alteration of existing infrastructure: It refers to the impact generated by vehicular traffic on the road that leads to the boarding areas that are in the District of Nueva Colonia.

Variation in the coverage and quality of public services: It refers to the increase in demand for these, due to the arrival of foreign population that puts more pressure on the service of drinking water, energy, sewage and garbage collection.

Alteration in the transit of vessels: It refers to the temporary interruption of the transit of canoes, boats and motorboats, as a consequence of the dredging activities developed in the Nueva Colonia canal and the León river; as well as the presence of larger vessels carrying out embarkation and disembarkation operations in Bahía Colombia de Urabá.

Variation in the volume of vehicular traffic: It makes reference to the increase of the vehicular flow in the Rio Grande-Nueva Colonia road for the transport of cargo coming

from the region and the personnel that work in the banana plantations of the region and carry out economic activities in the zone associated with it.

- Political - organizational component

Institutional and community strengthening: This impact refers to the increase in the presence of authorities, institutions and community organizations.

Generation of community expectations: Expectations are understood as the perceptions that individual or group subjects are creating or constructing to assume a position in front of it or to make interpretations about the benefits or damages that may be generated by the development of a project, work or activity in the region.

8.2.4 Identification matrix and results of the impacts of the Environmental Assessment Without Project

Starting from the environmental characterization of the project for this Modification of Environmental License and of the activities present in the study area and the environmental impacts defined above, the environmental impacts that are exerted on the abiotic, biotic and socioeconomic environment by the execution were identified of the activities of the study area without the activities of the project. Based on this information, the Impact Identification Matrix Without Project is presented in Table No. 8.2..

Subsequently, the qualitative assessment of the impacts for the abiotic, biotic and socioeconomic environment was made taking into account the evaluation criteria for the qualification as presented in Table No. 8.3, which were defined in the methodology presented in the Chapter of General Aspects of the present study such as the nature of the positive or negative impact, the intensity, extent, moment, persistence, reversibility, synergy, accumulation, effect, periodicity and recoverability, which are the variables that were considered for the qualitative assessment of the impact from of the degree of incidence of the alteration produced and its effects.

The details of the qualification of the assestment of environmental impacts is presented in Annex 8.1 ID Impacts Without Project.

Tabla No. 8.2 Identification matrix of environmental impacts Without a Project

ENVIRONMENT	ELEMENT	ENVIRONMENTAL IMPACT / EXCHANGE FACTOR	ACTIVITIES WITHOUT PROJECT									
			Transit of vessels (fishermen and banana convoys))	Maintenance dredging of the Canal Nueva Colonia and Río León	Traffic of vehicles de vehículos	Artisanal fishing	Agriculture with the use of agrochemicals	Vegetation felling	Establishment of forest plantations	Solid waste generation	Banana export	Human settlements
ABIOTIC	CONTINENTAL WATERS	Changes in the physicochemical and microbiological characteristics of continental water		X			X			X		X
		Change in resource availability					X					X
	ATMOSPHERIC	Alteration of air quality caused by gases and particulate matter	X	X	X							
		Alteration of noise levels	X	X	X							
	SOILS, GEOLOGY AND GEOMORPHOLOGY	Alteration of the physicochemical properties of the soil					X			X		
		Alteration in the morphology of continental floors		X								
		Resuspension and redistribution of sediments (Continental)		X								
	LANDSCAPE	Landscape alteration					X	X	X	X		X
	OCEANOGRAPHY	Changes in the physicochemical and microbiological characteristics of seawater		X			X			X		X
BIOTIC	ECOSYSTEMS	Alteration of continental aquatic habitats	X	X						X		
		Alteration of marine aquatic habitats	X							X		
		Alteration of terrestrial habitats			X		X	X		X		X
		Formation of new habitats		X								

ENVIRONMENT	ELEMENT	ENVIRONMENTAL IMPACT / EXCHANGE FACTOR	ACTIVITIES WITHOUT PROJECT									
			Transit of vessels (fishermen and banana convoys))	Maintenance dredging of the Canal Nueva Colonia and Río León	Traffic of vehicles de vehículos	Artisanal fishing	Agriculture with the use of agrochemicals	Vegetation felling	Establishment of forest plantations	Solid waste generation	Banana export	Human settlements
	FAUNA AND FLORA	Variation of vegetation cover					X	X		X		
		Change in the dynamics of wildlife communities					X	X		X		
		Modification in the structure (distribution, abundance and composition) of marine planktonic communities	X									
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities		X								
		Modification in the structure (distribution, abundance and composition) of the ichthyological communities		X								
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.		X								
SOCIOECONOMIC O-CULTURAL	CULTURAL	Alteration of cultural patterns								x		
	ECONOMIC	Currency generation									x	
		Modification of the income level of the population	x			x						
		Change in labor supply							x			
		Alteration of the property value					x		x			
		Modification of productive activities	x	X			x		x			

ENVIRONMENT	ELEMENT	ENVIRONMENTAL IMPACT / EXCHANGE FACTOR	ACTIVITIES WITHOUT PROJECT									
			Transit of vessels (fishermen and banana convoys))	Maintenance dredging of the Canal Nueva Colonia and Río León	Traffic of vehicles de vehículos	Artisanal fishing	Agriculture with the use of agrochemicals	Vegetation felling	Establishment of forest plantations	Solid waste generation	Banana export	Human settlements
	ESPACIAL	Alteration of existing infrastructure			x							
		Variation in the coverage and quality of public services										x
		Alteration in the transit of vessels	x	X								
		Variation in the volume of vehicular traffic			x							
	POLITIC - ORGANIZATIONAL	Institutional and community strengthening										x
		Generating expectations in the community										x

Source: Elaborado por Aqua & Terra Consultores Asociados S.A.S., 2015

Tabla No. 8.3 Matrix of results of the assessment of environmental impacts Without Project

ENVIRONMENT	ELEMENT	ENVIRONMENTAL IMPACT / EXCHANGE FACTOR	ACTIVITIES WITHOUT PROJECT									
			Tránsito de embarcaciones (pesqueras y convoyes bananeros)	Dragado de mantenimiento canal Nueva Colonia y Río León	Tránsito de vehículos	Pesca Artesanal	Agricultura con uso de agroquímicos	Tala de vegetación	Establecimiento de plantaciones forestales	Generación de residuos sólidos	Exportación de banano	Asentamientos Humanos
ABIÓTICO	CONTINENTAL WATERS	Changes in the physicochemical and microbiological characteristics of continental water	0	-44	0	0	-37	0	0	-35	0	-30
		Change in resource availability	0	0	0	0	-36	0	0	0	0	-22
	ATMOSPHERIC	Alteration of air quality caused by gases and particulate matter	-27	-24	-27	0	0	0	0	0	0	0
		Alteration of noise levels	-26	-23	-26	0	0	0	0	0	0	0
	SOILS, GEOLOGY AND GEOMORPHOLOGY	Alteration of the physicochemical properties of the soil	0	0	0	0	-45	0	0	-39	0	0
		Alteration in the morphology of continental floors	0	-24	0	0	0	0	0	0	0	0
		Resuspension and redistribution of sediments (Continental)	0	-45	0	0	0	0	0	0	0	0
	LANDSCAPE	Landscape alteration	0	0	0	0	38	-30	28	-35	0	-32
	OCEANOGRAPHY	Changes in the physicochemical and microbiological characteristics of seawater	0	-30	0	0	-26	0	0	-25	0	-23
BIÓTICO	ECOSYSTEMS	Alteration of continental aquatic habitats	-23	-43	0	0	0	0	0	-41	0	0
		Alteration of marine aquatic habitats	-23	0	0	0	0	0	0	-28	0	0
		Alteration of terrestrial habitats	0	0	-24	0	-33	-54	0	-28	0	-25
		Formation of new habitats	0	32	0	0	0	0	0	0	0	0

	FAUNA Y FLORA	Variation of vegetation cover	0	0	0	0	-33	-54	0	-30	0	0
		Change in the dynamics of wildlife communities	0	0	0	0	-33	-38	0	-30	0	0
		Modification in the structure (distribution, abundance and composition) of marine planktonic communities	-23	0	0	0	0	0	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities	0	-44	0	0	0	0	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of the ichthyological communities	0	-30	0	0	0	0	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.	0	-44	0	0	0	0	0	0	0	0
Socioeconomic and cultural	CULTURAL	Alteration of cultural patterns	0	0	0	0	0	0	0	-33	0	0
	ECONÓMICO	Currency generation	0	0	0	0	0	0	0	0	44	0
		Modification of the income level of the population	28	0	0	-25	0	0	0	0	0	0
		Change in labor supply	0	0	0	0	0	0	21	0	0	0
		Alteration of the property value	0	0	0	0	-34	0	23	0	0	0
		Modification of productive activities	24	-23	0	0	-28	0	21	0	0	0
	ESPACIAL	Alteration of existing infrastructure	0	0	-31	0	0	0	0	0	0	0
		Variation in the coverage and quality of public services	0	0	0	0	0	0	0	0	0	-28
		Alteration in the transit of vessels	-25	-23	0	0	0	0	0	0	0	0
		Variation in the volume of vehicular traffic	0	0	-32	0	0	0	0	0	0	0
	POLÍTICO - ORGANIZATIVO	Institutional and community strengthening	0	0	0	0	0	0	0	0	0	27
		Generating expectations in the community	0	0	0	0	0	0	0	0	0	-26

Fuente: Elaborado por Aqua & Terra Consultores Asociados S.A.S., 2015

8.2.5 Analysis of the results of the Environmental Assestment Without Project

According to the results obtained in the assestment of impacts Without Project in the study area (see Table No. 8.3), 64 positive and negative class impacts were identified for the abiotic, biotic and socioeconomic environments, of the 310 possible interactions of the impacts related to the main activities (10 activities) such as the transit of vessels (fishermen and banana convoys), maintenance dredging of the Nueva Colonia and León rivers, vehicle traffic, artisanal fishing, agriculture with the use of agrochemicals, felling of vegetation, parking of forest plantations, generation of solid waste, export of bananas and human settlements. Based on the analysis and identification of impacts by activity, there were 54 negative impacts with an equivalence of 84.4% and 10 positive impacts equivalent to 15.6%, as shown graphically in the Figure No. 8.1.

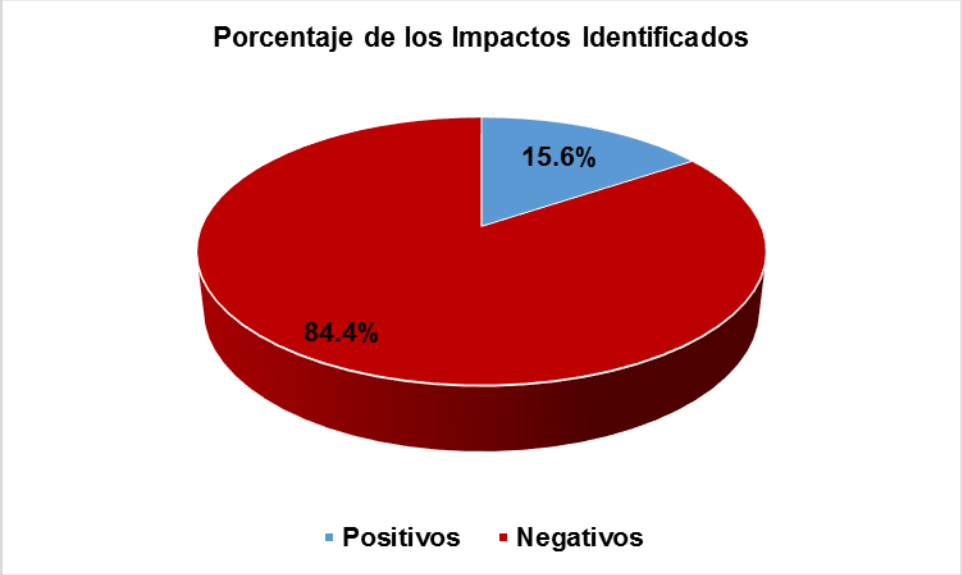


Figure No. 8.1 Percentage of the nature of the Impacts identified Without Project
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

According to the results of the significance assessment presented in Table No. 8.3 Without Project, 54 negative class impacts were identified, of which 15 impacts with irrelevant importance are subdivided, equivalent to 27.8%, 37 impacts with one moderate importance equivalent to 68.5%, two (2) impacts with a severe importance that is equivalent to 3.7%, which indicates that there was greater impact on the environment in a negative way with a moderate rating due to some activities such as vessel traffic, maintenance dredging, agriculture for the use of

agrochemicals, generation of waste and human settlements (see Figure No. 8.2).

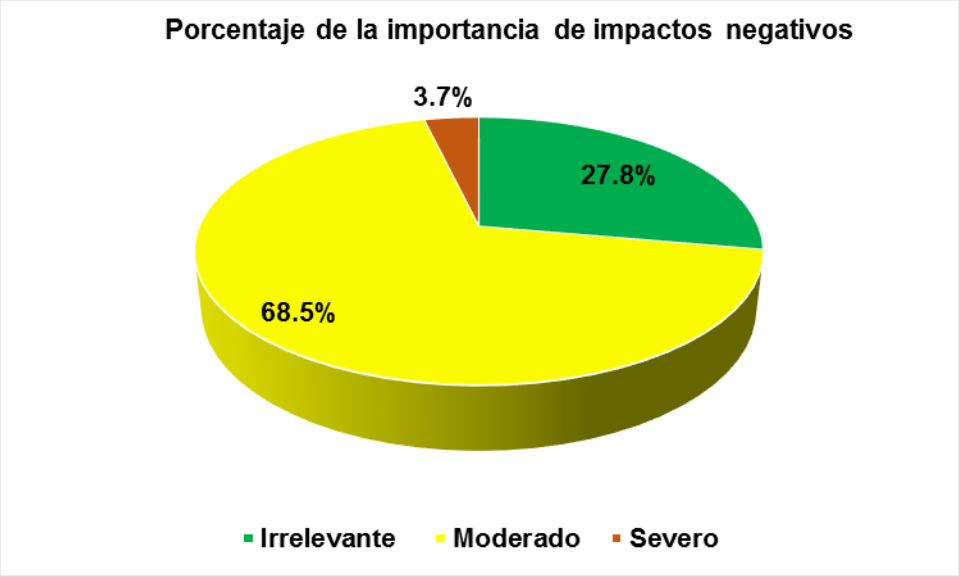


Figure No. 8.2 Percentage of importance of negative impacts Without Project
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

On the other hand, positive class impacts were also identified Without Project, of which eight (8) insignificant impact and two (2) moderately significant impact with a representation percentage of 80% and 20% respectively, as presented in the graph in Figure No. 8.3. These impacts were generated by the boat traffic activities because they modify the productive activities, establishment of forest plantations since they improve the visual quality of the landscape, change the labor supply, alteration of the property value, among others.

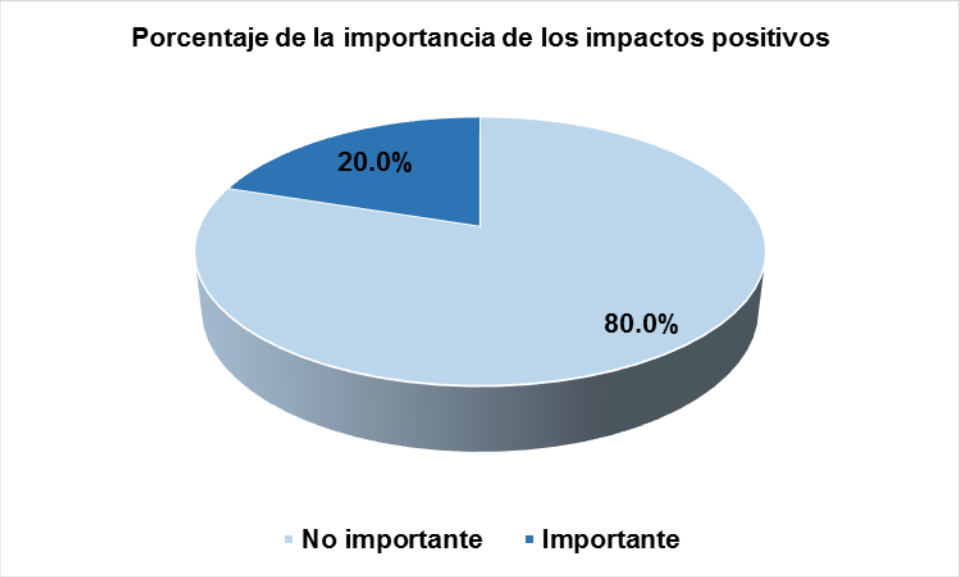


Figure No. 8.3 Percentage of importance of positive impacts Without Project
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

According to the obtained results, the most impacted activities in the scenario Without Project are presented in Figure No. 8.4, where the activities that received the greatest number of impacts are found with a frequency between 5 and 13 impacts, related to the activity maintenance dredging in the Nueva Colonia canal and the León river, which was the most impacted, followed by agriculture with the use of agrochemicals, generation of solid waste, human settlement, transit of vessels (fishermen and banana convoys) and the minor impact was the transit of vehicles.

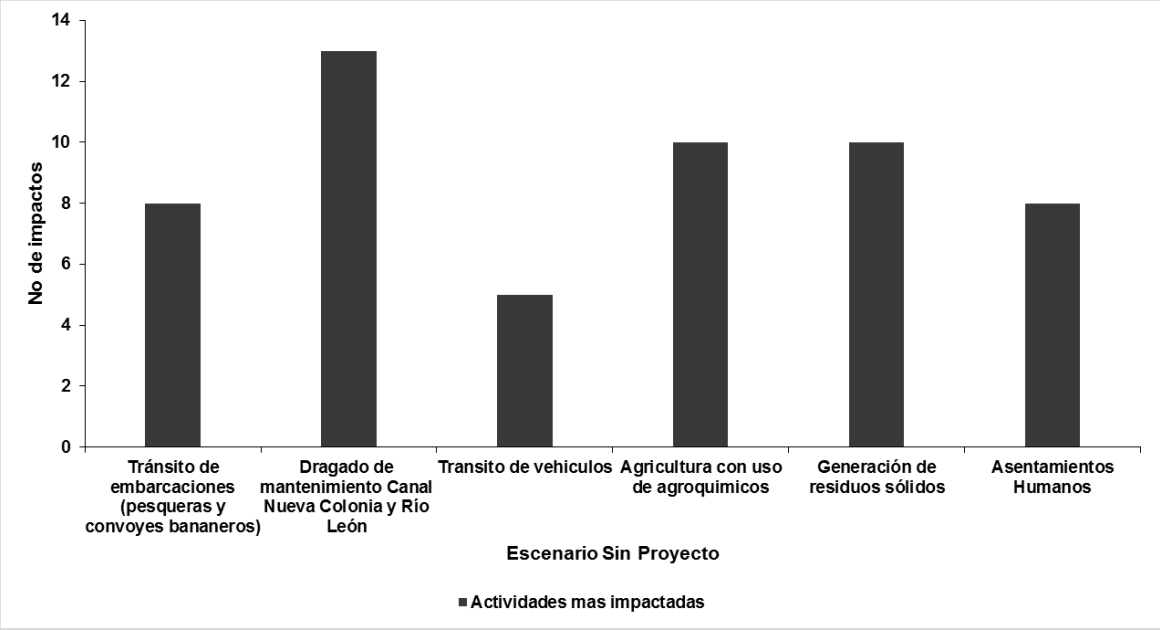


Figure No. 8.4 Most impacted activities - Scenario Without Project
Source3: Aqua & Terra Consultores Asociados S.A.S., 2015

Below is the analysis for each abiotic, biotic and socioeconomic environment according to the impacts identified without a project for each one of them.

- *Abiotic environment*

Based on the significance ratings of the impacts identified for the main activities that are carried out in the study area without a project, an analysis of the results for the abiotic environment of the impacts with greater relevance is presented below.

- Changes in the physicochemical and microbiological characteristics of continental water

The main factors in the change of the water´s physicochemical characteristics are produced by the discharges of human settlements on the banks of water sources due to the precarious provision of sewerage services without prior treatment in wastewater treatment plants or septic tanks systems, where the river León is the receiving channel of the sewer systems of municipalities such as Apartadó, Chigorodó, Carepa and Mutatá, also receiving runoff and the drainage systems of the banana plantations along its basin. Another factor that influences is the mining activity upstream of the mouth of the León River in Bahía Colombia and the inadequate disposal of solid waste which is discharged into the waters.

One of the most representative activities in the region is associated with the production, transport, export and marketing of products such as bananas, plantains and, to a lesser extent, pineapples. Due to the high production of these products in the area, the industry requires the use of agrochemicals and drainage systems, Agrochemicals and drainage systems that reach the water bodies by runoff.

Additionally, the products to be exported require marine-fluvial transport and the development of loading and unloading maneuvers, which requires the development of maintenance dredging activities on the Nueva Colonia canal and the León River to guarantee constant traffic in the area, since the channels for natural actions sediment and lose the draft required for the transit of the banana convoys. These are the main activities that exert negative pressure on the water resource in the study area.

Due to the above, any alteration in the water quality of the León River and the Nueva Colonia canal is reflected as a negative impact, since it presents contamination by total coliforms, fecal coliforms and suspended solids, among others, valued as an impact of moderate importance (see Figure No. 8.5), which is in accordance with the results obtained in the water quality samplings in the León River study area, where a poor and very bad water quality index was presented, related to the activities that are externalized in the area.

On the other hand, REDCAM information was reviewed in which it is shown that the León River is one of the rivers with the highest microbial load represented in coliforms compared to the other rivers that flow into the coastal area of the department of Antioquia, such as the Hobo River in San Juan de Urabá and the Negro River in the Golfo Alto, which corroborates the above-mentioned related to domestic wastewater discharges, which can cause gastrointestinal diseases such as cholera and hepatitis by direct contact or ingestion of contaminated food.

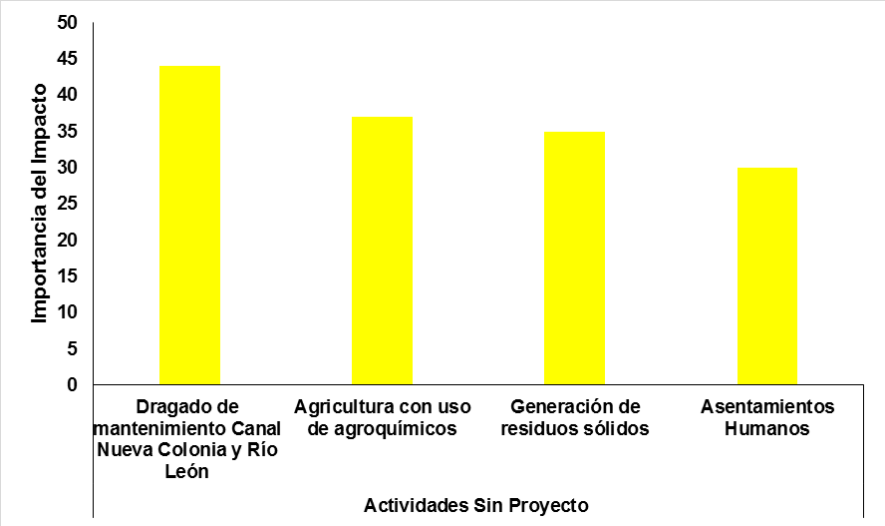


Figure No. 8.5 Environmental significance of the impact Without Project for changes in the physicochemical and microbiological characteristics of continental water
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Change in resource availability

The consumption of water for the different activities carried out in the region decreases the availability of the resource for other uses, which makes it a negative impact, since agriculture activities require water consumption for crops and human settlements require the consumption of water for subsistence. Therefore, it was considered that the impact has an environmental importance between irrelevant and moderate as shown in Figure No. 8.6.

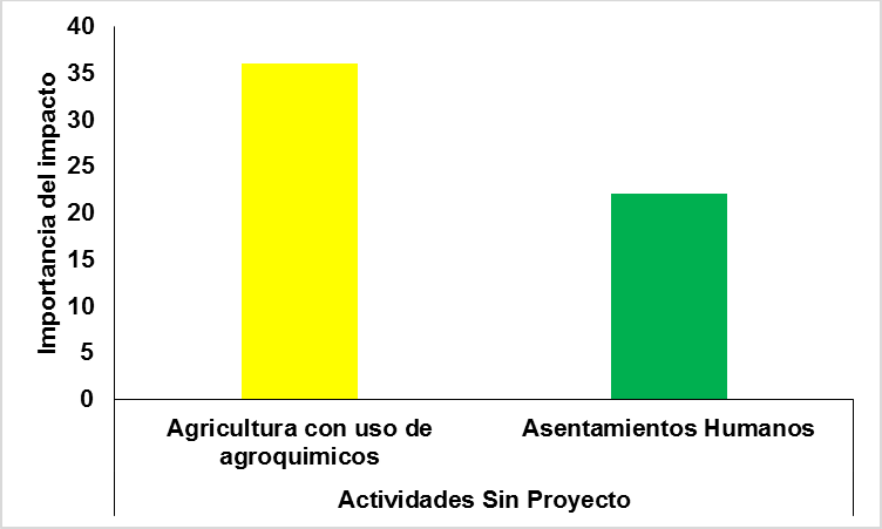


Figure No. 8.6 Environmental significance of the impact Without Project for changes in resource availability
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of air quality caused by gases and particulate matter and alteration of noise levels

The impact of the alteration of air quality by gases and particulate matter and the alteration of noise levels, are valued with an environmental importance between irrelevant and moderate, these impacts are generated due to the activities of boat traffic in artisan fishing and fluvio-marine transit of the banana convoys to Bahía Colombia. Additionally, dredging of constant maintenance on the Nueva Colonia canal and the León River to maintain navigability in the channel according to the drafts required by the banana convoys, can generate emissions due to the use of fuels and the constant transit of these generates increase in noise levels.

On the other hand, the transit of light and heavy vehicles that pass through the district of Nueva Colonia, either for public use or for the main economic activity in the area, such as the transportation of banana production, are the main activities that emit pollution to the environment, by the fuel that is used (gasoline) and the frequency with which it is passed, it generates an increase in the level of noise, which decreases the quality of the air and increases the sound pressure level (see Figure No. 8.7 and Figure No. 8.8).

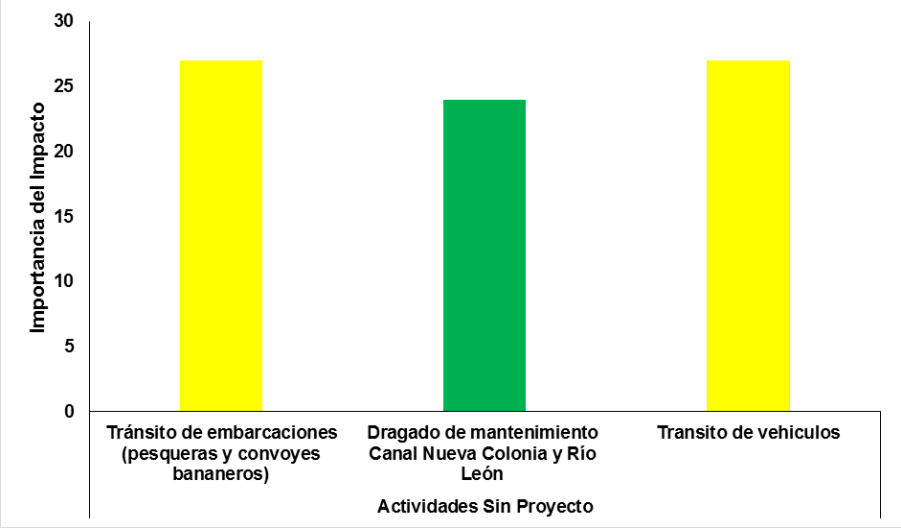


Figure No. 8.7 Environmental significance of the impact Without Project for the alteration of air quality caused by gases and particulate matter
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

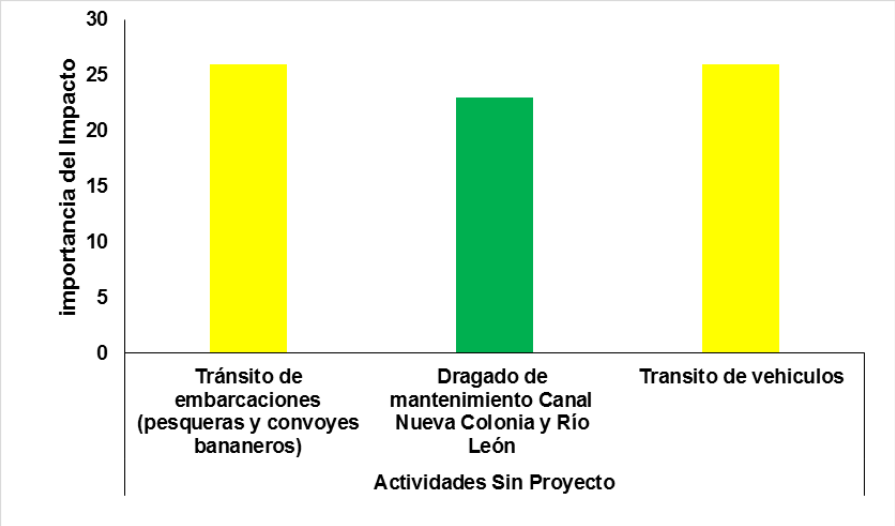


Figure No. 8.8 Environmental significance of the impact Without Project for the alteration of noise levels

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of the physicochemical properties of the soil

The alteration of the physicochemical properties of the soil presented a negative nature valuation with a moderate environmental importance as shown in Figure No. 8.9, related to the economic activity in the Gulf of Urabá, an area with great agricultural vocation, mainly banana plantations and plantain, which implies the use of agrochemicals and fertilizers in the soil, which in turn brings consequences of direct contamination to the soil. Additionally, the study area has an inefficient coverage of public services, which leads to the disposal of solid waste in areas that are not destined for this purpose, implying contamination in the soils by the waste slurry that generate said waste, the decomposition of the same and the permanence of waste that is not biodegradable.

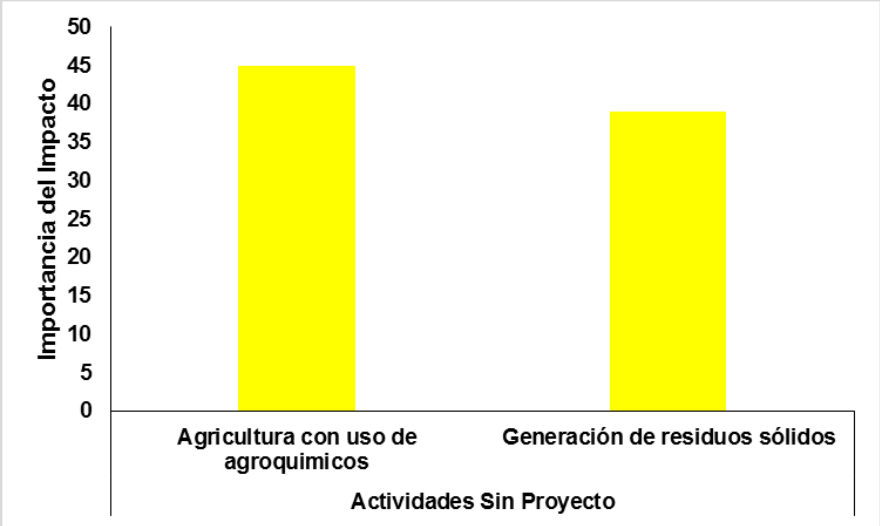


Figure No. 8.9 Environmental significance of the impact Without Project for the alteration of the physicochemical properties of the soil
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration in the morphology of continental floors and resuspension and redistribution of sediments (Continental)

The changes that appear in the morphology of the continental floors on the Nueva Colonia canal and the León river are generated by the constant activity of the maintenance dredging to maintain the navigability in the channel according to the drafts required by the banana convoys, which implies changes in the natural bathymetries of the channels. However, it was considered of a negative nature with irrelevant environmental importance, since the intervention has been presented since the 90's and the authorized draft with the dredging activity is maintained.

On the other hand, the maintenance dredging activity generates the resuspension and redistribution of sediments in the water column of the aforementioned channels, which implies a change in the physico-chemical characteristics due to the increase of suspended, dissolved and total solids in the section of the channel intervened and in turn alters the natural conditions downstream of the same, in addition the sediments change the visual characteristics of the body of water temporarily, changing the color of the water and disturbing the aquatic ecosystems, therefore, it was valued of nature negative with moderate environmental importance, as presented in Figure No. 8.10.

Figure No. 8.10 Environmental significance of the impact Without Project for the Resuspension and redistribution of sediments (Continental)
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Landscape alteration

Due to the presence of some activities that are carried out in the study area of the project, alterations of the landscape are presented in a negative way. This impact was assessed with moderate environmental importance as presented in Figure No. 8.11.

The changes to the landscape are mainly due to the clearing of vegetation that occurs on the left bank of the León River, to the disposal of solid waste in places that alter the visual quality of the landscape such as the waste deposited at the pier of Nueva Colonia both on land and in the water column, which are generated by the surrounding populations settled in the study area.

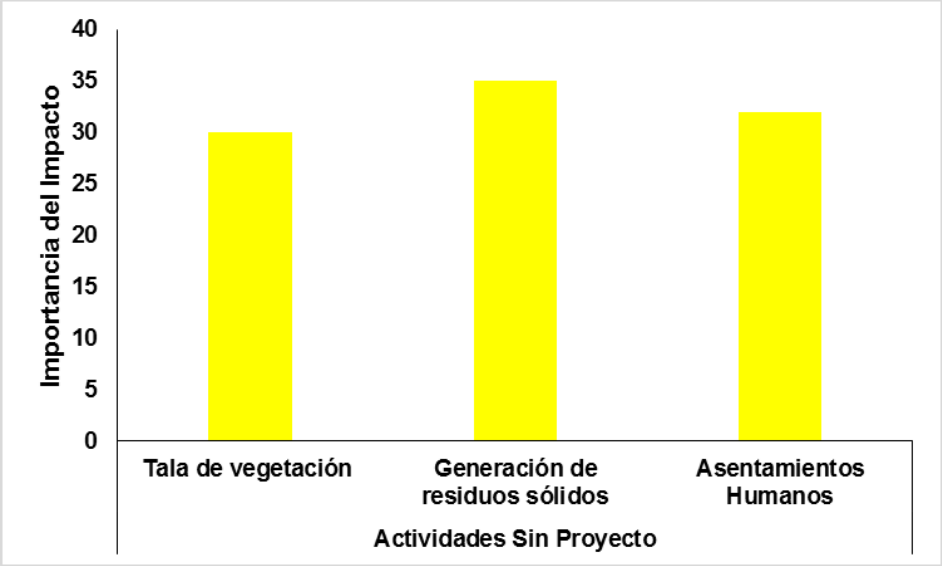


Figure No. 8.11 Environmental importance of the impact Without Project for the alteration of the landscape

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Changes in the physicochemical and microbiological characteristics of seawater

The change in the conditions of the quality of the marine water obtained an assessment of negative nature with environmental importance between moderate and irrelevant as shown in Figure No. 8.12 which can be generated by the activities carried out in the populations settled in the river banks or close to them, which for not having a sewer system with wastewater treatment plant and an adequate management of solid waste, generate dumping discharge directly to continental waters and deposit the waste in the column of water, which, due to currents and climatic conditions and natural hydrodynamics, reach the marine waters.

Additionally, the maintenance dredging activity generates alteration of the physical-chemical conditions of the continental water of the León River, being this tributary of Bahía Colombia which alters some areas near the mouth of the river in the bay.

Another activity that contaminates the marine waters is the one coming from the run-off from the areas contaminated by agrochemicals due to the high agricultural development of the banana and plantain production. However, the increase in this type of activities means that these are the main sources of pollution, since runoff from the continental area brings with it pesticides, fertilizers, among others, which

infiltrate or reach the riverbed due to influences from the highlands, precipitations and climate changes in the Gulf of Urabá.

On the other hand, according to REDCAM information, Bahía Colombia presented an inadequate marine water quality index in the dry season and between acceptable, inadequate and poor quality in the rainy season in 2013, these results being consistent with the sampling results made in July 2015 in Bahía Colombia.

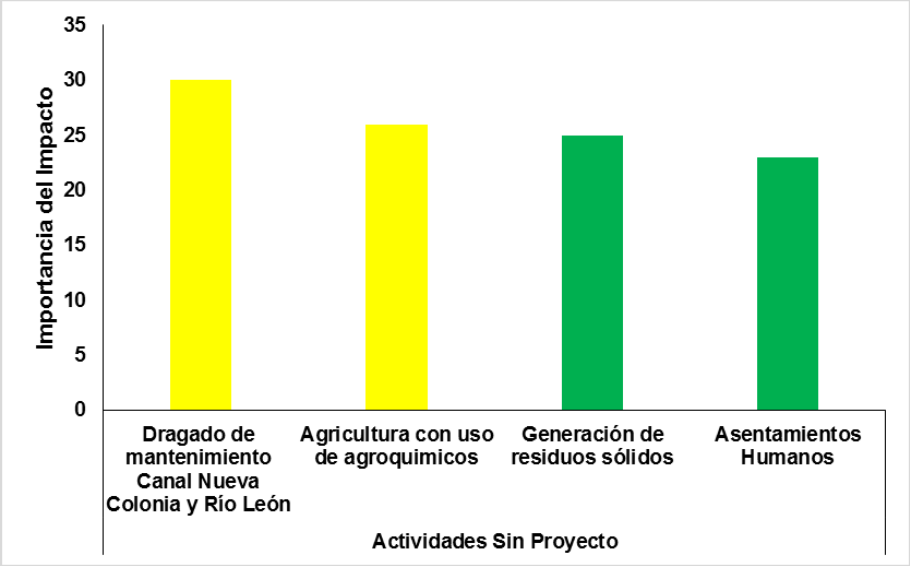


Figure No. 8.12 Environmental significance of the impact Without Project for changes in the physicochemical and microbiological characteristics of seawater
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- *Biotic Environment*

Based on the significance ratings of the impacts identified for the main activities that are carried out in the study area without a project, an analysis of the results for the biotic environment of the impacts with greater relevance is presented below.

- Alteration of terrestrial habitats and changes in vegetation cover

In the area of influence of the project, activities that may be generating moderate and severe impacts of a negative nature are identified (Figure No. 8.13, Figure No. 8.14); such activities are associated with the use of agrochemicals for crops, the use of flora without control and sustainable use, garbage and waste production, human

population growth that implies expansion of the border in housing infrastructure, which by their characteristics alter the terrestrial habitat through the transformation of natural ecosystems, quickly becoming fragmented habitats with high anthropic intervention. For both impacts the felling of vegetation was the most impressive activity with a severe importance, since this includes both the cutting of secondary, riparian and present mangrove forest.

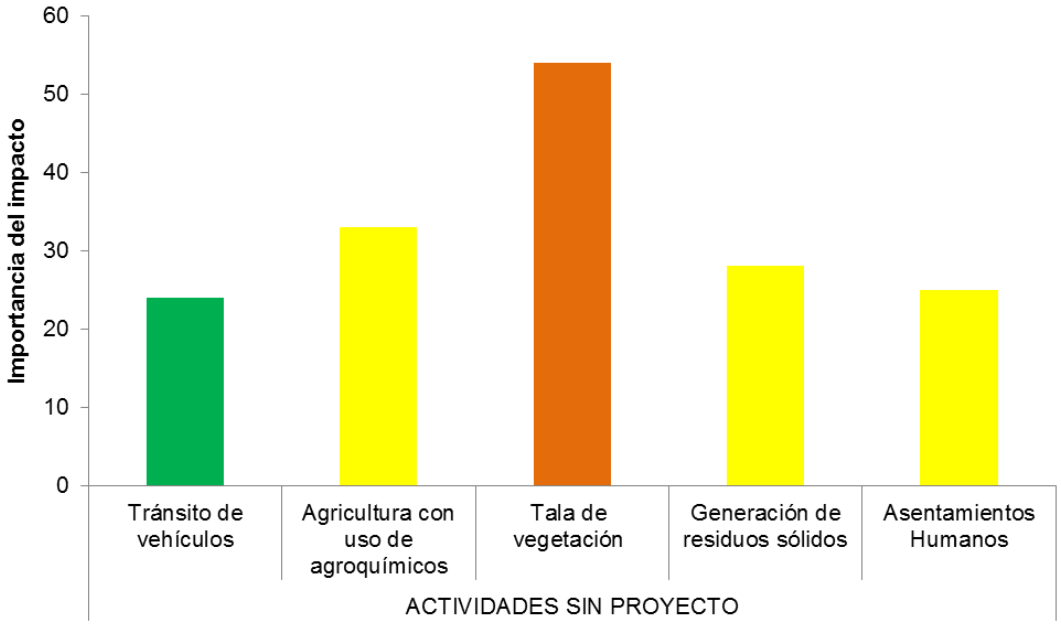


Figure No. 8.13 Environmental significance of the impact of terrestrial habitats alteration
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

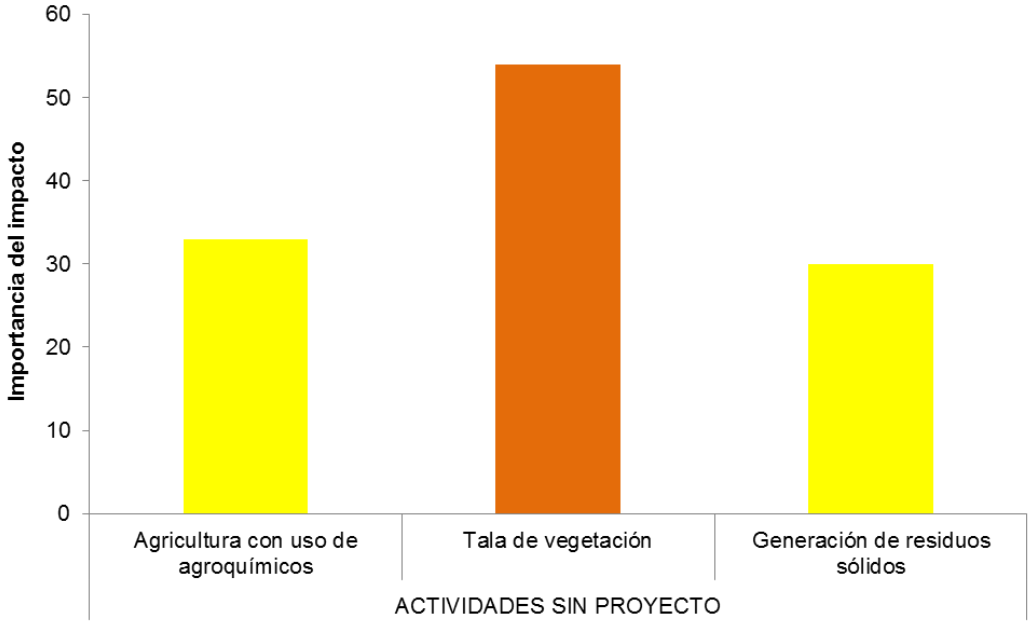


Figure No. 8.14 Environmental significance of the impact variation of the vegetation cover
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of continental aquatic habitats, modification in the structure (distribution, abundance and composition) of the macroinvertebrate, continental and periphytic fish communities

To ensure the transit of small boats, used for the transport of different agricultural products of the area, such as banana, pineapple and others, maintenance dredging is done on the river León and the Nueva Colonia canal. Additionally, solid waste is generated as a result of the anthropic activities of the industry and human settlements in the area of influence. It is considered that these activities negatively impact both the continental aquatic habitat and its associated communities (Figure No. 8.15). The environmental importance of the impact is moderate; being the maintenance dredging activity the most impressive and the activity in common for the alteration of continental aquatic habitats and the modification of the structure of their associated communities.

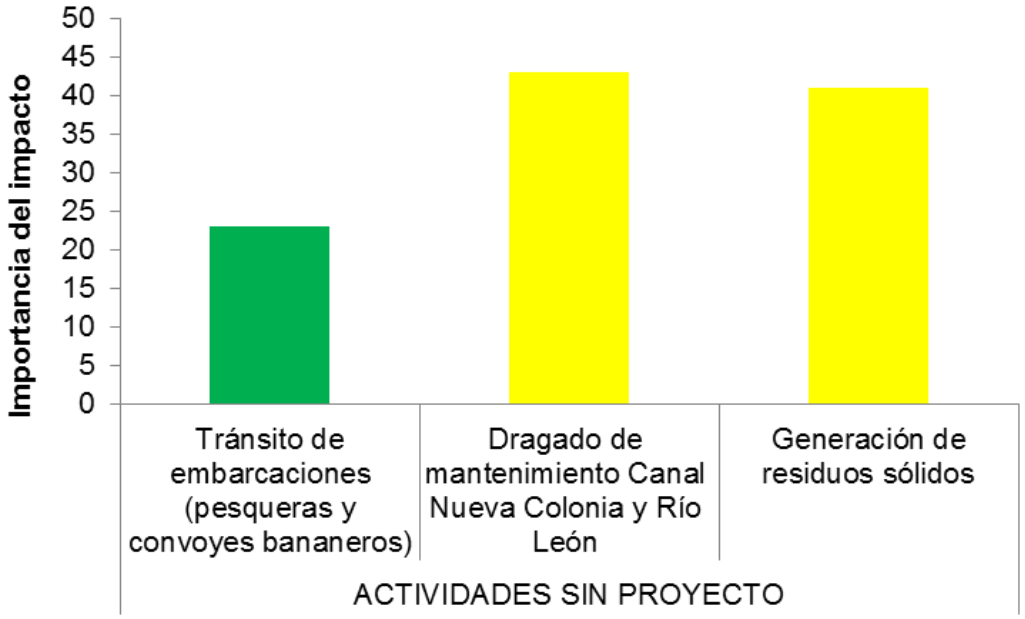


Figure No. 8.15 Environmental importance of the impact of continental aquatic habitats alteration

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of marine aquatic habitats and modification of the structure (distribution, abundance and composition) of marine planktonic communities

In the area of influence, an inadequate management of the waste resulting from the anthropic activities carried out by the community, of organic and inorganic type, which in many cases are disposed in the water sources, is identified, affecting the quality of the marine aquatic habitat and its Associated communities, since materials such as plastics, polystyrene, among other waste, are observed floating adrift. This impact is considered negative with moderate environmental importance (Figure No. 8.16).

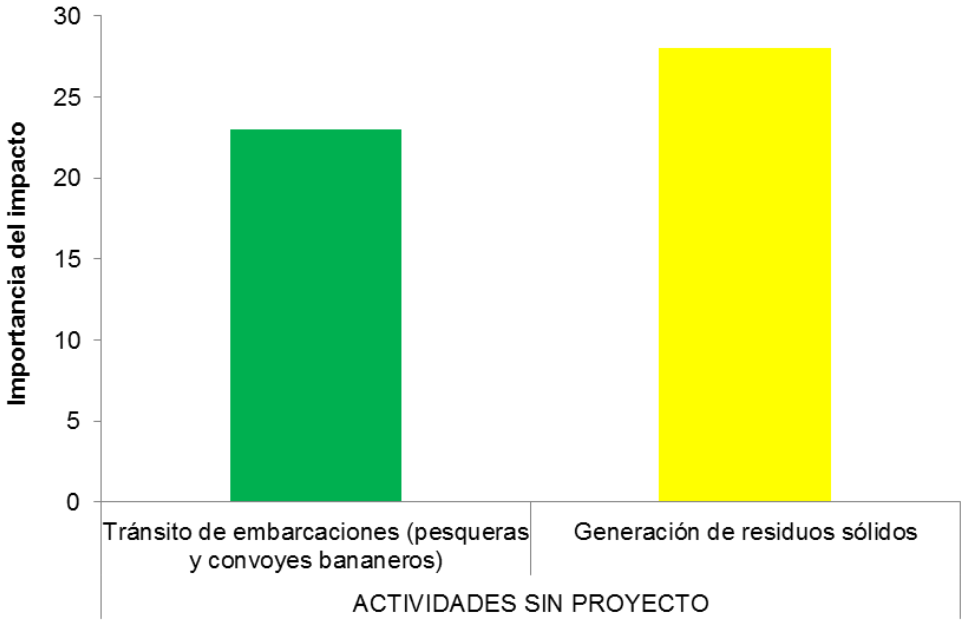


Figure No. 8.16 Environmental importance of the impact of marine aquatic habitats alteration

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Formation of new habitats

To guarantee the continuous transit of vessels, the Leon river and the Nueva Colonia canal have maintenance dredging to maintain the navigation depth. The provision of this material may be generating new substrates for the establishment of flora and fauna; as is the case of the mangroves settlement. In this regard, this impact is considered positive with a low environmental importance.

- Change in the dynamics of wildlife communities

In the area of influence of the project, activities that may be generating moderate impacts of a negative nature are identified (Figure No. 8.17); such activities are associated with the use of agrochemicals for crops, the use of uncontrolled flora and sustainable use, garbage and waste production, such activities affect the habitat of the fauna and therefore the natural ecological behavior of the species.

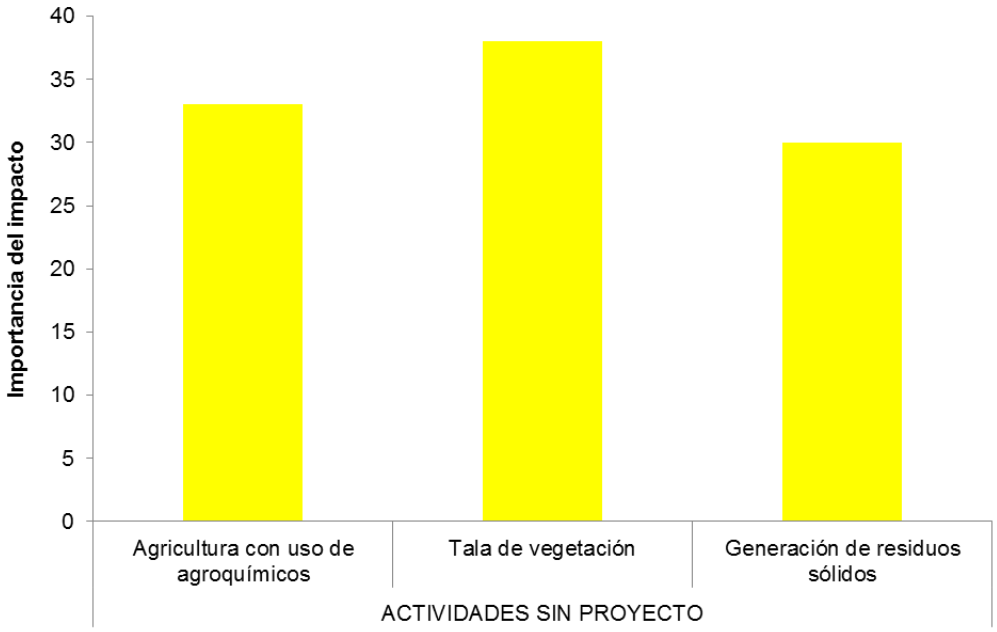


Figure No. 8.17 Environmental importance of the impact change in the dynamics of wildlife communities

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- *Socioeconomic environment*

Based on the importance ratings of the impacts identified for the main activities that are carried out in the study area without a project, an analysis of the results for the socioeconomic environment of the impacts with greater relevance, such as the moderate, severe and critical impacts is presented below.

- Alteration of cultural patterns

The impact of altering cultural patterns in the development of waste generation activity was assessed in the scenario without a project, as an activity of a moderate negative nature, due to the fact that it is currently evident that the population settled in the minor territorial units performs inadequate practices in the disposal of waste where its final disposal is in the open field, burned or buried. In the same way, the disposal of solid waste in bodies of water is identified, such as the Nueva Colonia canal.

The interaction of the population with the environment affected by the poor disposal of solid waste, can generate alterations to cultural patterns.

However, there is currently a provision of garbage collection service twice a week in the Nueva Colonia district and every 15 days in the El Canal settlement.

With respect to the waste management generated by agroindustrial activities that are developed in the region due to the use of agrochemicals and pesticides; these have a special treatment for the collection and final disposal of them (see Figure No. 8.18).

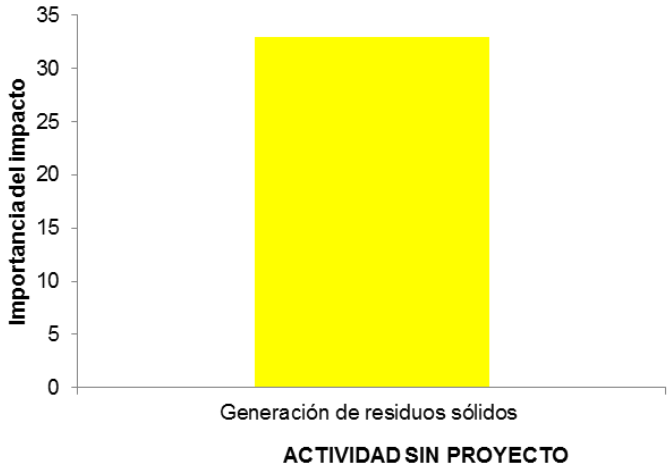


Figure No. 8.18 Alteration of cultural patterns
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Currency generation

The impact of the agroindustrial economic activity of banana and banana exports on the currency generation was valued as very important in a positive nature, since it is a source of income and a generator of wealth for the region, and through this industry generates most of the labor supply in the area directly and indirectly (see Figure No. 8.19).

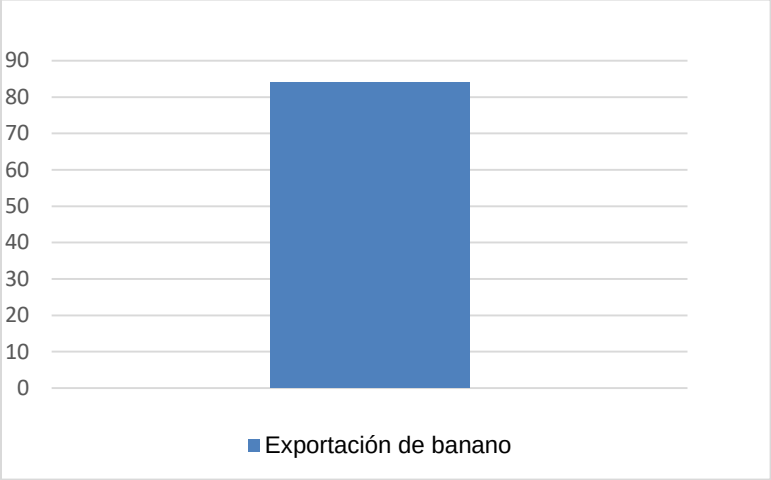


Figure No. 8.19 Currency generation
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Modification of the income level of the population

The impact of the agroindustrial economic activity of the export of bananas on the modification of the level of income of the population, was valued in a positive way, since it is a source of income and a generator of wealth for the region, and through this industry most of the labor supply in the area is generated (Figure No. 8.20).

The impact generated by the artisanal fishing activity was valued as positive, because it is not only an economic activity, but also a traditional and cultural activity of the coastal population. The development of the same, allows to guarantee the alimentary security of the populations of fishermen when it is not possible to accede to other crafts related with the agroindustrial activities developed.

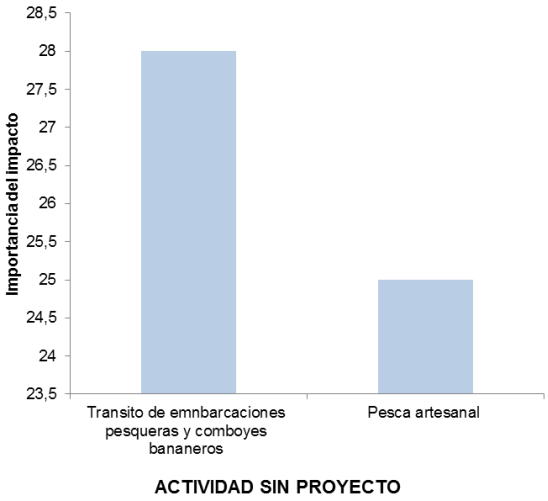


Figure No. 8.20 Modification of the income level of the population
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Change in labor supply

The present impact was valued as important of a positive nature, due to the diversification of economic activities because of the increase in the planting of forest plantations in the area. Currently, large areas of land dedicated to forest plantations are identified for later export and commercialization that have generated a different work dynamic (Figure No. 8.21).

Figure No. 8.21 Change in labor supply
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Alteration of the property value

The present impact was assessed as moderate of a negative nature for the development of agribusiness with the use of agrochemicals, due to the fact that currently in the region, due to the added value that organic crops are given in the export processes, the areas free of agrochemicals have been valorized and are devaluing the land in which the use of them is highly intensive.

The impact of alteration of property, generated by the establishment of forest plantations, was assessed as positive in nature, because the region has soil, climate and location conditions that have increased the value of the property for the development of these commercial plantations; especially the teak and gmelina plantations (Figure No. 8.22).

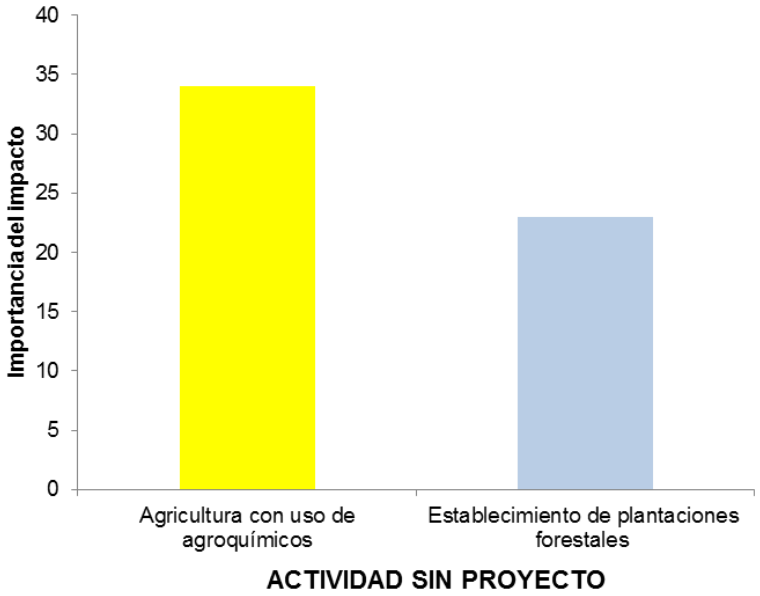


Figure No. 8.22 Alteration of the property value
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Modification of productive activities

The present impact was assessed as being moderate of a negative nature for agricultural activities with the use of agrochemicals. Regarding the dredging activity for the maintenance of the Nueva Colonia canal, the importance of the impact was assessed as irrelevant due to the fact that for many years this operation has been carried out, which makes it possible to maintain the navigability especially of the banana convoys.

The impact of activities related to the transit of fishing vessels, banana convoys and the establishment of forest plantations were valued as positive because these activities generate direct and indirect employment for the population of the region that arrives to the area in search of job opportunities. (Figure No. 8.23).

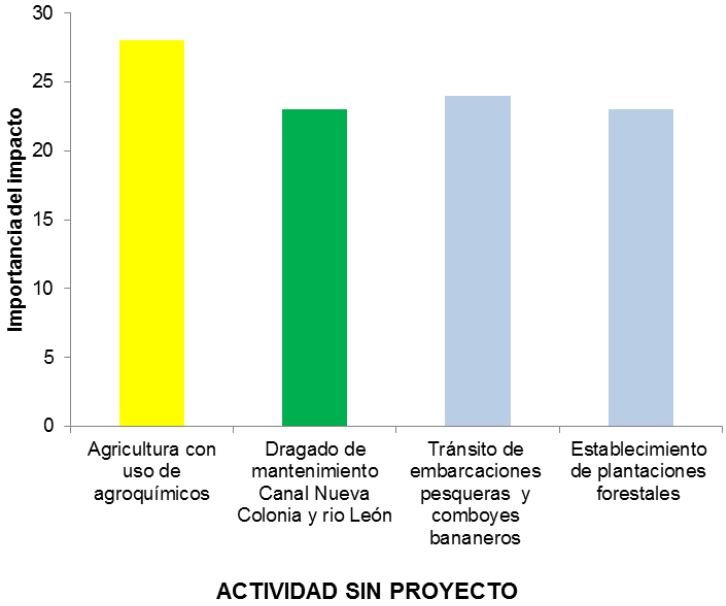


Figure No. 8.23 Modification of productive activities
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Alteration of existing infrastructure

This impact was assessed as moderate of a negative nature due to the transit of light and heavy vehicles that circulate in the district of Nueva Colonia, either for the transport of personnel who carry out their labor activities in the area or for the transportation of banana production from the farms bordering the shipping areas of Nueva Colonia where the logistic centers of export of products such as banana, plantain, pineapple (Banacol, Uniban) are located (see Figure No. 8.24).

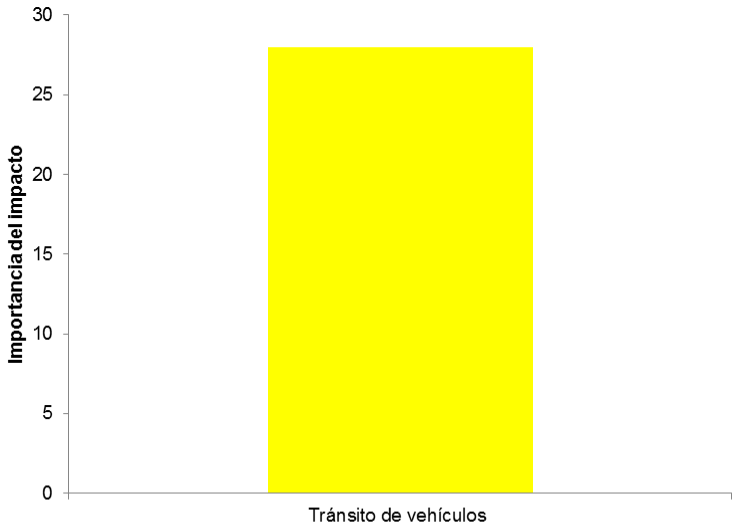


Figure No. 8.24 Alteration of existing infrastructure
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Variation in coverage and quality of services

This impact was assessed as moderate, of a negative nature, due to the permanent presence of foreign personnel who come to the region in search of job opportunities in companies and farms where agroindustrial activities such as banana, pineapple and plantain production are carried out to be exported and marketed. The presence of floating population in the area generates greater demand for public services and greater pressure on them, diminishing the quality and access to them (Figure No. 8.25).

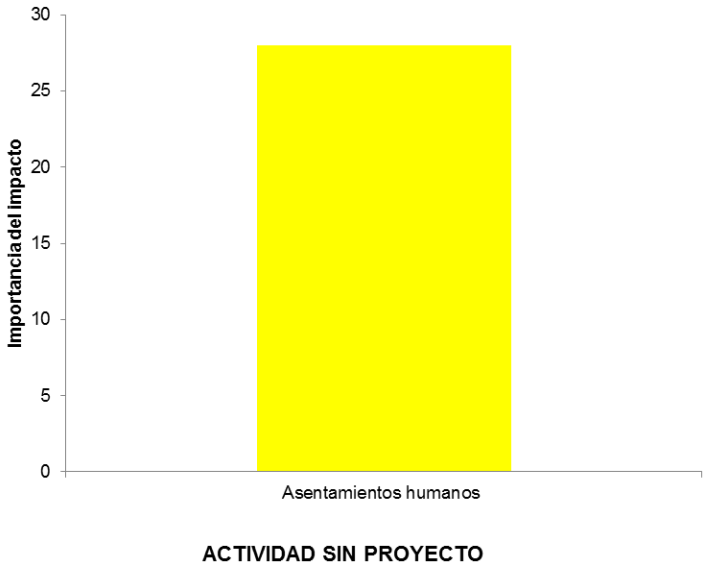
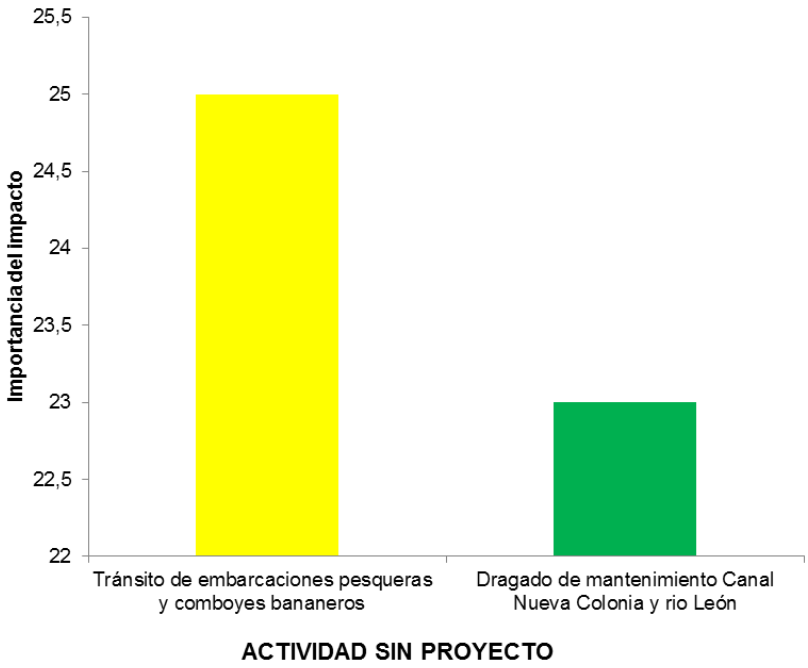


Figure No. 8.25 Variation in coverage and quality of services

Source: Aqua &Terra Consultores Asociados S.A.S., 2015

- Alteration in the transit of vessels

This impact was assessed as moderate, of a negative nature, due to the eventual interruption that may arise during the navigation of banana boats that carry out transport operations, load and unload. The maintenance dredging activities of the Nueva Colonia and Río León rivers were rated as irrelevant for the present impact, because these activities do not interrupt the navigability in the area (Figure No. 8.26).



Significance of impact,
Figure No. 8.26 Alteration in the transit of vessels
Source: Aqua &Terra Consultores Asociados S.A.S., 2015

8.3 IDENTIFICATION AND ASSESTMENT OF IMPACTS FOR THE SCENARIO WITH PROJECT

Below are the actions that can generate an impact, the definition of the impacts identified due to the activities that will be carried out during the construction and the operation of the project, and the qualitative assessment of the impacts for each environment with its respective analysis of the most relevant impacts independent of their positive or negative nature.

8.3.1 Identification and description of impacting actions - Scenario With Project

According to the processed information, both primary and secondary and the field work required for the characterization of the abiotic, biotic and socioeconomic environments of the project´s area of influence and environmental zoning, the group of specialists identified the following actions in accordance with the project activities,

such as the most relevant during the construction and operation of the port terminal, which were taken into account for the environmental assestment.

- *Previous activities*

- Hiring of labor

This activity implies a direct relationship between the project and the local and regional population, because the different contractors during the construction and operation activities must hire, both unskilled and qualified labor, mainly from the project´s area of influence.

- Hiring services

This activity involves the process of contracting goods and services needed in the construction phase, including transportation, materials, supplies, maintenance of equipment and machinery, among others.

- *Activities during construction*

- Viaduct, pier and jetty

Dismantle, clean, strip and land fills: This work consists of the clearing and cleaning of the natural terrain in the areas that will occupy the land works, which are covered with mulch, pastures, etc., including the removal of roots, debris and garbage. It also includes the final disposal inside or outside the project area, of all materials from the operations described above. Subsequently, the layer of organic soil is removed, located in the area where the piles will be located for the viaduct, the bridge and the fluvial pier located in the terrestrial part. The areas that require full material for the construction of an embankment, initially require the stabilization of the ground by preload, by gravel columns, by vibrocompaction or by Jet Grouting, which will be carried out when the vegetation cover and organic layer of the soil have been removed.

Transport, manufacture and driving of the piles: Metal piles, cylindrical and with diameters between 50 "and 70" and lengths between 65 and 75 m, will be transported, where the raw material can be obtained in two ways: by importing steel sheets and subsequently producing the piles in a workshop on site or, importing the piles, which will be transported by floating platforms called bongos or barges to be able to begin the process of pile driving, which must be anchored in the appropriate site according to the required location. The works that require piles is the quay phase I and phase II, viaduct, bridge and quay.

On the floating platform, the crane equipped with the appropriate hammer will be installed to carry out this activity, which will be driven to the depth defined in the geotechnical study. At the same time the pile, a metal structure, which has the angle of inclination with which the pile must be driven, must be placed at the site where the pile will be driven, since this will serve as a guide.

The above procedure is repeated until a certain number of piles is reached, so that a metal platform can be mounted where the crane will be installed to continue the process of driving. The metallic platform will be installed to speed up the driving process and provide greater stability to the crane.

Assemble and fuse of heads and beams: As the metal platform moves, the prefabricated ring or capital will be installed on the top of the pile. In the transition of the installation of the capitals, the installation of the prefabricated beams will begin. Which will rest on the capitals. When all the beams are already installed, the knots must be emptied to ensure the correct union between elements.

Armed and melted plates: After the melting of the knots begins the installation of the prefabricated slabs, after having all the panels installed a concrete casting is made to obtain a more homogeneous surface and facilitate the transport of containers.

Anchoring and construction of the bridge and jetty: The activity contemplates the placement of the piles, which will be done with the piloting equipment´s crane, later with the same crane the hammer will be placed on the head and the piling will proceed; the crane will hold the hammer during the whole driving so that it does not work freely: the pile will slide until reaching the penetration due to its own weight.

For the jetty the driving is suspended when the head of the pile reaches the level design or when the pile presents rejection of the pile, capitals will be installed later, the beams, the knots, the prefabricated slabs and the casting of upper slab.

After piles driving at its final elevation for the bridge, the reinforcement steel basket is lifted by the crane to its final position inside the pile and the concrete is melted at the head of the pile. The reinforcing steel that is installed in the head of the pile and that develops inside the concrete mooring head, allows a connection that joins the two materials forming a structural node.

The transport of the concrete will be done with a pump and pipe and the placement may be direct discharge, bucket-crane or pump-pipe, depending on the conditions of access to the element.

Installation of the conveyor belt and laying of the service connections of the pier: The activity includes the installation on the viaduct of the bidirectional band of high capacity (more than 2,000 t / hour) with its corresponding covers and inspection and maintenance footbridges.

- Onshore terminal

Dismantle, clean, stripp and filled the land: This work consists of the clearing and cleaning of the natural terrain in the areas that will be occupied because of the land works, which are covered with mulch, pastures, etc., including the removal of roots, debris and garbage. It also includes, the final disposition within or outside the project area, of all the materials coming from the operations described above. Afterwards, the layer of organic soil is removed and in the areas that require material fill it will be made when the vegetal cover and organic layer of soil have been removed.

Concrete manufacturing for civil works: For the construction of the project, a plant will be installed for the manufacture of the concrete required in the infrastructure of the project, which will have a closed system of circulation through sedimentation ponds.

The concrete and prefabricated plant in situ, will have an approximate area of 7 ha. This plant will be located on a stabilized land. The soil that is going to stabilize previously for storage of materials.

Construction equipment maintenance: The projection of work machinery in the area will be hired as outsourcing, where this contractor will be responsible for the operation and maintenance of equipment. The area of routine maintenance, would be relocating according to the evolution of the work and will only be for cases of minor maintenance. For heavy maintenance conditions, outsourcing will assume full responsibility for executing this activity in a workshop suitable for this function outside the terminal area on land.

Material transportation: It consists of the loading and transport of the material required for the project works from the authorized quarries that comply with the current legal environmental regulations and mining title to the project´s area of intervention and vice versa.

Navigation of minor support vessels: This activity refers to the fluvio-marine transport of the construction materials stored in the terminal on land to the marine area, which will be delivered by means of bongos or barges to be able to begin the construction process.

Construction and operation of temporary facilities: The conception of the project proposes the installation of portable units such as the use of offices and necessary facilities during the construction of the port. The feeding and lodging will be developed to the outskirts of the terminal on land. For the construction, storage areas will be conditioned as warehouses for solid and liquid materials.

It will also have a collection center for construction materials, prefabricated buildings and infrastructure assembly. This area will consist of approximately 4 ha. The main collection materials are: gravel, sand, aggregates, geotextiles, steel (reinforcing steel, structural elements and steel sheet), excavated material (if reused), prefabricated concrete and prefabricated piles.

Construction of infrastructure and facilities associated with the operation of the terminal: For the operation of the port terminal, the associated infrastructure will be built, such as the entrance portal, vehicle yards, container washing warehouse, repair and master warehouse, consolidation and deconsolidation warehouse, perishable warehouse, bulk carriers silos, facilities for handling liquid bulk and buildings for surveillance and control, administration building, dining room building for storage areas, lodging area for anti-narcotics police, inspection warehouse for perishable exports, import inspection warehouse, maintenance workshop, spare parts warehouse, fire brigade building, nursing, fuel station, and fuel storage and office.

- Deep dredging

Referencing the intervention area: Before starting the deepening dredging activities, it is necessary to perform a precision bathymetric survey using an echo sounder, recording position and depth data along the area to be dredged, activity that takes place in a minor support vessel. Once the bathymetric measurements are obtained, the data will be processed to obtain the morphometric characteristics of the soil to be dredged, and in this way the dredging activity can be started.

The TSHD suction type dredge (Trailing Suction Hopper Dredge) to be used, has a satellite positioning system in real time that allows it to locate itself within the areas to be dredged.

Extraction of material from the seabed: It consists of extracting approximately 2,800,000 m3 of material from the seabed of the maneuvering area and access channel in Bahía Colombia at a maximum depth of 16.7 m, which corresponds to clays and loose silts (mud). This activity will be carried out with a TSHD suction type dredge, which once located in the area to be dredged, the dredging arm descends

until the head touches the bottom, proceeding to initiate the suction of the material from the seabed, and then be driven by pumping and pipelines to the hopper with a capacity of approximately 11,000 m3, which will transport the material to the dump site.

Transfer of dredged material: It consists in carrying out the transportation from the point of extraction of the dredged material in the maneuver area and access channel in Bahía Colombia to the dump area requested in the current Environmental License Modification located at approximately 2.2 nautical miles (4 km).

This activity will be in charge of a TSHD suction type dredge with an approximate capacity of 11,000 m3.

Disposal in dump of dredged material: It consists of the disposal of dredging material in the dump area; When the TSHD suction type dredge arrives at the site, it proceeds to open the gates to evacuate the dredged material and deposit it in the bottom, which has depths close to 25 m, where navigation and marine dynamics will not be affected, since the wave conditions at these depths are not influenced by the seafloor.

The unloading activity of the dredged material will be supervised by a dredging inspector, who will verify with a positioning system that the suction dredge in progress performs the discharge or dumping within the dump area.

It is important to highlight that the dump for the disposal of the dredged material must be previously authorized by the General Maritime Directorate - DIMAR to dispose in this area the material generated during the dredging activities. In addition, said dump presents depth shafts between 25 and 26 meters to avoid damage to navigation and coastal dynamics.

Navigation of minor support vessels: During the deepening dredging activity, there will be the support of smaller vessels for the supply of inputs, the transport of personnel, support during an emergency and those in charge of conducting the surveys and bathymetries.

- Road

Land clearing, cleaning and stripping: This activity consists on the clearing and cleaning of the natural terrain in the areas that will occupy the access road to the port terminal, which are covered with mulch, grasses, etc., including the removal of roots, debris and garbage. It also includes, the final disposal inside or outside the

project area, of all the materials coming from the operations described above. Afterwards, the layer of organic soil is removed and in the areas that require material filling it will be made when the vegetal cover and organic layer of soil have been removed.

Fillings or embankments: Before starting with the fillings and embankments, the subgrade will be compacted, when the compaction operation is carried out, after leveling with the motor grader up to the required height of the subgrade layer, by means of conventional techniques in the movement of earth, a compaction is carried out with a compacting roller kickstand, and / or vibratory roller depending on the type of material, subsequently, the placement and compaction of the affirmed materials on the finished subgrade is made, according to the specifications , the alignments, slopes and dimensions indicated in the project´s plans and the instructions of the auditor.

Transport of materials: It consists of the loading and transport of the material required for the construction of the access road from the authorized quarries to the area of intervention of the project and vice versa, which must comply with the current legal environmental regulations and mining title. This material is placed on the surface of the subgrade avoiding its segregation, or damage or contamination on the existing surface.

- *Activities during the operation*

- Port, maritime and river operations

Navigation, anchoring and approach of boats and tugboats: The ships will sail to the marine pier, in case of being in arrival turn they will be located in the anchorage area authorized by the DIMAR in Bahía Colombia, then they will arrive at the phase 1 and phase 2 pier, which will be located depending on the type of cargo.

Phase 1

Pier 1A. - Container Pier.
Pier 1B. - Solid Bulk Pier and General Cargo.
Pier 1C. - Roll-On / Roll-Off Pier for vehicles and General Cargo.
Pier 1D. - Solid Bulk Pier.

Phase 2

Pier 2A. - Container Pier.
Pier 2B. - Solid Bulk Pier.

Loading and unloading of goods (solid): The unloading configuration of ships with solid bulk in docks 1B, 2B and 1D, will be made with the ship's own cranes and it workes with an average of three (3) of the ship's own cranes (3 services). Each service will be with a clam (spoon) with a gross capacity of approximately 25 t and a hopper with a capacity of approximately 20 t. The goods will be delivered to the importers at the side of the ship while the storage facilities are made in the ground terminal. The main types of solid bulks that will be operated are animal feed products, corn, wheat and fertilizers.

In order to unload solid bulks, it has been planned to have a Super Post Panamax mobile gantry crane that will be equipped with a clam (spoon) and a double hopper to load two (2) vehicles simultaneously.

Once the specialized bulk cargo installations are made on land, the merchandise will be delivered to the side of the ship and in the bulk cargo installations on land, the transfer between the side of the ship and the ground facilities will be made with specialized vehicles to transport solid bulk, the specialized facilities on land will have the technology to prevent air pollution with particles, in addition they will be made up of a battery of silos and specialized warehouses interconnected by conveyor belts systems that will have delivery systems of loads for vehicles.

Loading and unloading of goods (liquids): The multipurpose terminal of Puerto Antioquia will operate tankers with liquid cargo other than oil and its derivatives, such as vegetable oils, mineral oils, baits, among others. The download will be made with the specialized systems of the tankers, the cargo will be made with an external specialized mobile or fixed pumping system, typical of the liquid cargo ship.

The product that will arrive at the port in tank cars and will be unloaded to be stored in the tanks of the facility on land, on the other hand, the liquid bulk will arrive at the port in ships, where they will be driven or transported to the respective tanks and finally dispatched to tanker trucks.

The unloading of the tanker trucks will be carried out in an area called unloading zone, which is carried out below the tanker, through a system of receipt pumps, the product will be conducted to the storage tanks. From there, the liquid cargo will be pumped and to the maritime pier.

Loading and unloading of goods (general cargo): The loading / unloading operation of container ships will be done with modern New Post Panamax Gantry Cranes and the Liebherr Model LHM 550 Mobile Crane, the transfer between the side of the ship and the yard and vice versa, will be done with dock tractors and the receipt and

delivery of containers in the yards it will be done with RTG.

The operation of general cargo ships is planned with the ship's own cranes and an average of three (3) cranes owned by the ship (3 services) are used for the general cargo operation at the side of the ship and at the terminal on land a (1) forklift of 25 t, one (1) , a forklifts of 16 t, two (2) forklifts of 7.5 t, two (2) forklifts of 5 t will be used, you can also use forklifts of 3, 5 t capacity with forks or gripping devices. The main types of general cargo that we plan to operate are: project cargo, steel rolls, paper reels, bales, packaged wood, big bags, etc.

For the operation of heavy and extra-dimensioned cargo, the use of one (1) Super Post Panamax port mobile crane is planned.

The discharge operation is planned with a group of certified drivers who will move the vehicles from on board the ship to the storage site in the ground terminal. The unloading of all rolling vehicles (cars, tractors, backhoes, etc.) is planned. These ships are designed to transport a wide variety of rolling vehicles types for import, export and transshipment and even have the possibility of transporting chassis, platforms, trailers with heavy loads.

Port´s Transportation and storage: For the transport of the terminal on land to the terminal in water, tractors will be used to carry out the transfer of the cargo, for solid bulks: specialized vehicles for bulk transport will be used, high speed hopper for unloading and coupling

The storage of general cargo will be carried out in the yards of the maritime terminal and in the yards of the terminal on land, later the transfer will be made to the ships by means of cranes.

The storage of the solid bulks will be carried out in storage silos in concrete or conical bottom steel with approximately 8 m diameter and 1,100 m3 of capacity.

The storage of the liquid cargo that will reach the port, will be stored in the tanks of the facility on land. In addition, in the storage tanks areas, contained in dams, two (2) fire system monitors (SCI) by dam will be available.

8.4 Loading and unloading of trucks: The terminal will have an obstruction parking lot where the tractors with export cargo can wait for the exporters to carry out the procedures with the competent authorities to be able to

enter into the terminal the export goods, this parking will be the traffic regulator entering and leaving the marine terminal.

For solid bulk cargoes, the storage silos allow the loading and unloading of silos under a closed system of emissions, either with load truck access design to the silo or by automated control of closed transport.

The liquid cargo will arrive at the port in tank cars and will be unloaded to be stored in the tanks of the facility on land, on the other hand, the liquid bulk will arrive at the port in ships, where they will be driven or transported to the respective tanks and finally dispatched to tanker trucks. The unloading of the tanker trucks will be carried out in an area called unload zone, which is carried out below the tanker, through a system of receipt pumps, the product will be conducted to the storage tanks. From there, the bulk will be pumped and to the maritime pier.

Operación y mantenimiento de infraestructura e instalaciones asociadas a la operación de la terminal: For the operation, water consumption is required to supply the associated personnel in the operation phase of the terminal and for the washing activities, maintenance of the infrastructure and associated facilities. The drinking water service will be provided through a water treatment plant. Due to the operation of the facilities, wastewater discharges will be generated during the operation of the infrastructure, where they will be treated before being discharged through a wastewater treatment plant. In general, maintenance of civil works will be carried out, with routine inspection and repair activities in civil works if necessary.

Maintenance of machinery and equipment: For the operation of the port terminal there will be a maintenance workshop. However, the maintenance of machinery and heavy equipment will be carried out in specialized workshops just outside the terminal, which will be hired as outsourcing, where this contractor will be responsible for the operation and maintenance of equipment.

At the south eastern end of the pier, an auxiliary platform with nominal dimensions of 33 m in width and 117 m in length will be created for the maintenance of the platform crane equipment, return of vehicles, personnel services and minor operations not directly related to the ships and in turn serves as a junction with the single vehicular access footbridge from the land port.

- Maintenance dredging or dredging activities

Referencing of the intervention area: Before beginning maintenance dredging or dredging activities, it is necessary to perform a precision bathymetric survey using echo sounder, recording position and depth data throughout the area to be dredged,

activity that takes place in a smaller support vessel. Once the bathymetric measurements are obtained, the data will be processed to obtain the morphometric characteristics of the soil to be dredged, and in this way the dredging activity can be started.

Extraction of seabed material: It consists of extracting the seabed material of the maneuvering area and access channel in Bahía Colombia to the authorized depth, which corresponds to clays and loose silts (mud). This activity will be carried out with a TSHD type suction dredge (Trailing Suction Hopper Dredge), which once located in the area to be dredged, descends the dredging arm until the head touches the bottom, proceeding to initiate the suction of the material from the seabed, to be then driven by pumping and pipelines to the hopper with a capacity of approximately 11,000 m3, which will transport the material to the dump site.

Transfer of dredged material: It consists in carrying out the transport from the point of extraction of the dredged material in the maneuver area and access channel in Bahía Colombia to the landfill area requested in the current Environmental License Modification located at approvimately 2.2 nautical miles (4 km).

This activity will be in charge of the dredged up TSHD suction type with a capacity of approximately 11,000 m3.

Disposal in dump of dredged material: It consists of the disposal of dredging material in the dump area; When the TSHD-type suction dredge arrives at the site, it proceeds to open the floodgates to evacuate the dredged material and deposit it in the bottom, which has depths close to 28 m, where navigation and marine dynamics will not be affected, since the wave conditions at these depths are not influenced by the sea floor.

The unloading activity of the dredged material will be supervised by a dredging inspector, who will verify with a positioning system that the suction dredge in progress performs the discharge or dumping within the dump area.

It is important to highlight that the dump for the disposal of the dredged material must be previously authorized by the General Maritime Directorate - DIMAR to dispose in this area the material generated during the dredging activities. In addition, said dump presents depth shafts between 25 and 26 meters to avoid damage to navigation and coastal dynamics.

Navigation of minor support vessels: During the deepening dredging activity, there will be the support of smaller vessels for the supply of inputs, the transport of

personnel, support during an emergency and those in charge of conducting the surveys and bathymetries.

- Road Improvement

Activities for the placement of the pavement (affirmed, granular sub-bases, granular and stabilized bases): The activity consists in the placement of granular materials on the access road that starts from the head of the Nueva Colonia district to the port terminal access, which is executed by means of heavy machinery and motor graders, the pavement is then placed and the necessary hydraulic works for the proper operation will be made.

- *Activities during closing*

- Construction phase activities

Demolition and Dismantling of temporary infrastructure: It consists of the total or partial demolition of existing structures and the removal, loading, transport, unloading and final disposal of the materials coming from the demolition. Initially, for the existing works they will be used during the construction process and will be demolished in the shuffle of the construction of the ground terminal phase 1.

Urbanism and landscaping works: When the construction works are completed in the port terminal, the final planning works are carried out, such as the planting of plant species in green areas, signage on internal and external roads and land and marine facilities, infrastructure construction for the improvement of visual quality, among other activities.

8.4.1 Identification of components and environments susceptible to receiving changes or impacts - scenario With Project

The means and environmental components susceptible to receiving changes or impacts for each environment (abiotic, biotic and socioeconomic) in the area of influence were identified, taking into account the activities to be developed in the scenario With Project. Table No. 8.4 shows the impacts identified on the environment which could cause a fleeting, temporary or permanent change in the study area under the scenario With Project, where they can be representative for each component and indicate involvement in the quality or quantity of the item evaluated. The assestment was carried out in order to estimate the impact of the construction, operation and closure activities on the current state of the natural systems.

Table No. 8.4 Components and its change factors or impact -With project

Environment	COMPONENTS / ELEMENTS	IMPACTS
ABIOTIC	CONTINENTAL WATERS	Changes in the physicochemical and microbiological characteristics of continental water
		Change in resource availability
	ATMOSPHERIC	Air quality alteration caused by gases and particulate matter
		Noise levels alteration
	SOILS, GEOLOGY AND GEOMORPHOLOGY	Changes in morphodynamic, continental and coastal processes
		Alteration of the physicochemical properties of the soil
		Alteration of organic or agrological soil
		Alteration in the morphology of the seabed
		Resuspension and redistribution of sediments (Continental and marine)
		Alteration in continental morphology
	LANDSCAPE	Alteration of the landscape
	OCEANOGRAPHY	Changes in the physicochemical characteristics of marine sediments
		Changes in the physicochemical and microbiological characteristics of seawater
		Changes in the oceanographic dynamics
BIOTIC	ECOSYSTEMS	Alteration of continental aquatic habitats
		Alteration of marine aquatic habitats
		Alteration of terrestrial habitats
		Formation of new habitats
	FAUNA AND FLORA	Vegetation cover variation
		Change in the dynamics of wildlife communities
		Modification in the structure (distribution, abundance and composition) of marine planktonic communities
		Modification in the structure (distribution, abundance and composition) of marine benthic communities
		Modification in the structure (distribution, abundance and composition) of the marine fish communities
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities
		Modification in the structure (distribution, abundance and composition) of the continental fish communities
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.
Socioeconomic and cultural	CULTURAL	Alteration of cultural patterns
		Intervention of the archaeological, historical or architectural heritage
	ECONOMIC	Generation of currencies
		Modification of the income level of the population
		Variation of the budget of the region

		Change in labor supply
		Alteration of the property value
		Modification of productive activities
	DEMOGRAPHIC	Variation in the number of inhabitants
	SPATIAL	Alteration of existing infrastructure
		Variation in the coverage and quality of public services
		Alteration in the transit of vessels
		Variation in the volume of vehicular traffic
	POLITICAL - ORGANIZATIONAL	Institutional and community strengthening
		Generating expectations in the community

Source: Prepared by Aqua & Terra Consultores Asociados S.A.S., 2015

8.4.2 Definition of environmental impacts - With Project scenario

The description and / or definition of the environmental impacts identified for each of the abiotic, biotic and socioeconomic environment with their respective environmental components applicable to the activities with project in the area of influence is described below.

- *Abiotic environment*

For the present assesment, the abiotic environment is comprised of the following components: continental waters, atmospheric, soils, geology, geomorphology, landscape and oceanography. For each component, alterations in the quality represented in impacts were identified, which are described below.

- Continental Waters component

Changes in the physicochemical and microbiological characteristics of the continental water: It is an alteration or modification of the physical, chemical or bacteriological characteristics of the continental water due to the inadequate management of the activities during the construction and operation of the port terminal. Some of the characteristics that can be modified are turbidity, solids, color, pH, hardness, oxygen, presence of heavy metals, salinity, fecal coliforms, total coliforms or other pathogenic elements.

Change in resource availability: It is a variation of the amount of the available resource to be used for other uses because of the consumption that is intended to

be carried out in the León River during the construction and operation of the port terminal.

- Atmospheric Component

Air quality alteration by gases and particulate matter: Are increases or decreases in the concentration of traditional gaseous pollutant compounds such as carbon dioxide (SOx), carbon monoxide (CO), nitrogen oxides (NOx) or others. These can be issued by the increase in the transit of activities during the construction and operation of the port terminal. Additionally, the emission of dispersed particles of different sizes in the air, generated by the activities of transport of material in unpaved roads, stripping of the area of intervention and by the operation of the solid bulks, which due to their weight can remain in the air, according to its weight.

Noise levels alteration: Are variations in sound pressure levels generated by external elements such as vehicles, equipment, heavy machinery, ships, tugboats, among others, present in a study area due to the construction and operation activities of the port terminal.

- Soils, geology and geomorphology component

Changes in morphodynamic, continental and coastal processes: It consists of the removal and placement of the surface material either natural or anthropic, which generate changes in the topography that in turn can generate changes in coastal and continental systems such as accretion and erosion. Another factor that influences the morphodynamic changes, is the new infrastructure, which can generate changes in the natural dynamics of the coast in a long-term time scale.

Alteration of the physicochemical properties of the soil: corresponds to a physicochemical alteration of the organic layer of the soil and its main horizons, which may originate naturally or through anthropogenic activities, in which agricultural activities are associated with the use of agrochemicals and inadequate management of solid waste.

Alteration of organic or agrological soil: This impact corresponds to an alteration generated from the modifications of the organic layer of the soil and its main horizons, which can originate naturally or through anthropic activities.

Alteration in the morphology of the seabed: It consists in the change of the natural bathymetry of the seabed, by the removal of the substrate from the seabed or by the dumping of material in the dump area.

Resuspension and redistribution of sediments (Continental and marine): Due to deepening dredging activity in the maneuver area and access channel in Bahía Colombia, the bottom sediments in Bahía Colombia will be resuspended and redistributed, altering the physicochemical characteristics of the seawater column and weather conditions such as the swell and the wind, which can alter the conditions of the continental waters.

Alteration in the continental morphology: It consists in a physical removal of the substrate from the continental bottom, generated by anthropic activities such as dredging.

- Landscape component

Landscape alteration: It can be defined as the changes that are generated by the presence of elements alien to the original, natural and / or artificial landscape, which cause a change in the visual perception of the observer, by the dimensions of the project´s works which can be identified at great distances, becoming a dominant factor of the landscape.

- Oceanography component

Changes in the physicochemical characteristics of marine sediments: It is an alteration to the physical and chemical characteristics of marine sediments, generated by natural conditions and / or anthropogenic activities, which modifies the natural state of the seabed.

Changes in the physicochemical and microbiological characteristics of seawater: It is an alteration or modification of the physical, chemical or bacteriological characteristics of seawater. Some of the characteristics that can be physically modified are: turbidity, solids, color, among others; Chemically such as: pH, hardness, oxygen, presence of heavy metals, salinity, among others; and the microbiological characteristics such as: the concentration of fecal coliforms, total coliforms or other pathogenic elements.

- *Changes in the oceanographic dynamics: It is the change that can be generated by the presence of new infrastructure in the marine area, which can alter the normal conditions of the bay. Biotic environment*

For the present evaluation the biotic environment is comprised of the components of: ecosystems as well as fauna and flora; for each component, alterations in the quality represented in impacts were identified, which are described below.

- Ecosystems component

Alteration of continental aquatic habitats: This impact refers to modifications or alterations that may occur in the lotic system of the León River, related to anthropogenic activities or natural causes that affect the hydro biological community of the river, such as the modification of refuge areas for fish and macroinvertebrates and changes in the availability of the substrate for the development of periphyton. It also refers to changes in water quality, such as temperature increase or decrease, turbidity, pH, electrical conductivity, among other factors that influence the natural dynamics of fish, macroinvertebrates and periphyton.

Alteration of offshore aquatic habitats: This impact refers to modifications or alterations that may occur in the offshore environment, related to anthropogenic activities or natural causes that may affect the planktonic, benthic and fish communities, such as the modification of refuge areas for fish and benthos. It also refers to changes in water quality, such as temperature increase or decrease, turbidity, pH, electrical conductivity, among other factors that influence the natural dynamics of fish, benthos and plankton.

Alteration of onshore habitats: This impact refers to modifications or alterations that may occur in the onshore environment, related to anthropic activities or natural causes that may affect the floristic and faunal communities, such as the modification of refuge areas for herpes, birds and mammals, changes in the availability of the substrate for the development of the flora. It also refers to changes in coverage, availability of food and perches, among other factors that influence the natural dynamics of the flora, herpes, birds and mammals.

Formation of new habitats: This impact refers to structures (piles) of a temporary or permanent nature that can be considered as a temporary habitat, providing refuge and substrate for the establishment of organisms such as barnacles and limpets. This under the premise that any non-polluting material sunk or floating in the sea is liable to attract and support groups of organisms.

- *Component fauna and flora*

Variation in vegetation cover: Corresponds to the loss or removal of forest cover and associated floristic species, product of human activities directly or indirectly, or natural phenomena.

Change in the dynamics of faunal communities: Corresponds to the decrease or increase in the number of individuals or species, product of the displacement

generated by the development of activities in the different stages of the project or due to the changes that occur in the natural habitats present in the project area. It also refers to changes in the population structure of the flora and fauna communities present in the area of influence of the project.

Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities: Corresponds to the decrease or increase in the number of individuals or species, product of anthropic activities either by communities or external factors (civil works) on the bed of the river and its banks.

Modification in the structure (distribution, abundance and composition) of the continental fish communities: Corresponds to the decrease or increase in the number of individuals or species, product of anthropic activities either by communities or external factors (civil works) on the column, bed of the river and its banks.

Modification in the structure (distribution, abundance and composition) of the periphytic communities: Corresponds to the decrease or increase in the number of individuals or species, product of anthropic activities either by the communities or external factors (civil works) on the river banks and availability of substrates for the settlement of this community.

Modification in the structure (distribution, abundance and composition) of the offshore planktonic communities: This impact refers to changes in water quality in the column, causing temporary alterations in the planktonic community, either by increasing or decreasing nutrients, salinity, penetration of light and temperature.

Modification in the structure (distribution, abundance and composition) of offshore benthic communities: Corresponds that with the alteration of water quality (mainly changes related to salinity), resuspension and redistribution of sediments, benthic communities are affected in reproductive processes, growth, feeding and habitat availability.

Modification in the structure (distribution, abundance and composition) of the offshore fish communities: Corresponds to the transfer or temporary aggregation of the fish community present in the area of influence, due to anthropogenic activities, such as the possible increase in sound pressure in the aquatic environment and the removal of the bottom, affecting the structure of the community in the fish population as well as habitat availability.

- *Socioeconomic environment*

For the present evaluation, the socioeconomic environment is composed of the following components: economic, demographic, spatial and political - organizational. For each component, alterations in the quality represented in impacts were identified, which are described below.

- Cultural component

Alteration of cultural patterns: refers to the impact that the work will generate in the lifestyles of the population that inhabits urban and rural settlements close to the project area. The impact will be reflected in the change of trades and work that has been historically developed in the area such as agriculture and artisanal fishing considered as a traditional way of life that provides means of subsistence to a large part of the population settled there.

In the same way, the presence of port infrastructure and the arrival of foreign personnel, due to the expectation of labor demand, can generate processes of acculturation due to changes in language, customs, ways of life and the demand for new services.

Intervention of the historical or architectural archaeological heritage: Corresponds to the impact generated by natural conditions or anthropogenic activities that may affect archaeological remains that can be identified on land or at sea by the development of project activities.

- Economic component

Generation of currencies: The generation of foreign currency is understood as the money (in foreign currency) generated by the port operation, both in the payment of freights, as well as in tariffs and other taxes associated with the transport of cargo to and from abroad.

The scope of this impact links the requirement of law 1 of 1991, in its seventh article, which establishes the percentage of the amount that will be imposed on the port concession, for consideration that must be distributed in a proportion of 80 % and 20% for the nation and for the municipality or district where the port concession is located, respectively.

Modification of the level of income of the population: Due to the increase in the supply and labor demand that is expected to have with the development of the port project, it is expected that the income level of the population, as well as the supply and

demand of services will increase, generating development and economic growth for both the construction and operational phases.

Variation in the budget of the region: This impact is defined as the economic income that the region will receive for the development of the project in each of its stages.

In this way, taxes generated by the construction and valuation of real estate in the area are sources of income for the department and the municipality, which could generate greater public collection for property tax and valuation.

In the same way, it is expected that the increase in the labor supply will generate an increase in spending and therefore in the collection of taxes and will boost the economy of the region.

The demand of commercial establishments of different nature for the provision of services and the commercial operation developed by the port operation will generate a greater collection of taxes by industry and commerce.

Likewise, this impact also refers to the resources generated by the 1% investment payment that the project owner must make once only, in accordance with the provisions of Decree 1900 of 2006 and the investments in compensation matters that must be performed.

Regarding the consideration for the port concession, by virtue of Law 1 of 1991, in its seventh article, the entry of an item is established as consideration that will be imposed on the port concession in a proportion of 80% and 20%. % for the nation and for the municipality or district where the port concession is located, respectively.

Change in the labor supply: The change in the labor supply is understood, as the increase in the profiles of work required, for the provision of direct and indirect jobs.

With the development of the port project, both in the execution of the activities proposed in the previous stages of construction and operation of the port, it is expected that the economic sectors present in the area will enhance and expand the supply of services and generate direct as well as indirect jobs of both skilled and unskilled labor, expanding the labor supply for the economically active population of the region.

Alteration of the value of the property: This impact is understood as the increase in the value of the property generated by the speculation in the demand of the real estate market in the area for the provision of direct and indirect services that will be required for the development of the port project such as, warehousing services,

housing services for foreign personnel, demand for commercial establishments among others.

Modification of productive activities: The modification of productive activities is understood as the variation in productive activities that take place in the area, due to the labor demand produced by the port project, especially for people who develop activities in an informal way such as fishing and agriculture in the area. The possibility of employment in the medium and long term, could generate the abandonment or development of alternative activities to those traditionally developed.

- Demographic component

Variation in the number of inhabitants: The execution of the port project will generate the presence of foreign or migrant personnel in the area, who move towards the possibility of accessing a job opportunity by temporarily or permanently increasing the number of inhabitants in the area. This population will demand services of different kinds.

- Spatial component

Alteration of existing infrastructure: The alteration of existing infrastructure, refers to the impact generated in the construction stage, by the increase of vehicular traffic in the area due to the transportation of material necessary for its construction and the displacement of necessary personnel to work on the project works.

Variation in the coverage and quality of public services: It refers to the increase in the demand for public services, due to the arrival of foreign population that will exert greater pressure on the service of drinking water, energy, sewage and garbage collection by the increase of solid waste and also generate the presence of diseases caused by vectors and insects.

In the same way, it could increase the demand for social services for the foreign population that will arrive in the area and will require access to health services, education, housing, among others.

Likewise, this impact refers to the demand that can be generated by the construction of the port on public services for the operation of equipment, machinery and temporary facilities that are suitable for the area of influence.

Alteration in the transit of boats: It refers to the temporary interruption of the transit of canoes, boats and motorboats, as a consequence of the activities of the project

within the area of influence and the presence of machinery and larger vessels in the maritime and fluvial area of the project which could generate variation in the transit routes of the vessels that regularly use the area as a route or anchoring area.

Additionally, for safety reasons, there will be restrictions on the navigation of smaller vessels in the perimeter of the work.

Variation in the volume of vehicular traffic: It refers to the increase of vehicular flow in the Rio Grande-Nueva Colonia road in the construction stage, for the transport of the material required for the development of the work and transportation of personnel and in the operational stage by the activities of loading and unloading merchandise.

- Political - organizational component

Institutional and community strengthening: This impact refers to the increased presence of authorities and institutions in the site where the project will be built, in compliance with its mission of monitoring and representing the communities.

In the same way, due to the development of the project and the formulation and execution of social projects in the area, it is expected that the community will organize itself to mediate, intervene, present or represent their concerns, ideas, needs or opinions concerning a specific topic before public or private entities.

Generation of expectations of the community: In the constructive stage of the project, expectations of the possible generation of jobs are created in the community of influence area. Expectations are understood as the perceptions that individual or group subjects are creating or constructing about the project, and on which conclusions are drawn to qualify it, assume a position in front of it or make

interpretations about the benefits or damages that may be generated by the development of the project itself.

8.4.3 Matrix of identification and results of the impacts of the Environmental Assessment - scenario with Project

Starting from the environmental characterization of the project of the present Environmental License Modification and of the activities considered during the construction, operation and closure phases during the construction of the port terminal and the environmental impacts defined above, the environmental impacts that may arise were identified about abiotic, biotic and socioeconomic means for the

execution of project activities. Based on this information, it is presented in Table No. 8.5 (construction phase) and Table No. 8.6 (operative phase) the matrix of impact identification of the scenario with Project from the abiotic, biotic and socioeconomic context.

Subsequently, the qualitative assessment of the impacts for the abiotic, biotic and socioeconomic media was carried out, as presented in Table No. 8.7 for the construction stage and Table No. 8.8 for the operational stage and closure during construction. The assessment was carried out in accordance with the criteria defined in the methodology such as the nature of the positive or negative impact, the intensity, extent, timing, persistence, reversibility, synergy, accumulation, effect, periodicity and recoverability, presented in Chapter 2 General present study, which are the variables that were considered for the qualitative assessment of the impact from the degree of incidence of the alteration generated and its effects.

The details of the qualification of the evaluation of environmental impacts is presented in Annex 8.2 ID Impacts with Project.

Table No. 8.5 Matrix of identification of environmental impacts With Project - Previous Activities and Construction

PUERTO ANTIOQUIA			ACTIVITIES																							
			PREVIOUS ACTIVITIES		BUILDING																					
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
MEDIUM	COMPONENT	IMPACTS	Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service connections of the dock	Dismantle, clean, stripping and [illegible]	Concrete manufacturing for civil	Maintenance of construction	Material transportation	Navigation of minor support vessels	Construction and operation of [illegible]	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and grubbing	Fillings or embankments	Transport of materials
ABIOTIC	CONTINENTAL WATERS	Changes in the physicochemical and microbiological characteristics of continental water				X																			
		Change in resource availability										X													
	ATMOSPHERIC	Alteration of air quality by gases and particulate matter			X	X	X	X	X		X	X		X	X	X	X		X	X		X	X	X	X
		Alteration of noise levels			X	X	X	X	X	X	X	X		X	X	X	X		X	X		X	X	X	X
	SOILS, GEOLOGY AND GEOMORPHOLOGY	Changes in morphodynamic, continental and coastal processes				X																			
		Alteration of the physicochemical properties of the soil											X												
		Alteration of organic or agrological soil			X						X												X		
		Alteration in the morphology of the seabed																	X		X				
		Resuspension and redistribution of sediments (Continental and offshore)				X													X		X				

PUERTO ANTIOQUIA			ACTIVITIES																								
			PREVIOUS ACTIVITIES		BUILDING																						
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
MEDIUM	COMPONENT	IMPACTS	Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service connections of the dock	Dismantle, clean, stripping and [illegible]	Concrete manufacturing for civil	Maintenance of construction	Material transportation	Navigation of minor support vessels	Construction and operation of temporary facilities	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials
		Alteration in continental morphology			X						X													X	
	LANDSCAPE	Alteration of the landscape			X	X		X	X		X					X	X						X	X	
	OCEANOGRAPHY	Changes in the physicochemical characteristics of offshore sediments																			X				
		Changes in the physicochemical and microbiological characteristics of seawater				X													X		X				
		Changes in oceanographic dynamics				X																			
BIOTECH	ECOSYSTEMS	Alteration of continental aquatic habitats				X			X																
		Alteration of offshore aquatic habitats				X													X		X				
		Alteration of onshore habitats			X	X					X												X		
		Formation of new habitats				X																			
		Variation of vegetation cover			X						X												X		

PUERTO ANTIOQUIA			ACTIVITIES																								
			PREVIOUS ACTIVITIES		BUILDING																						
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via				
MEDIUM	COMPONENT	IMPACTS	Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service connections of the dock	Dismantle, clean, stripping and [illegible]	Concrete manufacturing for civil	Maintenance of construction	Material transportation	Navigation of minor support vessels	Construction and operation of [illegible]	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials		
	FAUNA AND FLORA	Change in the dynamics of wildlife communities			X						X												X				
		Modification in the structure (distribution, abundance and composition) of offshore planktonic communities				X													X		X						
		Modification in the structure (distribution, abundance and composition) of offshore benthic communities				X													X		X						
		Modification in the structure (distribution, abundance and composition) of the offshore fish communities				X													X		X						
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities							X																		
		Modification in the structure (distribution, abundance and composition) of the continental fish communities							X																		

PUERTO ANTIOQUIA			ACTIVITIES																								
			PREVIOUS ACTIVITIES		BUILDING																						
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
MEDIUM	COMPONENT	IMPACTS	Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service connections of the dock	Dismantle, clean, stripping and [illegible]	Concrete manufacturing for civil	Maintenance of construction	Material transportation	Navigation of minor support vessels	Construction and operation of [illegible]	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.							X																		
SOCIOECONOMIC-CULTURAL	CULTURAL	Alteration of cultural patterns	X			X				X																	
		Intervention of the archaeological, historical or architectural heritage									X								X				X				
	ECONOMIC	Generation of foreign currency																									
		Modification of the income level of the population	X	X												X	X					X				X
		Variation of the budget of the region																									
		Change in labor supply	X	X									X		X	X	X					X		X	X		X
		Alteration of the value of the property	X	X												X	X										
		Modification of productive activities	X	X									X		X	X	X					X					X

PUERTO ANTIOQUIA			ACTIVITIES																								
			PREVIOUS ACTIVITIES		BUILDING																						
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
MEDIUM	COMPONENT	IMPACTS	Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service connections of the dock	Dismantle, clean, stripping and [illegible]	Concrete manufacturing for civil	Maintenance of construction	Material transportation	Navigation of minor support vessels	Construction and operation of [illegible]	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials
	DEMOGRAPHIC	Variation in the number of inhabitants	X													X	X								
	SPACE	Alteration of existing infrastructure												X											X
		Variation in the coverage and quality of public services	X	X												X	X								
		Alteration in the transit of vessels				X			X	X					X			X	X		X	X			
		Variation in the volume of vehicular traffic				X								X		X	X								X
	POLITICAL - ORGANIZATIONAL	Institutional and community strengthening	X														X								
		Generation of expectations in the community	X			X				X						X	X		X	X	X		X		X

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

Table No. 8.6 Matrix of identification of environmental impacts With Project - Operation and Closure during construction

PUERTO ANTIOQUIA			ACTIVITIES															
			OPERATION														CLOSING	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
MEDIUM	COMPONENT	IMPACTS	Navigation, anchoring and approach of boats and tugboats	Load and unload goods (solid)	Load and unload merchandise (liquid)	Load and unload merchandise (general cargo)	Transportation and storage in Port	Load and unload trucks	Operation and maintenance of infrastructure and facilities associated with the operation of the terminal	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged	Navigation of minor support vessels	Activities for the placement of the pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
ABIOTIC	CONTINENTAL WATERS	Changes in the physicochemical and microbiological characteristics of continental water							x								x	
		Change in resource availability							X	X								
	ATMOSPHERIC	Alteration of air quality by gases and particulate matter	X	X		X	X	X	X	X		X	X	X	X	X	X	
		Alteration of noise levels	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
	SOILS, GEOLOGY AND GEOMORPHOLOGY	Changes in morphodynamic, continental and coastal processes																
		Alteration of the physicochemical properties of the soil																

PUERTO ANTIOQUIA			ACTIVITIES																
			OPERATION													CLOSING			
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase		
MEDIUM	COMPONENT	IMPACTS	Navigation, anchoring and approach of boats and tugboats	Load and unload goods (solid)	Load and unload merchandise (liquid)	Load and unload merchandise (general cargo)	Transportation and storage in Port	Load and unload trucks	Operation and maintenance of infrastructure and facilities associated with the operation of the terminal	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged	Navigation of minor support vessels	Activities for the placement of the pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
		Alteration of organic or agrological soil																	X
		Alteration in the morphology of the seabed										X		X					
		Resuspension and redistribution of sediments (Continental and offshore)										X		X					
		Alteration in continental morphology																	
	LANDSCAPE	Alteration of the landscape														X	X	X	X
	OCEANOGRAPHY	Changes in the physicochemical characteristics of offshore sediments												X					
		Changes in the physicochemical and microbiological characteristics of seawater										X		X					

PUERTO ANTIOQUIA			ACTIVITIES																
			OPERATION														CLOSING	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
MEDIUM	COMPONENT	IMPACTS	Navigation, anchoring and approach of boats and tugboats	Load and unload goods (solid)	Load and unload merchandise (liquid)	Load and unload merchandise (general cargo)	Transportation and storage in Port	Load and unload trucks	Operation and maintenance of infrastructure and facilities associated with the operation of the terminal	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged	Navigation of minor support vessels	Activities for the placement of the pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
		Changes in oceanographic dynamics																
BIOTECH	ECOSYSTEMS	Alteration of continental aquatic habitats															X	
		Alteration of offshore aquatic habitats										X		X				
		Alteration of onshore habitats																
		Formation of new habitats																
	FAUNA AND FLORA	Variation of vegetation cover																X
		Change in the dynamics of wildlife communities																
		Modification in the structure (distribution, abundance and composition) of offshore planktonic communities										X		X				
		Modification in the structure (distribution, abundance and										X		X				

PUERTO ANTIOQUIA			ACTIVITIES															
			OPERATION														CLOSING	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
MEDIUM	COMPONENT	IMPACTS	Navigation, anchoring and approach of boats and tugboats	Load and unload goods (solid)	Load and unload merchandise (liquid)	Load and unload merchandise (general cargo)	Transportation and storage in Port	Load and unload trucks	Operation and maintenance of infrastructure and facilities associated with the operation of the terminal	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged	Navigation of minor support vessels	Activities for the placement of the pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
		composition) of offshore benthic communities																
		Modification in the structure (distribution, abundance and composition) of the offshore fish communities										X		X				
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities							X								X	
		Modification in the structure (distribution, abundance and composition) of the continental fish communities							X								X	
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.							X								X	

PUERTO ANTIOQUIA			ACTIVITIES																
			OPERATION														CLOSING		
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase		
MEDIUM	COMPONENT	IMPACTS	Navigation, anchoring and approach of boats and tugboats	Load and unload goods (solid)	Load and unload merchandise (liquid)	Load and unload merchandise (general cargo)	Transportation and storage in Port	Load and unload trucks	Operation and maintenance of infrastructure and facilities associated with the operation of the terminal	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged	Navigation of minor support vessels	Activities for the placement of the pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
SOCIOECONOMIC-CULTURAL	CULTURAL	Alteration of cultural patterns							X							X		X
		Intervention of the archaeological, historical or architectural heritage														X		
	ECONOMIC	Generation of foreign currency		X	X	X	X											
		Modification of the income level of the population		X	X	X	X	X	X						X	X		
		Variation of the budget of the region		X	X	X	X											
		Change in labor supply		X	X	X	X	X	X							X	X	
		Alteration of the value of the property														X		
		Modification of productive activities		X	X	X	X	X	X						X	X		

PUERTO ANTIOQUIA			ACTIVITIES															
			OPERATION														CLOSING	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
MEDIUM	COMPONENT	IMPACTS	Navigation, anchoring and approach of boats and tugboats	Load and unload goods (solid)	Load and unload merchandise (liquid)	Load and unload merchandise (general cargo)	Transportation and storage in Port	Load and unload trucks	Operation and maintenance of infrastructure and facilities associated with the operation of the terminal	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged	Navigation of minor support vessels	Activities for the placement of the pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
	DEMOGRAPHIC	Variation in the number of inhabitants		X	X	X	X	X	X								X	
	SPACE	Alteration of existing infrastructure														X		
		Variation in the coverage and quality of public services							X									
		Alteration in the transit of vessels	X									X		X	X			
		Variation in the volume of vehicular traffic		X	X	X	X	X	X							X		
	POLITICAL – ORGANIZATIONAL	Institutional and community strengthening														X		
		Generation of expectations in the community	X	X	X	X	X	X					X			X	X	x

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

Table No. 8.7 Matrix of results of the assessment of environmental impacts With Project - Previous Activities and Construction

MEDIUM	COMPONENT	IMPACTS	PREVIOUS ACTIVITIES		BUILDING																					
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
			Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service	Dismantle, clean, stripping and filled with the land	Concrete manufacturing for civil works	Maintenance of construction equipment	Material transportation	Navigation of minor support vessels	Construction and operation of temporary facilities	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials
ABIOTIC	AGUAS CONTINENTALES	Changes in the physicochemical and microbiological characteristics of continental water	0	0	0	-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Change in resource availability	0	0	0	0	0	0	0	0	0	-20	0	0	0	0	0	0	0	0	0	0	0	0	0
	ATMOSPHERIC	Alteration of air quality by gases and particulate matter	0	0	-25	-32	-23	-23	-23	0	-36	-26	0	-48	-26	-26	-26	0	-26	-23	0	-23	-32	-32	-32
		Alteration of noise levels	0	0	-24	-31	-22	-22	-22	-22	-29	-22	0	-31	-25	-26	-26	0	-22	-22	0	-22	-32	-31	-31
	SOILS, GEOLOGY AND GEOMORPHOLOGY	Changes in morphodynamic, continental and coastal processes	0	0	0	-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Alteration of the physicochemical properties of the soil	0	0	0	0	0	0	0	0	0	0	-20	0	0	0	0	0	0	0	0	0	0	0	0
		Alteration of organic or agrological soil	0	0	-24	0	0	0	0	0	-56	0	0	0	0	0	0	0	0	0	0	0	-34	0	0
		Alteration in the morphology of the seabed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-46	0	-31	0	0	0	0
		Resuspension and redistribution of sediments (Continental and offshore)	0	0	0	-36	0	0	0	0	0	0	0	0	0	0	0	0	-40	0	-48	0	0	0	0
		Alteration in continental morphology	0	0	-24	0	0	0	0	0	-36	0	0	0	0	0	0	0	0	0	0	0	0	-31	0
	LANDSCAPE	Alteration of the landscape	0	0	-33	-58	0	-44	-44	0	-56	0	0	0	0	-30	-32	0	0	0	0	0	-31	-28	0

MEDIUM	COMPONENT	IMPACTS	PREVIOUS ACTIVITIES		BUILDING																					
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
			Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service	Dismantle, clean, stripping and filled with the land	Concrete manufacturing for civil works	Maintenance of construction equipment	Material transportation	Navigation of minor support vessels	Construction and operation of temporary facilities	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials
	OCEANOGRAPHY	Changes in the physicochemical characteristics of offshore sediments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-37	0	0	0	0
		Changes in the physicochemical and microbiological characteristics of seawater	0	0	0	-33	0	0	0	0	0	0	0	0	0	0	0	0	-35	0	-48	0	0	0	0
		Changes in oceanographic dynamics	0	0	0	-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BIOTECH	ECOSYSTEMS	Alteration of continental aquatic habitats	0	0	0	-21	0	0	-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Alteration of offshore aquatic habitats	0	0	0	-31	0	0	0	0	0	0	0	0	0	0	0	0	-63	0	-26	0	0	0	0
		Alteration of onshore habitats	0	0	-65	-21	0	0	0	0	-65	0	0	0	0	0	0	0	0	0	0	0	-39	0	0
		Formation of new habitats	0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FAUNA AND FLORA	Variation of vegetation cover	0	0	-65	0	0	0	0	0	-65	0	0	0	0	0	0	0	0	0	0	0	-39	0	0
		Change in the dynamics of wildlife communities	0	0	-65	0	0	0	0	0	-65	0	0	0	0	0	0	0	0	0	0	0	-31	0	0
		Modification in the structure (distribution, abundance and composition) of offshore planktonic communities	0	0	0	-25	0	0	0	0	0	0	0	0	0	0	0	0	-23	0	-26	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of offshore benthic communities	0	0	0	-31	0	0	0	0	0	0	0	0	0	0	0	0	-63	0	-40	0	0	0	0

MEDIUM	COMPONENT	IMPACTS	PREVIOUS ACTIVITIES		BUILDING																					
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
			Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service	Dismantle, clean, stripping and filled with the land	Concrete manufacturing for civil works	Maintenance of construction equipment	Material transportation	Navigation of minor support vessels	Construction and operation of temporary facilities	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials
		Modification in the structure (distribution, abundance and composition) of the offshore fish communities	0	0	0	-25	0	0	0	0	0	0	0	0	0	0	0	0	-23	0	-26	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities	0	0	0	0	0	0	-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of the continental fish communities	0	0	0	0	0	0	-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.	0	0	0	0	0	0	-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOCIOECONOMIC-CULTURAL	CULTURAL	Alteration of cultural patterns	-27	0	0	-39	0	0	0	-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Intervention of the archaeological, historical or architectural heritage	0	0	0	0	0	0	0	0	-20	0	0	0	0	0	0	0	-17	0	0	0	-17	0	0
	ECONOMIC	Generation of foreign currency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Modification of the income level of the population	51	40	0	0	0	0	0	0	0	0	0	0	0	36	43	0	0	0	0	27	0	0	43
		Variation of the budget of the region	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Change in labor supply	47	40	0	0	0	0	0	0	0	0	40	0	27	57	74	0	0	0	0	27	0	43	43

MEDIUM	COMPONENT	IMPACTS	PREVIOUS ACTIVITIES		BUILDING																					
					Viaduct, Pier and Jetty						Terminal on Earth							Dredging Deepening					Via		
			Hiring of Labor	Hiring services	Dismantle, clean, stripping and filled with the land	Transport, manufacture and driving of the piles	Armed and fused heads and beams	Armed and melted plates	Anchoring and construction of the bridge and pier	Installation of the conveyor belt and laying of the service	Dismantle, clean, stripping and filled with the land	Concrete manufacturing for civil works	Maintenance of construction equipment	Material transportation	Navigation of minor support vessels	Construction and operation of temporary facilities	Construction of infrastructure and facilities associated with	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Land clearing, cleaning and stripping	Fillings or embankments	Transport of materials
		Alteration of the value of the property	49	41	0	0	0	0	0	0	0	0	0	0	0	29	31	0	0	0	0	0	0	0	0
		Modification of productive activities	47	40	0	0	0	0	0	0	0	0	46	0	27	41	43	0	0	0	0	27	0	0	43
	DEMOGRAPHIC	Variation in the number of inhabitants	-32	0	0	0	0	0	0	0	0	0	0	0	0	-39	-39	0	0	0	0	0	0	0	0
		Alteration of existing infrastructure	0	0	0	0	0	0	0	0	0	0	0	-36	0	0	0	0	0	0	0	0	0	0	-36
		Variation in the coverage and quality of public services	-41	-41	0	0	0	0	0	0	0	0	0	0	0	-60	-68	0	0	0	0	0	0	0	0
		Alteration in the transit of vessels	0	0	0	-26	0	0	-27	-27	0	0	0	0	-16	0	0	-20	-20	0	-20	-16	0	0	0
		Variation in the volume of vehicular traffic	0	0	0	-48	0	0	0	0	0	0	0	-62	0	-31	-31	0	0	0	0	0	0	0	-31
	POLITICAL – ORGANIZATIONAL	Institutional and community strengthening	42	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0
		Generation of expectations in the community	-39	0	0	-39	0	0	0	-39	0	0	0	0	0	-44	-44	0	-44	-44	-44	0	-44	0	-44

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

Table No. 8.8 Matrix of results of the assessment of environmental impacts With Project - Operation and Closure

MEDIUM	COMPONENT	IMPACTS	OPERACIÓN														CIERRE	
			Port, maritime and river operations							Maintenance dredging or relieving					Road Improvement	Construction phase	
			Navigation, anchoring and approach of boats and tugboats	Products Load and Unload (Solid)	Products Load and Unload (liquid)	Products Load and Unload (General loads)	Transportation and storage in Port	Trucks Load and Unload	Operation and maintenance of infrastructure and facilities	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Activities for the placement of the Pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
ABIOTIC	CONTINENTAL WATERS	Changes in the physicochemical and microbiological characteristics of continental water	0	0	0	0	0	0	-31	0	0	0	0	0	0	0	-23	0
		Change in resource availability	0	0	0	0	0	0	-22	-24	0	0	0	0	0	0	0	0
	ATMOSPHERIC	Alteration of air quality by gases and particulate matter	-32	-32	0	-32	-34	-34	-22	-22	0	-23	-23	-23	-23	-32	-26	0
		Alteration of noise levels	-31	-31	-31	-31	-33	-33	-21	-21	0	-22	-22	-22	-22	-31	-31	0
	SOILS, GEOLOGY AND GEOMORPHOLOGY	Changes in morphodynamic, continental and coastal processes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Alteration of the physicochemical properties of the soil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Alteration of organic or agrological soil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
		Alteration in the morphology of the seabed	0	0	0	0	0	0	0	0	0	-34	0	-34	0	0	0	0

MEDIUM	COMPONENT	IMPACTS	OPERACIÓN														CIERRE	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
			Navigation, anchoring and approach of boats and tugboats	Products Load and Unload (Solid)	Products Load and Unload (liquid)	Products Load and Unload (General loads)	Transportation and storage in Port	Trucks Load and Unload	Operation and maintenance of infrastructure and facilities	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Activities for the placement of the Pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
		Resuspension and redistribution of sediments (Continental and offshore)	0	0	0	0	0	0	0	0	0	-36	0	-36	0	0	0	0
		Alteration in continental morphology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LANDSCAPE	Alteration of the landscape	0	0	0	0	0	0	0	0	0	0	0	0	0	-24	-24	32
	OCEANOGRAPHY	Changes in the physicochemical characteristics of offshore sediments	0	0	0	0	0	0	0	0	0	0	0	-41	0	0	0	0
		Changes in the physicochemical and microbiological characteristics of seawater	0	0	0	0	0	0	0	0	0	-36	0	-34	0	0	0	0
		Changes in oceanographic dynamics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BIOTECH	ECOSYSTEMS	Alteration of continental aquatic habitats	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-25	0
		Alteration of offshore aquatic habitats	0	0	0	0	0	0	0	0	0	-26	0	-25	0	0	0	0
		Alteration of onshore habitats	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Formation of new habitats	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MEDIUM	COMPONENT	IMPACTS	OPERACIÓN														CIERRE	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
			Navigation, anchoring and approach of boats and tugboats	Products Load and Unload (Solid)	Products Load and Unload (liquid)	Products Load and Unload (General loads)	Transportation and storage in Port	Trucks Load and Unload	Operation and maintenance of infrastructure and facilities	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Activities for the placement of the Pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
	FAUNA AND FLORA	Variation of vegetation cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
		Change in the dynamics of wildlife communities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of offshore planktonic communities	0	0	0	0	0	0	0	0	0	-26	0	-25	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of offshore benthic communities	0	0	0	0	0	0	0	0	0	-34	0	-35	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of the offshore fish communities	0	0	0	0	0	0	0	0	0	-26	0	-25	0	0	0	0
		Modification in the structure (distribution, abundance and composition) of macroinvertebrate communities	0	0	0	0	0	0	-25	0	0	0	0	0	0	0	-25	0
		Modification in the structure (distribution, abundance and composition) of the continental fish communities	0	0	0	0	0	0	-25	0	0	0	0	0	0	0	-25	0
		Modification in the structure (distribution, abundance and composition) of the peripheral communities.	0	0	0	0	0	0	-25	0	0	0	0	0	0	0	-31	0

MEDIUM	COMPONENT	IMPACTS	OPERACIÓN														CIERRE	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
			Navigation, anchoring and approach of boats and tugboats	Products Load and Unload (Solid)	Products Load and Unload (liquid)	Products Load and Unload (General loads)	Transportation and storage in Port	Trucks Load and Unload	Operation and maintenance of infrastructure and facilities	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Activities for the placement of the Pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
SOCIOECONOMIC-CULTURAL	CULTURAL	Alteration of cultural patterns	0	0	0	0	0	0	-44	0	0	0	0	0	0	-27	0	26
		Intervention of the archaeological, historical or architectural heritage	0	0	0	0	0	0	0	0	0	0	0	0	0	-17	0	0
	ECONOMIC	Generation of foreign currency	0	46	46	46	46	0	0	0	0	0	0	0	0	0	0	0
		Modification of the income level of the population	0	37	37	37	37	37	37	0	0	0	0	0	27	51	0	0
		Variation of the budget of the region	0	43	43	43	43	0	0	0	0	0	0	0	0	0	0	0
		Change in labor supply	0	39	39	39	39	39	74	0	0	0	0	0	0	40	70	0
		Alteration of the value of the property	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0
		Modification of productive activities	0	47	47	47	47	47	47	0	0	0	0	0	27	47	0	0
	DEMOGRAPHIC	Variation in the number of inhabitants	0	-32	-32	-32	-32	-32	-32	0	0	0	0	0	0	0	-40	0
		Alteration of existing infrastructure	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0
		Variation in the coverage and quality of public services	0	0	0	0	0	0	-68	0	0	0	0	0	0	0	0	0
		Alteration in the transit of vessels	-16	0	0	0	0	0	0	0	0	-20	0	-20	-16	0	0	0
		Variation in the volume of vehicular traffic	0	-72	-72	-72	-76	-76	-72	0	0	0	0	0	0	-31	0	0

MEDIUM	COMPONENT	IMPACTS	OPERACIÓN														CIERRE	
			Port, maritime and river operations								Maintenance dredging or relieving					Road Improvement	Construction phase	
			Navigation, anchoring and approach of boats and tugboats	Products Load and Unload (Solid)	Products Load and Unload (liquid)	Products Load and Unload (General loads)	Transportation and storage in Port	Trucks Load and Unload	Operation and maintenance of infrastructure and facilities	Maintenance of machinery and equipment	Referencing the intervention area	Extraction of material from the seabed	Transfer of dredged material	Disposal in dump of dredged material	Navigation of minor support vessels	Activities for the placement of the Pavement (affirmed, granular sub-bases, granular and stabilized bases)	Demolition and Dismantling of temporary infrastructure	Urban planning and landscaping
	POLITICAL – ORGANIZATIONAL	Institutional and community strengthening	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0
		Generation of expectations in the community	-44	-39	-39	-39	-39	-39	0	0	0	0	-44	0	0	-39	-39	39

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

8.4.4 Analysis of the results of the Environmental Evaluation with Project

According to the results obtained in the evaluation of impacts with Project in the area of study of the municipality of Turbo in the Nueva Colonia District (see Table No. 8.3), 283 positive and negative class impacts were identified for the abiotic media, biotic and socioeconomic of the 1,569 possible interactions of the impacts related to the main activities (39 activities) for the phases of construction, operation and closure during construction. From the analysis and identification of impacts by activity, there were 214 negative impacts with an equivalence of 75.6% and 69 impacts are positive, equivalent to 24.4%, as presented graphically in the Figure No. 8.27.

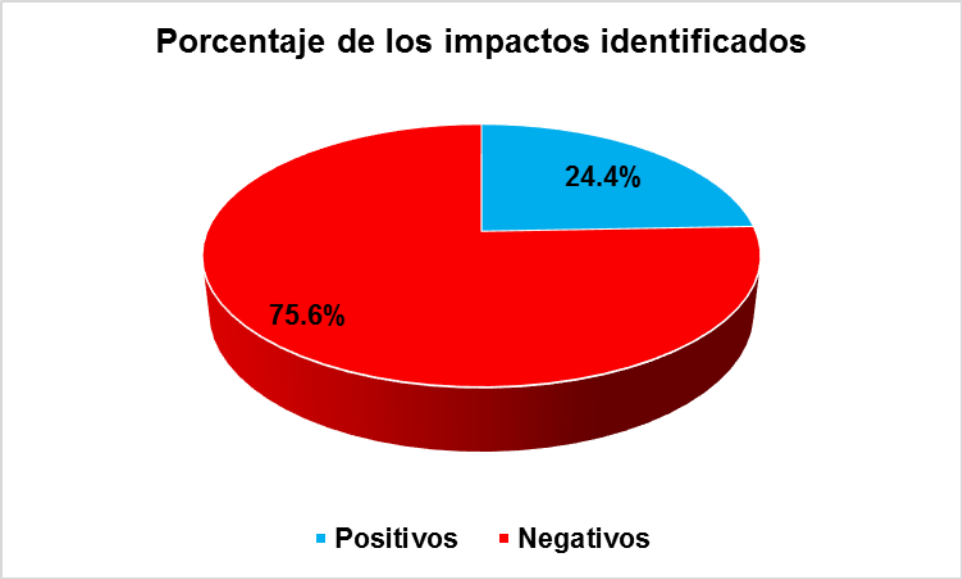


Figure No. 8.27 Percentage of the nature of the impacts identified with the project
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

According to the results of the assessment of importance presented in Table No. 8.3 scenario With Project, 214 negative class impacts were identified, of which 62 impacts with irrelevant importance are subdivided, equivalent to 29.0%, 131 impacts with moderate importance equivalent to 61.2%, 19 impacts with a severe importance that is equivalent to 8.9% and two (2) impacts of critical importance equivalent to 0.9%, which indicates that there was greater impact on the medium of negative form with moderate qualification because of some activities such as clearing, cleaning and filling the land, the construction of the viaduct, pier and jetty for the manufacture, transport and driving of piles, deepening dredging, port, maritime and fluvial operation and closure during the construction of the port terminal (see Figure No. 8.28).

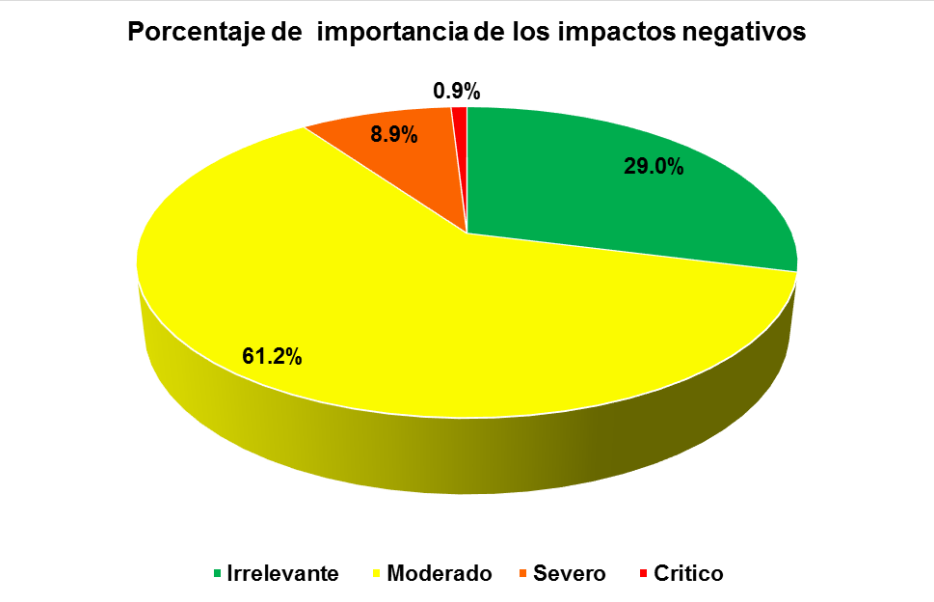


Figure No. 8.28 Percentage of importance of negative impacts With Project
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

On the other hand, positive class impacts were also identified in the Project scenario, of which 28 insignificant impacts amount to 40.6%, 39 have a moderately significant impact that equals 56.5% and two (2) very significant impacts with a representation percentage of 2.9%, as shown graphically in Figure No. 8.29. These positive impacts were generated by previous activities such as the hiring of labor, the hiring of services which can be provided by the nearest populations, which implies changes in family income, increases the labor supply in the region, additionally the income of the project in the study area can alter the valuation of the properties, due to the economic activity that will be exercised at a national level, such as the operation of a port terminal of great draft, which stimulates the local and regional economy.

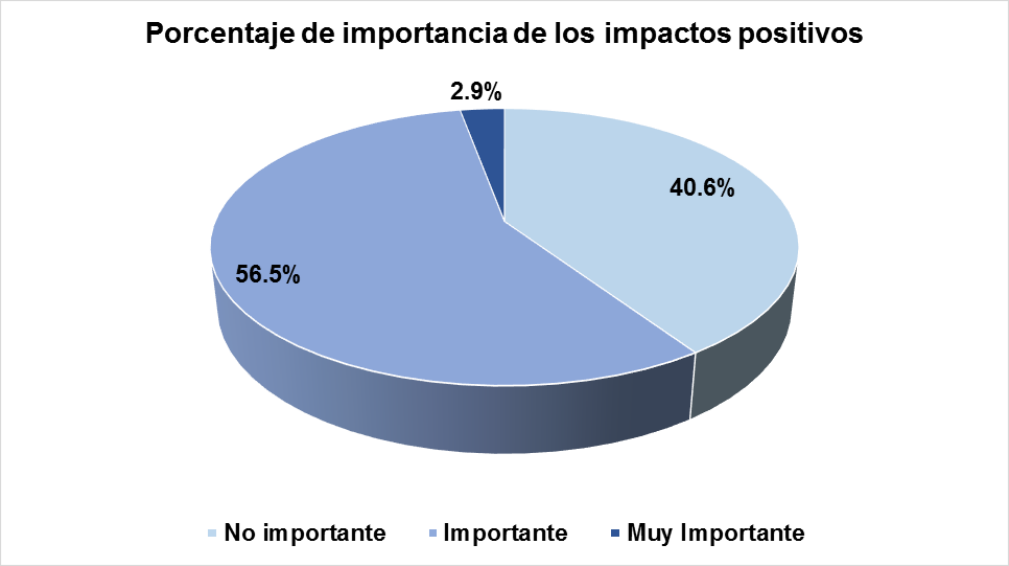


Figure No. 8.29 Percentage of importance of positive impacts With Project
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

According to the results obtained, the most impacted activities in the scenario with Project is presented in Figure No. 8.30 and Figure No. 8.31, where the activities that received the greatest number of impacts are found with a frequency between 8 and 19 in the construction stage, related to the construction of the viaduct, pier and jetty, followed by the terminal on the ground and access road. For the operation of the project, the most impacted activity is with a frequency between 10 and 14 impacts per activity, related to the operation and maintenance of infrastructure and facilities associated with the operation of the terminal and improvement of the road.

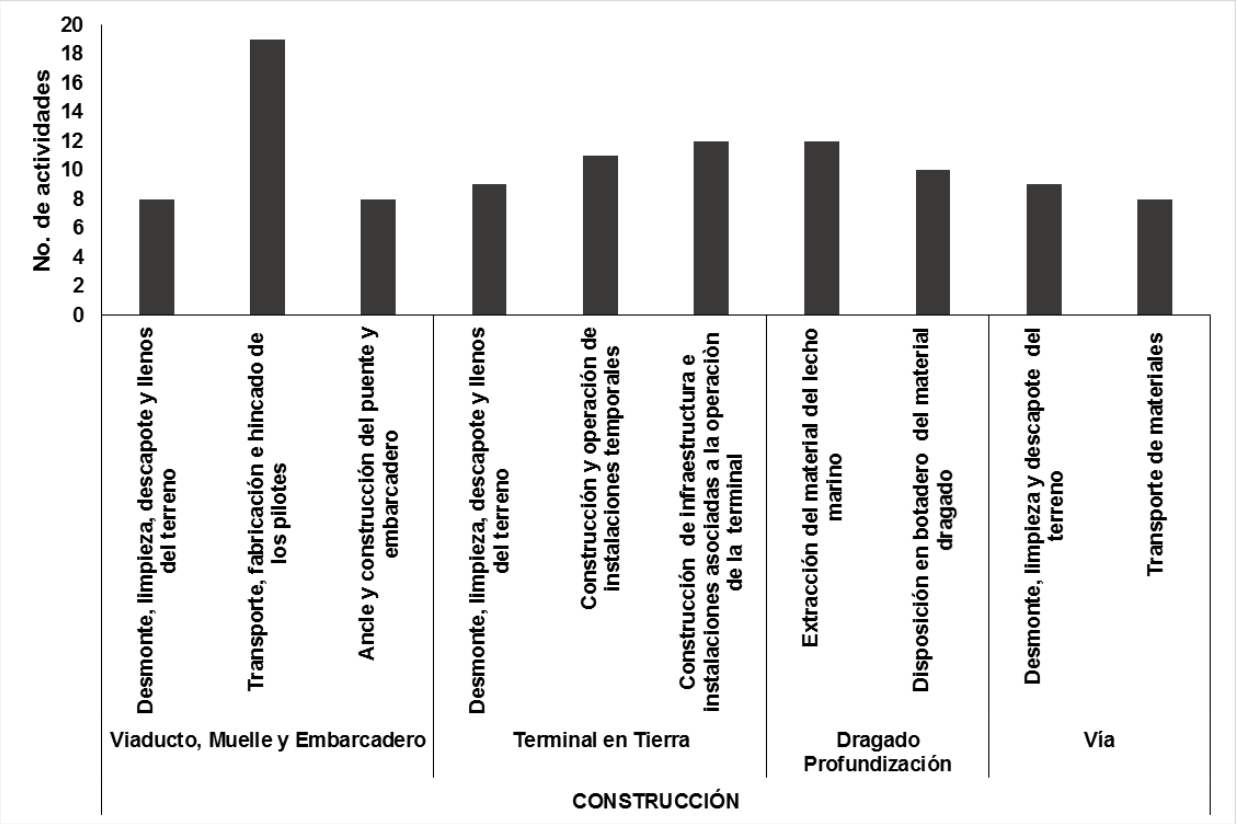


Figure No. 8.30 Most impacted activities - Scenario With Project - Constructive Phase
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

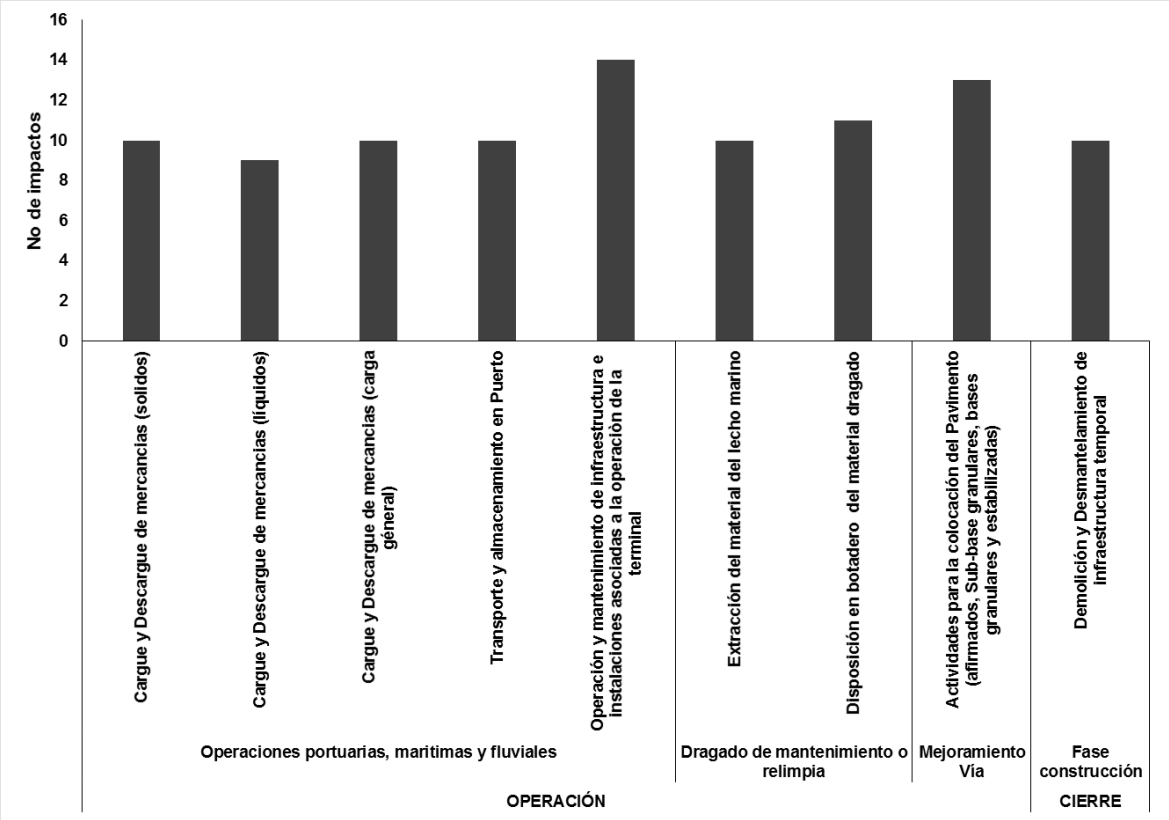


Figure No. 8.31 Most impacted activities - Scenario With Project - Operational Phase and Closing Phase

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

Below is the analysis for each medium (abiotic, biotic and socioeconomic) in accordance with the impacts identified with the project for each of them.

- *Abiotic environment*

Based on the importance ratings of the impacts identified for the main activities that will be carried out in the study area during the execution of the project (scenario with Project), an analysis of the results of the impacts with greater relevance is presented below. such as moderate, severe and critical impacts and, to a lesser extent, an analysis of irrelevant impacts.

- Changes in the physicochemical and microbiological characteristics of continental water

The natural conditions of the water network that may be affected by the execution of the works of the port terminal project in the phases of construction, operation and closure of the construction, presented an index of water quality bad to very bad, which indicates that the water body in question is intervened either by anthropic or natural activities. Therefore, the activities of the project during the construction and closure of the construction will not affect the water body by the transport, manufacture and driving of piles and by the demolition and dismantling of temporary infrastructure, but for the operation of the port terminal by generate continuous discharge being these discharges with previous treatment, could change the physicochemical and bacteriological characteristics of water very strongly, since the dispersion of the pollutants is expected to be fast since the flow discharged (3 L / s) compared to The flow of the León River (average flow 40,000 L / s) is very low.

As a consequence of the above, the impact of a negative nature with environmental significance between irrelevant and moderate was rated as can be seen in Figure No. 8.32. The operation activity of the port terminal as the maintenance of infrastructure and facilities associated with the operation of the port terminal, was the one that obtained greater environmental importance, since the shedding will be executed during the useful life of the project continuously, so that it can change the physicochemical and microbiological characteristics of the Nueva Colonia canal of a strut area.

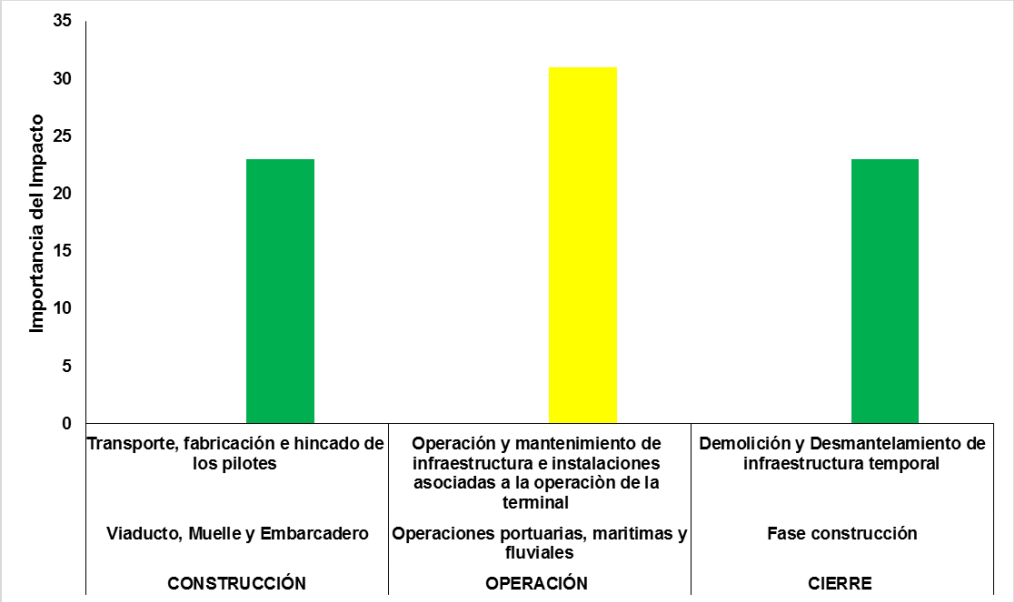


Figure No. 8.32 Environmental importance of the impact With Project for changes in the physicochemical and microbiological characteristics of continental water
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of air quality by gases and particulate material

The current air quality in the area of influence of the project, are in good condition according to the results of the sampling of the criteria pollutants like PM10, CO, NOx and SO2 in comparison with the permissible limits of emission of Resolution 610 of 2010[2] of the Ministry of Environment, Housing and Territorial Development now Ministry of Environment and Sustainable Development. These current mentioned conditions could vary due to the construction activities of the project, since the impact on air quality was one of the impacts with higher frequencies according to the activities that will be executed during this phase, due to the construction of the viaduct, pier and jetty, the ground terminal and the access road, since the frequency of land vehicle transport and fluvial-offshore transport with construction materials would increase in relation to current traffic.

[2] COLOMBIA. MINISTRY OF HOUSING, ENVIRONMENT AND TERRITORIAL DEVELOPMENT now, MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT. Resolution 610 (March, 24, 20101). By which Resolution 601 of April 4, 2006 is modified. Bogotá D.C., 2010

Therefore, the impact of a negative nature with moderate environmental importance was rated for construction activities, as can be seen in Figure No. 8.33. However, during transport of materials, these should always be covered to reduce the risk of particulate matter.

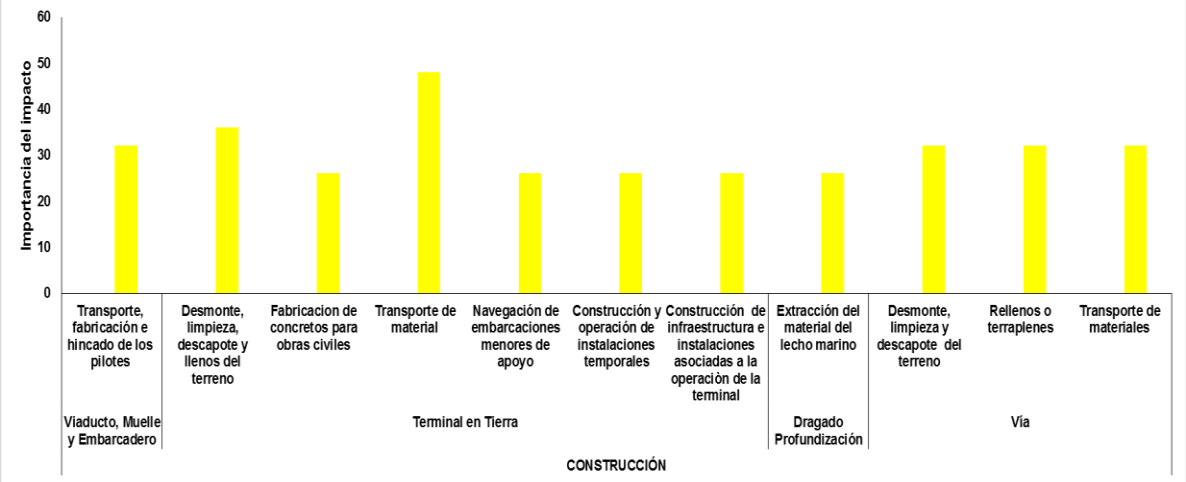


Figure No. 8.33 Environmental importance of the impact With Project for the alteration of the quality of the air by gases and particulate material - Construction
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

During the operation of the terminal, several interactions of the impacts were also presented with the activities that will be carried out in this phase, generated by the activities of the port, maritime and fluvial operations and the improvement of the road. These activities can generate impacts on air quality, in order to determine the concentrations emitted, a modeling was carried out to evaluate the environmental emissions generated by the port operation and in accordance with the results of the modeling during the operation of vehicle traffic. of load type export and import unloaded in the terminal on land and terminal in water towards the yards and vice versa, the contribution of the pollutants criteria how: PM10, SO2, NOx and CO indicate relatively low values for the operation of the viaduct according to the modeling presented in Chapter 5 Characterization of the area of influence of the present study, which are below the maximum permissible limits established in

Resolution 610 of 2010[3] f the Ministry of Environment, Housing and Territorial Development now Ministry of Environment and Sustainable Development

For the activities in the phase of operation and closing in construction, the impact of negative nature with moderate importance was described as can be seen in Figure No. 8.34, since the contribution of pollution levels contributed by the operation of the viaduct, added to the values obtained in the baseline for the current conditions (without project), it remains below the maximum permissible limits; On the other hand, the closing activities, at the end of construction, of the infrastructure of the port terminal are minimum particulate material emissions, due to the demolition and dismantling of the temporary and permanent installations required.

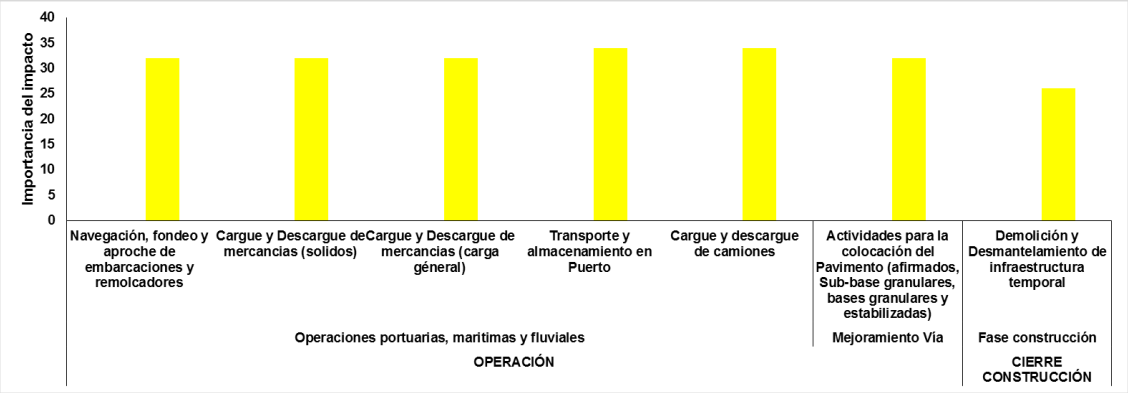


Figure No. 8.34 Environmental importance of the impact With Project for the alteration of air quality by gases and particulate material - Operation and closure
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of noise levels

The noise levels in the area of influence of the project in accordance with the results presented in the sampling of environmental noise determined in daytime and night time, during working and non-working days, presented an average of 64.7 in the Nueva Colonia District. dB and in the area of intervention of the project an average of 51.4 dB. It is worth mentioning that the levels of ambient noise determined during the night, on a working and non-working day, of some stations sampled exceeded

[3] Ibíd.

the permissible limit established in Resolution 627 of April 2006[4] or sector C, restricted intermediate noise, subsector zones with commercial permitted uses

These current mentioned conditions could be increased by the construction activities of the project, since the impact on the sound pressure levels was one of the impacts with higher frequencies according to the activities that will be executed during this phase, due to the construction of the viaduct, pier and jetty, the terminal on the ground and the access road, since the frequency of land vehicle transport and fluvial-offshore transport with construction materials would increase in relation to current traffic, implying higher noise levels than those present currently. Therefore, the impact of a negative nature with moderate environmental importance was rated for construction activities, as can be seen in Figure No. 8.35.

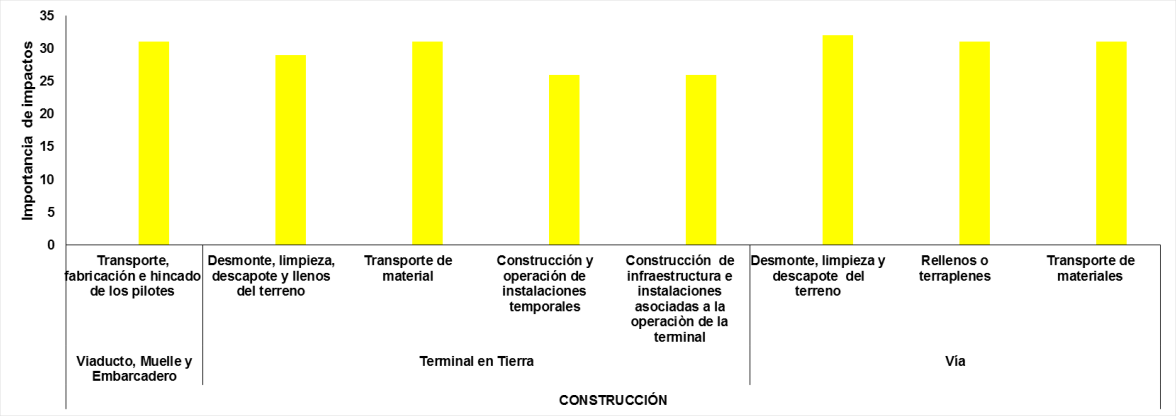


Figure No. 8.35 Environmental importance of the impact With Project for the alteration of noise levels - Construction

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

During the operation of the terminal, several interactions of the impacts were also presented with the activities that will be carried out in this phase, generated by the activities of the port, maritime and fluvial operations and the improvement of the road, causing an increase in the sound pressure. However, according to the modeling in the viaduct for the transit of the vehicles from the ground terminal to the terminal in water, the noise emission levels estimated in the study are below the

[4] COLOMBIA. MINISTRY OF ENVIRONMENT, HOUSING AND SUSTAINABLE DEVELOPMENT. Resolution 627 (April, 07, 2006). By which the national norm of emission of noise and environmental noise is established. Bogotá D.C., 2006.

permissible limits established in Resolution 627 of 2006[5] of the MAVDT today MADS, both for the day and night shift, which is stipulated in 75 dB (A), for Sector C- Restricted Intermediate Noise, Sub-sector "Areas with industrial permitted uses, such as industries in general, port areas, industrial parks, free zones ". This is because the maximum value obtained in the modeling is 65.9 dB (A) at the point of emission.

For the sector of Nueva Colonia, which is the nearest town, a contribution of less than 40 dB (A) is estimated in the operation of the viaduct, a value that is below the permissible noise emission limits for residential areas. established in the regulations of 65 dB (A) in the day and 50 dB (A) in the night. Another activity that can alter the sound pressure levels in the population is the operation of the projected route, "Nueva Colonia-Puerto Antioquia", which according to the results of the modeling does not exceed 70 dB (A). none of the 152 receiver points (blocks) calculated within the area of interest and for the Nocturnal day exceed 55 dB (A) in six (06) of the 152 receiver points (blocks) calculated within the area of interest.

Therefore, in the phase of operation and closure in construction of the project, the negative impact of moderate nature was rated, as can be seen in Figure No. 8.36, since the execution of activities can change the normal decibels in the population closest to the project, such as the communities located on the edge of the path of the Nueva Colonia District

[5] COLOMBIA. MINISTRY OF ENVIRONMENT, HOUSING AND SUSTAINABLE DEVELOPMENT. Resolution 627 (April, 07, 2006). Op Cit.

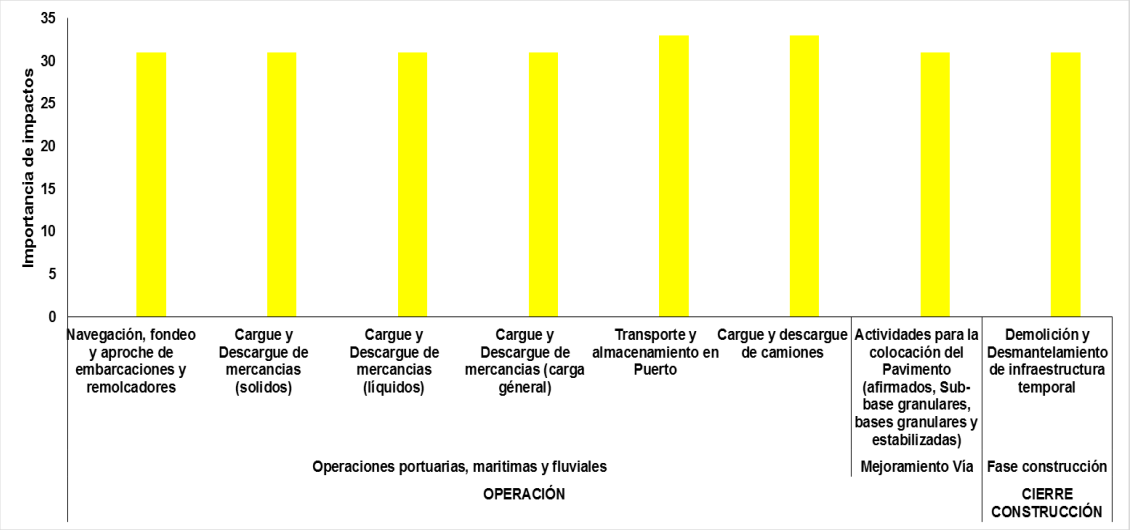


Figure No. 8.36 Environmental importance of the impact With Project for the alteration of noise levels - Operation and Closure

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- - Alteration of organic or agrological soil

For the construction of the infrastructure of the project such as the piling of the piles on the mainland, the intervention area for the construction of the terminal on the ground and the access road, require the removal of the first 10 cm of the organic soil, in order to reuse in eroded areas or environmental recovery areas to better use the organic soil and in turn, protect the geotechnical stability of the works before the execution of the same, since these soils have low geotechnical capacity and require improving the soil by means of techniques such as compaction and leveling with a motor grader up to the required height according to the technical design specifications, the alignments, slopes and dimensions indicated in the plans of the project and the instructions of the controller in accordance with the load that must be supported , without overturning and other alterations in the river bank, either in the Nueva Colonia Canal or in the Leon River.

Therefore, the impact with an environmental significance between irrelevant, moderate and severe for the construction phase of the project was valued, which refers to the cleaning, stripping and full terrain activities required for the execution of some works. of the project, as presented in Figure No. 8.37. The variations in environmental importance are due to the extension of the impact on the intervention area, since the construction activity of the terminal on land is greater than those required by the other construction activities.

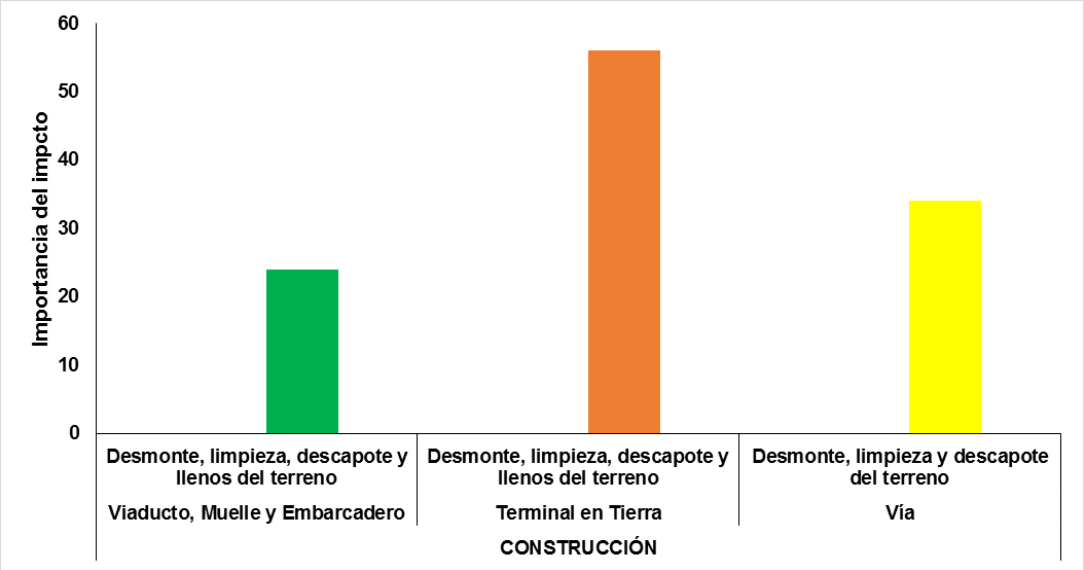


Figure No. 8.37 Environmental importance of the impact With Project for the alteration of the organic or agrological soil

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration in the morphology of the seabed

The variations that may occur in the seabed in Bahía Colombia are due to the activities that will be carried out in the project, such as the deepening dredging in the maneuvering areas of the vessels and the access channel, since vessels with higher drafts will enter to the depths currently existing. Therefore, the dredged area will change the current seafloor bathymetries and this extracted material will be deposited in the area of the dump that is authorized for the project, which when depositing the material dredged in said area will also change the seabed bathymetry in lesser proportion, since the area of the dump will have an area greater than the dredged area, which implies greater dispersion of the material without generating heights that impede navigability in the area, or that modify the coastal dynamics.

For the above, the impact with moderate environmental importance was assessed for the activities during the construction of the deepening dredging and during the operation phase the maintenance dredging, as presented in Figure No. 8.38.

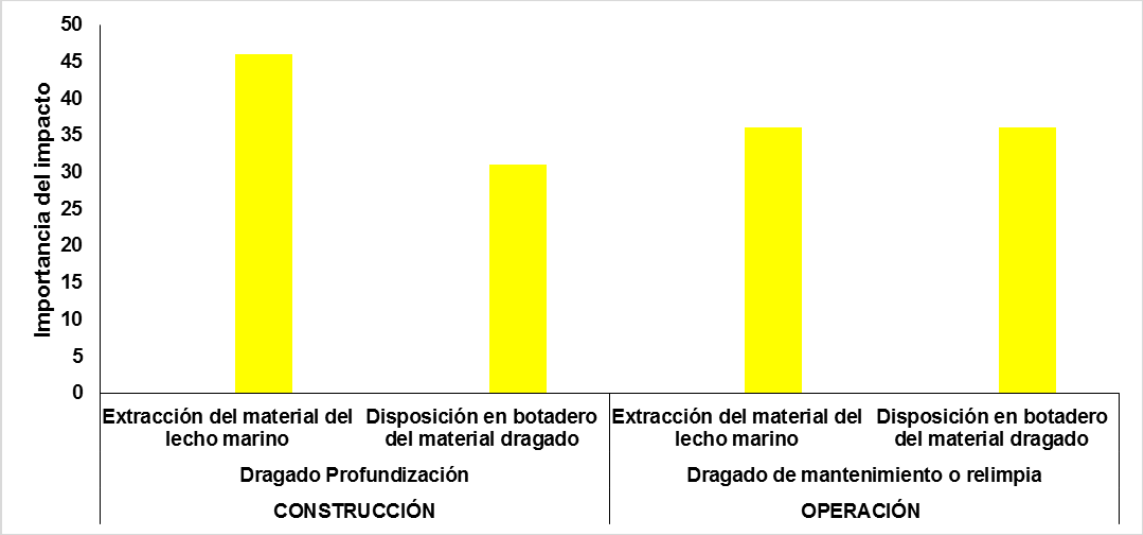


Figure No. 8.38 Environmental importance of the impact With Project for the alteration in the morphology of the seabed

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Resuspension and redistribution of sediments (continental and offshore), changes in the physicochemical characteristics of offshore sediments and changes in the physicochemical and microbiological characteristics of seawater

The activities that will be executed for the construction of the viaduct and the terminal in water, require the piling of piles, which implies variation in the concentrations of the sediments when the piloting is executed on the seabed, since it causes vibrations in the site generating the resuspension of the sediments in contact with the sea water, causing alteration in the characteristics of both the quality of the water column and the concentrations of the sediments in suspension.

Another activity that generates impact on the quality of the sediments and water column, are the dredging of deepening and maintenance when the action of the extraction of the material is executed and then the disposal of the dredged material in the area of the dump that is authorized for the project, which may have effects on the physicochemical and bacteriological characteristics of offshore water and offshore sediments in Bahía Colombia. Water pollution can reach a lower proportion of coastal areas due to climatic effects such as waves. However, Bahía Colombia is influenced by the drainage areas of the rivers that flow into it, these being the main contributors of sediment and pollution.

On the other hand, water could accidentally be contaminated by spills of particles and construction waste, by accidental spills of fuels or other liquid substances used during construction and operation activities, along with the discharge of wastewater into the tributary. that ends at Bahía Colombia in the operation phase.

It is worth mentioning that the quality of the seawater according to the REDCAM [6] and the samplings made in Bahía Colombia in July 2015, the quality of the sea water is on average between acceptable and inadequate, this means being altered naturally by the processes erosive and sediment trawling contained in the tributaries that reach the bay and anthropically by dredging activities in the León River that in turn reach the bay. The quality of the sea water with better conditions are located within the same, which are waters that conserve good conditions and few restrictions of use, in other sectors near the mouths of rivers presents lower quality with greater restrictions of use.

Therefore, the impacts on sediments, the quality of the water column and the resuspension and redistribution of sediments with a moderate environmental importance, product of five (5) activities, which are part of the construction phase of the deepening dredging, were evaluated. (extraction of the material from the seabed and disposal of the dredged material in the dump) and by driving the piles and for the maintenance dredging activity that are part of the operational phase (extraction of the material from the seabed and disposal of the dredged in the dump), as shown in Figure No. 8.39, Figure No. 8.40 and Figure No. 8.41.

[6] INVEMAR, REDCAM, 2015. Óp. Cit.

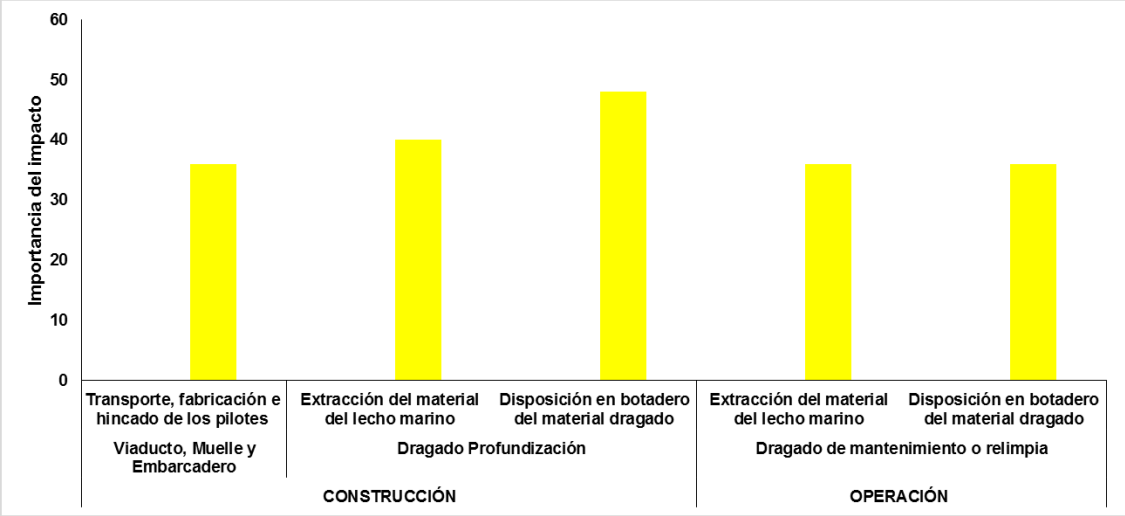


Figure No. 8.39 Environmental importance of the impact With Project for the resuspension and redistribution of sediments (Continental and offshore)
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

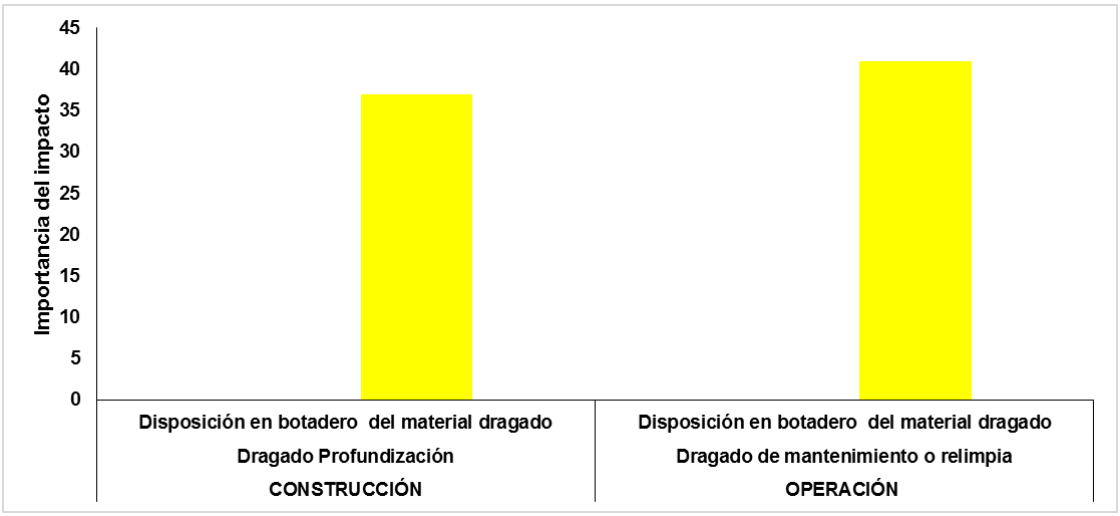


Figure No. 8.40 Environmental importance of the impact With Project for the change in the physicochemical characteristics of the offshore sediments
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

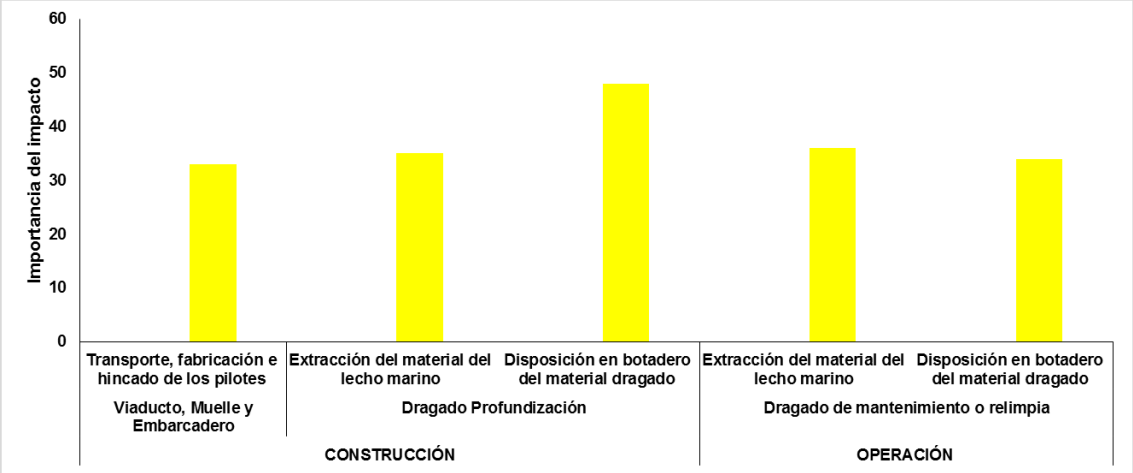


Figure No. 8.41 Environmental significance of the impact With the project due to changes in the physicochemical and microbiological characteristics of seawater
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration in continental morphology

The activities carried out for the construction of the terminal on the ground and the access road require landfilling activities in order to stabilize the intervention areas, due to the low geotechnical capacity that these areas present since they are loose soils that are not very compact, which implies a variation in the current topography of the soil.

Another factor during the construction of the bridge, is the generation of blockages in the channel, derived from the anchoring and construction of the pillars of the suspension bridge. Likewise, due to the same aspect of obstruction to the free circulation of the waters, alterations in coastal and oceanic drift currents of Bahía Colombia may occur, with possible imbalances in the processes of erosion and sedimentation, with the reduction of the depth in the area of the pier and viaduct.

Therefore, the impact of a negative nature with an environmental significance between irrelevant and moderate was assessed for the activities of the construction of the viaduct, pier and jetty, terminal on land and access road, as shown in Figure No. 8.42.

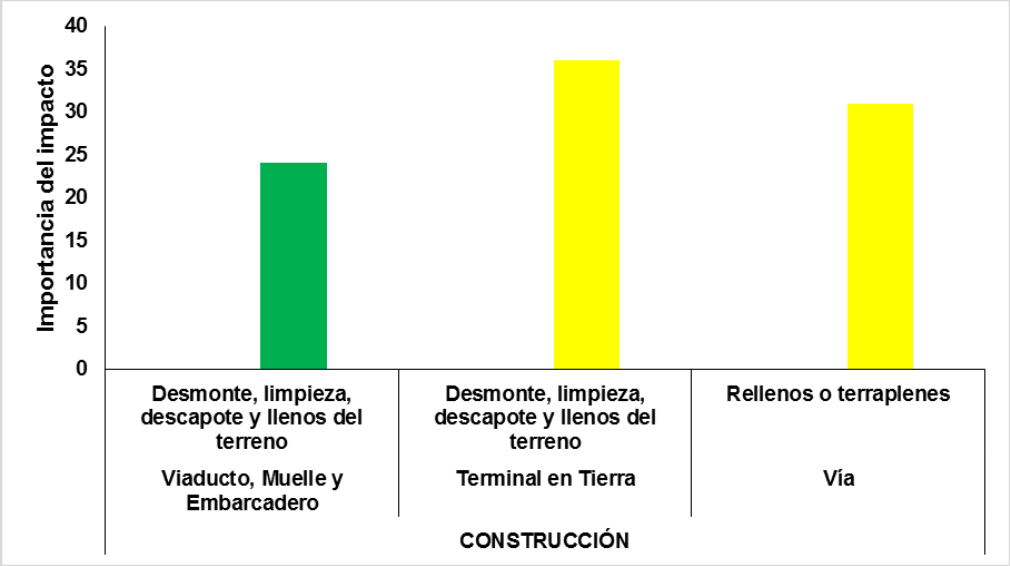


Figure No. 8.42 Environmental importance of the impact With Project for the alteration in the continental morphology
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of the landscape

In general, the results of the construction activities in offshore and onshore areas, cause the modification of the visual quality of the project area by the activities of clearing, cleaning, stripping, and filling of material, and the introduction of port infrastructure such as administrative and operational areas, the storage of solid bulk in silos, liquid storage tanks, parking yards, viaduct, bridge, and quay, among others, which will affect the visual quality and modify the landscape of the area of influence; however, the area is of port vocation according to the Turbo POT[7], therefore, the impact has been evaluated as compatible according to the zoning of land use.

However, the visual modification of the landscape and the deterioration of the visual quality of the margins of the León River due to the logging and constant traffic from Bahía Colombia to the León River, change the current forestry, livestock and agricultural conditions due to the port infrastructure in the project site.

[7] COLOMBIA. MUNICIPALITY OF TURBO. Land Management Plan: Integrated diagnostic book. Turbo: 2000. Book 2. Part 2. 90 p.

Therefore, the impact of a negative nature with moderate to severe environmental importance was assessed for the activities of the construction of the viaduct, pier and jetty, terminal on land and access road, as shown in Figure No. 8.43.

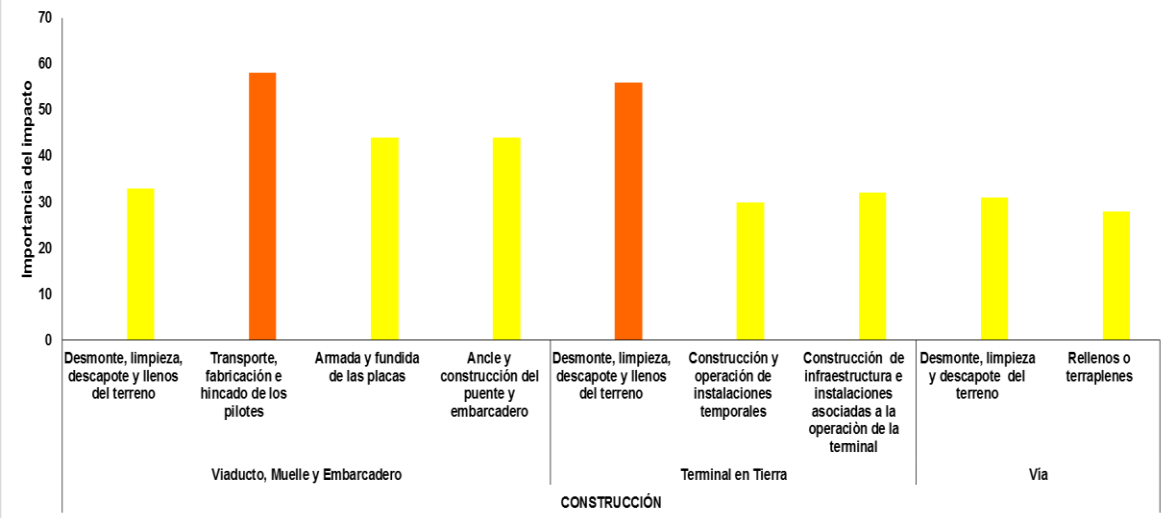


Figure No. 8.43 Environmental importance of the impact With Project for the alteration of the landscape
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Analysis of synergistic and cumulative impacts

For the abiotic environment, impacts on water and offshore sediments were considered as synergistic and cumulative, finding five (5) impacts of which two (2) are synergistic and three (3) cumulative as shown in Figure No 8.44, due to the characteristics that can change or increase due to the activities that the project will carry out in the construction and operation phases and the existing conditions in the study area produced either naturally or anthropically.

The synergic impacts identified were the changes in the physicochemical characteristics of the seawater and the resuspension and distribution of continental and offshore sediments, due to five (5) activities such as the driving of the piles, dredging, dredging and dredging maintenance and disposal of material dredged from maintenance, such activities by acting simultaneously generate several impacts that in turn are greater and generates an additional impact related to the increase in changes in the quality of seawater with high concentrations of suspended sediments.

Regarding the cumulative impacts identified in the evaluation, they may present a greater impact on the environment and its components during the different activities

of the project phases on a common resource, where the impacts that individually are minor but are transformed into significant in the course of time or distance. The cumulative impacts that can be generated are changes in the physicochemical characteristics of seawater, the resuspension and distribution of continental and offshore sediments and changes in the physicochemical characteristics of offshore sediments, due to five (5) activities related to driving of the piles, dredging and disposal of the dredged material, said activities carried out at the same time or with little time space can generate a greater impact on the quality of the sea water, additionally the dredged material disposal activity changes the characteristics of the sediments of the area of disposal and in turn may increase the impact on this component, which implies greater sediment accumulation over time during the construction and operation phase.

Currently, the maintenance dredging activity is carried out on the Nueva Colonia and León rivers, where said activity carried out at the same time as the project activities, may increase the impact in relation to the suspended sediments in Bahía Colombia. However, they are impacts that do not last long due to the natural influence of climatic conditions.

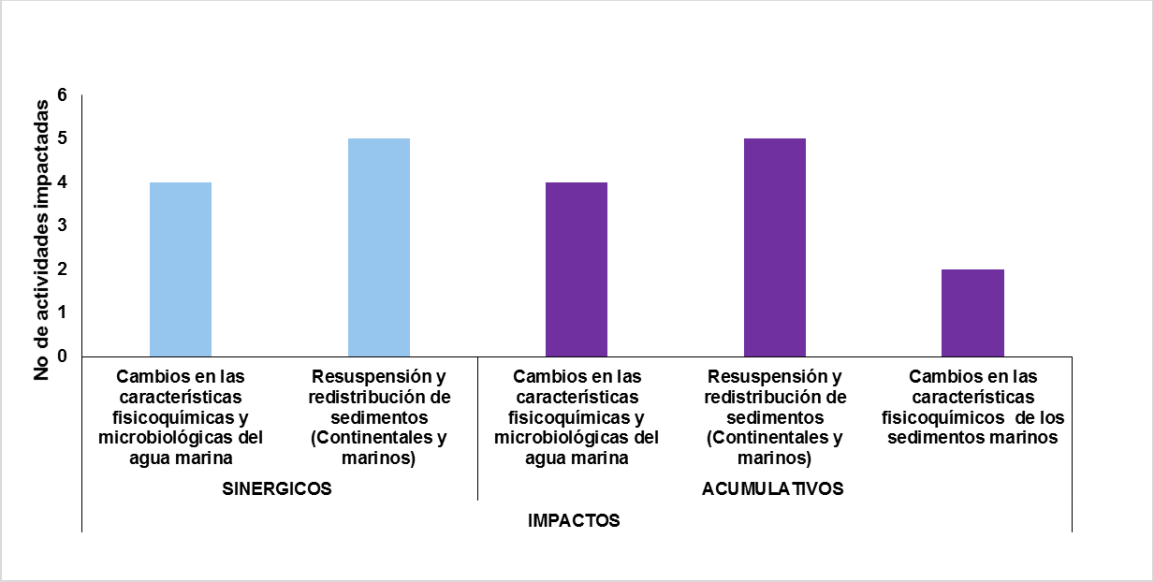


Figure No. 8.44 Synergistic and cumulative impacts for the abiotic environment With Project
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- *Biotic environment*

For the analysis of the different impacts vs the activities of the project, those impacts whose assessment is between moderate and critical will be considered. Additionally,

the irrelevant impacts for this medium are considered given their ecological importance and relevance because ecosystems and sensitive species appear in the area. The environmental importance of the impacts identified in relation to the project's activities is presented below.

- Alteration of onshore habitats

The definition of habitat over the years has had different approaches and conceptions. The most complete definition that encompasses the different points of view, states it as the space that meets the conditions and physical and biological characteristics necessary for the survival and reproduction of a species, being described by the features that define it ecologically and allows to see explicitly the spatial dimension, gathering the biotic and abiotic elements that make up the habitat[8] [9].

According to the above, any alteration that affects the characteristics of the habitat and the conditions that it gathers to establish a niche for the different communities, is a negative impact that for the project the activity of clearing, cleaning, stripping and full of Land, both in the viaduct and in the terminal on land and in the road, had an environmental importance between severe and moderate respectively (Figure No. 8.45), this environmental significance is due to the fact that with this activity the availability of habitat would be decimated (refuge, breeding, perch and feeding areas) for the identified floristic and faunal communities.

[8] TREFETHEN, J.B. Wildlife management and conservation. D.C. Heath & Co, Boston. 1964.
[9] STORCH, I. Linking a multiscale habitat concept to species conservation. En: BISSONETTE, J.A. E I. STORCH (eds.). Landscape ecology and resource management: linking theory with practice. Island Press, Washington, D.C., 2003. p. 303-320.

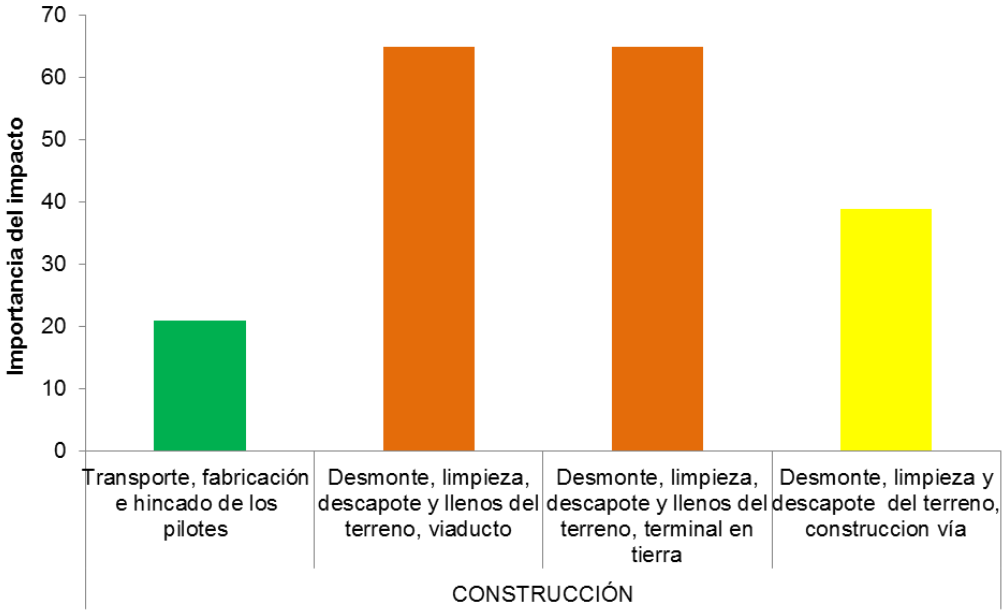


Figure No. 8.45 Environmental importance of the impact alteration of onshore habitats
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Alteration of continental aquatic habitats

The definition of habitat over the years has had different approaches and conceptions. The most complete definition that encompasses the different points of view, states it as the space that meets the conditions and physical and biological characteristics necessary for the survival and reproduction of a species, being described by the features that define it ecologically and allows to see explicitly the spatial dimension, gathering the biotic and abiotic elements that make up the habitat[10] [11]. Aquatic habitats due to their intrinsic characteristics are more susceptible to variations because they offer less diversity of refuges and present more constant temperatures. Additionally, pollutants are the first order of alteration in water quality, which affects the population and ecological dynamics in continental water bodies, in general they are polymers, hydrocarbons, surfactants, eutrophication, among others those that change the conditions in the aquatic content

[10] TREFETHEN, J.B. Wildlife management and conservation. D.C. Heath & Co, Boston. 1964.
[11] STORCH, I. Linking a multiscale habitat concept to species conservation. En: BISSONETTE, J.A. E I. STORCH (eds.). Landscape ecology and resource management: linking theory with practice. Island Press, Washington, D.C., 2003. p. 303-320.

at a physical and chemical level, these factors usually exceed the carrying capacity of the aquatic ecosystem and can finally overcome the period of stabilization of the waters by natural routes, leading to septic ecosystems and usually with very negative and costly recovery rates at a natural scale, temporary space. In many cases, if the system is left to rest, it can reach natural stabilization[12].

According to the above, any alteration that affects the characteristics of the aquatic habitat and the conditions that it gathers to establish a niche for the different communities, is a negative impact that for the project the activity of anchoring and construction of the bridge and wharf it had a moderate environmental importance (Figure No. 8.46), this environmental significance is due to the fact that this activity would affect the aquatic habitat (refuge, breeding and feeding areas) for the identified floristic and faunal communities. However, it is an impact whose moment is immediate with a recovery in the medium term once construction works stop.

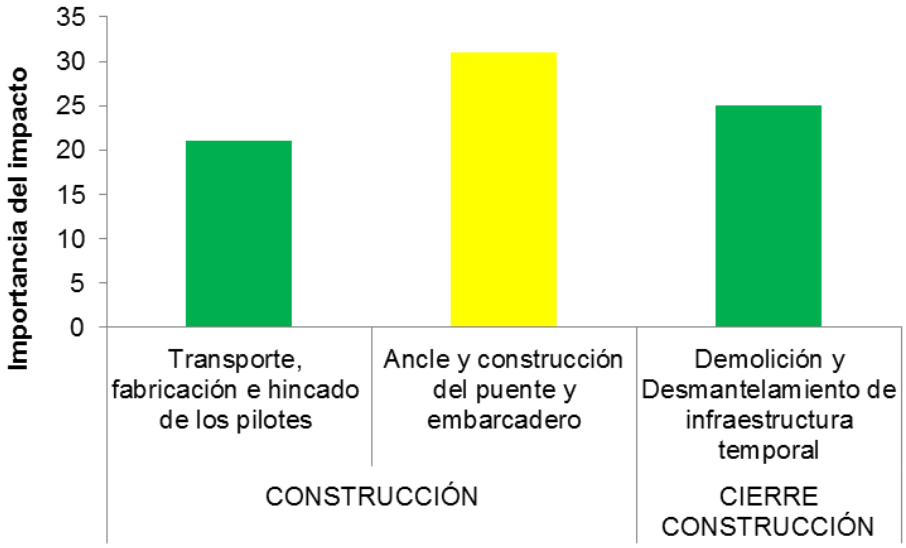


Figure No. 8.46 Environmental importance of the impact alteration of continental aquatic habitats

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

[12] MARGALEF, Ramón. Ecology. Ed. 8. Omega. 1998. 968 p. ISBN 978-84-282-0405-7

- Alteration of offshore aquatic habitats

The definition of habitat over the years has had different approaches and conceptions. The most complete definition that encompasses the different points of view, states it as the space that meets the conditions and physical and biological characteristics necessary for the survival and reproduction of a species, being described by the features that define it ecologically and allows to see explicitly the spatial dimension, gathering the biotic and abiotic elements that make up the habitat[13] [14]. Aquatic habitats due to their intrinsic characteristics are more susceptible to variations because they offer less diversity of shelters and have more constant temperatures, on the other hand the tropical offshore ecosystem is considered very productive with a high diversity of species characterizing the pelagic, benthic species and sessile.

According to the above, any alteration that affects the characteristics of the aquatic habitat and the conditions that it meets to establish a niche for the different communities, is a negative impact that for the project the activities: transport, manufacture and driving of piles, cutting and extraction of the material from the seabed, disposal of the dredged material in the dump, had an environmental importance between severe and moderate (Figure No. 8.47). The activity that generates the most important impact has to do with dredging in the construction phase, since this activity would be losing bottom substrate that may be used by in fauna species as areas of refuge, reproduction and feeding.

[13] TREFETHEN, J.B. Wildlife management and conservation. D.C. Heath & Co, Boston. 1964.
[14] STORCH, I. Linking a multiscale habitat concept to species conservation. En: BISSONETTE, J.A. E I. STORCH (eds.). Landscape ecology and resource management: linking theory with practice. Island Press, Washington, D.C., 2003. p. 303-320.

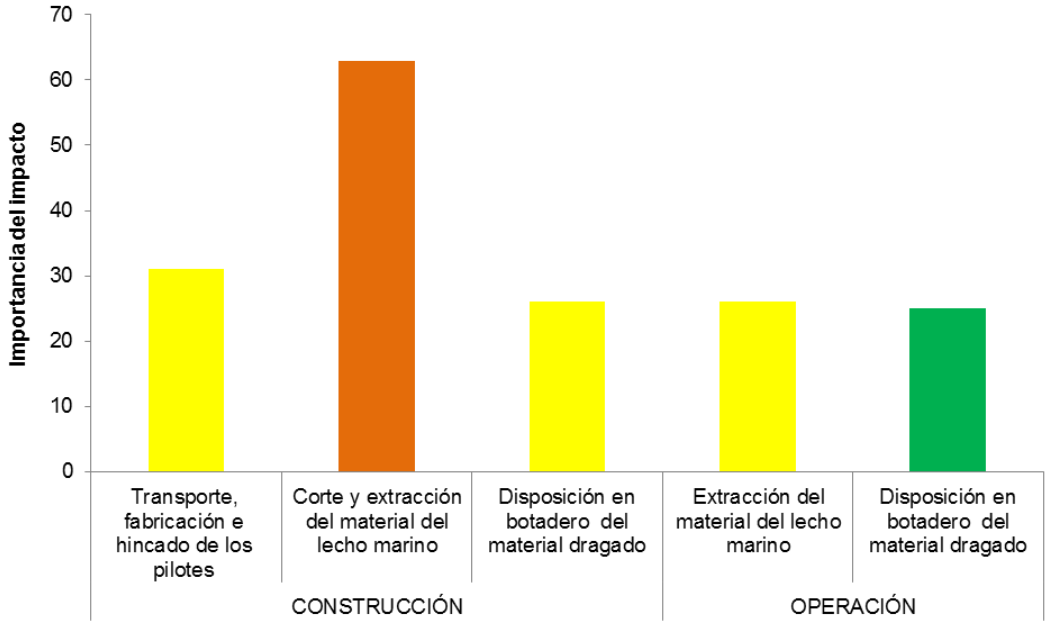


Figure No. 8.47 Environmental importance of the impact alteration of offshore aquatic habitats

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Formation of new habitats

The piles, can be considered as a temporary habitat, becoming surfaces that provide shelter and a fixed substrate for the maintenance of sessile communities such as barnacles, hydrozoan limpets and other organisms that use these structures to colonize them, once the ecological succession occurs, can become a habitat for various organisms. The impact is considered positive with an environmental importance classified as not important.

- Variation of plant cover

Plant cover in biotic terms defines ecological scales and transitions between ecosystems, in general, the coverage is an integral system product of the interaction of biotic and abiotic components as the ecosystem is delimited, and in general to the scale on which the ecosystems are developed. Studies, in relative terms, is the spatio-temporal association of plant biological components inherent in the area, which make up structural and functional units. Plant covers provide much environmental goods and services such as protecting the soil, improving its quality

(fertility, erosion, structure and pests), forest cover provides shelter to seedlings in development stages and finally provide different habitats for animal species[15].

For the project, the impact on the vegetation cover of the clearing, clearing, and land filling activity both on the viaduct and on the ground terminal and the road, presented moderate to severe environmental importance (Figure No. 8.48).). This environmental significance is due to the fact that with this activity there is vegetation loss, since space is required for the constructive activities of the project. On the other hand, in the closing phase under construction, a positive impact is identified related to the urban planning and landscaping works that involve the planting of live fences and different ornamental and fast growing species that allow a landscape improvement inside the port facilities. on land, being potential attractors of different faunal species.

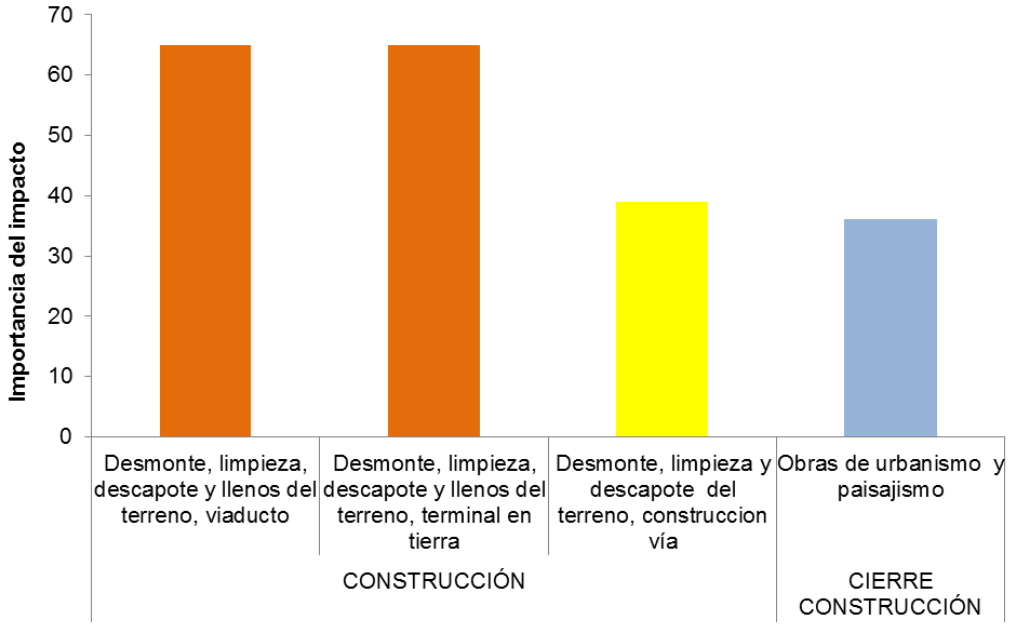


Figure No. 8.48 Environmental importance of the impact variation of the plant cover
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

[15] TERRADAS, JAUME. Ecology of vegetation. Omega, 2001. 760 p. ISBN 978-84-282-1288-5.

- Change in the dynamics of wildlife communities

A faunal community can be defined within the geographic range of distribution of one or several species where they all coexist, this being the spatial reflection of the ecological niche, whereby a community develops in geographic ranges with spatial overlapping of niches, finding the species where the Ecological conditions are favorable or appropriate (availability of resources). However, the environmental and geographical definition for the distributions presents ambiguities, fundamentally when the niche covers zones of variable size that have presented degradation or affectation (natural or anthropic), which can be called fragmented or mosaic habitat.

In general, communities and populations exhibit a characteristic behavior, which fluctuates in time and space, be it by distribution, competition, birth and mortality, determining factors for the success of the species, generally when the habitat is intervened, since usually there are no measures that allow 100% recovery of lost natural conditions, only heterogeneous homologies can be established based on allowable ecological ranges, hence only a percentage of the ecological quality can be recovered and finally of the goods offered[16].

For the project, the impact on the dynamics of the faunal communities of the activity of clearing, cleaning, stripping and land fill in both the viaduct and the terminal on land and the road, presented an environmental importance between moderate and severe (Figure No. 8.49). This environmental significance is due to the fact that this activity affects the niches occupied by the faunal communities, generating habitat fragmentation and deterioration, causing the areas to lose important quality properties for the healthy establishment of wildlife communities.

[16] McNAUGHTON, S. J. WOLF, L. L. General ecology. OMEGA, 1984. 724 p. ISBN 978-84-282-0730-0.

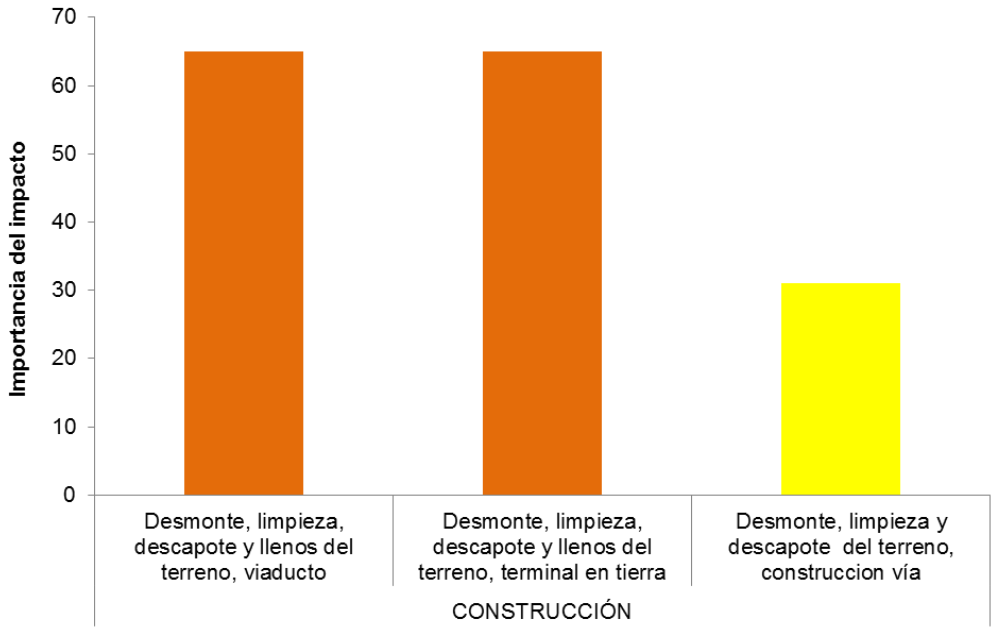


Figure No. 8.49 Environmental importance of the impact change in the dynamics of wildlife communities

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Modification in the structure (distribution, abundance and composition) of the macroinvertebrate communities and in the continental fish communities

The impacts related to the activities to be carried out in the continental aquatic environment that may affect the present communities of macroinvertebrates and fish in the León River, were considered as negative but irrelevant (Figure No. 8.50 and Figure No. 8.51), since they are activities very specific times are defined and that, in addition, according to the characterization, there are few representatives of these communities in the sampled section of the León River.

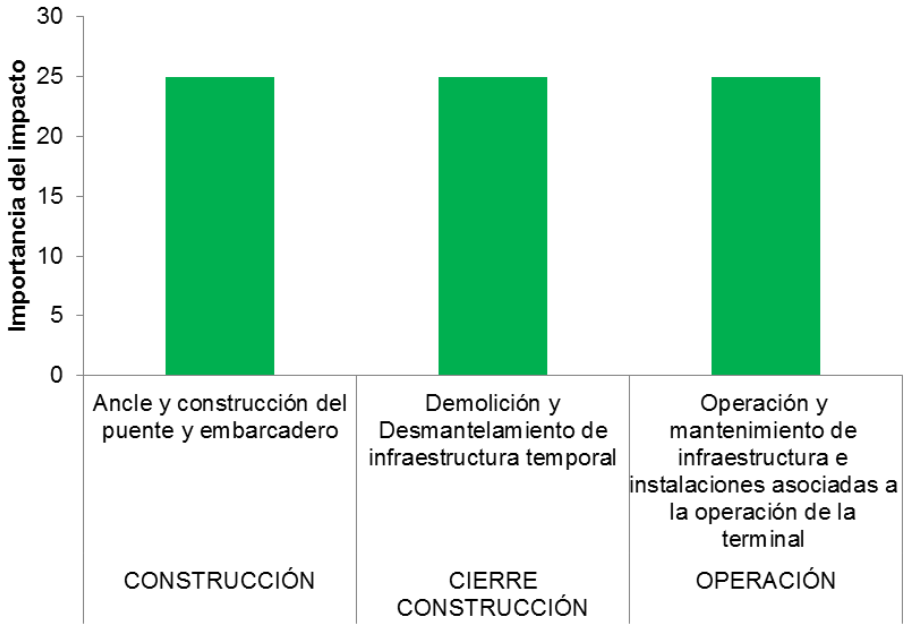


Figure No. 8.50 Environmental importance of the impact modification in the structure (distribution, abundance and composition) of the macroinvertebrate communities

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

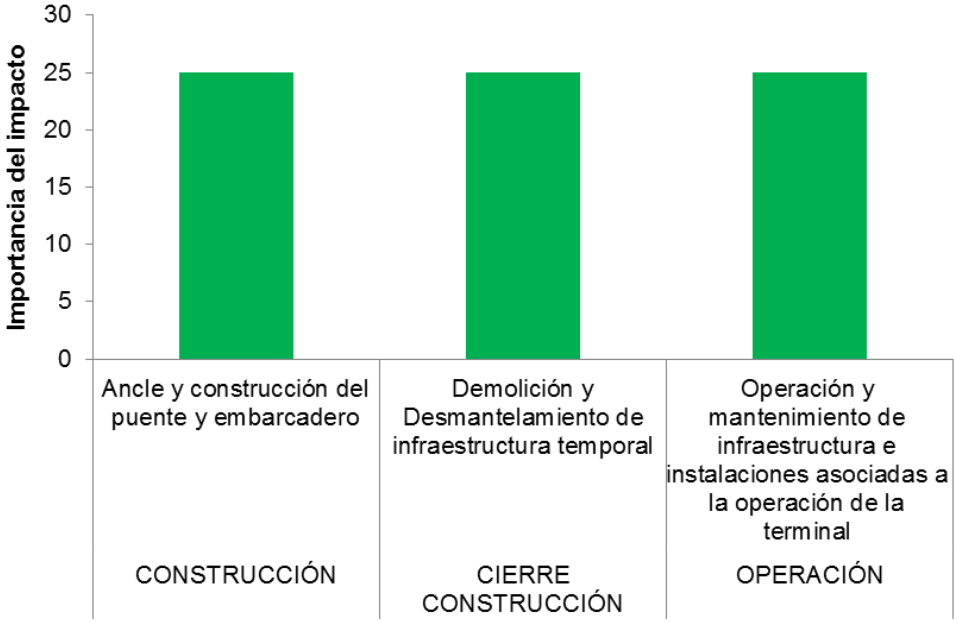


Figure No. 8.51 Environmental importance of the impact modification in the structure (distribution, abundance and composition) of the continental fish communities

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Modification in the structure (distribution, abundance and composition) of the periphytic communities

Periphyton is one of the most important communities present in aquatic systems, it is mainly constituted by microalgae that develop on solid submerged surfaces such as rocks, sediment, plant material, sands, leaves and aerophytes[17]. The main factors that control the dynamics of the periphytic algae are light, the chemical composition of water, herbivores, temperature, speed of the current and type of substrate; As all these factors interact with each other, it is difficult to say which is the factor that limits the growth of algae[18]. Periphytic algae develop best on substrates that offer stability and where the action of currents is minimal.

In this sense, in the activity of demolition and dismantling of temporary infrastructure during the closure of the construction phase, it can generate disturbances on the banks of the Leon River, modifying the availability of substrates for the periphery community, causing changes in this while the activity lasts. Therefore, it is considered that this activity could generate a negative impact with a moderate environmental importance (Figure No. 8.52).

[17] WETZEL, R. G. Opening remarks. En: Periphyton of freshwater ecosystems. 1982. p. 3-4.

[18] ALLAN, J. David. Stream ecology: structure and function of running waters. Illustrated, reprint., Chapman & Hall. 1995. 388 p. ISBN 0412355302

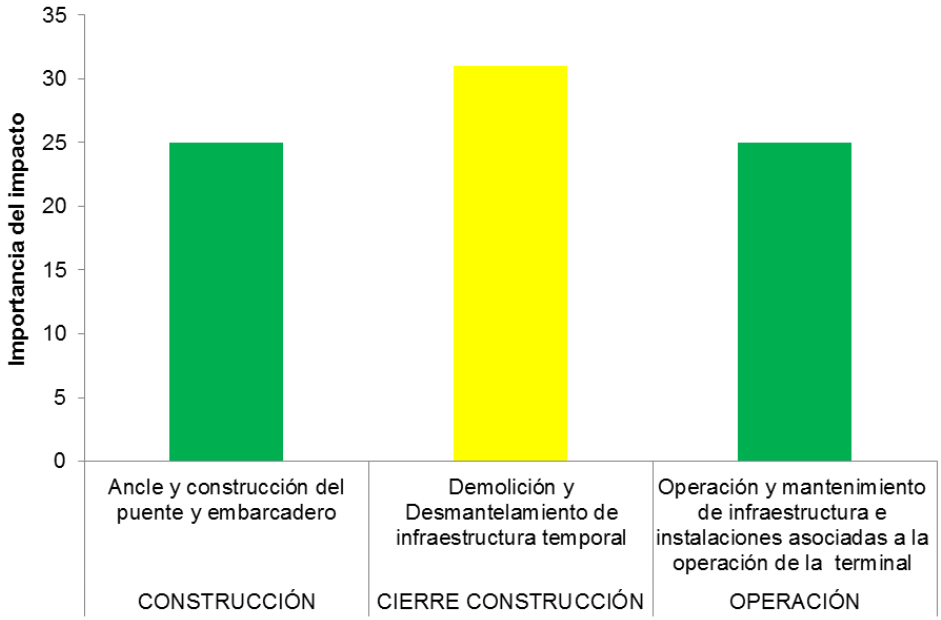


Figure No. 8.52 Environmental importance of the impact modification in the structure (distribution, abundance and composition) of the periphytic communities
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Modification in the structure (distribution, abundance and composition) of offshore planktonic communities

Offshore phytoplankton is of special interest due to its importance within the trophic network, since it brings together the largest portion of primary producers in the ocean, so that the impacts it supports, as a result of physical or biological variations in the environment, have an impact on the rest of the communities that depend on him. Phytoplankton depends mainly on the supply of light, inorganic nutrients and temperature, since it is responsible for collecting and transforming solar energy into chemical energy and therefore become a primary source of food expressed in organic matter to subsequently be the maintenance of trophic networks. Zooplankton acting as a transporter of energy from the primary level to higher levels makes it a

very important community in the offshore environment, so any impact on it generates an imbalance in other communities[19].

Taking into account the activities of the project, the disposal of dredged material in the construction phase and the extraction of seabed material in the operational phase were identified as negative activities that moderately impact the offshore planktonic communities (Figure No. 8.53), due to the possible dispersion of sediment on the water column in a timely and temporary manner.

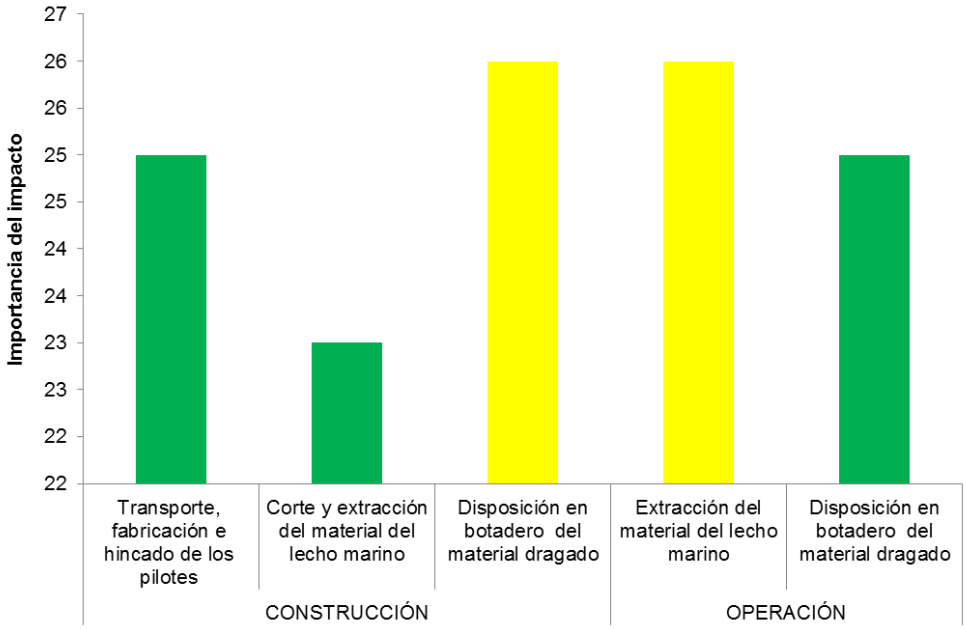


Figure No. 8.53 Environmental importance of the impact modification in the structure (distribution, abundance and composition) of offshore planktonic communities
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

[19] VANEGAS, T. Wealth of orders and dynamics of marine mesozooplankton in coastal environments of the Gulf of Salamanca and Tayrona Park, Colombian Caribbean. Thesis to apply for the title of Marine Biologist. Santa Marta .: Jorge Tadeo Lozano University. 2002. 109 p.

- Modification in the structure (distribution, abundance and composition) of offshore benthic communities

The offshore benthic organisms are of great importance, since they constitute one of the most diverse offshore communities and likewise promote the establishment and growth of new species; likewise they are considered as bioindicators of the environment[20].

The activities of transport, manufacture and driving of piles, as well as cutting and extraction of the material from the seabed, disposing of the dredged material in the constructive and operational phase in a dump, could generate a negative impact with an environmental importance between moderate and severe (Figure No. 8.54). This is due to the fact that seabed substratum that houses organisms of the in fauna community associated with the benthos is lost, generating changes in the structure of this community.

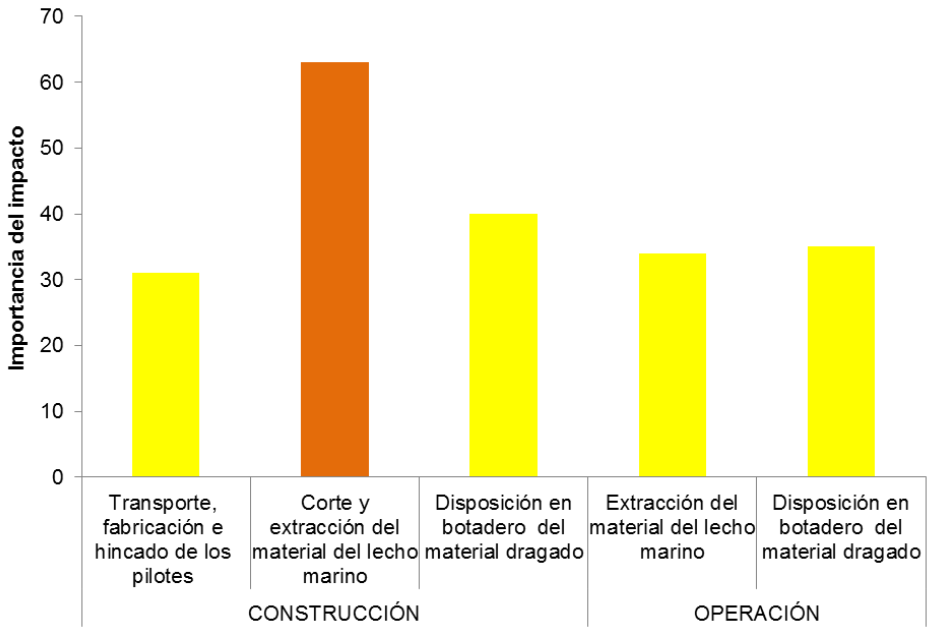


Figure No. 8.54 Environmental importance of the impact modification in the structure (distribution, abundance and composition) of the offshore benthic communities

[20] CIFUENTES, J., TORRES-GARCIA, P. and FRIAS, M. The Ocean and its resources. Chap. IV: The sciences of the sea: Biological Oceanography, Cap. V: Plankton, Cap. VI: Bentos and Necton. 2nd edition. Editorial Science for all. 1997

Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Modification in the structure (distribution, abundance and composition) of the offshore fish communities

The identified activities that may cause some variation in the fish community are related to the dump disposal of the dredged material in the construction phase and the extraction of the material from the seabed in the operational phase, presenting a negative character and an importance on the fish communities with moderate environmental importance (Figure No. 8.55). This impact is related to possible disturbances caused by resuspension and noise levels that can temporarily scare away the groupings of fish in the area.

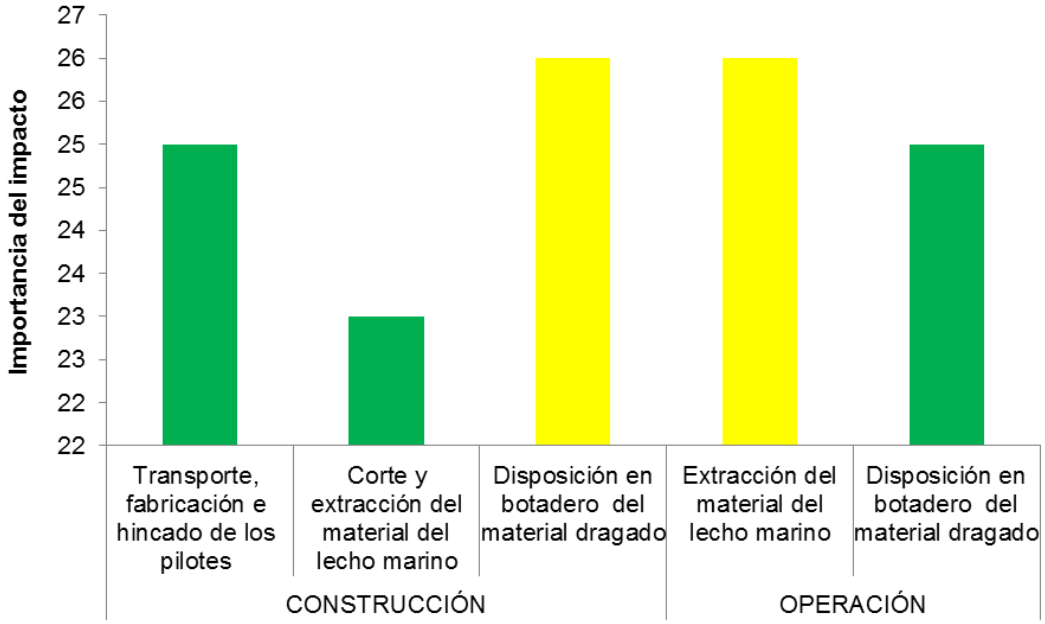


Figure No. 8.55 Environmental importance of the impact modification of the structure (distribution, abundance and composition) of marine fish communities
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- Analysis of synergistic and cumulative impacts

In Figure No. 8.56, the impacts that due to their characteristics were considered synergistic and cumulative are identified, finding seven (7) synergistic impacts and

two (2) cumulative impacts. Within the synergistic impacts the modification in the structure (distribution, abundance and composition) of the offshore planktonic communities, the modification in the structure (distribution, abundance and composition) of the offshore benthic communities and the modification in the structure (distribution, abundance and composition) of the offshore fish communities, were synergistic with five (5) activities, since they reinforce and act on the same component; These activities are related to pile driving and dredging to deepen the construction phase and maintenance dredging in the operational phase. The other impacts were synergistic with three (3) activities related to the activities for the construction of the terminal on land and in the offshore environment with the dredging activities.

Regarding cumulative impacts, only two (2) were identified, present in an activity, related to the dredging activity and the positive impact on the urban planning and landscaping works respectively (Figure No. 8.56).

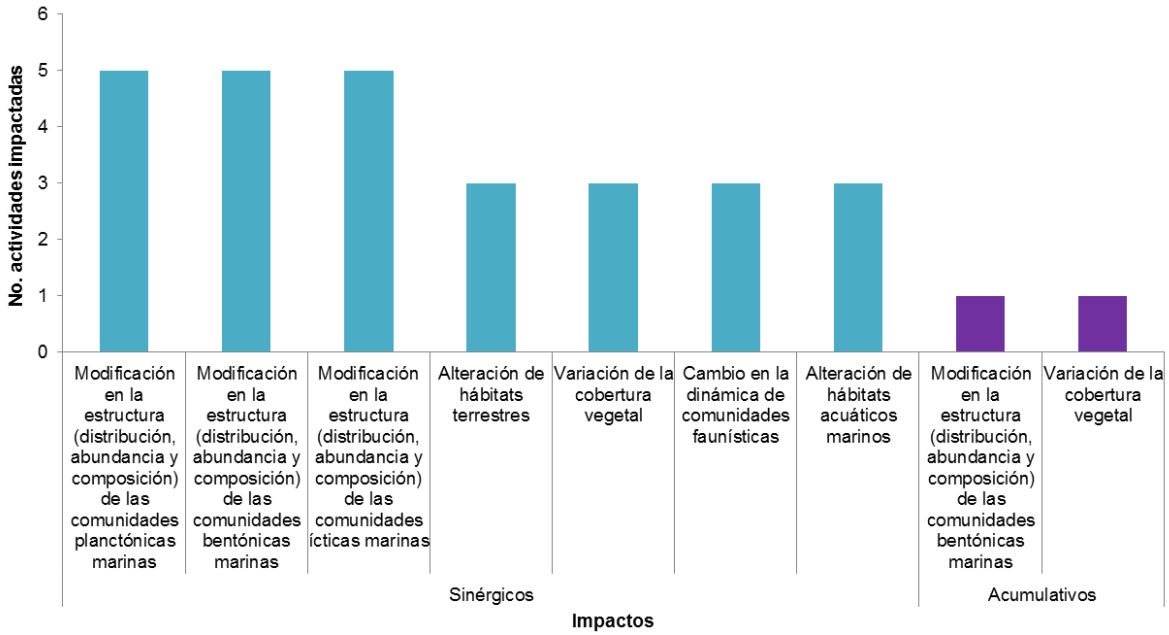


Figure No. 8.56 Synergistic and cumulative impacts identified in the biotic environment
Source: Aqua & Terra Consultores Asociados S.A.S., 2015

- *Socioeconomic environment*

Based on the importance ratings of the impacts identified for the main activities that will be carried out in the study area in the with project scenario, an analysis of the results of the most relevant impacts is presented below.

– Alteration of cultural patterns

The alteration of cultural patterns is an impact that was identified for the previous activity of contracting labor because it is possible that inhabitants of the area, abandon their traditional economic activities, to access the job offer generated by the work. Additionally, the arrival of foreign personnel contributes to the loss of cultural features due to behavior different from the inhabitants of the area that could lead to changes in the lifestyle and weakening of some customs of the native population.

In the construction and operation stage, the installation and commissioning of hard works is planned, both on land and in the maritime area, which will generate a different economic dynamic in addition to the visual impact of the new works that will modify the landscape.

In the same way, the present impact was valued during the activities of installation of the conveyor belt, transport, manufacture and driving of piles for the visual impact generated to a greater extent to the population that carries out fishing activities considered as traditional result of a historical relationship of communities with the natural environment, which in turn determines particular ways of thinking and acting of a specific community. The presence of the new port infrastructure will generate a change in the fishermen's relationship with the environment. For the conditions mentioned above, the present impact assessing as of a moderate negative nature.

In the closing stage, this impact was assessed as not important in a positive way, due to the development of urban planning and landscaping works that aim to recover the natural environment in the area (see Figure No. 8.57).

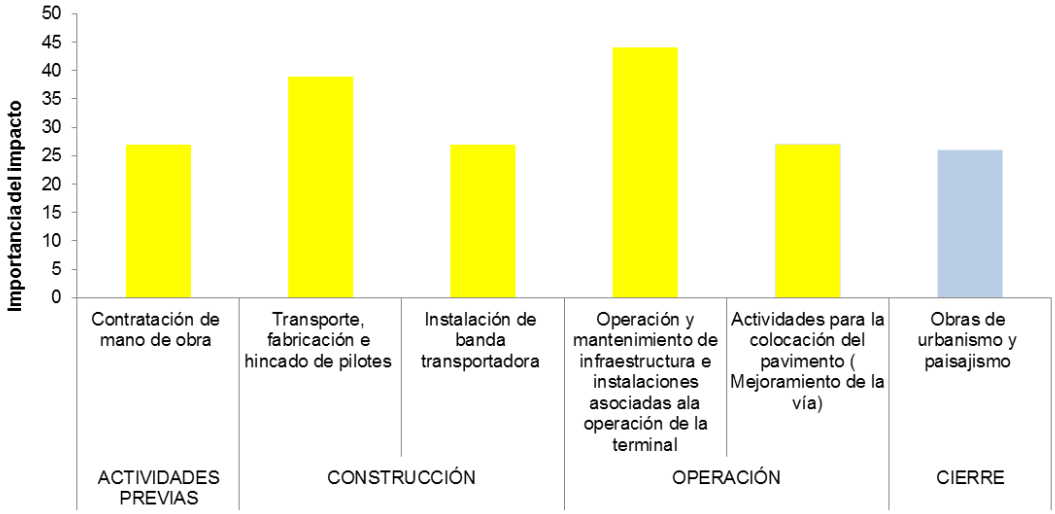


Figure No. 8.57 Environmental importance of the impact Alteration of cultural patterns
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Intervention of archaeological, historical and architectural heritage

Due to the identification in the area of swampy soils or prolonged flooding (according to the classification of soils of the IGAC), it is not feasible to find archaeological remains of pre-Hispanic communities in the area of interest.

Additionally, because the project area is a recently emerged zone derived from sedimentation processes triggered by the high sediment load of the León River and the disposal of dredged material from the León River and the Nueva Colonia canal; and considered by the DIMAR as a low interest area for shipwrecked species, the present impact was assessed as of a negative nature of irrelevant importance for the activities described in Figure No. 8.58.

The community described this impact as irrelevant or of low impact, considering that it has never been heard about archaeological precedents in the area.

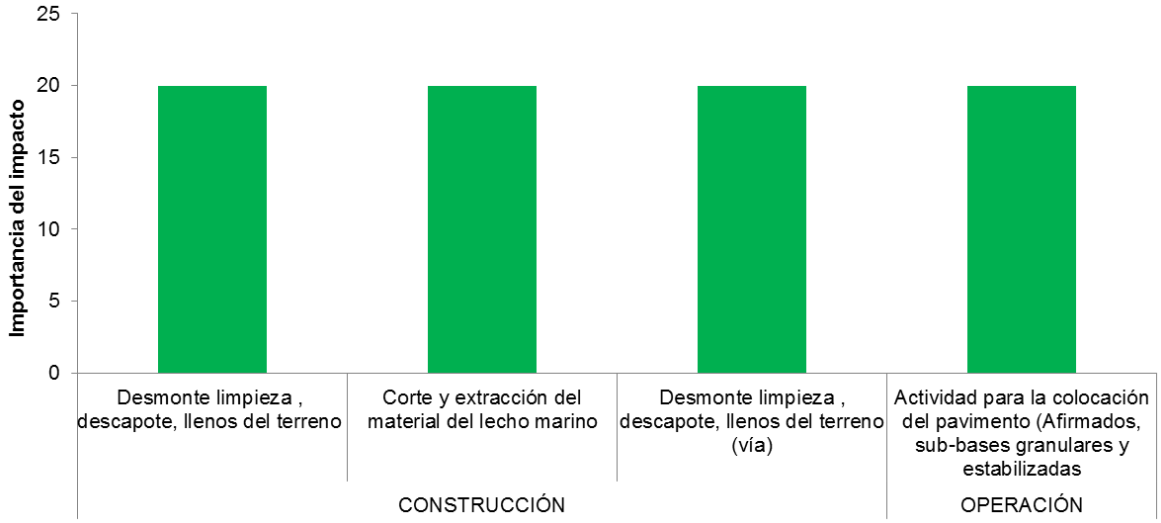


Figure No. 8.58 Environmental importance of the impact Intervention of the archaeological, historical and architectural heritage
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

– Currency generation

This impact is materialized in the operation stage of the port, given that the reason for this is to allow the change of means of transport of cargo, both incoming and outgoing, from a land environment, such as a truck, to an aquatic one, as it would be a container ship generating payments for freight, tariffs and other taxes associated with the transport of cargo to and from the country.

The scope of this impact is very broad and was assessed as positive of an important character for each of the activities valued, since by the effects of the 1st law of 1991, in its seventh article, an amount is established that will be imposed on the port concession, for concept of consideration that must be distributed in a proportion of 80% and 20% for the nation and for the municipality or district where the port concession is located, respectively.

The workshop was attended and attended by representatives of the local and municipal administration, who were very satisfied with the construction of the Port qualifying as positive for both the municipality and the region in general, the generation of foreign currency, arguing that the new currencies obtained from the port activities will allow a greater development (Figure No. 8.59).

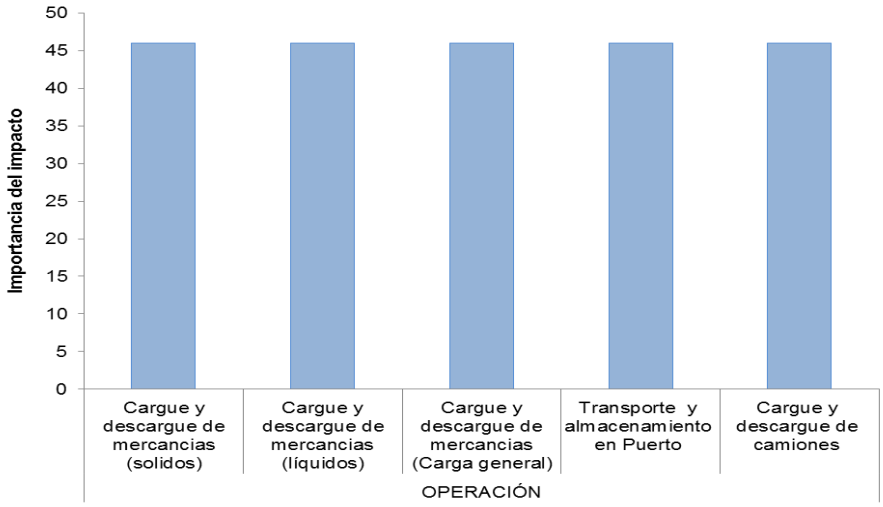


Figure No. 8.59 Environmental importance of the impact Generation of foreign currency
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Modification of the income level of the population

The most predominant activities in the area are associated with crafts related to artisanal fishing and the work generated by banana activity in specific times. These activities are the main means of subsistence for the population. During the development of the project, it is expected that part of the population will have access to stable jobs with fixed salaries that will increase income and thus generate greater access to the population.

This impact was assessed as positive, coinciding with the rating granted by the community, due to the execution of previous activities, construction and operation of the project. It is expected that the demand for labor and services for the economically active population will generate constant income in the population, improving the standard of living.

The economy is not only limited to hiring labor or services generated by the project, but also the indirect jobs that arise from there, such as: Increase in food services, lodging, pharmacies, transportation and general trade, which will be reflected in the increase in the income of the community.

The impact was rated as important, especially during the activities prior to the development of the work, such as contracting of labor and contracting of services. The construction phase will require, to a greater extent, unskilled labor for the

construction of the infrastructure associated with the work. As well as the direct and indirect services that the development of the same will require.

For the operation stage, although the impact is classified as positive, a decrease in the demand for unskilled labor is expected, demanding new profiles for the provision of jobs in the operation of the port (Figure No. 8.60).

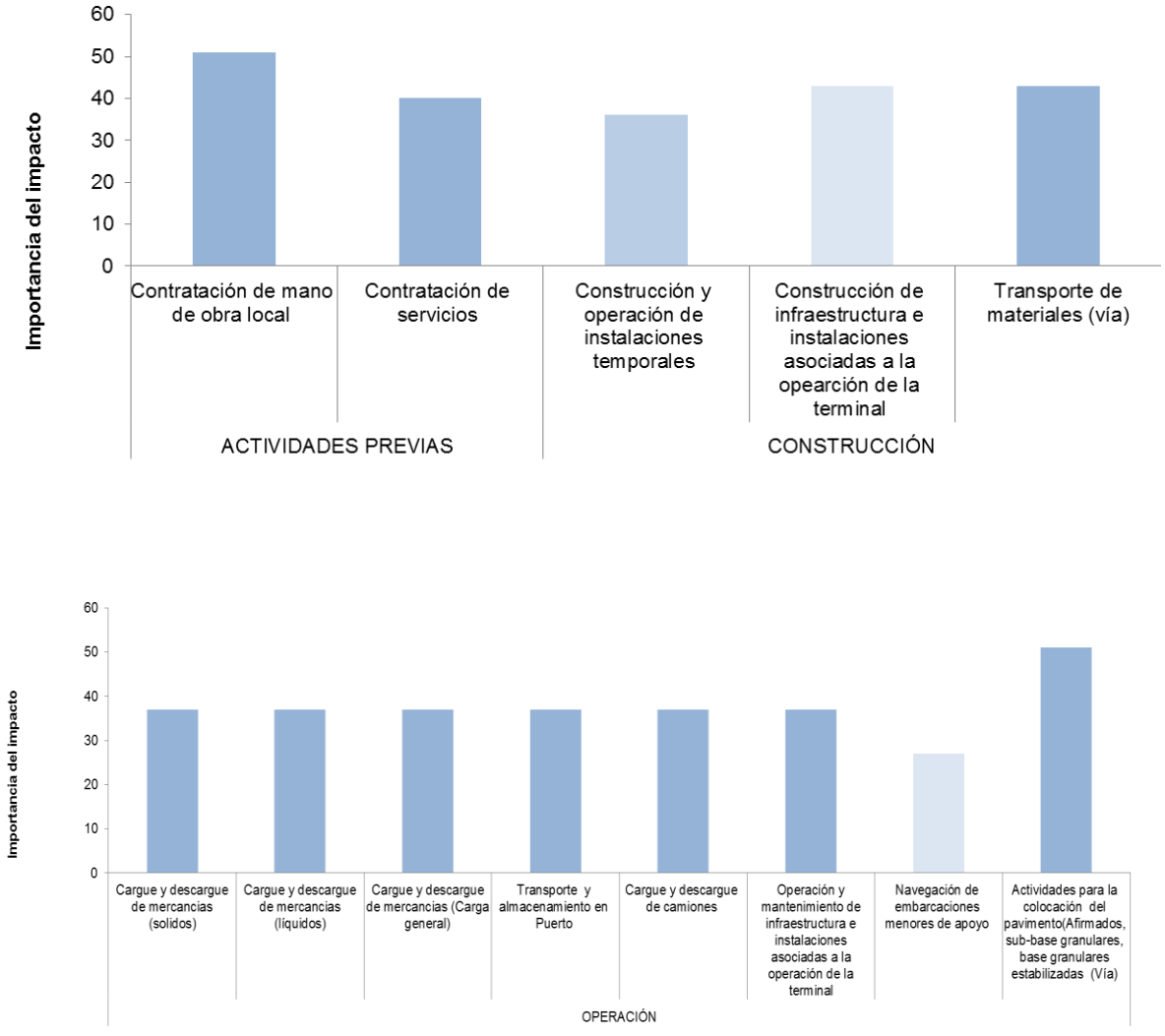


Figure No. 8.60 Environmental importance of the impact Modification of the income level of the population

Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Variation of the budget of the region

This impact was valued as an important positive due to the income that is expected to be received due to the increase in the labor supply that will generate an increase in spending and therefore in the collection of taxes, boosting the economy of the region.

In the same way, the demand of commercial establishments of different nature for the provision of services and the commercial operation developed by the port operation, will generate a greater collection of taxes by industry and commerce as well as the considerations for the port concession in the stage of operation

In addition, the improvement of the quality of life of surrounding municipalities is expected as a side effect (Figure No. 8.61).

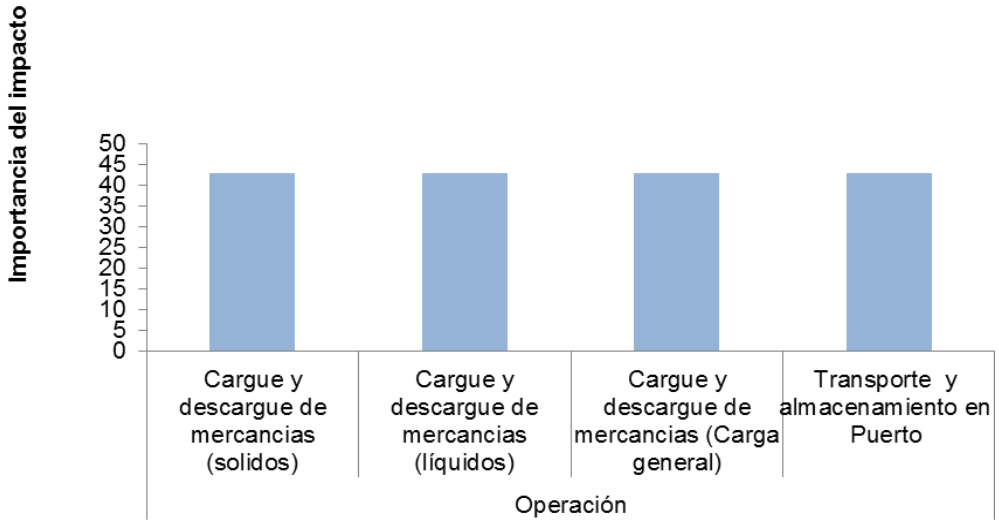


Figure No. 8.61. Environmental importance of the impact Variation of the budget of the region

Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

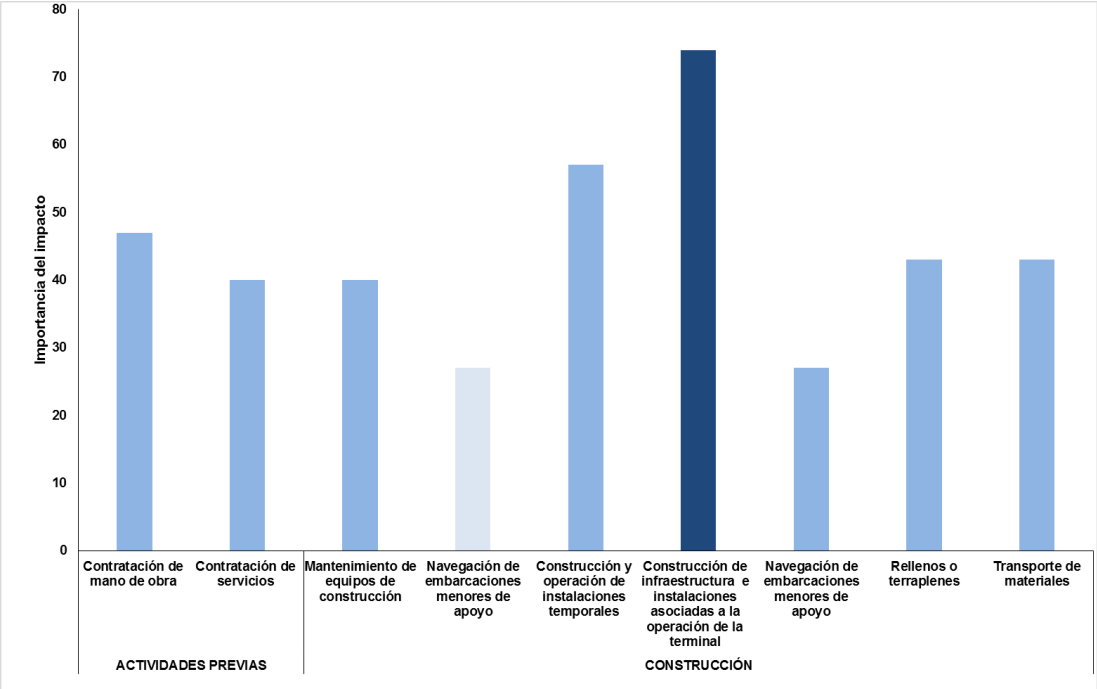
- Change in labor supply

Because it is a beneficial impact that will be developed in a large area, where the duration of the impact will be for the duration of the construction of the project and

this can be extended to the operational stage of the project, and where the conditions of improvement will be improved life and the income of the families of the hired personnel, without harming the productive activities that are currently taking place in the area, is considered within the environmental range as an activity of a significant positive nature and very important in the construction stage of the port facilities and in the operation stage.

In the operation phase of the port, the demand for labor profiles related to unskilled labor will be reduced.

Although this impact is considered to be positive in nature for the different stages, a secondary impact that can occur is the discouragement to the existing sources of work and migration of the labor force and, therefore, change in the economic and traditional activities carried out (Figure No. 8.62).



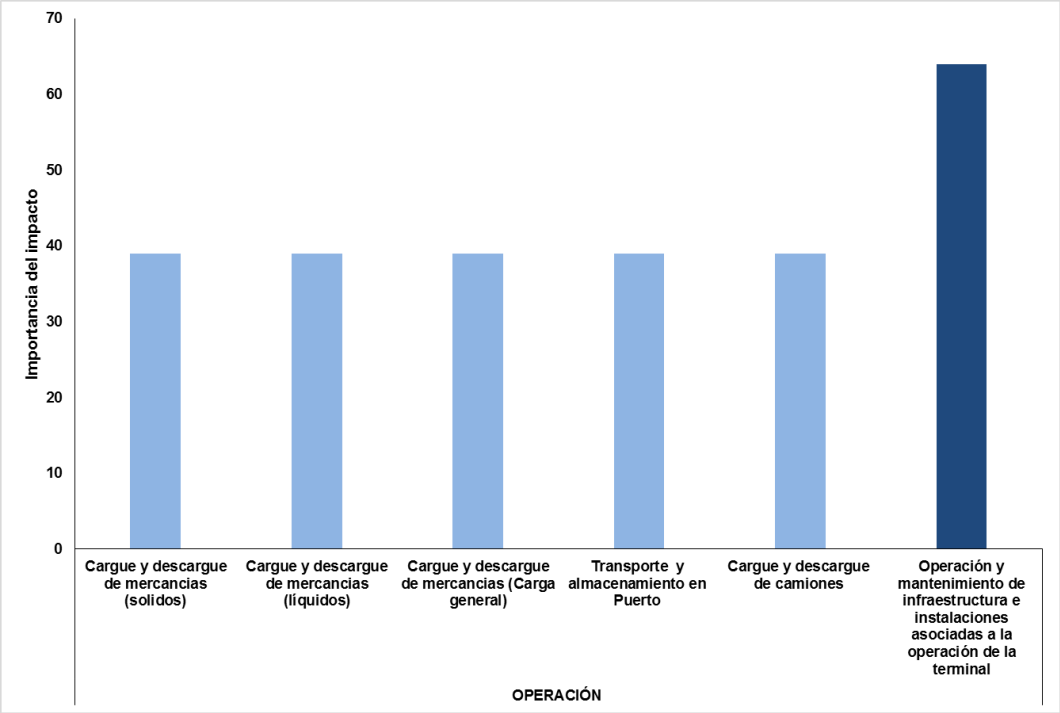


Figure No. 8.62 Change in labor supply
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

– Alteration of the value of the property

This impact was assessed as an important positive, due to the development of infrastructure, improvement in access roads, as well as future housing and industrial developments in the area, which will bring an increase in the value of the property. Additionally, the adequacy of the offer of services will contribute so that this value continues to increase over time.

However, a secondary effect that this positive impact will bring, is the pressure exerted on people who, without owning land, live in the area, due to the increase in the cost of living associated with the value of the property, both for purchase and for rent, making it difficult for these people to maintain their life status in the area (Figure No. 8.63).

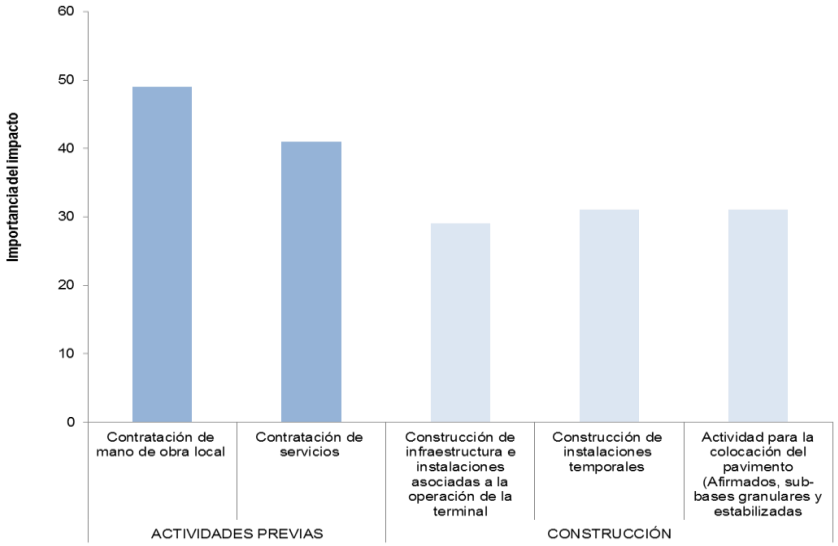


Figure No. 8.63. Environmental importance of the impact Alteration of the value of the property

Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Modification of productive activities

The main socioeconomic activity in the region is agricultural, with a general tendency to large estate, mainly banana cultivation, which contains a large logistic and port component widely developed in the area where the construction of the terminal is planned. Currently, unemployment levels are high in the area, because the jobs that are generated for salaried workers and day laborers depend on the period of banana production, the main source of employment in the area.

With the development of the project, in each of its stages, it is expected that the economically active population of the area will access the labor supply required for both skilled and unskilled labor, diversifying labor options.

This situation can generate, the temporary abandonment of economic and productive activities developed traditionally with it are agriculture, livestock and fisheries mainly.

Although this impact was classified as positive in nature, for the operation stage, it is expected that there will be a decrease in the supply of unskilled labor, resulting in personnel cuts due to the change of profiles required for the stage of work. operation (Figure No. 8.64 and Figure No. 8.65).

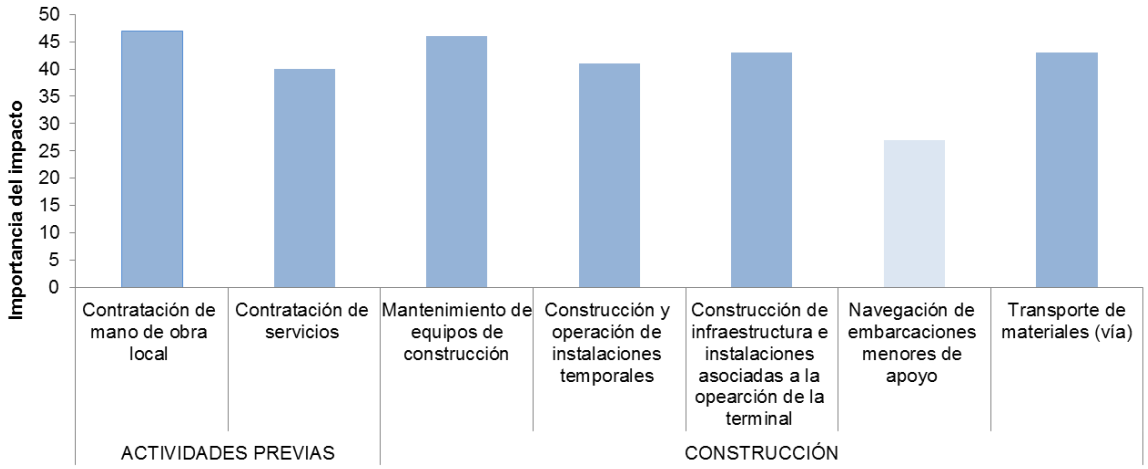


Figure No. 8.64 Environmental importance of the impact Modification of productive activities
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

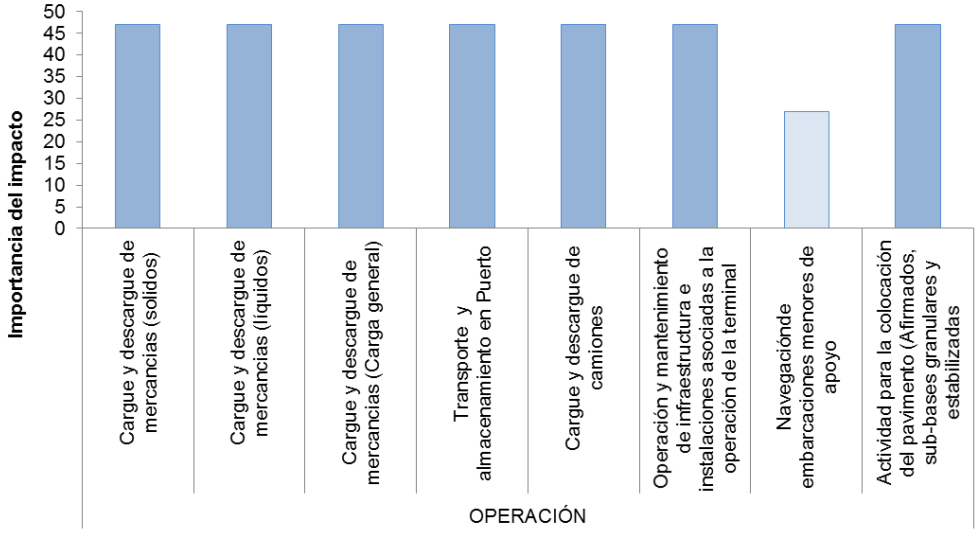


Figure No. 8.65 Environmental importance of the impact Modification of productive activities
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Variation in the number of inhabitants

This impact was assessed as of a moderate negative nature for the previous stages of the project, due to the arrival of foreign personnel with the expectation of accessing the different labor profiles required for the construction of the port project.

The presence of foreign personnel in the region can generate pressure on the population living in the area and trigger conflicts over access to public services as a result of over-demand of these, as well as conflicts related to access to housing services. The arrival of this floating population will require greater coverage of both public and social services in the area.

It is interesting to note that the results obtained in the impact evaluation workshop, the participants said that the arrival of new foreigners is not a new phenomenon, because they consider that both Nueva Colonia and El Canal are pluricultural communities, finding families of different regions of the country and those that have a good coexistence and acceptance by the natives of the place (Figure No. 8.66).

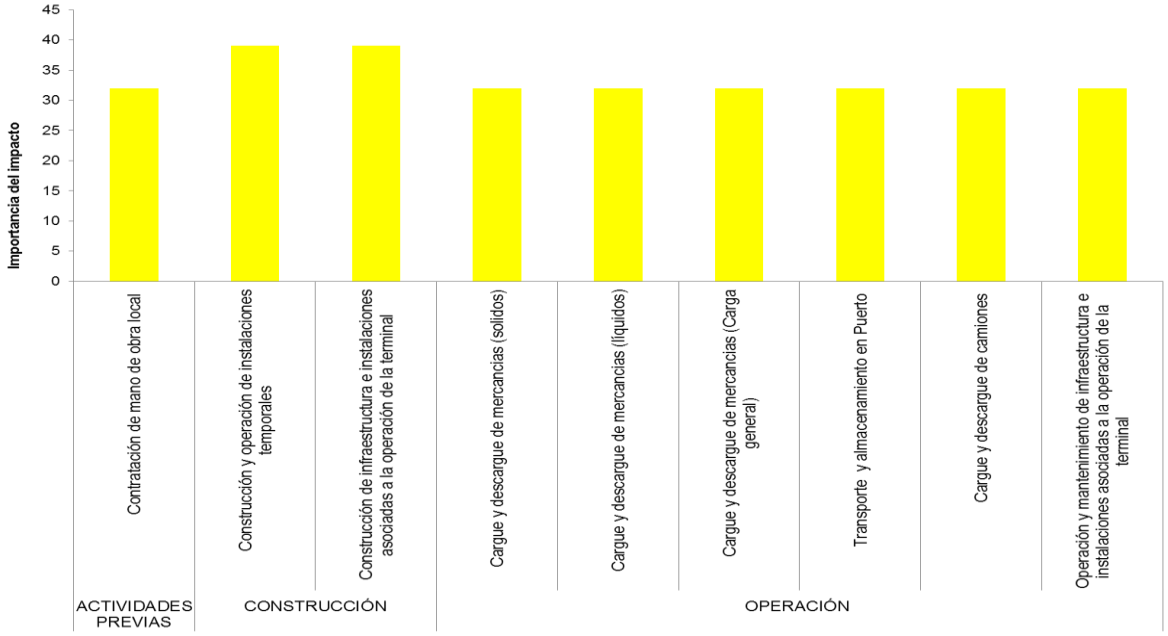


Figure No. 8.66 Environmental importance of the impact Variation in the number of inhabitants

Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

– Alteration of existing infrastructure

This impact is assessed as having a moderate negative nature for the activities of transporting material both for the construction of the port and for the rectification of

the road that leads from Nueva Colonia to the port lot, which due to the increase in transit of trucks transporting material, there will be deterioration in the road.

The activity of placing the pavement on the road was evaluated as positive, not important. This activity will be developed once the construction of the port is completed. The improvement that will be made to the road, will have technical specifications of a primary road, generating optimal conditions for land traffic that will increase during the operation stage (Figure No. 8.67).

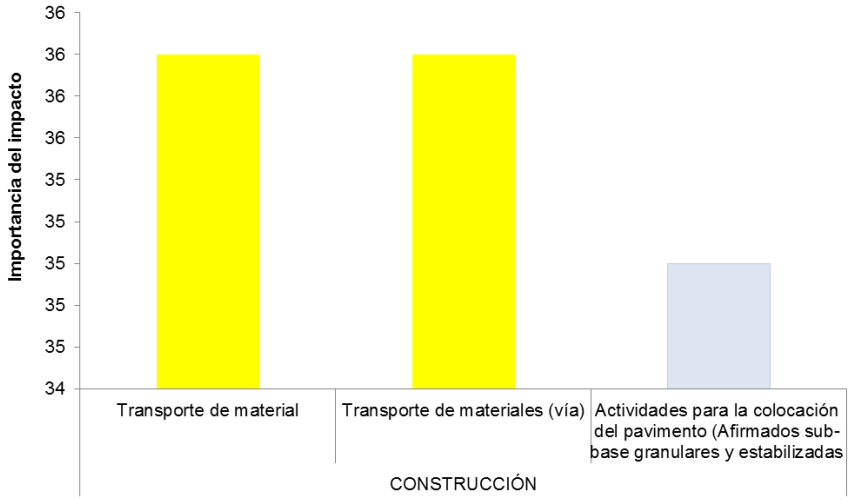


Figure No. 8.67 Environmental importance of the impact Alteration of the existing infrastructure
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Variation in the coverage and quality of public services

The variation in the quality and coverage of public services was assessed as a severe negative impact. The arrival of foreign population in the area due to the construction of the port project, will generate greater pressure on public services currently provided in the area, increasing conflicts over access to services such as drinking water, basic sanitation in the population.

The hiring of labor and services, which will demand the port project, will increase the production of solid waste in the area, demanding an increase in the frequency of garbage collection and thus a greater demand for potable water services due to the population increase and the development of all direct and indirect activities

This impact was classified as severe, due to the high level of sensitivity that the population has to accessing public services.

According to the results obtained in the impact evaluation workshop, the community said that the services they currently receive are very inadequate, so it is expected that with the project the municipal administration can participate in the development by improving the services existing, and installing new services (Figure No. 8.68).

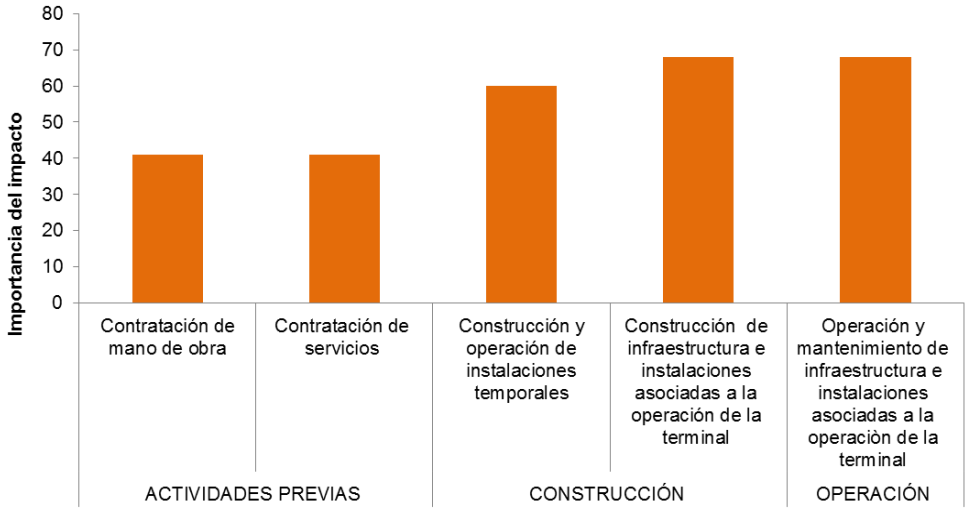


Figure No. 8.68 Environmental importance of the impact Variation in the coverage and quality of public services
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

– Alteration in the transit of vessels

The impact alteration of the traffic of boats, was qualified, as moderate of negative nature during the activities of transport, manufactured and driven of piles, anchor and construction of the bridge and jetty; installation of conveyor belt and laying; due to the occasional interference that can be generated to the smaller vessels that use the area as a transit zone or to develop occasional fishing activities, as well as the banana boats that carry out loading and unloading maneuvers in the maritime zone.

According to the impact assessment workshop, they stated that this activity will generate a negative impact, because the fishermen had fishing activities leaving from the pier of Nueva Colonia, without any restriction of displacement and even to carry out some fishing activities, in the area contemplated for the Port project.

It is important to note that safety measures will prevent the occurrence of accidents due to the development of maneuvers in the area (Figure No. 8.69).

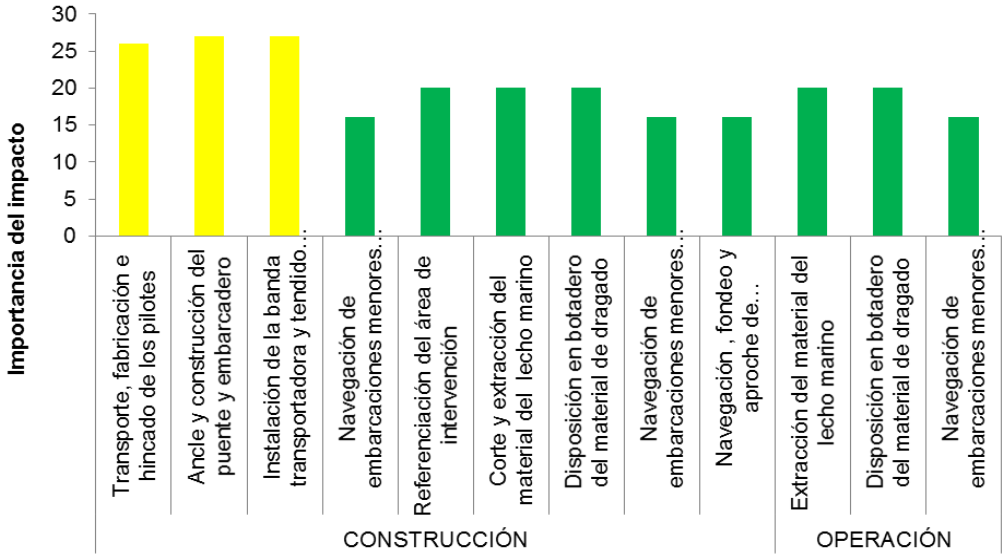


Figure No. 8.69 Environmental importance of the impact Alteration in the transit of vessels
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Variation in the volume of vehicular traffic

The present impact was assessed as moderate, due to the initial increase in transport required in the construction stages of the project, for the transfer of equipment, heavy machinery, materials and transportation of personnel to the construction site, necessary to carry out the activities mentioned then.

- Transportation, manufacture and driving of piles
- Construction and operation of temporary facilities
- Construction of infrastructure and facilities for the installation of the terminal
- Load and unload solid and liquid goods.
- Activity for the placement of pavements

The increase of vehicular flow in the Rio Grande-Nueva Colonia road in the construction phase, will generate inconveniences to the communities that are settled near the road that leads from Nueva Colonia to the port area due to the deterioration of the existing road infrastructure and the houses that are settled in the road edge area due to the constant passage of vehicles with heavy loads. The increase in noise

levels, the increased risk of accidents and the generation of particulate material can generate respiratory diseases in the population.

For the first year of operation of the port projected in 2019, an increase in vehicular flow between trucks, buses and light vehicles of 9,154 vehicles per day is expected, based on the results of the traffic study carried out by the company Group vial in 2015. The increase in road traffic in the operation phase will depend on the supply and demand of port services required in the region and the interior of the country.

From the start of the project activities, the existing primary roads will be used, which currently have a high traffic volume, due to the existence of the banana plantations in the sector.

According to the results obtained in the impact workshop, the attendees requested that all activities be permanently controlled and monitored on the subject of traffic safety with speed reducers, and the trucks duly protected and not overloaded to avoid the spreading of the material. The community considered that the impact is severe especially in the buildings that are adjacent to the transit road to the project (Figure No. 8.70).

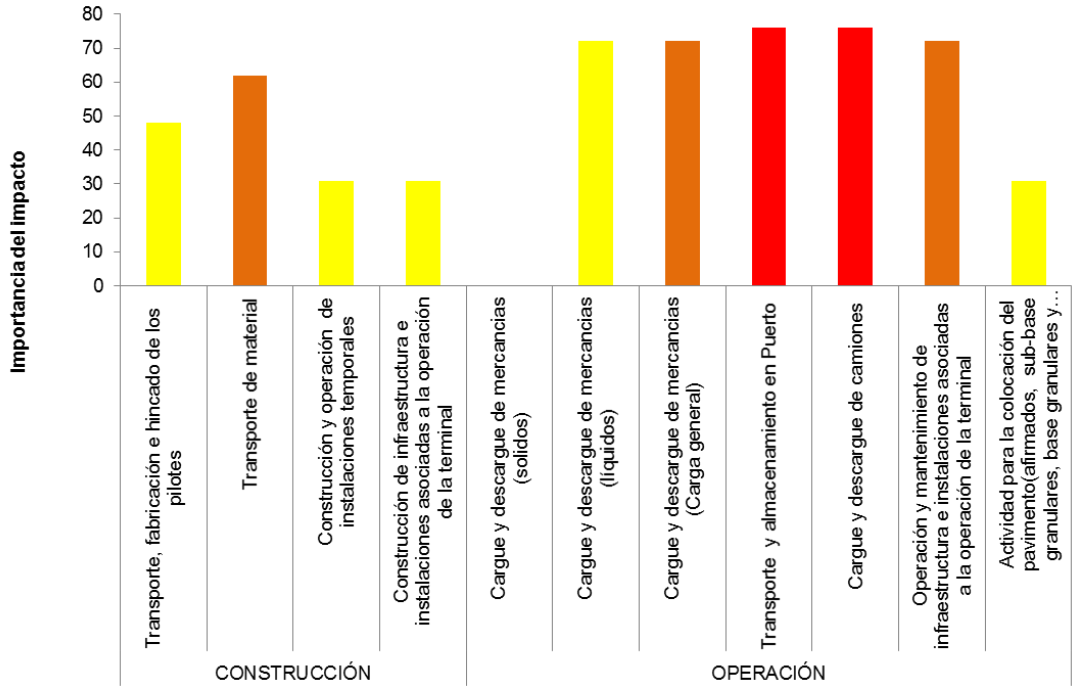


Figure No. 8.70 Environmental importance of the impact Variation in the volume of traffic vehicular
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

– Community Institutional Strengthening

According to the current situation presented by the district, there is evidence of a community organized in its base groups, with highly participative leadership, which makes it possible to evaluate the positive impact on community institutional strengthening. With new job opportunities and the consolidation of a new organizational and social structure will allow the motivation of existing groups and the formation of new organizations.

It is important to maintain communication channels so that there is a Project-Community relationship, with proactive and synergistic characteristics. It should be noted that since the initial meetings held by the Project of Puerto Antioquia, the attendance of the groups established in the district has been well attended and they have been quite participatory. Highlighting the representatives of the community action boards of the different neighborhoods of Nueva Colonia and the Canal, as well as the organization Prodesarrollo, a group that is legally constituted and recognized by the entire community (Figure No. 8.71).

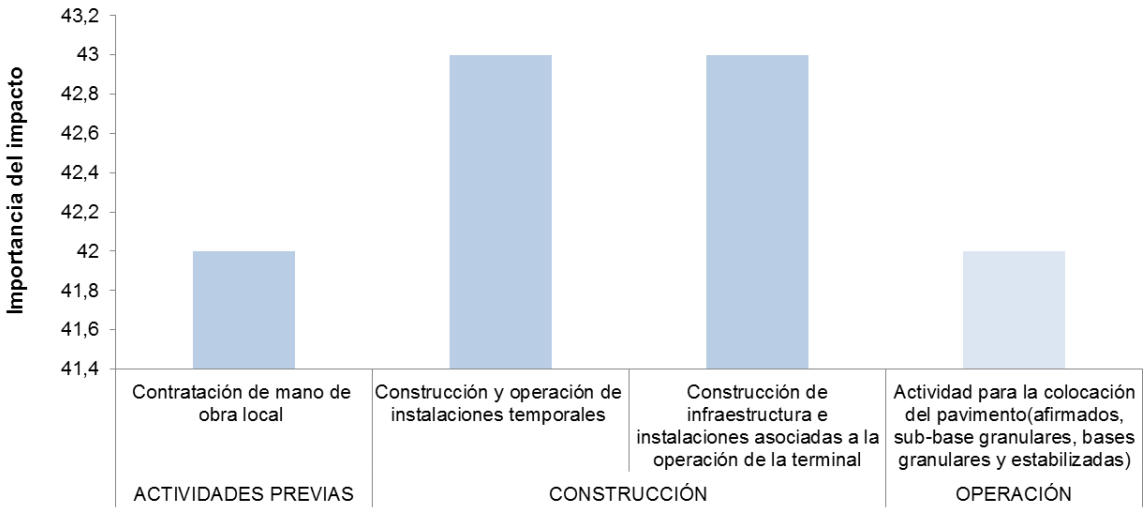


Figure No. 8.71 Environmental importance of the impact Community Institutional Strengthening
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

– Generation of community expectations

For the communities of the Nueva Colonia District and the Canal, it generates a high expectation, the fact of being neighbors of the Port, because they bring with it the possibility of labor linkage and that contribute to the economic and social development of their territory. In general terms, the residents of Nueva Colonia and El Canal express the need to train to be qualified in the new job opportunities that are offered and can hire local labor and to a lesser extent the one that has to hire from other sides.

In the impact assessment workshop, the community demonstrated the expectation of the project, with the high participation of the community and the manifestation of its commitment to continue with the same enthusiasm and accompaniment to the process (Figure No. 8.72 and Figure No. 8.73).

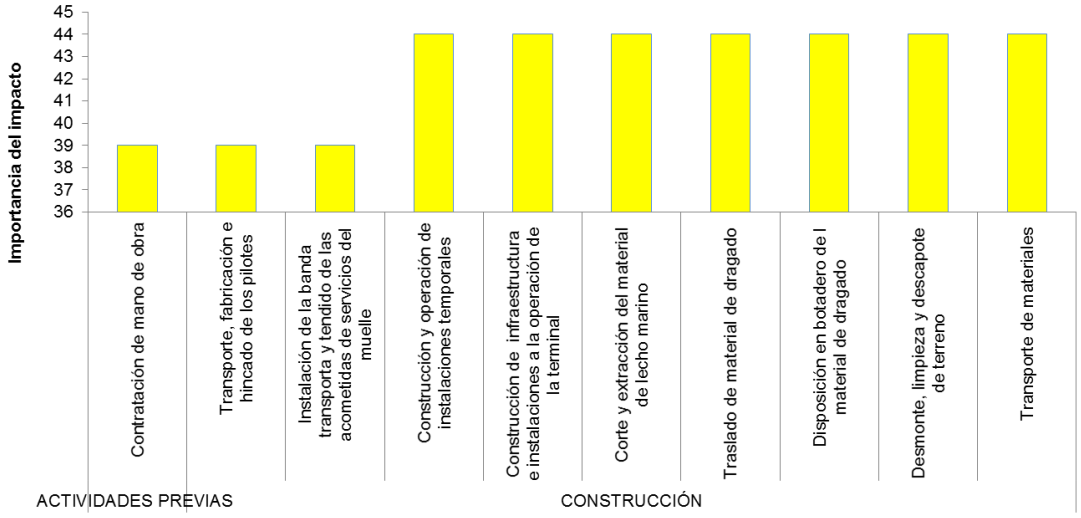


Figure No. 8.72 Environmental importance of impact Generation of community expectations
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

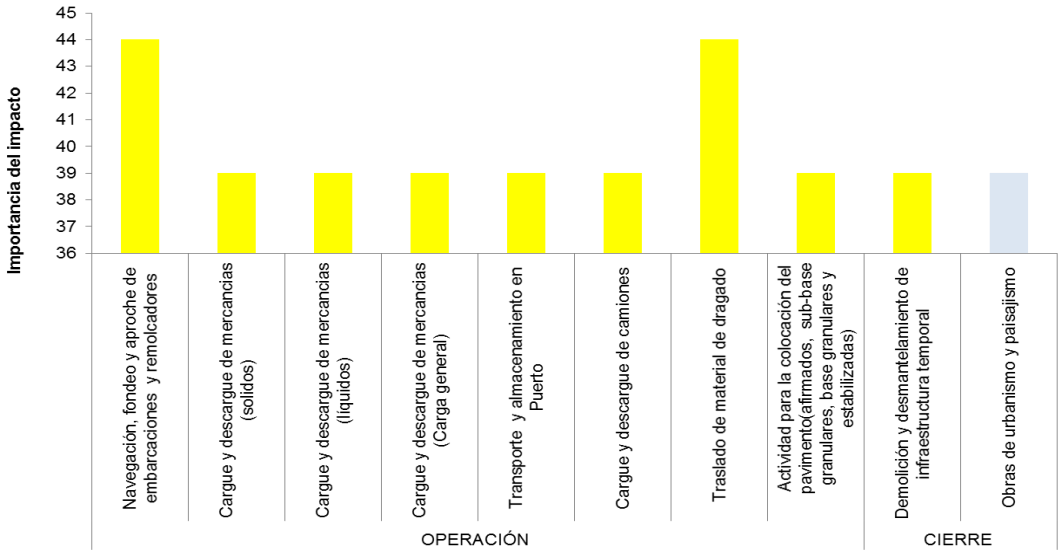


Figure No. 8.73 Environmental importance of impact Generation of community expectations
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

- Analysis of synergistic and cumulative impacts

For the socioeconomic component, in 10 of the identified impacts, synergism was presented, especially in the development of activities in the operation stage, such as activities related to port operations, such as the loading and unloading of goods (solids, liquid, cargo). general, transport and storage in port)

The impacts that presented the greatest synergy were the modification of the productive activities, the alteration of the transit of vessels, the variation in the number of inhabitants and the institutional and community strengthening.

In the construction stage, the impacts related to the generation of expectations, the alteration in the transit of vessels and the variation in the volume of vehicular traffic presented greater synergism. These impacts showed a predominant synergy in the activities related to pile driving, dredging to deepen the construction phase and the construction of infrastructure associated with the port.

Regarding cumulative impacts, only two (2) were identified, present in an activity, related to the dredging activity and the positive impact on the urban planning and landscaping works respectively (Figure No. 8.74).

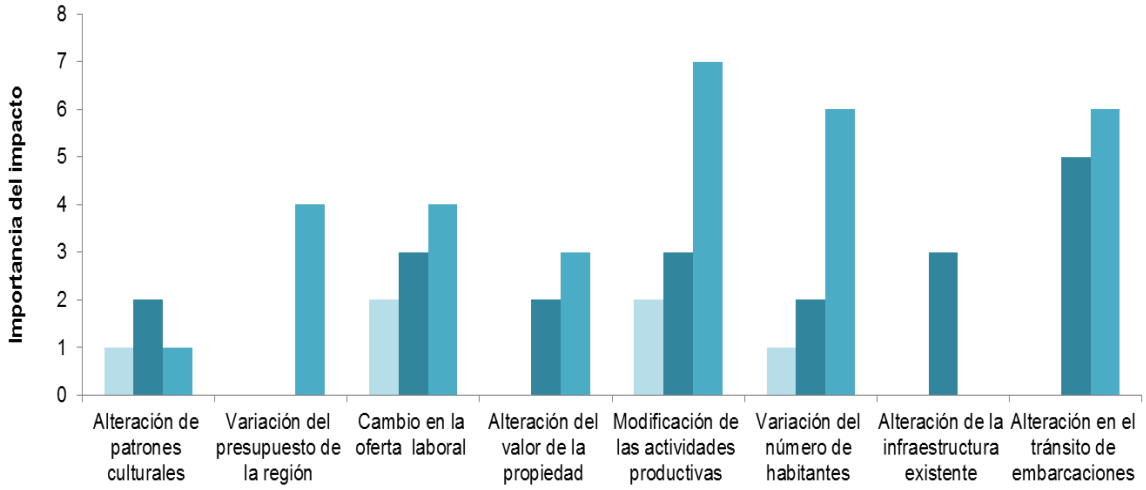


Figure No. 8.74 Synergistic impacts identified in the socioeconomic environment
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015

In Figure No. 8.75, the cumulative impacts are identified in which it was identified that the continued presence of the action can grow over time. The largest number of activities rated with cumulative impacts, were the activities developed during the operation stage, because the development of activities such as loading and unloading of goods and activities related to the port operation, are expected to generate cumulative impacts in time.

The impacts that presented the highest valuation in this criterion were the impacts associated with the modification of productive activities, the variation in the volume of vehicular traffic and the generation of expectations.

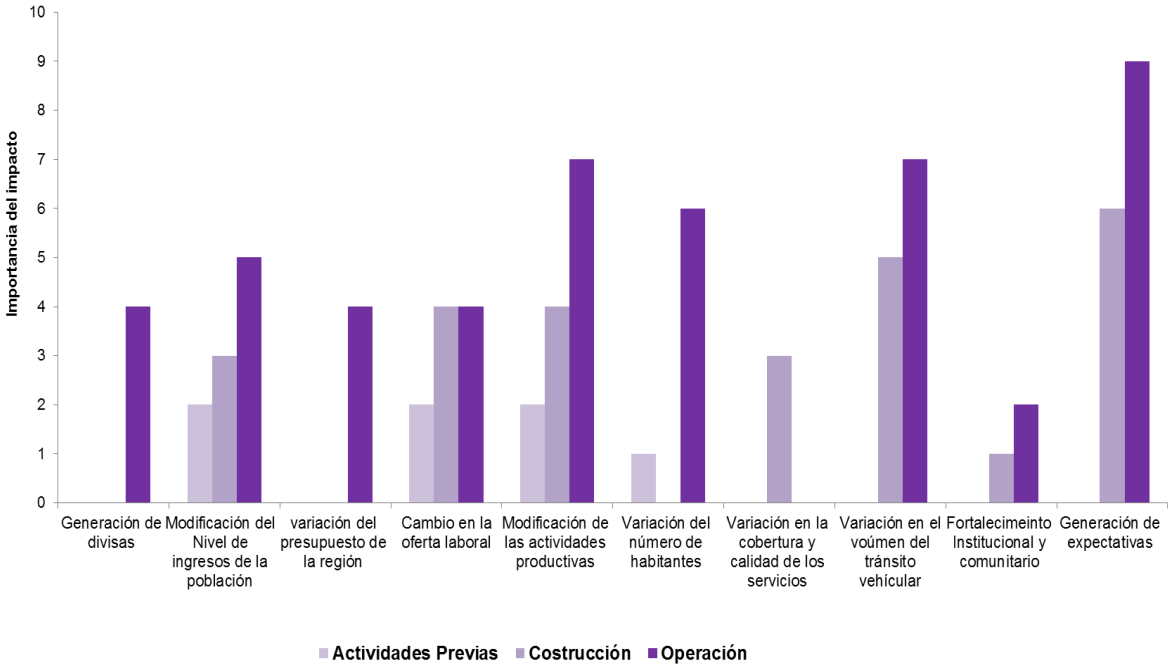


Figure No. 8.75 Cumulative impacts identified in the socioeconomic environment
Source: Made by Aqua & Terra Consultores Asociados S.A.S, 2015