

SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

OF THE

NGHI SON CEMENT CORPORATION PROJECT

IN THE

SOCIALIST REPUBLIC OF VIETNAM

January 1996

ABBREVIATIONS

CO	-	Carbon Monoxide
EIA	-	Environmental Impact Assessment
MOSTE	-	Ministry of Science, Technology and Environment
NO _x	-	Nitrogen Oxides
SO ₂	-	Sulfur Dioxide

WEIGHTS AND MEASURES

cm	-	centimeter
ha	-	hectare
km	-	kilometer
m	-	meter
m ³	-	cubic meter
mm	-	millimeter
mg/l	-	milligram per liter
s	-	second

NOTES

In this Report, the symbol "\$" refers to the US dollar and "ton" refers to metric ton.

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A. Introduction

1. The economy of Viet Nam is growing steadily owing to the successful economic reform program (Doi Moi Policy), and foreign investment is increasing. The domestic demand for cement in Viet Nam is expanding rapidly. Viet Nam is in the center of Southeast Asia, surrounded by countries whose economies are undergoing remarkable economic growth. Thus, Viet Nam is in an advantageous position for exporting cement to these countries. Nghi Son, Than Hoa Province, is 210 kilometers (km) south of Hanoi. The district is a favorable location for the proposed cement plant Project because it has abundant limestone resources nearby and a deep bay where large ships could berth along a pier. Quarries for limestone, clay and silica sand are located in Quynh Luu, northern Nghe An Province. The location map of the Project site is given in Appendix 1. In addition, the Project includes a cement distribution terminal that will be constructed in the Hiep Phuhoc Commune, within Nha Be District of Ho Chi Minh City.

2. The environmental impact assessment (EIA) for the Project was carried out by the Environmental Protection Center in Ho Chi Minh City. The EIA report was prepared in September 1994, and approved by the Ministry of Science, Technology and Environment (MOSTE) in April 1995. This Summary EIA was prepared by the Borrower and has not been evaluated or assessed by the Bank. The Bank's assessment of the Report and evaluation of the environmental impacts related to the Project will be included in the documentation presented to the Board at the time the Project is considered for approval.

B. Project Description

3. The total cement production of the proposed plant will be 2.13 million tons/year. The limestone quarry, with deposit of more than 200 million tons, will be developed to provide annually about 2.3 million tons safely as well as steadily. The limestone, clay, and silica sand will be carried by dump trucks to the crushing plants, and will be crushed to less than 80 millimeters (mm). A long-distance belt conveyor designed for heavy load operation, a part of which passes through a tunnel, will provide a stable supply of limestone, clay, and silica sand to the cement plant.

4. In the cement plant, silica sand will be ground separately in a vertical mill. Another large vertical roller mill with a dynamic separator will dry and grind the other raw materials. One vertical-type coal mill will dry and grind the kiln fuel — anthracite. Anthracite coal from Quang Ninh Province of Viet Nam will be used. Coal, gypsum, and iron material will be purchased. Pyrite sinter, the by-product of a fertilizer plant at Lam Thao in northern Viet Nam, will serve as the initial source of iron material.

5. A five-stage preheater with preliminary furnace (calciner) will be adopted in the kiln system. The product after reaction in the kiln system is clinker. Gypsum and other additives will be measured and fed with the clinker into the cement ball mills. Ordinary Portland cement, which is mainly for export, and Portland cement 40, for domestic use, will be produced by the mills according to market demand. The transport systems to silos for each type of cement will be shared. Shipping facilities will handle various types of packing: in bulk for export by ship, in bulk for Ho Chi Minh City by ship, and bagged for central Viet Nam and for north Viet Nam by truck. The pier for loading products and receiving raw materials will be approximately 1.4 km from the seashore. Products and raw materials will be carried by a conveyor belt system between the plant

and the pier.

6. In addition to the crushers, raw mills, a coal mill, a kiln system, a cement mill, and shipping facilities, the Project will include facilities for loading and storing raw materials, warehouses for bagged cement, loading facilities for the cement, offices and workshops, and port facilities. The process flow of the cement plant is shown in Appendix 2.

7. The distribution terminal in Ho Chi Minh City will receive, store, bag, and distribute the bulk cement shipped from the Nghi Son plant by two bulk carriers, whose capacities are 10,000 tons and 8,500 tons. Among the plant's main facilities are bucket elevators, air slides, a cement silo, feed tanks, rotary packers, and loading facilities for trucks and ships.

C. Description of the Environment

1. Physical Environment

a. Geology and Topology

8. The cement plant is proposed to be located on 32 hectares (ha) belonging to Hai Thuong Commune of Thinh Gia District in Thanh Hoa Province. At present, the area is cultivated land and hillside. The proposed site for limestone and sand exploitation is a mountain in Quynh Loc Commune of Quynh Luu District within Nghe An Province. The mountain rises at a distance of 200 meters (m) from highway 1A and 500 m from the nearest point of the railway. The mountain has a large quantity of limestone, estimated at 210 million tons, of suitable quality. Clay will be exploited from hills in Quynh Thien Commune of Quynh Luu District in Nghe An Province. The proposed site for the distribution terminal is far from the center of the city (25 km south of the city) and is near Soai Rap River. The site is 2.2 ha, and belongs to an area planned for heavy industry development.

b. Weather

9. The Project is in a tropical monsoon area, with mainly northeasterly wind in autumn and winter, and north and/or northwesterly wind in spring and summer. The annual average wind speed varies between 1.8 and 2.2 m/second (s). The wind blows especially hard in the period from autumn until winter.

10. The annual average temperature at the proposed plant site is 23.6 °C. The absolute maximum temperature is 40.7 °C and the minimum is 5.6 °C. The average maximum temperature occurs in July and the minimum in January. About 90 percent of the total annual rainfall is concentrated in May-November (the rainy season). The highest rainfall occurs in September, while the lowest occurs in January, February, or March. At Thanh Hoa, the annual average rainfall is 1,746 millimeters (mm); the highest is 3,011 mm; and the lowest 1,049 mm.

11. Through the last 36 years, there have been a number of storms and tropical low pressure areas, averaging 0.56/year but occurring at irregular intervals.

c. Surface, Ground, and Coastal waters

12. Because of high annual rainfall, the area has abundant surface water. Rivers and streams flow down on hillsides in a catchment area, which consists of many limestone mountains and bare hills with thin layers of soil. As a result, the water regulating capacity is bad and the flow in dry season is very poor, while floods can occur easily in rainy season, especially when there are storms.

13. The Thanh Hoa coastal area is influenced by the south-north tidal system in both winter and summer. The maximum speed of this system is 30 centimeters (cm)/s at Hauloc and 70 cm/s at the Bienson area. The proposed pier is near the coastline and Nghi Son Island, which mitigates the influence of waves so that it is relatively easy for ships to anchor in this area. The sea depth at the pier site is approximately 7 m.

14. There are only a few small rivers in the Project area. The water sample taken at Bo Bong bridge, the edge of a limestone mountain in Qunh Loc Village within Quynh Luu District, showed good quality. However, all the rivers and dams downstream have been polluted, mainly by domestic wastewater. Nghi Son coastal water is slightly polluted by domestic and agricultural effluents. At Nghi Son Island, shallow well waters show slightly saline intrusion and have been rather heavily polluted by domestic wastes. In the south part of the Project area within Quynh Luu District of Nghe An Province, shallow wells have better quality water, although they are also slightly polluted by domestic wastes and wastewater.

d. Air and Noise

15. The concentrations of pollution indicators such as sulfur dioxide (SO₂), nitrogen dioxide, and particulate matter are still below the ambient air quality standards promulgated by MOSTE. Except along roadsides, the air in the proposed Project area is not polluted by the industrial development of the region.

16. Noise and vibration levels in the area were within the MOSTE standards, although areas close to the railway station and highway exceeded the standards.

2. Ecological Environment

17. The site for the proposed cement plant includes areas cultivated with rice, maize, and potatoes, and hillsides mainly covered with trees. The mountain to be quarried is almost solid limestone. The area surrounding the limestone mountain is paddy field or wetland covered with grasses. The hill to be exploited for clay is also covered with grasses. The area to be mined for sand is almost barren land. The coastline has no coral reefs or valuable native flora such as mangrove.

18. Quynh Loc Commune, where limestone and sand will be exploited, has few wild animals. Only a few wild boars remain because of uncontrolled hunting for a long time. Although there are still some natural fauna such as chamois, monkeys, pythons, porcupines, and panthers in the more inland areas of Quynh Thien Commune, where the clay will be extracted, such animals are not seen near the quarry site.

3. Socioeconomic Environment

19. The cement plant is proposed to be located in Hai Thuong Commune, which has a total population of 5,500 of which 40 percent are laborers. The commune's annual population growth rate is 2.8 percent. Most residents are engaged in agriculture, fishing, and salt making. The commune has a total area of 3,500 ha, including 230 ha of agriculture land, 250 ha of forest plantation, 5 ha with residential housing, and 140 ha of lake. Total rice production is 1,000 tons/year.

20. Limestone and silica sand will be extracted from Quynh Loc Commune of Quynh Luu District in Nghe An Province. Quynh Loc Commune comprises 1,500 ha, including 450 ha of agriculture land. The commune has 7,300 people, including 1,400 families, and 3,160 people of working age. The population is increasing at 3 percent per year. The main crops of the commune are rice, sweet potatoes, and ground nuts. Because of the soil's low fertility, yields are low and the commune produces only 500 tons of rice per year.

21. The clay is to be extracted in Quynh Thien Commune, which has a total population of 6,250 in 1,300 families, including 1,800 laborers. The annual population growth rate is 3.1 percent. Most residents are engaged in agriculture, forestry, and handicraft making. The commune includes 220 ha of agricultural land on which rice, potato, ground nut, and sugarcane are planted. Production targets for 1994 are 1,100 tons of rice and 1,500-1,600 tons of ground nuts, which is 300-400 tons above the 1993 combined production of rice and ground nuts.

D. Anticipated Environmental Impacts and Mitigation Measures

1. Physical Environment

a. Construction

22. The main impact of construction will be to alter the topography at the plant site. Construction of the plant will require grading and leveling the site, cutting the mountain slope, and using the excavated soil and rock. To prevent impacts from runoff during land preparation, leveling will be stopped and the excavated face and leveled ground will be covered by vinyl sheets during heavy rains. Also, temporary drainage grooves and sedimentation ponds will be constructed.

b. Exploitation and Transportation of the Materials

23. Impacts from limestone exploitation include (i) loud noise and high vibration generated during blasting at the mine; (ii) high concentrations of dust; and (iii) rain runoff carrying solids into crop fields, possibly collecting surface water and endangering aquatic life in the surrounding areas. These problems will be mitigated by (i) creating buffer zones of 300 m between residential areas and the quarry sites to reduce the impact of dust, noise, and vibration; (ii) implementing strict safety regulations regarding blasting, which will not be allowed at night in order to avoid accidents and endangering the health of local residents; and (iii) constructing a drainage system to conduct the runoff from the mining area into sedimentation ponds, and removing sludge from the ponds regularly.

24. The main impacts of clay and silica sand exploitation are dust and noise. However, because they will be exploited without blasting, the environmental impacts are less severe than those of limestone exploitation. Buffer zones of 100 m will be kept between the exploitation site and the nearest residential area in order to mitigate the impacts of dust and noise.

25. To mitigate the dust caused by the transport of raw materials in the quarry sites, trucks will have water spraying equipment. Also, all excavators, mills, and screening machines will be equipped with dust collectors. A conveyor belt system will be used to transport materials from the exploitation sites to the plant. The use of this equipment should minimize the generation of dust.

c. Operation of The Cement Manufacturing Plant

26. One of the most critical impacts of cement manufacturing is the dust generated during transport, storage, milling, packing, etc. To reduce the dust emission from coal and material storage areas, dust proof circular silos and stockyards with roofs and walls will be installed. Dust generated from the milling and screening area will be collected and treated by dust collectors. During material transportation, all materials that can cause pollution will be carried by conveyor belts in enclosed galleries. Electrostatic precipitators will be installed to treat gasses from kiln firing, calcining, and clinker cooling. Dust in the air after treatment is expected to be less than 30 milligrams (mg) per cubic meter (m^3), which is an acceptable level by international standards and is much lower than the Vietnamese emission standard for new cement facilities (50 mg/m^3 for dust emission containing silica and 100 mg/m^3 for the smoke stack), which was established in March 1995.

27. As for gaseous pollutants, the air emitted from the kiln and calciner contains SO_2 , nitrogen oxides (NO_x), and carbon monoxide (CO). SO_2 gas comes in contact with calcined raw meal at 800-1000 °C, and is absorbed by calcium oxide and other basic oxides to form calcium sulfate and calcium sulfite. Traces of SO_2 are emitted from the 80-m smokestack. NO_x gases are generated at high temperature in the kiln. By burning 50-60 percent of the fuel in the calciner system, NO_x emissions can be reduced. Furthermore, the kiln's main burner, with effective fuel dispersion, can reduce NO_x generation. The concentrations of SO_2 , NO_x , and CO in gas emitted from the stack are 30 mg/m^3 , 490 mg/m^3 , and 20 mg/m^3 , respectively, and these meet the newly established Vietnamese emission standards (500 mg/m^3 for SO_2 , 1000 mg/m^3 for NO_x , and 500 mg/m^3 for CO).

28. The Gaussian dispersion model was used to predict a maximum dust concentration at ground level at the critical wind speed (2 m/s). The concentration, at 0.036 mg/m^3 , is lower than the Vietnamese ambient air quality standard (0.2 mg/m^3 , over a 24-hour average). The maximum concentration of SO_2 is 0.005 mg/m^3 , which satisfies the Vietnamese ambient quality standard (0.3 mg/m^3 , 24-hour average).

29. Noise will be generated from the milling process, air compressors, and air blowers during operation, but silencers will be installed to mitigate such noise.

30. Industrial wastewater from the cement plant will consist mainly of high temperature cooling water. The plant will not discharge industrial water because the cooling water will be reused after being cooled below 30 °C. About 160 m^3 of water will be consumed for domestic use

in the plant each day. Most of the water will be used for bathing, washing, and cooking. Domestic wastewater will be collected and treated by a system consisting of a stabilization pond and septic tanks. The biochemical oxygen demand of the effluent will be kept below 50 mg/liter which is the Vietnamese effluent standard for class B (the classification for the water bodies used for navigation, irrigation, bathing, and breeding aquatic life.)

d. Distribution Terminal

31. Dust caused by transport, unloading, loading, storing, and packing cement and raw materials will be controlled by installing bag filters at appropriate points. Dust emission from the outlet of filters will be kept below 30 mg/m³.

2. Ecological Environment

32. The main impact on the ecological environment will be the conversion of 32 ha of cultivated land and hillside covered with trees. The vegetation on hills to be mined for clay will be destroyed. The loss can be mitigated by developing green areas and rehabilitating the quarry site after completion of the mining operation. Because there are no valuable flora or fauna in the Project area, the Project will not have a significant impact on the ecological environment.

3. Sociocultural Environment

33. The Project will entail relocating approximately 50 families in Thanh Hoa Province and 100 in Nghe An Province from the proposed plant and quarry sites. The families at the proposed plant site will be relocated and settled before the plant construction begins. In both provinces, the policy is to relocate the people near their original neighborhood. The families will be also provided with farm lands. The borrowers will compensate the families for their lost real estate and expected income from crops.

34. The Project will create job opportunities for 470 new staff members and for a number of others with services supporting the operation of the plant. The Project will also contribute to the improvement of the local economy by bringing job opportunities and improving technological levels. Increased employment and the improved income level will enhance access to health, education, cultural, and recreational facilities.

35. The impact on the people's health of the Project-generated dust and gaseous emissions is expected to be minimal, because pollution control facilities will be based on existing state-of-the-art technologies used in Japan and the concentration of air pollutants is predicted to be within acceptable levels.

E. Alternatives

36. Agriculture is a main industry in the Project area, but on a small scale because the soil is not very fertile and seems unsuitable for rice cultivation. People on Nghi Son Island live by small-scale fishing and salt production activities. The Nghi Son area is very poor from the viewpoint of land productivity. Therefore, the government has encouraged industrialization that is appropriate for the area. The Nghi Son area's rich limestone deposits and nearby deep sea make

it suitable for a large-scale cement plant. The government formerly had planned an oil storage base in the area; however, the project was suspended because funds were lacking and the site was not appropriate.

37. The cement plant will make good use of the natural resources and promote industrialization of surrounding areas. Strong demand for cement is expected to continue throughout the country as well as in Southeast Asia. As the Project assumes that 40 percent of the product will be exported by ships. Nghi Son, with deep sea access, is an appropriate site, and surveys have not found an acceptable alternative location. The modernized plant will be almost dustproof, and other pollutants, such as gasses and wastewater, will be controlled at acceptable levels. The port to be constructed will be a long pier, separate from the seashore where many small fishing boats are anchored, so that it will not interfere with local fishing activities and can coexist with the community.

38. The other alternatives to meet the demand for cement in Viet Nam are to (i) increase importation, and (ii) increase the production from existing facilities. Continued importation is not a viable alternative because of the high cost of transporting and storing cement and the lack of foreign exchange to pay for imported cement. Viet Nam wants to be self-reliant in cement supply to sustain its development program. In terms of the global environment, importation would avoid the environmental impacts of the Project in Viet Nam, but the CO₂ emissions would be higher because additional energy would be required to transport the final product to Viet Nam. Regarding the second option, overloading the existing cement plants would result in serious environmental pollution in the surrounding areas, as most of their pollution control equipment is inadequate.

F. Cost-benefit Analysis

39. The Project will provide financial returns and substantial economic and social advantages to the society by industrializing surrounding areas, stimulating production of technology for cement and related industries, and providing labor employment opportunities.

40. The total Project cost is \$373 million. The estimated economic internal rate of return on the total investment is 12.11 percent, on equity it is 22.87 percent, and the payback period for investment is 8.90 years. The cost of pollution control equipment amounts to \$14,996,000 and its ratio to total investment is 4.02 percent. The list of equipment and its cost is given in Appendix 3. Other expenditures for environmental protection include greenbelts inside the plants and on their boundaries, and sediment ponds for mining areas. Costs for these are included in the Project cost. The main benefits of these measures are reduced air, water, and noise pollution in the Project area. The borrower will pay the \$400,000 cost for resettlement.

G. Institutional Requirements and Environmental Monitoring Program

41. The Project's electrostatic precipitators and all bag filters are designed to limit dust exhaust to 30 mg/m^3 . During commissioning periods, performance guarantees will be imposed on equipment suppliers. During commercial operations, a dust meter will continuously monitor emissions from the main chimney, and the management will submit records when requested by government authorities. NO_x and CO in the kiln exhaust gas will be sampled and measured continuously by gas analyzers, while SO_2 will be monitored periodically. The noise, dust, and SO_2 around the plant or quarry sites will be monitored periodically, probably once a week or so, by monitoring apparatus. Dust deposits will be measured in several places near the plant, and the components of the collected dust will be analyzed in the company's own laboratory, which will do a daily chemical analysis of cement, clinker, and raw materials.

42. The environment management section of the plant will include administrative and production staff. Technological matters such as maintaining environmental facilities, checking records, and monitoring will be done by the production section, and the administration personnel will handle public information. The environmental committee, consisting of concerned personnel (representing production and administration sections) and the plant manager, will meet periodically to examine related issues and maintain environmental performance.

43. Once a year, the Nghi Son Cement Corporation will submit to the Asian Development Bank (i) a compilation of the all monitoring data; (ii) a highlight of the activities related to environmental protection and plant safety; and (iii) if the plant has been cited for violation of environment and safety standards or regulations, certification from the relevant government authorities showing that the defect has been corrected or an acceptable plan of action is in place to correct the defect.

H. Public Involvement

44. During the EIA process, the relevant provincial governments have provided opportunities to explain to the local communities the Project and its possible environmental impacts. The Project is widely publicized by the mass media, particularly in newspapers, and local communities have shown their acceptance of the Project.

I. Conclusion

45. The Vietnamese Government encourages foreign investment, especially in heavy industries that will provide materials necessary for developing basic infrastructure and improving indigenous technological capacity. Thus, the proposed Project will contribute to Viet Nam's economic development and to the local society.

46. The main impacts of the Project are dust, noise, and runoff. If the recommended mitigation measures are implemented and pollution control facilities are properly operated, such impacts can be mitigated to acceptable levels.

Appendix 1

Location of NSC Plant

Appendix 2

Conceptual Process Flow

THE COST OF MITIGATING MEASURES

Equipment	Cost(\$)
1. Smoke Stacks	1,200,000
2. Electrostatic Precipitators	
a. Suspension Preheater	4,474,000
b. Clinker Cooler	2,552,000
3. Bag Filters	
a. Coal Mill System	909,000
b. Cement Mill System	1,753,000
c. Crusher System	277,000
d. Silos and Hoppers	199,000
e. Belt Conveyors Systems and Feeder Systems	580,000
4. Burning and Calcining System for NO _x Mitigation	2,657,000
5. Sewage Treatment System	300,000
6. Silencers for Noisy Blowers and Fans	95,000
Total	14,996,000