

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

**TUPI CEMENT PROJECT**

**PR-L1054**

**ENVIRONMENTAL AND SOCIAL MANAGEMENT REPORT  
(ESMR)**

**October 2011**

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# **TUPI CEMENT PROJECT**

**Paraguay**

**PR-L1054**

## **Environmental and Social Management Report – ESMR**

### **I. BASIC FACTS**

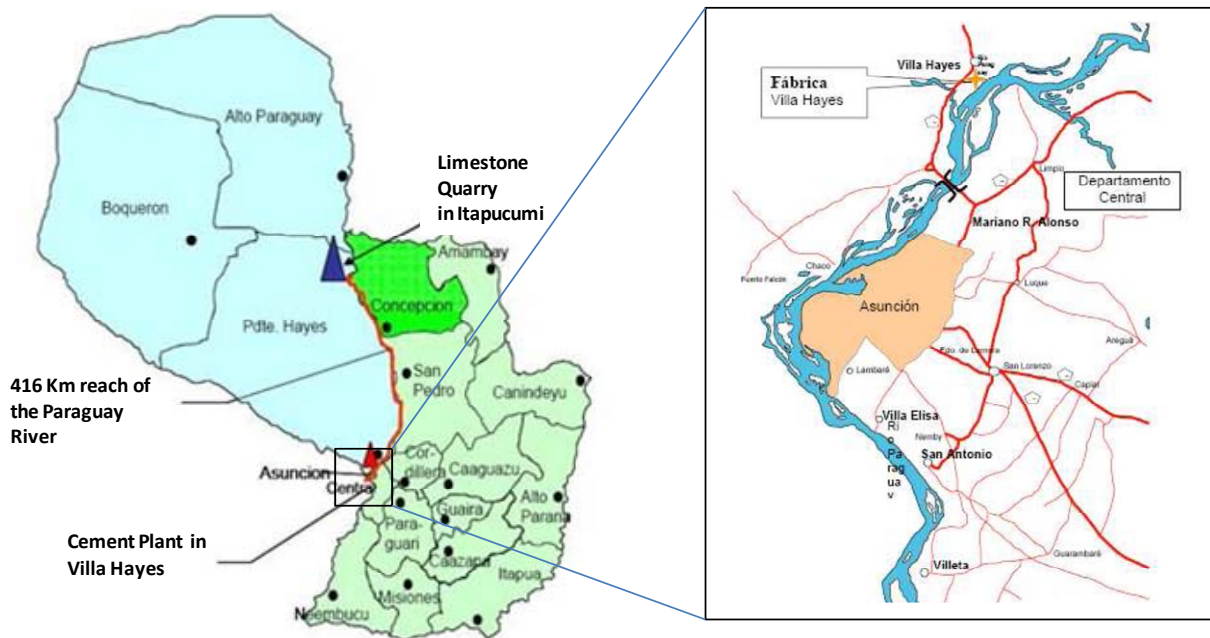
<b>Project Name:</b>	Tupi Cement
<b>Country:</b>	Paraguay
<b>Borrower:</b>	Yguazú Cementos
<b>Project Cost:</b>	US\$150 million
<b>IDB A-Loan:</b>	Currently estimated at US\$50 million (Up to US\$51.75 million)
<b>Resp. Department:</b>	Structured and Corporate Finance Department (SCF)
<b>Environmental Category:</b>	A

### **II. PROJECT DESCRIPTION**

- 2.1 The Project involves the construction and operation of a cement plant and a limestone quarry in Paraguay, with an annual production of 300,000 tons of clinker and 400,000 tons of cement, as well as supporting activities such as the construction of a river port and transportation of raw materials by barge through the Paraguay River. The Project Sponsor is Yguazú Cementos (composed by the brazilian companies Camargo Correa Cimentos S.A. and Votorantim Cimentos Ltda., and the paraguayan Concret Mix S.A.). The estimated cost of the project is US\$ 150 Mill., including an IDB Loan currently estimated at US\$ 50 Mill. (up to US\$51.75 Mill.)

#### **A. Site Location**

- 2.2 **Cement Plant.** The cement plant will be located in Villa Hayes, approximately 30 km north of Asunción on the Paraguay River (see Figure 1). The site is accessible by Route Nr. 9, paved, and an existing 0.8 km access road will be enhanced to connect the plant to the existing road network. The facilities will be located in an area of 50 ha owned by Yguazú Cementos, although they will occupy only 19 hectares of the total area.



**Figure 1: Project location**

- 2.3 **Limestone quarry.** The project also includes quarrying infrastructure for extracting and crushing limestone at Itapucumi, 400 Km north of Asunción on the Paraguay River, and a pier enabling transportation of raw materials by barge. The main access to the quarry is by water, through the Paraguay River. The quarry site is located on 750 hectares owned by Yguazú Cementos.
- 2.4 The sites of the **clay and pozzolana quarries** will be chosen at a later stage and subject to specific Environmental and Social Impact Assessments (ESIAs). The clay quarry is expected to be located in Villa Hayes, close to the cement plant, and the pozzolana quarry at the Paraguri Department, 90 Km SE of Asuncion.

## **B. Components**

### Raw materials:

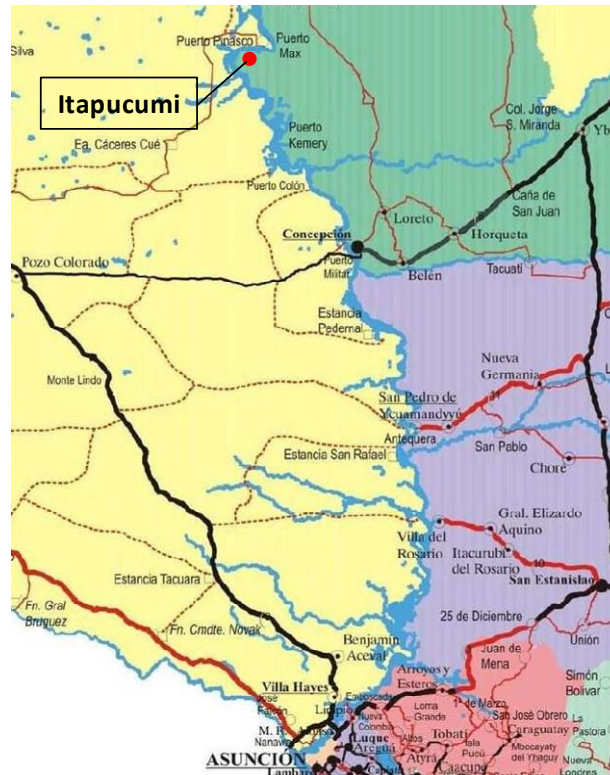
- 2.5 The plant will produce Portland cement (30% of the total output) and Pozzolan cement (70%). Portland cement is made from the mixture and calcination of limestone and clay materials in a proper proportion. Thus, in addition to limestone, cement production requires the use of clay, gypsum to regulate the setting time of cement, and iron ore to adjust the composition of the mixture. To make pozzolanic cement, pozzolana must also be added to the mixture. Table 1 summarizes the consumption and source of raw materials and other inputs, such as energy and water.

**Table 1: Consumption and source of raw materials and other inputs**

INPUT	CONSUMPTION	SOURCE
RAW MATERIALS		
Limestone	460,000 t/year	Limestone quarry in Itapucumi
Fine limestone	12,000 t/year	
Clay	76,000 t/year	Clay quarry (site not yet defined, close to the plant)
Gypsum	20,000 t/year	Brazil or Argentina
Pozzolana	56,000 t/year	Pozzolana quarry (site not yet defined, probably Paraguari, 80 Km SE of Asuncion)
Iron ore	11,000 t/year	Brazil or Argentina
FUELS		
Petcoke	22,400 t/year	Brazil or Argentina
Coal	22,400 t/year	Brazil or Argentina
OTHER INPUTS		
Electricity	0,12 GWh	220 kV transmission line, which supplies Asunción
Water (for the cement production)	330 m <sup>3</sup> /day	Paraguay River
Water (for use in offices, laboratory and irrigation)	211,2 m <sup>3</sup> /day	Villa Hayes water distribution system

Limestone quarry:

- 2.6 The estimated monthly production of the quarry is 40,000 tons of limestone, with an average production of 1,688 m<sup>3</sup>/month of sterile material (soil and rock). It is estimated that the life span of the quarry will be 150 years.



**Figure 2: Location of Itapucumi**

- 2.7 Concret Mix (one of the sponsors of the project) currently operates a limestone quarry in a site adjacent to the Yguazú Cementos property, to provide limestone for a lime plant that operates in the site. The energy required to operate the mill and other facilities will be supplied from an existing transmission line of 23 kV, which feeds two transformers located in a substation at the quarry.

Transport of raw materials:

- 2.8 Both limestone from Itapucumi and other raw materials imported from Brazil and Argentina will be transported to the cement plant in Villa Hayes by barges through the Paraguay River. Transportation will be contracted to third parties. Barges with a capacity of 2,000 tons will be used, in convoys of 8 barges, totaling 16,000 tons per convoy.

Cement plant:

- 2.9 The main component of the cement plant will be a 5-stage preheater, precalciner kiln, considered to be the best available technology. The temperature in the kiln, designed for firing a mixture of coal and petcoke, will increase until it reaches a maximum of about 1,450°C. The material then falls into the clinker cooler to cool the clinker to less than 60°C and to recuperate heat from the clinker to preheat combustion air.



**Fig. 3: Planned final layout of the cement plant**

### **C. Workforce and Schedule**

- 2.10 Workforce during construction. An estimated workforce of 422 workers will be needed in average during construction of the plant and limestone quarry facilities, with a peak of about 915 workers. Approximately 40 of these workers will be needed to build the facilities and install the equipment at the limestone quarry. In addition to direct labor, it is estimated that an indirect workforce of 180 persons will be needed during the construction phase in Villa Hayes.
- 2.11 Workforce during operation. For operation, the cement plant will require 122 workers, in 8 hour shifts. In addition to direct labor, is also estimated that the plant operation will create another 180 indirect jobs, corresponding to workers for subcontractors. The operation of the limestone quarry in Itapucumi will require 8 workers, in addition to those of the subcontractor who will operate the quarry.
- 2.12 Schedule. The construction phase of the project will last 28 months. Work on the cement plant has been running since the beginning of 2011; some fillings, access roads and internal roads have already been made, and the works at the port started in March 2011.

### **D. Alternative Analysis**

- 2.13 Project Site Options: The availability of limestone is the primary criterion for determining potential sites for a new cement plant. In Paraguay, limestone is only available in the northern part of the Eastern Region, mainly in the Concepcion Department. One of the project sponsors (Concret Mix) is already operating a limestone quarry in Itapucumi since 1998, with enough limestone to supply the project with raw material for 150 years.
- 2.14 Regarding the cement plant location, an alternative analysis was conducted that included two possible sites: Itapucumi, close to the limestone quarry, or Villa Hayes, next to the largest consumer of cement of the country, Asunción. The alternative near Asunción, despite being distant approximately 412 km of the quarry, has the following advantages: proximity to the main market; located in an industrial area; availability of electrical power; favorable port conditions; accessibility, and, more importantly, human resources availability. In addition, most of the other raw materials and fuels for the process, as petcoke, could be imported from Argentina, and were therefore closer to Villa Hayes than to Itapucumi. The only exception would be iron ore, which will be transported from Corumbá, Brazil.
- 2.15 From an environmental standpoint, Itapucumi presented a much more preserved environment than Villa Hayes. Therefore, with the factory in Itapucumi, the environmental footprint would be much more significant regarding natural environment than in Villa Hayes. But the most sensitive issue of the alternative of locating the plant in Itapucumi may have been of social nature: the town does not have enough population to provide the workforce needed to carry out the project (about 900 workers). Itapucumi has only about 700 inhabitants, and 90% of the economically active population works already in the existing lime factory. Installing the factory in Itapucumi would have brought an



influx of population and the need to implement housing and urban infrastructure to meet the requirements of the migrant population, creating therefore significant environmental and social impacts.

- 2.16 Fuel. At the initial stage of the project design, the use of charcoal as fuel was taken under consideration. After technical discussions regarding –among other issues- the environmental and social impacts of the charcoal, coal and petcoke were adopted as the main fuels for the project.

### **III. OPERATION COMPLIANCE EVALUATION**

#### **A. Compliance with relevant country requirements**

- 3.1 The environmental licensing process in Paraguay is ruled by Law Nr. 294/93. Its enforcement authority is the Secretary of the Environment (*Secretaría del Ambiente*, SEAM). The legal framework does not establish a categorization of projects and, therefore, all projects go through the same procedure, which begins with the submission of a basic environmental form (*Cuestionario Ambiental Básico*, CAB) by the proponent of a project to the SEAM, who determines whether or not to conduct an environmental impact assessment (EIA). In case of a project requiring an EIA, it must be carried out by individual consultants or consulting firms registered in the SEAM, based on terms of reference issued by this. Once the EIA report is approved by SEAM, a summary thereof (*Relatorio de Impacto Ambiental*, RIMA) must be made available to the public. In some cases, public hearings must be held for presenting the project to the stakeholders. The environmental licence issued by the SEAM as the final result of the process has to be renewed every two years.
- 3.2 The EIA of the limestone quarry in Itapucumi was first approved in 1998, and since then the environmental license has been renewed and updated several times. Currently is pending the approval by SEAM of an upgraded license, which separates the quarry to be operated by Yguazú Cementos of that of Concret Mix, whose application was filed more than a year ago. The cement plant in Villa Hayes and its corresponding port received the environmental license from SEAM in 2009, after an Environmental Impact Assessment was conducted, and was upgraded in 2010 to include the electrical substation.
- 3.3 JGP Consultoria e Participações Ltda., a Brazilian consulting firm, was contracted by Yguazú Cementos to perform an Environmental and Social Impact Assessment (ESIA) in order to enhance the scope of previous studies and to cover IDB as well as other international EIA requirements. The study was concluded in May 2011. Considering that the works are already under construction and that the contract for their execution was signed prior to the preparation of the study, a gap analysis has to be undertaken comparing the management plans for construction described in the ESIA with the current practices and the construction's contracts, followed by an Action Plan aimed to ensure that all of the plans and mitigation measures are set in place during construction. Also, a monitoring campaign should be undertaken, aimed to improve the baseline information regarding air quality, water quality and noise: (i) seasonality will need to be



taken into account for water quality, (ii) air quality measurements will need to be done in Itapucumi (for dust), (iii) more samples will need to be taken in Villa Hayes and (iv) noise will need to also be measure over 24 hours every hour to have a more complete baseline (see Section VIII).

## **B. Compliance with Bank Policies and other international regulations**

- 3.4 The Project was classified as Category A by the project team according to Directive B.3 of the Environmental Safeguards Policy (OP-703). The environmental and social Due Diligence (DD) determined that the Project is compliant with the applicable policy directives of OP-703 and with the relevant provisions of other policies, specifically the Access to Information Policy (OP-102), the Disaster Risk Management Policy (OP-704) and the Policy on Gender Equality (OP-270). According to the findings of the DD, no impacts on indigenous people or the need for resettlement of population are expected, in which case the OP-710 (Involuntary Resettlement) and OP-765 (Indigenous People) policies would apply.
- 3.5 The Project complies with the the EIA requirements of Directive B.5 (see paragraphs 3.11 and 3.12 above), and the consultation requirements of Directive B.6 (see Section VII). The Project also adheres to all applicable national laws according to Directive B.2 (see Section III.A above). The Project includes provisions for Bank monitoring of compliance with all policy requirements (see Section VII.C) according to Directive B.7. The Project does not significantly convert or degrade critical natural sites, affect protected areas or damage cultural sites as prescribed by Directive B.9. Project waste management procedures and standards, and pollution and emissions limits are in compliance with Directives B.10 and B.11 (see Section V).
- 3.6 The IDB Cement Manufacturing Plant Guidelines<sup>1</sup> apply to this project, and based on the information provided by the Company and assessed by the Bank, the Project will meet the threshold requirements. Other international standards that apply to the Project include the cement industry guidelines of the IFC, as well as the World Bank's extractive industry guidance for quarries. According to the results of the Due Diligence (DD), the Company will comply with the relevant IDB and IFC/World Bank standards.
- 3.7 Although the project will meet the Minimum Performance Criteria proposed by the IDB Cement Manufacturing Plant Guidelines for thermal energy consumption and gross CO<sub>2</sub> emissions, the operation was classified as "A" under OP-703, mainly because of its high CO<sub>2</sub> emissions (approximately 250,000 ton of CO<sub>2</sub>/year). Other potential moderate impacts such as air emissions, noise production and other industrial plant construction impacts will be mitigated and managed if the proposed mitigation and management measures proposed by the Company are implemented.

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<sup>1</sup> Cement Manufacturing Plant Guidelines; An Approach to Reconciling the Financing of Cement; Manufacturing Plants with Climate Change Objectives, August 2010: [www.iadb.org/document.cfm?id=3560176](http://www.iadb.org/document.cfm?id=3560176)

## IV. ENVIRONMENTAL AND SOCIAL SETTING

### A. Villa Hayes (cement plant)

#### Environmental setting:

- 4.1 **Land use.** The cement plant in Villa Hayes is located in an industrial district, with the biggest player being the steel manufacturing plant of ACEPAR (Aceros del Paraguay S.A.), located about 3 km north from the cement plant, on the Paraguay River. The steel plant has a production capacity of 150,000 tons of steel per year, and has been operating since 1986. The Yguazú Cementos plant site and its surroundings are located in a degraded area, at the confluence of the Paraguay and Confuso rivers, subject to flooding during severe flood events of the Paraguay River (See Section V.E). Also close to the plant are located a basaltic stone quarry, the municipal landfill and a periurban conglomerate named Remansito.
- 4.2 **Air quality.** In Villa Hayes, air quality is mainly affected by the emission from ACEPAR. However, no monitoring of its emissions or air quality in Villa Hayes is performed by this industry. Yguazú Cementos will conduct a monitoring campaign aimed to determine the air quality baseline, including PTS, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, CO and SO<sub>x</sub>.
- 4.3 **Noise.** To establish a baseline for assessing the noise impacts arising from the project, 5 points were selected and monitored in Villa Hayes during the preparation of the ESIA. All measurements carried out (except one) were above both national and IFC regulations (60/45 and 55/45 dB(A) respectively, for daytime/nighttime). Measured values ranged from 68.5 to 57.4 dB(A) for daytime, and from 68.9 to 58.1 for nighttime. This indicates that the area is currently acoustically degraded.
- 4.4 **Habitats.** The cement plant site, located in the periurban area of Villa Hayes, is highly disturbed and does not exhibit a great deal of biodiversity. The entire area has been deforested in the past and vegetation completely removed. In this site, there is a predominance of palm trees, floodplains and some degraded forest formations (8% of direct area of influence). Samples taken in Villa Hayes pointed to the presence of 88 species of birds, none of them recorded in the international list of threatened species (IUCN 2010) and only one (*Bartramia longicauda*) is near threatened with extinction in the national list of Paraguay. Samples in Villa Hayes have also pointed out the local presence of 13 species of large mammals of which six are wild, the rest are domestic or farmed species. As a result of interviews with fishermen during the ESIA, 15 species of fish were listed, which are not endemic to the watershed.
- 4.5 **Water Resources.** In Villa Hayes, the cement plant is located at the confluence of the Paraguay River and the Confuso River, a medium size river that flows into the right bank of the Paraguay River. During preparation of the ESIA the water quality was monitored. The results of the analysis of samples taken in Villa Hayes showed relatively

high values of turbidity and fecal coliforms, although low in BOD<sub>5</sub><sup>2</sup>, probably due to poor wastewater treatment and indicating that the water quality is currently degraded.

*Social setting:*

- 4.6 Villa Hayes was founded in 1786. With a population of 69,493 and an area of 47,156 km<sup>2</sup>, it has a population density of 1.2 km<sup>2</sup>. It is a predominantly urban district with nearly 70% of its population living in urban areas against 30% who live in rural areas. It is also an industrial district, with some heavy industries like the above mentioned steel factory.
- 4.7 Several localities in rural or periurban areas are under the jurisdiction of the Municipality of Villa Hayes, and most of them have important urban blocks, such as Remansito, which has more than 10,000 residents and is located at a distance of 11 km. from Villa Hayes and about 5 Km from the cement plant. This urban conglomerate is made up of low-income families that a few years ago have invaded a state-owned property.
- 4.8 The local labor force employed in factories and businesses in Villa Hayes has a high percentage of employees commuting from other towns in the district. Currently in the construction of the cement factory are working 100 people, of whom half live in Villa Hayes and others in surrounding cities. A high rate of respiratory diseases has been identified in the area, attributed by both health authorities and the population to emissions of particulate matter from ACEPAR.

**B. Itapucumi (limestone quarry)**

*Environmental setting:*

- 4.9 **Land use.** The project area in Itapucumi is located in a small rural village; although not pristine, 43% of the land is covered by somehow degraded native vegetation.
- 4.10 **Air quality.** The current limestone quarry and the lime plant operated by Concret Mix are the largest emitters. Baseline measures for air quality are currently being enhanced, especially for particulate matter from the lime plant.
- 4.11 **Noise.** In Itapucumi only daytime noise measurements were made during the ESIA preparation, since the site will not operate during the night. Of the five points measured, three showed values below the provisions of the national legislation and of these, only two were below those recommended by the IFC. Measured values ranged from 61.9 to 44.8 dB(A), while IFC limit for daytime is 55 dB(A), which indicates that the area is also moderately degraded acoustically, mainly due to the operation of the limestone quarry and the lime factory.
- 4.12 **Habitats.** In the Itapucumi direct area of influence there is a predominance of native forest formations (43%), although the area on which the quarry will operate is partly

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<sup>2</sup> BOD<sub>5</sub> represents the biochemical oxygen demand during decomposition occurring over a 5-day period.

already under operation. There are no protected areas in the surroundings of any of the project facilities that could be impacted. The samples at Itapucumi noted the presence of 111 species of birds, none of them present in the international list of threatened species (IUCN, 2010). However, in the national list can be found the following species considered almost threatened in the country: *Cairina moschata*, *Amazona aestiva*, *Philydor rufum* and *Xolmis velatus*. In Itapucumi a total of 20 species of large mammals were recorded, of which 16 are wild and four domestic. At this location, two species of mammals listed in the IUCN Red List as Vulnerable were recorded: *Tapirus terrestris* and *Myrmecophaga tridactyla*.

- 4.13 **Water Resources.** In Itapucumi, the limestone quarry is located in the left bank of the Paraguay River. During preparation of the ESIA the water quality was monitored, the results showed that water quality is relatively good, except for high values of fecal coliforms, due to the absence of wastewater treatment and its discharge to the Paraguay River.

Social setting:

- 4.14 Itapucumi has a population of approximately 700 inhabitants and the village consists of 130 houses, most of them made of wood. The town is devoted almost entirely to the manufacture of lime and its inhabitants are mostly employees of Concret Mix S.A., in place since 1998. At the time of the beginning of operation, the population was resettled further away from the quarry. The town is located on land belonging to Concret Mix S.A., and the company plans to give residents the titles of the land they occupy. Currently, there is no labor union.
- 4.15 The entire area is considered as rural, the streets have no name and are not paved. All houses have electric power, there is no storm drain or sewer. The water comes directly from the Paraguay River without any treatment, being stored in a tank of 5,000 liters. The principal means of access to Itapucumi is by navigating the Paraguay River and by air. From Concepcion (capital of the Department) to Itapucumi or vice versa the stretch that ships must travel is 136 Km by water, the frequency is once a week and the travel takes approximately 10 hours. Fishing is not the main activity in the area.

**C. The waterway between Villa Hayes and Itapucumi**

- 4.16 The Parana and Paraguay rivers (known as the *Hidrovia Paraguay-Parana*) have been used for many years to transport goods and raw materials using barges. This activity is highly regulated and the legal framework in Paraguay is defined by Law Nr. 269/93, approving the Agreement for Water Transportation through the Paraguay-Parana Waterway.
- 4.17 According to the experience of different shipping companies, time of transport could be 4 days between Itapucumi and Villa Hayes (downstream) and 5 days from Villa Hayes to Itapucumi (upstream). Barges currently do not operate at night on the Paraguay River, which requires several stops along the way. The Paraguay River has an average of four-month low level by year, in which navigation is restricted depending on the depth of the

vessels. During this period, barges will be charged under their capacity, thus allowing navigability.

## **V. ENVIRONMENTAL AND SOCIAL, HEALTH AND SAFETY & LABOR IMPACTS AND RISKS**

- 5.1 The key potential environmental impacts and risks during construction include soil erosion, with the consequently risk of silting of water bodies, the risk of pollution of groundwater due to spills, accidents or mismanagement of fuels or other materials, and dust and noise generation by construction activities. Most important impacts and risks regarding social issues will be the risk of accidents due to the increase of traffic and the influx of construction workers (up to 900 during peak construction). The latter is particularly important in Itapucumi, where up to 40 workers will be employed for the implementation of the quarry, in a community of just 700 inhabitants.
- 5.2 During operation, the most relevant impact –and the main reason why the project was categorized as A under the OP-703- will be the GHG emissions (CO<sub>2</sub>). Other air emissions, like NO<sub>x</sub>, CO, SO<sub>2</sub>, are also expected, although moderate. At the quarry, the main impact will be the noise and vibrations generated by the blasting activities.
- 5.3 The CO<sub>2</sub> emissions have been minimized through design modifications, and represent a relatively small volume for a cement plant; however, the total emissions of 250,000 ton of CO<sub>2</sub>/year per year still will contribute a substantial input of CO<sub>2</sub>. The remaining impacts and risks are expected to be managed, mitigated, and monitored through the proposed environmental and social management plans, implementation of which will be required by the Bank.

### **A. During construction**

#### **A.1 *Environmental impacts and risks***

##### *Villa Hayes:*

- 5.4 **Soil Erosion.** Removal of soil and other construction activities to be carried out at the cement plant site can generate moderate erosion produced by storm water. As an impact associated with the construction period, the alteration in water quality due to soil erosion at the cement plant is considered a temporary impact. After the end of the earth-moving activities, the potential for sediment transport to the Paraguay and Confuso Rivers will be significantly reduced.
- 5.5 **Surface water.** In the area of the cement plant, the actions with greatest potential to cause impact on surface water are the filling with material dredged from the Paraguay River and other excavations and foundations, from which the soil can be carried into streams causing the silting of water bodies, especially the small ponds located on the flood plain of the Paraguay River and a lake formed by the left arm of the Confuso River. In this case, the impact can be permanent and irreversible because, unlike rivers and

streams, these water bodies are not able to transport this material downstream. However, this impact can be mitigated by soil erosion preventing measures. In the case of the main channel of the Paraguay River, due to its greater ability to transport sediments, the impact may be temporary and reversible. Other source of risk for the surface water is pollution generated by oil or fuel from vehicles and other machinery used in the construction works.

- 5.6 **Groundwater.** Any accidents involving toxic fuels or other materials during construction, due to the operation of machinery and equipment, may cause localized pollution problems. Additionally, there is a possibility of pollution with oil or other substances derived from the activities of washing, cleaning and lubrication of equipment and vehicles used during construction. This will be prevented implementing a management plan as described in Section VI.A.
- 5.7 **Air Emissions.** Construction activities can generate dust that can cause a nuisance to local residents and cause a health risk to construction workers. As the nearest residential receptors in Villa Hayes are approximately 300 m from the plant site, it is considered unlikely that there will be a significant impact on local people. The main risk is considered to be the exposure of workers on site, which will be managed through the implementation of a health and safety management plan as discussed in Section VI.A. The impact of emissions of vehicle exhaust gases on air quality is considered minimal.
- 5.8 **Noise.** Noise generation in this phase will be associated with the operation of machinery and equipment used for the construction of civil works. As mentioned in paragraph 4.12, at most of the points where measurements were made, the existing noise level is already above 60 dB (A), therefore it is expected that the noise from the different sources from construction will only increase the current levels in the surroundings and, therefore, this impact will mainly be on workers, and can be managed through the implementation of the management plans described in Section VI.A. The overall impact, if Personal Protection Equipment (PPE) is used as described in the referred management plans, is therefore considered minimal.
- 5.9 **Solid waste generation.** During construction, generation of several sorts of solid waste is expected, involving the risk of pollution of soil, surface- and groundwater: domestic, industrial (packaging, parts, tires, batteries, lamps, etc), hazardous waste (tows with oil, used oil, dirty oil barrels, etc.) and remains of works (packaging paper, cardboard and plastic, spools, spare electrical equipment, fittings, etc.).

Itapucumi:

- 5.10 **Soil Erosion.** Removal of preexisting vegetation on relatively large areas at the quarry (54 has) can generate impacts on the soil, like erosion produced by storm water, which can be minimized through the implementation of the plan for environmental, social and health and safety management during construction described in Section VI.A1.
- 5.11 **Surface water.** In the area of the limestone quarry the foundations on the banks of the Paraguay River and the construction of the embankment of the port are the two actions

with the greatest potential to cause silting. As an impact associated with the construction phase, after the end of earth-moving activities, the supply of sediment to the river will be reduced considerably.

- 5.12 **Air Emissions.** Similarly to Villa Hayes, the main risk at Itapucumi is considered to be the exposure of workers, some homes are very close to the worksite (about 50 to 100 meters) and, therefore, a moderate impact on the population is expected during construction, especially dust emissions. This will be managed through the implementation of the management plans described in Section VI.A. The impact of emissions of vehicle exhaust gases on air quality is considered minimal.
- 5.13 **Groundwater.** In addition to those potential impacts identified for Villa Hayes related to any accidents or spills of fuels, oils and other hazardous materials, at Itapucumi it will be an increased risk of contamination due to the possible infiltration of domestic sewage, associated to the improper management of wastewater during construction.
- 5.14 **Noise.** Impacts similar to those identified in Villa Hayes are expected at the quarry site, with the difference that the baseline noise levels at Itapucumi are lower, consequently the impact can be higher.
- 5.15 **Impacts on terrestrial habitats.** At Itapucumi it is expected a minimal to moderate impact on terrestrial habitats due to the loss of vegetation associated with the “clearance” of the quarry. Although the project’s quarry will be opened next to the one currently being operated by Concret Mix, the clearance of 54 Has will be required over the life of the Project, and this will cause an irreversible impact. Vegetation loss at the quarry cannot be avoided, but with good management measures it can be minimized. Changes in the natural drainage patterns will also be caused by quarrying activities, which may also have long-term impacts on the surrounding habitats. Another potential impact is the increased hunting of wild animals due to the presence of workers during construction.
- 5.16 **Solid waste generation.** As in Villa Hayes, during construction it is expected the generation of domestic solid waste, industrial solid wastes and hazardous waste, but in much smaller amounts.

## **A.2 Social impacts**

### *Villa Hayes:*

- 5.17 **Traffic.** This impact will be caused by the increased traffic on the access roads to the area of the factory in Villa Hayes, and the Route 9, connecting Villa Hayes and the capital, Asuncion. This traffic may cause discomfort to the population of the areas near the plant by the effect of re-suspension of dust on the unpaved roads, increased noise and risk of accidents, mainly affecting the population living in areas adjacent to the more intensively used roads and the users of these roads.
- 5.18 **Influx of workers.** It is expected that a maximum of 900 workers will be on site at the peak construction time. In the case of the cement plant in Villa Hayes, most of the impacts will be in the areas directly around the plant site. The population of Villa Hayes,



due to its size and proximity to Asunción, is accustomed to the presence of workers from other places. Whereas it is expected that most workers will come from neighboring areas, no camps or houses will be built for the workers.

Itapucumi:

- 5.19 **Influx of workers.** At Itapucumi, it is expected that a maximum of 40 workers will be on site at the peak construction time. Due to its limited accessibility, distance from other populated areas and for being a town almost totally linked to the mining of limestone and with little social infrastructure, Itapucumi is very sensitive to the presence of a large number of external workers, with a risk of conflicts within the community, increased violence, and other issues such as sexually transmitted disease.
- 5.20 **Traffic.** At the quarry, the effects of construction traffic are likely to be moderate when considered within the context of the current relatively low volumes of traffic passing through the area and the proximity of the population. This risk is increased by the fact that the only current access road to Itapucumi crosses through the property of the quarry.

**A.3 Labor health & safety**

- 5.21 During the construction phase of the project, moderate risks to health and safety of workers are expected, including falls, cuts, burns, knocks, exposure to dust, air emissions, noise and other risks related to the use of heavy equipment and vehicles, mostly during the construction of foundations, reinforced concrete and steel, ports, silos, industrial plants, dredging and mining. If properly implemented and monitored, these risks can be reduced and managed.

**B. During operation**

**B.1 Environmental impacts**

Villa Hayes:

- 5.22 **GHG emissions and energy consumption.** An assessment of the potential emissions of greenhouse gases from the Project and its energy consumption has been undertaken. Carbon dioxide (CO<sub>2</sub>) will be the main greenhouse gas emission, with an emission between 233,500 and 315,000 ton CO<sub>2</sub>/year<sup>3</sup>, being the sources the clinker production and the burning of fuel.
- 5.23 The project plans to produce on a basis of 1,000 ton/day of cement, with a maximum of 1,350 t/d. According to the IDB Cement Manufacturing Plant Guidelines, cement plants that have clinker production capacity equal to or less than 1,500 t/d fall under the excluded categories and will be assessed on a case-by-case basis to determine the applicable average design performance using energy efficient technologies. The project is

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<sup>3</sup> Estimated with an emission rate of 820 kg gross CO<sub>2</sub>/ton clinker, with a production rate oscillating between 1,000 and 1,350 ton cement/day, 70% of it being Pozzolan Cement (with 75% clinker content) and 30% Portland Cement (85% clinker).

expected to meet both minimum performance criteria for GHG emissions and energy consumption.

- 5.24 **Other air emissions.** A study of the potential atmospheric emissions from the proposed cement plant was undertaken as part of the ESIA, which included air emissions during normal operation of the cement kiln, as well as minor emissions of fine particulate matter from other processes, including NO<sub>x</sub>, CO, SO<sub>2</sub>, heavy metals, dioxins and furans. The study assessed the emission's ground level pollutant concentrations. These changes in local air quality were then compared to the IFC<sup>4</sup> guidelines for cement plants, considering that the country has no air pollution regulation. Atmospheric emissions were modeled using the US Environmental Protection Agency (EPA) atmospheric dispersion model AERMOD, an internationally recognized advanced dispersion model. The assessment focused on the locations of local residential areas where individuals may be exposed for relevant time periods according to the air quality criteria. The wider surrounding area was also modeled. It was concluded that at all sensitive receptors, the maximum changes in sulphur dioxide, carbon monoxide, particulate matter, and nitrogen dioxide concentrations due to plant operation are a small fraction of the relevant air quality criteria, and future air quality will remain well within the IFC guidelines criteria.
- 5.25 **Surface and groundwater.** The manufacturing of cement at the plant in Villa Hayes will be done using a dry process, and most process water (mainly cooling water) will be recycled, meaning water requirements will be minimal. The water for use in the industrial process will be supplied from the Paraguay River. There is a risk of pollution of water bodies close to the storage and handling of hazardous materials such as fuels and lubricants, due to possible leaks.
- 5.26 The actions that can lead to spills of pollutants in the industrial area are related to spills from vehicles and equipment involved in the internal transport of raw materials (coal, petcoke, pozzolana and clay) by trucks. There is also a risk of moderate pollution of the Paraguay River, in the case the wastewater treatment plant is not properly operated.
- 5.27 The risk of pollution of groundwater may come from leakage of effluent from the wastewater treatment plant or bad design and/or operation of the systems for collection and separation of water drained from the industrial area.

*Itapucumi:*

- 5.28 **Soil.** Besides the impacts described above for the quarry during construction, which will continue during operation, sterile material and organic soil will be removed from the upper part of the limestone quarry. It is expected that during the first two years of operation about 60,000 m<sup>3</sup> of sterile material will be removed, 87% of this being soil.
- 5.29 **Air emissions.** Despite the existence of equipment to control emissions of particulate materials during the operation of the limestone quarry, there is a moderate risk of dust

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<sup>4</sup> International Finance Corporation (part of the World Bank Group).

generation during the operation. If properly implemented and monitored, this risk can be reduced and managed.

- 5.30 **Groundwater.** The exploitation of the limestone quarry at Itapucumi, which will be held up to 70 m deep, can cause a localized reduction of the water table. There is also a risk of pollution of groundwater, which may come from leakage of effluent from the septic tank or the sewage system at the quarry.
- 5.31 **Landscape and Visual.** In the area of the quarry, where altitudes range between 80 and 140 m, significant alteration of relief will take place, as it is expected that the final level of the quarry reaches the height of 70 m.

*Paraguay River between Villa Hayes and Itapucumi:*

- 5.32 **Fluvial transportation of raw materials.** The movement of barges (convoy of 8 barges with 16,000 tonnes in total, for eight months a year) has the potential of destabilizing the river banks through the production of waves. Possible contacts between barges and margins can lead to compaction and alteration of river morphology, as well as to the generation of erosion and siltation processes.
- 5.33 There is also a potential impact of pollution of water bodies by dust, organic pollutants, metals and petroleum products due to the transport of limestone and other raw materials by barge across the Paraguay River. It is considered that the above mentioned impacts will be of low intensity and they will just barely increment the current impacts caused by the navigation through the Paraguay River.

**B.2 Social impacts**

*Villa Hayes:*

- 5.34 **Traffic and transportation.** In the case of the cement plant in Villa Hayes, it is anticipated that construction traffic will have a moderate impact on current volumes of traffic that use the main arterial highways and the local routes.
- 5.35 **Noise.** The ESIA concluded that noise levels generated from the cement production plant are unlikely to cause disturbance in any of the nearby communities during the evening or night, regarding the current high levels of noise existing in this area.

*Itapucumi:*

- 5.36 **Community dependence.** One of the main risks in Itapucumi is the strong dependence of the community on Yguazú Cementos and the future quarry operator, most probably to be the firm Concret Mix (one of the project sponsors and currently operating a limestone quarry and a lime plant), largely due to the isolation of the town and the absence of state institutions. This impact will be mitigated through the implementation of a Community Engagement Plan, as described in Section VI.B.

- 5.37 **Noise and vibrations due to blasting.** Blasting activities will take place once a week at the Itapucumi quarry. An assessment was conducted about the area of influence of the vibrations caused by the detonations at the quarry using propagation equations. As a result, it is estimated that the area of influence of vibrations will extend to a distance of 352 m from the emission source. Considering that the nearest houses are at a greater distance, it is estimated that the impact will be moderate. The depth of the quarry (up to 70 m) provides natural screening of noise to these communities. The company has committed to implement appropriate noise management practices in all aspects of the design and operation of the cement plant, quarry and transport.
- 5.38 **Traffic.** In the case of the quarry in Itapucumi, the traffic of trucks and heavy machinery at the site can cause moderate impact on the population, whereas the current only access road to the Itapucumi town crosses through the quarry facilities.
- 5.39 **Indigenous communities.** As a result of the due diligence phase, no negative impacts on indigenous communities are expected, considering that there are no such communities around Itapucumi, and it is not expected that indigenous people living on the other side of the Paraguay River will interact with the project during operation. This assumption still needs further confirmation.

### ***B.3 Labor health & safety***

- 5.40 The dust and noise emissions resulting from the detonation, drilling, extraction and transportation activities in the area of the quarry are inevitable and can be harmful to the health of the workers. Local regulations establish maximum permissible daily exposure to noise and annoying sounds within industrial facilities. The cement plant also presents health risks to workers, mainly associated with exposure to dusty material throughout the production process in the loading, unloading and transportation of raw materials and packaging of the final product.

## **C. Decommissioning**

- 5.41 No detailed assessment of environmental impacts associated with decommissioning can be made at present. The plant has an expected lifespan of over 100 years and, therefore, only general principles can be established at the present time. In broad terms, the process of decommissioning is likely to give rise to impacts similar to those experienced in the construction phase. Anyhow, the ESIA includes a management plan for the decommissioning phase.

## **D. Cumulative impacts**

- 5.42 The ESIA took into consideration the indirect area of influence and emissions from other industrial facilities at Villa Hayes. Air emissions from the project were determined to have a minimal impact on ambient air conditions so are therefore unlikely to result in cumulative impacts. Nevertheless, a baseline study for air emissions is currently being undertaken, especially to identify the current impacts from the ACEPAR steel plant.

Increased traffic could possibly contribute to cumulative effects on the roads, mainly at the cement plant in Villa Hayes. The emissions of CO<sub>2</sub> will contribute to the overall contribution of greenhouse gases.

**E. Other risks**

- 5.43 **Natural disasters and climate change.** One of the highest impacts of climate events in Paraguay is El Niño, which causes changes in the pattern of the general circulation of the atmosphere in southeastern South America, covering the central and northern Argentina, southern Brazil, Uruguay and Paraguay, where primarily impacts the Eastern Region of the country and the Paraguay River. During its occurrence, El Niño causes heavy rain and flooding in the Paraguay River basin, affecting in this case mainly the cement plant in Villa Hayes, which is located in a flood prone area. The elevation of the cement plant is specified to be 63.5 MASL or higher (63.5 MASL represents the calculated 60 year flood level, while the calculated 100 year flood level is 64.36 MASL). Yguazú Cementos has agreed to the IDB requirement to develop and implement a contingency plan in case of occurrence of floods above 63.5 MASL. This plan is considered adequate to mitigate significant impacts from flooding but will require monitoring during the life of the Project

**F. Positive impacts**

- 5.44 The Project will provide socio-economic benefits by employing up to 915 workers during construction and about 122 permanent jobs during operations, including training. Through the development of a community engagement plan, Yguazú Cementos commits to work with local communities on matters related to health, safety and environment, social and educational development.
- 5.45 At the same time, the new plant will: (i) fully replace the Company's imports, eliminating the long-distance transport costs and greenhouse gas emissions; (ii) address the growing local supply/demand imbalance; (iii) over time, create greater competition and reliability in the local cement market. Design and engineering of the plant under international standards will generate state-of-the-art production efficiency, reliability and product quality, as well as mitigation of environmental and social impacts according to international standards.

**G. IDB Additionality**

- 5.46 During the due diligence process, several enhancements were requested to strengthen Yguazú Cementos's management and mitigation measures, and specific design adjustments were necessary to manage the potential impacts and risks. In particular, additional measures were required in the design of the clinker calcination process in order to reduce CO<sub>2</sub> emissions. Also, as a result of the technical discussion undertaken during project preparation, the company decided to use coal as one of the main fuels, instead of charcoal.

## VI. MANAGEMENT OF ENVIRONMENTAL, SOCIAL, LABOR HEALTH AND SAFETY IMPACTS AND RISKS

### A. Management of impacts and risks during construction

#### A.1 Management scheme

- 6.1 The Environmental, Social, Labor, Health and Safety (ESLHS) management scheme for the construction phase includes two main elements:
- i) An Integrated Plan for ESLHS Management during Construction, which will be implemented by the Contractor and subcontractors, and supervised by the Sponsor;
  - ii) A Compliance Assurance Plan for ESLHS during Construction, whose implementation is the responsibility of the project sponsor.
- 6.2 **Integrated Plan for Environmental, Social and Health and Safety Management during Construction:** It will be implemented by the Contractor and its subcontractors. It contains *Environmental Control Instructions*, which include:
- general guidelines for environmental control, including air pollution control, control of dust and smoke emissions, noise management, hazardous materials management, hazardous spills management, water and wastewater management, construction solid waste management;
  - environmental control for land clearing activities;
  - environmental control for earth movement activities, including temporary drainage guidelines and general measures to control erosion and siltation;
  - environmental control of dredging;
  - environmental control of earth removal and storage areas for surplus earth, including measures to control erosion and siltation;
  - open pit excavation;
  - cement and concrete works;
  - environmental control for vehicles and equipment operation;
  - decommissioning and recovery of degraded areas, including general measures for the recovery of affected areas, decommissioning of facilities, and terrain and vegetation restoration.
- 6.3 The Plan includes *Guidelines* for: i) transportation management; ii) standard procedure for environmental emergencies response; iii) labor management; iv) construction camp regulations, including social aspects that affect construction camps and other support areas, labor issues of construction sites and other support facilities, minimum requirements for the construction camp and other support facilities, minimum requirements for employee Code of Conduct; v) community relations; vi) labor health and safety; vii) safe working procedures.
- 6.4 Also, the Plan includes a *Monitoring Program*, with i) biodiversity monitoring program, with a flora monitoring subprogram, a fauna monitoring subprogram for wild

vertebrates, and a fish monitoring subprogram; and a ii) deforestation program for operation of the quarry and adjacent areas.

- 6.5 **Compliance Assurance Plan for Environmental, Social and Health and Safety during Construction:** Consists of inspections and audits of all construction activities and associated ESLHS documentation, including activities of the contractor, subcontractors and major suppliers. It includes procedures for compliance assurance and performance indicators. The implementation scheme includes the hiring of a specialized firm that will act as an ESLHS technical consultant and will supervise the implementation of the Integrated Plan for Environmental, Social and Health and Safety Management during Construction that will be undertaken by the Contractor and its subcontractors. The firm will have a resident team throughout the construction process, which will include an environmental specialist, a health and safety specialist and a community relationship specialist. The project sponsor will assign a Manager for ESLHS Compliance Assurance. The Sponsor will be required to confirm the implementation of this management scheme prior to financial closure (see Section VIII).
- 6.6 For the construction works that are currently being undertaken, Yguazú Cementos has a very good supervision checklist, with key health and safety indicators. Nevertheless, some key environmental indicators have to be incorporated as part of the checklist, such as dust generation, fish mortality, erosion and other relevant environmental parameters. Also, a grievance mechanism for the community and the workers at Villa Hayes and Itapucumi should be implemented (see Section VIII).

## **A.2 *Management of impacts and risks on the environment***

### ***Villa Hayes:***

- 6.7 **Soil Erosion.** The procedures for control of soil-moving activities include the adoption of preventive measures, mitigation and corrective control of erosion and silting of watercourses that may be affected as a result of the activities. Such procedures will apply to all work fronts, including the implementation of the structures of the factory, as well as in labor camps and in the implementation of access roads. The Contractor will be required to minimize areas of exposed soil, compact and resurface the disturbed areas as soon as possible, build a drainage system during the initial stage of the project and implement water-bodies protection measures.
- 6.8 **Surface water.** The management plan during construction includes measures to prevent oil or fuel spills in water-bodies, to act in case they occur and to control erosion and siltation as described in the precedent paragraph. The environmental control of dredging works comprises –among other measures- the attenuation of the energy of the discharge jet of dredged material so as to avoid erosion of the original soil, covering the slopes of the filling with stones and monitoring of water and sediment in the dredging areas.
- 6.9 **Groundwater.** The contractor will be required to implement measures for the management of hazardous materials, including a plan for cleanup and remediation in the event of contamination of soil and, consequently, the underground aquifer. All work



areas will have adequate sanitary facilities (chemical toilets) to avoid pollution of groundwater by wastewater. The washing, cleaning and lubrication of equipment and vehicles used during construction will be held only at the maintenance and/or washing areas.

- 6.10 **Air Emissions.** Dust control measures will be implemented, like i) spraying of the non-paved roads and soil stockpiles with water, ii) periodic maintenance of roads, iii) covering of trucks carrying dry soil, iv) establishing speed limits for vehicles on and off-site, v) implementation of dust control equipment in the concrete processing machines, Gaseous emission will be mitigated by using well-maintained vehicles and equipment, by verifying the installation and functionality of vehicle-equipped emission controls, by optimizing the efficient use of equipment and vehicles through management practices and by using low greenhouse gas-emitting diesel fuel rather than gasoline.
- 6.11 **Noise.** The company will have noise management guidelines and measures, to ensure that all mechanical equipment used, within and outside the plant, must meet the noise limits set in national regulations and the IFC General Environmental, Health and Safety (EHS) Guidelines. It also establishes working time regulations in the areas close to inhabited areas, the implementation of measures for noise attenuation, communication to the public about noise-generating activities and the requirement to the workers to use protective equipment. All vehicles, heavy machinery and equipment shall be in accordance with noise emission standards and, if necessary, be equipped with sound absorbers.
- 6.12 **Solid waste generation.** A segregated waste collection will be implemented at the site. All areas that generate waste will have collectors, appropriate to the class of waste generated, which will be properly labeled. Workers will be trained on how to separate waste and place them in the specific containers. It will not be allowed any accumulation of waste, which will be removed as often as necessary to the temporary waste storage area. This area should be compatible with the waste generation capacity of the project, enough to accommodate the amount generated between external transport intervals. The solid waste will be collected twice a week by a contractor and transported to a processing plant in Villa Hayes, where they will be sorted, separating the recyclable fraction, with submission of non-recyclable to the municipal landfill. Soil, sand, gravel and other construction aggregates will not be considered wastes unless they are contaminated and will be treated as specified in the Environmental Control Instructions of Earthmoving Activities, while vegetation remains will be handled in accordance with the procedures of the Instructions for the Environmental Control of Land Clearing Activities. Hazardous waste will be kept in a temporary storage site until the completion of the works or until they reach a limit of 10 m<sup>3</sup>, when they will be transported to a duly licensed landfill. Sludge from the wastewater treatment plant and septic tanks will also be disposed in a properly licensed landfill.

Itapucumi:

- 6.13 **Soil erosion.** In addition to those measures described for Villa Hayes, the environmental control instructions for land clearing activities and the deforestation program for operation of the quarry and adjacent areas will be applied at Itapucumi. These include

measures like removing the topsoil from the intervention areas and storing in the storage area for decomposition of organic soil, use of access roads previously approved avoiding unnecessary access roads, minimizing areas of exposed soil, etc.

- 6.14 **Surface water.** At Itapucumi, mitigation measures similar to those described for Villa Hayes will be implemented.
- 6.15 **Air Emissions and Noise.** Among other measures, like those described for Villa Hayes, a vegetation barrier will be set in place at Itapucumi to minimize the impact of dust emissions and noise on the surrounding population.
- 6.16 **Groundwater.** At Itapucumi, maintenance of septic tanks will be required to avoid pollution of groundwater by domestic sewage, in addition to those measures described for Villa Hayes.
- 6.17 **Impacts on terrestrial habitats.** This impact will be mitigated applying the environmental control instructions for land clearing activities and the deforestation program for operation of the quarry and adjacent areas, contained in the Integrated Plan for Environmental, Social and Health and Safety Management during Construction to be implemented by the Contractor and supervised by the project sponsor. The quarry operation program contains details of all activities and procedures involved in the removal of vegetation to exploit the quarry. The procedures include access restrictions into adjacent areas, previous demarcation of areas for vegetation removal within the limits specified in the environmental licenses, staff training, wildlife removal procedures, specific procedures for the suppression of vegetation, fire prevention and control, classification and reuse of vegetation remains, ban of wild animals hunting.
- 6.18 **Solid waste generation.** The solid waste will be collected, separated into containers according to the type of waste (recyclable, hazardous) and stored temporarily until they reach a viable amount for transport by barge to Villa Hayes, where it will be subject to the same management that the waste generated at the cement plant.

### ***A.3 Management of social impacts and risks***

#### ***Villa Hayes:***

- 6.19 **Traffic.** To manage traffic impacts the company has put in place a transportation management plan, which includes (i) speed limits for different types of roads, (ii) the spraying of water on unpaved roads, (iii) the use of appropriate signaling, (iv) the obligation to use only the routes provided in the transportation plan for the construction phase, (v) the ban on making unauthorized stops, (vi) the implementation of a working team for traffic control, and (vii) measures to be implemented in case of accidents or vehicle damage.
- 6.20 **Workforce management.** The company will have a workforce management plan, which establishes the rights of workers and defines and prohibits forced labor, discrimination

based on gender and child labor. To minimize the influx of workers from other regions, offices for hiring local workers will be established in Villa Hayes. The sponsor will maintain contact with local community leaders to understand the expectations and needs for jobs, and to design a strategy for local recruitment. In Villa Hayes, where most workers will be required, Yguazú Cementos has also signed a framework agreement for cooperation with the local Municipality and the state National Labor Training System (SINAFOCAL), to train the local workforce in activities that are required for the project.

*Itapucumi:*

- 6.21 **Workforce management.** Mitigation measures similar to those described for Villa Hayes will be implemented at Itapucumi. Additionally, a Community Engagement Plan will be designed and set in place, aiming, among others, at minimize the impacts of the influx of workers on the community.
- 6.22 **Traffic.** Measures similar to those implemented in Villa Hayes will be set in place at Itapucumi. Additionally, an alternative access road will be constructed for the population, to minimize the risk of accidents due to the traffic of heavy machinery and trucks.

**A.3 Labor Health & Safety**

- 6.23 The project's management scheme entails a labor health and safety management plan, which will be implemented by the Contractor and supervised by the project's sponsor, including accidents prevention, labor health management, community health and safety, safe working procedures, management of explosives and hazardous materials, workers transportation, storage and handling of fuels and flammable products, operation of machinery and equipment, excavation works execution, working with concrete, working at height levels, electrical risk works, working under high temperature and in confined spaces, etc. During Due Diligence, it was verified that the company is applying good labor health and safety standards.

**B. Management of impacts and risks during operation**

***B.1 Management scheme***

- 6.24 The ESLHS management scheme for operation includes an **integrated plan for environmental, social, health and safety management during operation**, to be implemented by the project sponsor. The Plan includes: socio-environmental training, environmental control of vegetation removal, wildlife protection, dust control, control of stationary source emissions, control of vehicle emissions, control of air quality, control of noise and vibration, effluent management, procedures to reduce the risk of slope instability, erosion mitigation and control, procedures to reduce siltation of water bodies, procedures for reducing the risk of slopes instability of overburden piles, stabilization of the side walls of the pit, solid waste management, management of hazardous products, management of hazardous product spills, standard procedure for responding to environmental emergencies, control of explosives, health and safety management, control

of environmentally critical suppliers and service providers, transportation management and safe work procedures.

- 6.25 Additionally, the scheme includes a monitoring program, Social Communication and Community Relations Program, including public consultation guidelines, a Social Responsibility Program and a Plan for Quarry Decommissioning.
- 6.26 As for the construction phase, the Sponsor will be required to draw a detailed management plan for operation, taking into consideration the content of the ESIA. The operation of the limestone quarry at Itapucumi will be contracted to a third party. The terms of reference (TORs) of the bidding documents for the operation of the quarry, must include all above mentioned ESIA requirements, especially regarding management of explosives, movement of material, fuel management, following international standards (see Section VIII).

## ***B.2 Management of impacts and risks on the environment***

### ***Villa Hayes:***

- 6.27 **GHG emissions and energy consumption.** The proposed technology will minimize CO<sub>2</sub> emissions and will be consistent with the IDB Cement Manufacturing Plant Guidelines (August 2010). As a result of a technical evaluation conducted by the Bank, an adjustment to the clinker cooler aimed to reduce CO<sub>2</sub> emissions was proposed (conversion to a beam aeration type cooler), which was accepted by the Sponsor and incorporated into the design. With this modification, at a production rate of 1,350 ton/day, with a fuel combination of 50% coal and 50% petcoke, the project will meet the thermal efficiency guideline of 3.264 MJ/t clinker and the CO<sub>2</sub> per ton clinker guidelines of 820 kg CO<sub>2</sub>/t clinker (the estimated value is 822 kg CO<sub>2</sub>/t clinker, being 549 kg CO<sub>2</sub> from calcination and 273 kg CO<sub>2</sub> from fuel). Actual compliance with these guidelines will be confirmed during the commissioning of the plant and, afterwards, if the level of emissions is not met, the Sponsor is committed to make additional investments up to \$1.75 million, which will be financed by the Bank, to improve the emissions level. All these actions, including the emissions test, will become an affirmative covenant obligation to be performed by the Project prior to Project Completion under the Loan Documentation.
- 6.28 Being the clinker calcination one the most important sources of GHG emissions in the cement manufacturing, an effective way to reduce the emission of CO<sub>2</sub> is by producing blended cement, with the use of clinker substitute materials. With this goal, the plant intends to produce up to 70% of Pozzolan Cement, with 75 % clinker content.
- 6.29 Since the cement will be produced locally and used for infrastructure development within the country, this will reduce the greenhouse gases produced to transport cement into the country. In order to ensure that once operational the cement production process is as energy efficient as possible, the operator will be required to conduct customary energy efficiency measurements. The aim of the assessment will be to ensure that the plant is

operating as efficiently as possible, complying with the IDB Cement Manufacturing Plant Guidelines.

- 6.30 **Other air emissions.** The project design contemplates the control of particulate matter (PM) emissions through installation of modern bag filter systems for the raw mill, the clinker cooler and the cement mill (the main sources of PM emissions). All dust control equipments are designed to meet the IFC guidelines for cement manufacturing. NO<sub>x</sub> and SO<sub>2</sub> could be a concern while using petcoke as fuel, therefore control systems will be installed at the plant. In addition, in order to lower the dust emission, wetting of the access roads and the stored material piles will be implemented. Additionally, the materials which are more prone to generate dust, like clay, pozzolana, gypsum, coal, petcoke, iron ore and fine limestone, will be stored in a covered area.
- 6.31 **Surface and groundwater.** Measures to minimize the risk of surface or groundwater pollution due to spills or leaks are contained in the transportation management and hazardous materials management plans and other instruments. At the cement plant in Villa Hayes, all domestic sewage generated in the administrative facilities and laboratories of the cement factory will be collected and treated in a wastewater treatment plant. The water drained from the industrial area will first be sent to an oil and water separation system and then to the wastewater treatment plant, which final effluent will be monitored to evaluate the performance of the treatment system and verify compliance with the national and international standards (IFC Guidelines). However, currently the final design of the wastewater treatment system is not yet ready and will be required prior to the financial closure (see Section VIII).

Itapucumi:

- 6.32 **Soil.** In addition to the mitigation measures described for the construction phase that will also be implemented during operation, the management plan for operation includes erosion mitigation and control and procedures to reduce siltation of water bodies. The quarry will have a system for retention of sediment (rip-rap), drainage systems (internal, superficial and peripheral) and slopes and embankments will be protected with vegetation. The sterile material produced during the operation of the quarry will be disposed in specially designed landfills, whose construction and handling is subject of a special management plan.
- 6.33 **Air emissions.** Besides the use of bag filter systems and other measures described for Villa Hayes, at Itapucumi, a vegetation barrier will be set in place for the mitigation of the impact of dust on the population.
- 6.34 **Groundwater.** At Itapucumi, domestic wastewater will be collected and sent to a septic tank, which will also be monitored, according to the management plan during operation. Similarly to Villa Hayes, the final design of the wastewater treatment system is not yet ready and will be required prior to the financial closure (see Section VIII).
- 6.35 **Landscape and Visual.** Mitigation measures for this impact are mainly contained in the environmental control instructions for land clearing activities and the deforestation

program for operation of the quarry and adjacent areas, the solid waste management plan and measures for stabilization of the side walls of the pit. At Itapucumi, a vegetation barrier will be erected, which will act both as protection against dust and as visual barrier. The design of this barrier, including the costs and schedule, will be required prior to financial closure (see Section VIII).

Paraguay River between Villa Hayes and Itapucumi:

- 6.36 **Fluvial transportation of raw materials.** Subcontractors will be required to comply with national and international regulations for transport by barge. As determined by those regulations, the crew of the barges is required to remain on them during overnight stops that are made along the way, to avoid negative impacts on the populations of those ports. The Sponsor will be required to perform a characterization of the communities along the Paraguay River where the barges will stop, and an identification of expected impacts on them and its mitigation measures (see Section VIII).

**B.3 Management of social impacts and risks**

Villa Hayes:

- 6.37 **Traffic and transportation.** Traffic impacts during operation will be managed in the same way as described for the construction phase. The management plan for operation includes mitigation measures for the transport of raw materials from the quarries and of produced cement from the plant to distributions facilities, which include procedures to avoid or minimize negative impacts on the involved communities, e.g., speed limits, spraying of unpaved roads to avoid dust emissions, appropriate signaling, obligation to use only the routes provided in the transportation plan for operation, ban on making unauthorized stops, traffic control through working teams, measures to be implemented in case of accidents or vehicle damage, etc. A transportation plan will also be designed and implemented for the transport of raw materials from the clay and puzzolana quarries, once they are selected.
- 6.38 **Operational impacts on the community.** The Integrated Plan for Environmental, Social, Health and Safety Management during Operation also contains measures for dust control, control of vehicle emissions, control of air quality, control of noise and vibration, which all aim to reduce impacts on the population. The project also includes a Social Communication and Community Relations Program and a Social Responsibility Program.

Itapucumi:

- 6.39 **Community promotion.** The Sponsor will be required to draw and implement a Community Relations Plan, aimed –among others- to encourage and strengthen the state presence in the town and to promote community self-management, promoting actions like those that are already being implemented by the company in the community, such as building a health center in agreement with national and provincial health authorities, which are responsible for providing funds to pay the medical personnel. Steps similar to those already taken by the company in the field of health and education should be

implemented in other areas such as security and public works, with the involvement of the community and the departmental and national authorities and the support from the company.

- 6.40 **Noise and vibrations due to blasting.** In order to minimize the impacts of noise and vibration, the plan for use of explosives was designed in such a way that minimizes the number of explosions, in order to reduce the effects of that impact on the surrounding fauna and population: there will be one explosion per week, always at the same day and time (noon). The operator will use internationally recognized techniques of sequential blasting in order to minimize the blast wave and therefore reduce any impact, with the use of a silencing system to minimize the impact. Once greater depths are reached, and because of the local topography and the future morphology of the site, the detonations will be tempered by the rocks in the quarry, which will minimize the impact of noise and vibrations on both the wildlife and the population.
- 6.41 **Traffic.** Mitigation measures similar to those implemented in Villa Hayes will be undertaken at Itapucumi. Also, the Sponsor will be required to design and construct an alternative access road for villagers, as well as to make provisions for traffic control, access restrictions and other security measures to minimize the risk of accidents at the site (see Section VIII).
- 6.42 **Impacts on indigenous communities.** Although no impacts on indigenous communities are expected, Yguazú Cementos is collecting complementary information related to indigenous communities in order to confirm that there will be no impacts to these communities (see Section VIII). However, the management plan for operation includes training the project's staff and workers, including those of subcontractors, on issues related to the interaction with indigenous people. If any, the IDB Policy for Indigenous People (OP-765) will be applied.

#### **B.4 Labor Health & Safety**

- 6.43 **Labor Health & Safety.** The management plan for operation contains a Labor Health and Safety Management Plan, similar to the one mentioned for the construction phase, which will be implemented by the project's sponsor and its subcontractors. Regarding explosives, their handling, transportation, storage and use will be done in compliance with national regulations and the IFC Environmental, Health and Safety Guidelines for Mining.

### **C. Monitoring**

#### **C.1 Monitoring during construction**

- 6.44 ESLHS monitoring during construction will be conducted at two levels: by means of continuous inspection (daily) activities and facilities, and through monthly audits. The project sponsor, with the support from the ESLHS technical consultant, will conduct environmental monitoring, which will complement the monitoring under the



responsibility of the Contractor. This monitoring will include air and water quality. Table 2 summarizes the performance indicators for the monitoring during construction.

## C.2 *Monitoring during operation*

- 6.45 The *Monitoring Program* during Operation includes air quality monitoring, water quality monitoring, effluent monitoring, monitoring of quarry excavation slope stability conditions, monitoring of overburden and waste pile slope stability conditions, environmental monitoring and control of erosion and silting of drains and watercourses, monitoring of groundwater level behavior, noise and vibration monitoring.

**Table 2: Performance indicators during construction**

<b>Environmental, social, health and safety aspects</b>	<b>Indicator</b>
Environmental Management	Zero non-conformity notifications (NCNs) of level 1 (severe)
	< 10 NCNs of level 2 (secondary)
	90% of complaints resolved within the planned schedule
	Zero number of spills > 50 lt
Health and safety management	Rate of lost-time per incident for every 200,000 man/hour = 0.25
	Zero rate of fatalities
Community relationship	50% of unskilled labor locally hired
	90% of complaints resolved within 30 days
Workforce training	0.5% of total time in environmental training
	0.75% of total time in health and safety training

- 6.46 The effluent from the wastewater treatment plant at the cement plant will be monitored to evaluate the performance of the treatment and verify compliance with the limits laid down in national regulations for disposal in water bodies and the IFC - General EHS Guidelines for Environmental Wastewater and Ambient Water Quality. Monitoring will be done monthly or more frequently if malfunctioning is detected. In case the monitoring results show the presence of contaminants in the effluent, this will be diverted into a storage tank for complementary treatment prior to discharge in the receiving body.
- 6.47 The frequency of air quality monitoring will be monthly for the first year of operations and, from there, once every year or after the change of some important equipment. The information provided by the air quality monitoring will be used to verify the effectiveness of emissions management strategies. In the event that contaminant concentrations overstep permissible concentrations, corrective measures should be established for the operation of the factory. Additional monitoring will be made after the implementation of these measures to verify its efficiency. Monitoring indicators are summarized in Table 3.

**Table 3: Performance indicators during operation**

<b>Maximum allowable values for discharge in water bodies (IFC General EHS Guidelines)</b>			
pH		-	6 – 9
DBO 5 <sub>d</sub> 20° C		mg/l	50
DQO		mg/l	125
Receiving body temperature increase		° C	3
<b>Air emissions (IFC Guidelines)</b>			
<b>Parameter</b>	<b>Period</b>	<b>Unity</b>	<b>Maximum value</b>
NO <sub>x</sub>	Annual	µg/m <sup>3</sup>	40
	1 Hour	µg/m <sup>3</sup>	200
SO <sub>2</sub>	Annual	µg/m <sup>3</sup>	50
	24 Hours	µg/m <sup>3</sup>	125
MP <sub>10</sub>	Annual	µg/m <sup>3</sup>	50
	24 Hours	µg/m <sup>3</sup>	150

## VII. PUBLIC CONSULTATION

- 7.1 Public consultation was conducted simultaneously with the ESIA in the first quarter of 2011, including disclosure and consultation events with the communities of Villa Hayes and Itapucumi, and other stakeholders, on February 8<sup>th</sup> and 10<sup>th</sup>, 2011. The consultation consisted of formal meetings with local communities and other stakeholders. Earlier, during the field works, interviews were conducted with community members, government representatives and other stakeholders.
- 7.2 The main common issues that arose during the meetings and interviews are related to the community interest in job opportunities and economic benefits offered by the project. As a result of this, Yguazú Cementos has assigned a framework agreement for cooperation with the Municipality of Villa Hayes and the state National Labor Training System (SINAFOCAL), to train the local workforce in activities that are required for the project. At Itapucumi, similar training workshops will be held.
- 7.3 The ESIA report was made available to the public at the IDB Website since May 11<sup>th</sup>, 2011.

## **VIII. RECOMMENDATIONS FOR THE LOAN AGREEMENT**

- 8.1 The following recommendations are proposed to ensure a proper environmental and social management and compliance with IDB environmental and social policies and requirements throughout the project cycle, and will be included in the loan agreement.

### *During the life of the loan:*

- 8.2 The Bank (IDB) will require that Yguazú Cementos and all its contractors and subcontractor shall, at all times during the life of the loan, comply with each of the following:
- a. All applicable environmental, social, health and safety, and labor regulatory requirements of Paraguay, including all requirements associated with any environmental, social, health and safety, and labor related permits, authorizations, or licenses that apply to the Operation, to the Sponsor or to any party responsible for executing the operation or its mitigation measures.
  - b. All aspects and components of all of the operation's environmental, health and safety, social and labor provisions contained in the Environmental and Social Impact Assessment (EISA), and the implementation of the Environmental and Social Management Plans described in this.
  - c. Compliance with the IDB Policies Environment and Safeguards Compliance (OP-703), Access to Information (OP-102), Natural Disaster Risk Management (OP-704), Genre Equality (OP-270) and the IDB Cement Manufacturing Plant Guidelines (August 2010).
  - d. Compliance with the IFC Environmental, Health and Safety General Guidelines (April 30, 2007), the IFC Environmental, Health and Safety Guidelines for Mining (December 10, 2007), the IFC Environmental, Health and Safety Guidelines for Construction Materials Extraction (April 30, 2007) and the IFC Environmental, Health and Safety Guidelines for Cement and Lime Manufacturing (April 30, 2007), except in the case of gross CO<sub>2</sub> emissions per tonne of clinker and thermal energy consumption, for which the Minimum Performance Criteria contained in the IDB Cement Manufacturing Plant Guidelines (August 2010) will apply.
  - e. Consult with IDB before approving or implementing any and all substantive changes to the Operation (including its environmental and social management and mitigation plans) or its timetable which could potentially have negative environmental, social, labor, or health and safety effects.

- f. Send written notice of any and all noncompliance with any environmental, health and safety, social and labor requirement of the loan agreement and any significant environmental, social, labor, health and safety accident, impact, event, claim or material complaint.
- g. Ensure that all Sponsor's contractors hired for construction and operation activities comply with the applicable environmental, labor, social and health and safety requirements of the loan agreement.
- h. Implement ongoing information disclosure and consultation activities related to environmental, labor, social, and health and safety aspects of the Operation, including disclosure of Environmental and Social Compliance Reports and, as applicable, participatory monitoring.
- i. Implement an environmental, health and safety, social and labor management system that is consistent with ISO 14001 and OHSAS 18001.

Prior to Financial Closure:

8.3 Prior to the date of Financial Closure, Yguazú Cementos Cementos shall present, to the satisfaction of the Bank:

- a. The results of a gap analysis, based on the management plans for the construction phase described in the ESIA, regarding Yguazú Cementos's current practices and the –construction's contracts, and a detailed Action Plan –including budget and timelines- aimed to ensure that all plans and mitigation measures contained in the ESIA are set in place during construction.
- b. The final adjusted supervision checklist for construction works, including environmental performance indicators.
- c. Copy of the contract and TORs for the measurement of air quality, water and noise for the establishment of the base line in Villa Hayes and Itapucumi.
- d. The final design of the wastewater treatment system in Villa Hayes and Itapucumi, respecting the final discharge criteria specified in the IFC Environmental, Health and Safety General Guidelines (April 30, 2007),
- e. The design of a physical barrier (such as vegetation barriers) between the Itapucumi village and the quarry site and alternative routes for villagers, as well as provisions for traffic control, access restrictions and other security measures to minimize the risk of accidents at the site, including the costs and schedule.
- f. Complementary information in order to confirm that there are no indigenous communities in the project's area of influence that could be impact.
- g. Confirmation of the implementation of a grievance mechanism for the community and the workers at Villa Hayes and Itapucumi.
- h. A Community Relations Plan for Itapucumi, aimed –among others- to promote community self-management, as described in paragraph 6.39 of the ESMR.

- i. Confirmation of the implementation by Yguazú Cementos of an environmental and social management team, as proposed in the ESIA (Chapter 6 Environmental and Social Management of the ESIA).

Prior to First Disbursement:

- 8.4 Prior to First Disbursement of the Loan, Yguazú Cementos shall fulfill the following conditions:
  - a. Submit to the Bank the results of the measurements of air quality, water and noise for the establishment of the base line in Villa Hayes and Itapucumi.
  - b. Submit to the Bank a draft of a detailed action plan for environmental, social, health and safety management during operation, according to the provisions of the ESIA, including budget, timelines, supervision and monitoring provisions and performance indicators.

Prior to each disbursement:

- 8.5 Prior to each disbursement, the Sponsor shall certify compliance with all environmental social, health and safety and labor requirements in the loan agreement and the applicable IDB and IFC policies and guidelines, as described in paragraphs 8.2 c and d. The Bank will confirm through a third party consultant compliance with IDB policies and other requirements mentioned in the precedent paragraph.

During construction:

- 8.6 Prior to the beginning of barge's operation, Yguazu Cementos shall submit to the Bank a characterization of the communities along the Paraguay River where the barges will stop, and identification of expected impacts on them and its mitigation measures.
- 8.7 Prior to the beginning of the bidding process for the operation of the quarry, Yguazu Cementos shall submit, to the satisfaction of the Bank, the terms of reference (TORs), including ESIA requirements regarding management of explosives, movement of material and fuel management following international standards.
- 8.8 The Sponsor must prepare and submit to IDB a quarterly Environmental and Social Compliance Report (ESCR), in form, content and frequency acceptable to the Bank.

Prior to beginning of operation:

- 8.9 Prior to beginning of operation of the cement plant, Yguazú Cementos shall present, to the satisfaction of the Bank:
  - a. At least 3 (three) months prior to beginning of operation of the cement plant, an assessment of expected air emissions (NOx, CO, SO<sub>2</sub>, heavy metals, dioxins and furans), consisting of equipment supplier's specifications and performance guarantees. If needed, provisions to maintain them under international standards (IFC guidelines for cement plants) should be included.

- b. At least 60 days prior to beginning of operation of both the quarry and the cement plant, the final version of a detailed integrated environmental, social, health and safety management plan (ESMP) implementing the provisions of the ESIA and the IDB requirements, including a Contingency Plan, responsibilities, budget and timelines.
- c. At least six months prior to beginning of operation of the cement plant, a study conducted by the Sponsor related to the use of alternative fuels and/or other raw materials, or other measures capable of reducing CO<sub>2</sub> emissions.
- d. At least three months prior to beginning of operation of the cement plant, a plan to ensure adequate management of the kiln dust waste following international standards (like those of the US Environmental Protection Agency, EPA), taking into consideration the possibility that it could not be 100% reused.
- e. Within 30 days after the first commissioning test of the cement plant, confirmation that the operation of the plant complies with the IDB Cement Manufacturing Plant Guidelines (August 2010) regarding energy efficiency and gross CO<sub>2</sub> emissions.
- f. At least 90 days prior to the beginning of operation of the cement plant, a contingency plan containing actions to be carried out to address different levels of flooding of the Paraguay River in Villa Hayes.

During operation:

8.10 **During operation, and for the lifetime of the loan,** Yguazú Cementos shall fulfill the following conditions:

- a. During the first two years of operation, the Sponsor must prepare and submit to IDB a semi-annual Environmental and Social Compliance Report (ESCR), in form and content acceptable to the Bank.
- b. During the rest of the lifetime of the loan, the Sponsor must prepare and submit to IDB an annual Environmental and Social Compliance Report (ESCR), in form and content acceptable to the Bank.
- c. In addition, the Sponsor may be required to submit quarterly Environmental Monitoring Reports, in form and content acceptable to IDB, of evolving social or environmental conditions which the parties agree need to be closely monitored during construction, execution or both even if they are not specifically included in any Operation environmental or social management or mitigation plan.

General recommendations:

8.11 To provide for Bank monitoring of the Operation's environmental, social, health and safety, and labor aspects the Loan Agreement shall provide for:

- a. The Bank's right to perform supervision actions (e.g., site visits, review of documentation, consultations with affected parties and third parties, etc.)
- b. The Bank's right to contract an external independent environmental consultant to perform more detailed supervision/monitoring actions during the Project's construction and operation by Yguazú Cementos

- c. The Bank's right to contract for the performance of an independent environmental, social, health and safety, and labor audit, if the Bank deems necessary.
  - d. Yguazú Cementos agreement to provide access to all relevant documentation, facilities and personnel and cooperate fully with any inspection or audit by the Bank or its designated consultants.
  - e. Yguazú Cementos agreement to cooperate fully with the IDB's Independent Consultation and Investigation Mechanism (ICIM).
- 8.12 The Bank will monitor the Operation's environmental, health and safety, social and labor aspects via internal Bank supervision actions (e.g., site visits, review of documentation, etc.) and will contract an external independent environmental consultant to perform more detailed supervision/monitoring actions during construction and initial operation. This supervision is expected to be held quarterly during construction, semi-annually during the first year of operations, and annually thereafter. In addition, the Bank will have the right, as part of the Loan Agreement, to contract for the performance of an independent environmental, health, and safety audit, if needed.