


THE FEASIBILITY STUDY
FOR
THE ESTABLISHMENT OF A PULP AND PAPER MILL
IN
THE REPUBLIC OF ECUADOR

(SUMMARY)

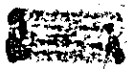
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JAPAN INTERNATIONAL COOPERATION AGENCY

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CONTENTS

	Page
1. Background of the Feasibility Study	1
2. Objective of the Feasibility Study	2
3. Scope of the Study	2
4. Substance of Survey	2
5. Membership and Mission Schedule of Survey Team	5
5.1 Survey Team Members	5
5.2 Mission Schedule	5
6. Summary of Study	5
6.1 Concordance with the Established Ecuadorian National Policy	6
6.2 Market Study	6
6.3 Forest Resources	9
6.4 Envisaged Product and Production Scale of Plant	10
6.5 Plant Site	15
6.6 Conceptual Design	17
6.7 Raw Material, Chemicals and Utilities	20
6.8 Pulpwood Supply	21
6.9 Reforestation	21
6.10 Plant Construction	22
6.11 Organization and Staffing	24
6.12 Plant Operation	25
7. Total Investment Cost	26
7.1 Total Investment Cost	27
7.2 Financing	27

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1. Background of the Feasibility Study

The Region of San Lorenzo, Province of Esmeraldas, in the northwest coast of the Republic of Ecuador, possesses a vast national resource of primeval forest containing approximately 200 species of mixed tropical hardwood.

Since 1969, the Government of Ecuador, with the assistance of the Food and Agricultural Organization of the United Nations and the International Bank for Reconstruction and Development, undertook a survey of forest resources and of development possibilities, with the view to promoting the economic development of the under-developed Province of Esmeraldas through full utilization of its forest resources.

The results of this survey were embodied in a report which recommended the establishment of a sawmill as a first step, and a plywood mill as a second step, which 2 mills have already been realized, and are today effectively contributing to the economic development of the region.

As Step 3, the report recommended the establishment of an integrated pulp and paper plant for manufacturing final paper products.

In Ecuador, the consumption of paper has paralleled the country's economic development, and the supply to meet the rising demand has so far been met by increasing dependence on imports, which reached 83% in 1981.

The extension of domestic paper production capacity has thus come to be a requirement of primary urgency for the country.

To meet this need, the establishment of a pulp and paper plant has been adopted as a National Project in the 1980 to 1984 Five-Year Plan, and is at present under study by the Corporación Financiera Nacional.

In view of these circumstances, the Government of the Republic of Ecuador requested the Government of Japan in December 1981, to conduct a feasibility study for evaluating the various aspects of the Project in question.

Having received this request, the Government of Japan called upon the Japan International Cooperation Agency to undertake the Feasibility Study, in line with which the

Agency sent a Preliminary Study team to Ecuador in July 1982.

This team consulted with the Ecuadorian authority on the basic items to be taken up by the envisaged *Feasibility Study*, to formulate the “Scope of Work for the Feasibility Study on the Establishment of a Pulp and Paper Mill in the Republic of Ecuador”, which was agreed upon and signed by the Ecuadorian and Japanese representatives on July 20, 1982.

In implementation of the above agreement, the Japan International Cooperation Agency assigned a Study team to carry out the necessary investigations for the Feasibility Study.

2. Objective of the Feasibility Study

The present Feasibility Study has an objective to evaluate the feasibility of a project for utilizing the mixed tropical hardwood obtainable from the Cayapas Forest Concession of the National Forest in the region of San Lorenzo, Esmeraldas Province through the establishment of an integrated pulp and paper plant to produce either (a) corrugated board (kraft liner and corrugating medium), or (b) printing/writing paper, with a view to (a) saving the outflow of foreign currency by reducing imports of corresponding products, (b) enhancement of employment opportunities, (c) assimilation of papermaking technology, and at the same time to contribute to (d) economical development of the region of Esmeraldas.

3. Scope of the Study

The Feasibility Study is to cover an integrated evaluation – based on technical, financial and economical criteria – of the alternative cases of adopting as final product (a) corrugated board (kraft liner and corrugating medium) and (b) printing/writing paper, to appraise the business prospects and to examine the means of realizing the projected Plant.

4. Substance of Survey

For achieving the objectives and for covering the scope of the Feasibility Study set forth in the preceding Chapters, the following items have been taken up as subject of investigation.

- (1) Ecuadorian national policy concerning the pulp and paper industry
- (2) Market study
 - Paper and paperboard supply and demand: Current trends and forecast of future market
 - Paper and paperboard market prices and trends
 - Paper and paperboard distribution channels and costs
 - Sawlog and plywood supply and demand: Current trends and forecast of future market
 - Sawlog and plywood market prices and trends
 - Sawlog and plywood distribution channels and costs
- (3) Forest resources
 - Review of available reports and documentary material on forest resources
 - Site survey of existing forest volume and practical means of logging and transportation
 - Pulping tests on representative samples of pulpwood from Cayapas Forest Concession
 - Selection of tree species suitable for pulping
- (4) Selection of final product and scale of production of the envisaged Plant
- (5) Raw materials
 - Pulpwood: Available wood volume and pulpwood cost
 - Auxiliary materials: Quantities required, prices and means of procurement
- (6) Plant site
 - Geographical environment
 - Water supply
 - Electric power, steam supply
 - Transportation facilities (port, highway and railroads)
 - Selection of plant site

- (7) **Conceptual design of envisaged Plant**
 - Basic data
 - Selection of manufacturing process
 - Conceptual design of plant
 - Conceptual design of auxiliary installations
 - Plant layout
- (8) **Means of pulpwood conveyance and infrastructure**
- (9) **Reforestation and environmental considerations**
- (10) **Organization and manpower distribution**
- (11) **Construction and operation of envisaged Plant**
 - Means of shipping the plant and construction equipment
 - Labor market
 - Construction materials and contractors
 - Selection of construction system (choice between platform-mounted and conventional piece-meal construction systems)
 - Plant equipment
 - Period required for construction
- (12) **Total investment cost for Project implementation**
- (13) **Financial analysis**
 - Production cost
 - Profitability analysis
- (14) **Evaluation of economic and social impacts**
- (15) **Overall evaluation and recommendations.**

5. Membership and Mission Schedule of Survey Team

5.1 Survey Team Members

Mr. Tadao KANO	Team Leader
Mr. Seiichi TONOYA	Production Engineering
Mr. Yoshinao OSADA	Forestry, Reforestation, Environmental Science
Mr. Masao YOSHIDA	Market, Regulations
Mr. Atsushi YAMASHITA	Primary Materials, Production Equipment
Mr. Eiichi TAKESHITA	Finance, Economics
Mr. Masahiko HAYASHI	Plant Location, Transportation, Infrastructure
Mr. Koji WAKUTA	Construction, Operation
Mr. Ushio DOISAKO	Interpreter

5.2 Mission Schedule

The Survey team stayed in Ecuador from October 3 to November 2, 1982, to undertake site survey, during which the team engaged in assembling pertinent information and documentary material and in exchanges of view with counterpart representatives.

The envisaged plant site and surrounding district were visited and surveyed.

6. Summary of Study

As mentioned in the preceding Chapters, 2. "Objective of the Feasibility Study" and 3. "Scope of the Study", the choice of final product to be manufactured by the projected Plant is to be made among (a) kraft liner, (b) corrugating medium and (c) printing/writing paper.

Each of these 3 alternative products are examined for their comparative merits based on both technical and economical criteria, to determine the final selection of most suitable product.

With this view, the study proceeded in general outline in the following manner.

6.1 Concordance with the Established Ecuadorian National Policy

As mentioned in Chapter 1. "Background of Feasibility Study", the rapidly rising trend of paper consumption in Ecuador has made it a matter of prime urgency to enhance indigenous production of pulp and paper, and the establishment of an integrated pulp and paper plant has been taken up officially as national project.

For this reason, proceeding with implementation of the present project without delay should directly and immediately contribute to reducing the outflow of foreign currency, and the realization of this Project is anxiously awaited in Ecuador.

The prerequisite conditions for adoption of a scheme as national project are:

- Effective utilization of nationally available resources
- Possibility of letting the envisaged product replace currently imported articles
- Contribution to promoting exports
- Benefit to regional development.

The present Project satisfies all of the foregoing criteria, and this is undoubtedly why the Ecuadorian Government has taken it up as national project.

6.2 Market Study

The market study was directed toward investigating the current situation and future estimates of the supply and demand, market prices and distribution channels of (a) corrugated board (kraft liner and corrugating medium) and (b) printing/writing paper, as well as sawlog and plywood.

(1) Corrugated Board

The current annual demand for corrugated board in Ecuador is 115,500 tons, of which 67% is that of kraft liner and 33% corrugating medium.

A largely predominant part – 103,500 tons – of this demand is consumed in the production of carton boxes for packing export banana, and is today entirely covered by imports from U.S.A and Canada to satisfy the stringent quality requirements specified for this carton.

It should be noted in this connection that, the boxes thus produced from the board being intended for exporting banana, this article is imported into Ecuador in the category of temporary admission and is not included in the official statistics covering importations.

Corrugated board for domestic consumption, while still only constituting a very small market compared with that for the export carton boxes, is of recent coming to be produced indigenously, and the production has increased particularly rapidly since 1979.

No national standards have yet been established in Ecuador for corrugated board, and the absence of abundant sources of softwood for pulping has led to the predominant use of waste paper as material for producing the corrugated board.

In respect of the sales prices of corrugated board, the existence of a large trade of imported board determines the price of any domestically produced competing articles, and in the present instance, the price envisaged for this product has been based on the current F.O.B price of U.S products to which freightage has been added to obtain the figures of:

US.\$440 per ton of kraft liner

US.\$430 per ton of corrugating medium.

The demand for corrugated board for export carton boxes cannot be expected to rise to any extent in the coming years, in view of the stagnant outlook of the international banana market, but appreciable increase is anticipated of domestic consumption, and a figure of approximately 132,000 tons a year is estimated for the year 1990.

Subtracting from this the 12,000 tons a year already being supplied by local manufacturer, there would remain approximately 120,000 tons a year to be additionally supplied as follow, based on the existing statistic datas:

80,000 tons a year of kraft liner

40,000 tons a year of corrugating medium.

(2) Printing/Writing Paper

The domestic consumption of printing/writing paper was 19,363 tons in 1981.

A particularly sharp rise in demand has been recorded since 1967, averaging 20% per year.

Such a rapid enlargement of the printing/writing paper market cannot be expected to continue indefinitely, and a more realistic annual increase of 10% has been adopted in the present forecast, which will bring the demand to 45,000 tons a year in 1990.

Printing/writing paper is marketed in a wide range of varieties combining different values of basis weight, quantity of added clay, whether or not coated, and other factors affecting the paper grade, and for a newly established plant, it is advisable to limit the grades of paper to those for which the largest demand can be expected, so as to minimize the frequency of product grade switching – an operation that entails marked lowering of production efficiency.

Based on the foregoing considerations, the range of printing/writing paper considered suitable for the projected Plant is 40 to 80 g/m² basis weight, which represents 65% of the market in Ecuador for this paper, and within this range it is envisaged to eliminate fancy qualities, to cut off a further 20% of the products in this range of basis weight.

This will still represent a market amounting to:

$$45,000 \times 0.65 \times 0.8 = 23,400 \text{ tons a year.}$$

An average sales price of US.\$851 per ton is envisaged for the above grade of printing/writing paper, based on the current C.I.F values of equivalent articles imported from Brazil, Argentine, U.S.A and other countries.

(3) Sawlog and Plywood

With the view to maximizing effective utilization of the available forest resources, it is envisaged for the present Project to divert to plywood manufacture and to sale as sawlog part of the logged wood most adapted to such other uses.

The exist in the region around San Lorenzo 3 plywood mills and 50 or so sawmills, and the plywood mills alone can consume 57,300 m³ per year of raw wood.

Study of the wood species and timber size occurring in the envisaged forest lot has revealed that 25% of the available wood volume is suitable as plywood and as sawlog, meaning that, assuming 190,000 m³ to be felled annually, roughly 47,300 m³ per year would be available for sale for these uses.

An average selling price of US.\$28 per m³ (Sc.920 per m³) has been estimated to apply, taking the average between the Sc.970 per m³ and Sc.870 per m³ for A and B grade wood paid currently in the region to loggers.

6.3 Forest Resources

The study of the Cayapas Forest Concession resources included estimation of the net available wood volume and selection of concession lot suitable for exploitation as pulpwood source.

The Cayapas Forest Concession is covered by tropical rain forest of mixed hardwood occupying an area of 213,337 ha, of which 128,747 ha is accessible for exploitation in considering the terrain type.

The Concession comprises terrains classified into Montafioso (mountainous), Quebrado (broken), Ondulado (undulating), Plano (plain) and Costero (coastal), of which the largest forest volume is carried by the mountainous terrain, followed in descending order by broken - coastal - plain - undulating.

The Concession is divided into 9 lots, of which Lots 2, 3 and 3a possess advantages over the remaining lots of large forest volume and absence of difficulties in log conveyance to Plant site.

These lots present net exploitable forest areas of:

14,600 ha in Lot 2
48,700 ha in Lot 3
11,000 ha in Lot 3a.

Of the above 3 lots, Lot 2 was chosen for the present site survey on account of the advantages it offers of permitting full utilization of the highways now under construction as logging road, as well as proximity to the envisaged Plant site in San Lorenzo.

Lot 4 also can be considered eligible as source of pulpwood, but this lot has been laid aside for its having to be reserved for supplying the existing Cayapas plywood mill and projected new sawmill.

The net available wood volume from Lot 2 should be utilized, according to wood quality, as pulpwood, as sawlog/plywood material, and as fuel.

Wood suitable for pulping should present a basic density in the range of 300 to 600 kg/m³, of pale color, with little latex content, and should possess small vessels.

The net available wood volume from Lot 2, separated into the 3 qualities respectively intended for the uses cited above would be approximately:

For pulpwood	1,138,800 m ³
For sawlog and plywood	467,200 m ³
For fuel	277,400 m ³
Total	1,883,400 m ³

6.4 Envisaged Product and Production Scale of Plant

(1) Pulping Tests

To obtain data for determining products suitable for manufacturing by the projected Plant, pulping tests were conducted on 10 specimens of wood from different species sampled in the Cayapas Forest Concession – out of the total 16 species sampled, upon eliminating 5 species which presented excessive basic densities of 700 to 800 kg/m³ and one species which conversely had extremely light and corky tissue.

The 10 samples were blended together for the pulping tests.

For purpose of comparison, blended samples of comparable hardwood occurring in the Island of Hokkaido, Japan, were also subjected to pulping tests under identical conditions.

The pulping tests yielded the following results.

- Wood suitable for pulping should present a basic density in the range of 300 to 600 kg/m³, of pale color, with little latex content, and should possess small vessels.

These species are able to produce pulp in mixture form.

- There are species which presented excessive basic densities of 600 kg/m³ and conversely had extremely light and corky tissue.

These species should be used for sawlog or plywood materials, light-weight package boxes, toys and buoys.

- Except for pulp wood and sawlog or plywood materials, the Cayapas Forest Concession includes off-specification logs, these logs should be used as fuel required for steam generation of envisaged Plant operation.
- The wood ratio from Lot 2, separated into the 3 qualities respectively intended for the uses cited above would be as follows.

For pulpwood	60%
For sawlog and plywood	25%
For fuel	15%

- Kraft Liner

Pulping test to produce liner by kraft process indicated that the mixed Cayapas wood is suitable for this purpose when blended to 30 to 40% with imported softwood pulp.

- Corrugating Medium

Pulping test by both kraft semichemical and neutral sulfite semichemical processes proved the Ecuadorian samples to provide higher yield as well as higher pulp strength compared with the Japanese equivalent.

The tests also proved the neutral sulfite semichemical process to be more suitable for pulping the present samples.

It is to be further noted that for corrugating medium, a product possessing ample pulp strength and other requisite qualities is obtainable from the Cayapas wood without necessity of blending with imported softwood pulp.

– Printing/Writing Paper

Pulping tests by kraft process followed by bleaching (chlorine - caustic extraction - hypo - caustic extraction - hypo) indicated the mixed Cayapas wood to be susceptible to the production of pulp of quality comparable to the Japanese material upon blending with 10% of bleached softwood kraft pulp.

The brightness obtainable with the above 5-stage bleaching reached 84 and it means the mixed Cayapas wood has marketable brightness as printing/writing paper.

(2) Choice of Product

The foregoing results of pulping tests have been integrated with considerations on the factors cited below for evaluating the comparative merits of the 3 products taken up, to prove the superiority of (a) corrugating medium and (b) printing/writing paper, in preferable to kraft liner, as product for the Plant, and between 2, corrugating medium has been finally found to be the most advisable; upon applying the financial analysis detailed in Chapter 8. further on.

Factors considered in the comparative evaluation of alternative products

– Softwood pulp required to be blended to ensure requisite pulp properties (%)

Kraft liner	30 to 40
Corrugating medium	Nil
Printing/writing paper	10

– Pulping yield (%)

Kraft liner	50
Corrugating medium	75
Printing/writing paper	40.5

- Plant construction cost for equal production scale (index 100 for corrugating medium)

Kraft liner	170
Corrugating medium	100
Printing/writing paper	255

- Market price of product (US.\$/ton, C.I.F Guayaquil)

Kraft liner	440
Corrugating medium	430
Printing/writing paper	851

- Plant operating skill

Kraft liner	Operator skill required
Corrugating medium	Relatively simple to operate
Printing/writing paper	Operator skill required

- Quality required of product

Kraft liner	Equivalent to softwood pulp
Corrugating medium	Equivalent to hardwood pulp
Printing/writing paper	Normal quality

The disqualified reason of kraft liner are:

- Kraft liner requires blending imported softwood pulp
- Plant construction cost
- Same level of market price
- Operator skill is required
- High quality of product is required.

(3) Production Scale

The production scale envisaged for the 2 alternative products is as follows.

– Corrugating medium

As mentioned in Section 6.2, an annual demand of 40,000 tons is expected for corrugating medium, estimated from the current market situation and estimation of future trend.

The quasi-totality of this article is today imported.

For this reason, in view of the savings that will be made on foreign payments, the entire national demand is envisaged to be supplied by the projected Plant.

The resulting envisaged production scale of the Plant is 39,600 tons a year (120 tons a day).

– Printing/Writing Paper

A figure of 45,000 tons a year has been given in Section 6.2, as national demand for printing/writing paper.

Further consideration for maintaining production efficiency, for obtaining a good balance of plant construction cost and finance evaluation, for expected operator skill and other pertinent factors indicate a figure roughly half this total demand – 23,100 tons a year or 70 tons a day – as the paper production scale to be envisaged for this kind of paper.

It is to be noted that both of the above 2 products being today almost totally imported, their production by the projected Plant should present no serious problems of competition with existing Ecuadorian plants.

The annual requirements of pulpwood to feed the Plant for maintaining production on the scales envisaged above for corrugating medium and printing/writing paper are respectively 113,548 and 112,192 m³.

6.5 Plant Site

(1) San Lorenzo

San Lorenzo, envisaged as Plant site for the present Project, is situated 01°18'N, 78°51'W, not far from the Mataje River forming the frontier with Colombia.

The key industries supporting the economy of San Lorenzo are forestry, sawing and fishery and the population is approximately 18,000 and there are 14 schools including colleges.

The terrain around San Lorenzo comprises the 5 varieties of coastal, plain, undulating, broken and mountainous.

The Subsoil in the plain and coastal terrains is mainly argillaceous layer averaging 2 meters in depth covering alluvial deposit.

There appears to be little presence of soil presenting particularly poor bearing capacity.

The climate is hot and humid throughout the year, registering yearly average of 25°C temperature, minimum of 85% humidity and 2,500 mm rainfall and heavy storms and other natural calamities are rare.

(2) Supply of Utiliteis

— Water supply

Water supply, indispensable for the Plant, is considered ensurable from deep wells to be sunk, based on information on underground water obtained from the Instituto Ecuatoriano de Obras Sanitarias.

It should be noted, however, that further boring studies will be necessary to ascertain the availability throughout the year of the requisite quantity of water for plant operation.

To provide against the event of this well water proving inadequate for supply-

ing the Plant, a survey was made also of the volume of water flowing in the Tululbí River flowing about 15 km from San Lorenzo.

It was found that the river flow presented a volume of 1.2 million tons per day, quite ample if adopted as substitute source of water supply.

In respect of water quality, analysis of well and river water samples proved both to be free of chlorine, and low in turbidity and hardness, and thus to present no foreseeable problems in treatment for drinking and as industrial water, through subject to verification on water sampled in other seasons of the year.

— Eelectric power

Electric power for the Plant will not be available from the public network.

This will call for provision of a private power station.

The same applies to plant steam supply, which will require the installation of an industrial boiler, to be fueled with wood, which will be available as mentioned in Section 6.3.

This boiler will also require to burn as auxiliary fuel heavy oil, which will be procured from Esmeraldas together with the much smaller quantities of diesel oil and gasoline required for motor vehicles and other machinery.

(3) Infrastructure

The infrastructure available in the San Lorenzo district comprises its port facility and highway system.

The San Lorenzo port can accommodate shipping up to 2,000 tons, but possess only one pier, at present being reconditioned, for completion in 1984.

The reconditioned pier facilities will very opportunely serve for unloading the construction equipment during the installation work and auxiliary materials after the Plant enters service, and also for loading the product from Plant.

2 highways are under construction, emanating from San Lorenzo and which are to be completed also in 1984.

These highways will run right across the Cayapas Forest Concession, and in particular the Lot-2 will be traversed roughly through its center.

This will very appreciably benefit logging operations in this lot.

(4) Plant Site

As site for the Plant, the choice has been made for a location on the bank opposite the existing plywood mill operated by the Industrial Forestal Cayapas, C.E.M.

The factors considered in determining this site selection were:

- Convenience of pulpwood supply
- Water supply
- Supply of auxiliary materials, chemicals, and utilities
- Suitability to adoption of platform-mounted system of construction
- Available infrastructure
- Means of conveyance and transportation
- Labor supply
- Convenience of plant construction
- Anti-pollution measures
- Distance from market
- Concordance with basic national policy

The Plant site will call for the construction of an access road about 3.5 km long, and partial dredging of the water channel to permit the floating platform incorporating the Plant to reach the site.

6.6 Conceptual Design

The conceptual designs of the plant for the 2 alternative cases are based on the following data.

(1) Corrugating Medium

-	Production rate	39,600 tons/year (120 tons/day)
-	Yearly operating days	330 days for plant operation 220 days for logging operation
-	Raw material	Mixed pulpwood from Cayapas Forest Concession
-	Wood consumption	
	Pulpwood	113,548 m ³ /year
	Fuelwood	76,000 m ³ /year
-	Pulping process	Neutral sulfite semichemical process
-	Paper machine	Fourdrinier with cylinder dryers
-	Chemical recovery	Brown stock washing - Black liquor evaporation - Chemical recovery boiler - Direct oxidation
-	Effluent treatment	Flocculation and sedimentation in lagoon, to bring effluent water quality within limits of regulations applied in Japan
-	Power station	Main boiler, recovery boiler, condensing extraction turbine generator
-	Make-up chemicals	
	Sodium sulfite	2,138.4 tons/year
	Sodium carbonate	534.6 tons/year
-	Papermaking chemicals	
	Dry strength resin	594 tons/year
	Wet strength resin	198 tons/year
-	Utilities	
	Process water	8,400 tons/day
	Electric power	7,700 kW
	Steam	
	Main boiler	50 tons/hour
	Recovery boiler	7.5 tons/hour
	Heavy oil	13,200 tons/year

(2) Printing/Writing Paper

-	Production rate	23,100 tons/year (70 tons/day)
-	Yearly operating days	330 days for plant operation 220 days for logging operation

–	Raw material	Mixed pulpwood from Cayapas Forest Concession and bleached softwood kraft pulp
–	Wood consumption	
	Pulpwood	112,192 m ³ /year
	Fuelwood	76,000 m ³ /year
–	Imported bleached softwood pulp for blending	2,524 tons/year
–	Pulping process	Kraft process and C-E-H-E-H 5-stage bleaching
–	Paper machine	Fourdrinier with cylinder dryers
–	Chemical recovery	Brown stock washing - Black liquor evaporation - Chemical recovery boiler - Reausticizing - Lime kiln
–	Effluent treatment	Flocculation and sedimentation in lagoon, to bring effluent water quality within limits of regulations applied in Japan
–	Power station	Main boiler, recovery boiler, condensing extraction turbine generator
–	Make-up chemicals	
	Salt cake	1,818 tons/year
	Limestone	726 tons/year
–	Bleaching chemical	
	Industrial salt	2,781 tons/year
		(from which to produce within Plant the necessary bleaching chemicals)
–	Papermaking chemicals	
	Clay	2,145 tons/year
	Sizing agent	231 tons/year
	Alum	693 tons/year
	Starch	346.5 tons/year
	Dyestuff	1.4 tons/year
–	Utilities	
	Process water	14,000 tons/day
	Electric power	6,000 kW
	Steam	
	Main boiler	35 tons/hour
	Recovery boiler	15 tons/hour
	Heavy oil	6,105 tons/year

Layouts considered separately for the cases of producing corrugating medium and printing/writing paper have resulted in a plant area of 18 hectares for both cases.

6.7 Raw Materials, Chemicals and Utilities

The requisites for producing either corrugating medium or printing/writing paper – cited in the preceding Section 6.6 – are envisaged to be procured in the following manner:

(1) Pulpwood

Pulpwood will be supplied from the Cayapas Forest Concession Lot 2, for which timber dues will be paid as stipulated in the contract for felling.

The Lot 2 carries a forest volume that would permit its continuing to ensure pulpwood supply during 10 years.

(2) Bleached Softwood Kraft Pulp

The bleached softwood kraft pulp, required for blending to produce printing/writing paper of requisite quality, is not obtainable domestically, and must be imported from U.S.A or Canada.

The current C.I.F Guayaquil price is US.\$791 per ton.

(3) Chemicals

All chemicals are imported and their current C.I.F Guayaquil prices are:

– Sodium sulfite	US.\$531/ton
– Sodium carbonate	US.\$430/ton
– Salt cake	US.\$327/ton
– Limestone	US.\$58/ton
– Industrial salt	US.\$236/ton
– Clay	US.\$351/ton
– Sizing agent	US.\$3,760/ton
– Alum	US.\$213/ton

(4) Boiler Fuels

The boiler fuels comprise (a) fuelwood and (b) heavy oil.

Fuelwood will include off-specification logs, waste from plywood mill, bark, screening rejects, all generated in the logging, wood preparation or processing stages of plant operation.

The heavy oil will be brought from Esmeraldas at a price delivered at the plant site of US.\$95 a ton.

6.8 Pulpwood Supply

Wholesale deforestation is envisaged with a view to reforestation and to maintenance of adequate efficiency in the felling and logging operations.

Deforestation will proceed at a rate of 1,467 hectares a year.

The logs felled by mechanized means will be gathered at an intermediate station, where they will be sorted out according to species and log diameter, and further grouped separately for the different destinations of pulp plant, sawmill, plywood mill and for burning as fuel.

These operations necessary for ensuring pulpwood supply will depend heavily on the availability of adequate logging roads, whose construction and maintenance therefore will be of vital importance, and adequate equipment and work force must indispensably be reserved for the purpose.

6.9 Reforestation

Wholesale indiscriminate felling to be applied to Lot 2 should not present problems of environmental deterioration, judging from the generally flat terrain presented by this lot and from the climatic conditions.

This judgement is substantiated by the firm generation observed of secondary out-growths in clearings remaining from wholesale felling exercised in Lot 4.

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Reforestation activity will be undertaken from the first year of Plant operation.

Plantation of species of tree most suitable as pulpwood will permit 600 hectares of forest to furnish the wood volume required for keeping the Plant in full operation.

This amount of forest will be ultimately reforested every year, after following the preliminary experimental steps of (a) trial plantation for selecting the species most suitable for reforestation, (b) pilot plantation for studying the economical and technical problems to be solved in plantation, and (c) industrial plantation in which the problems of full-scale reforestation will be further studied and solved.

Among the numerous varieties of eligible tree species occurring in the region and others successfully planted in various parts of the world, 13 species have been tentatively selected for testing in step (a) referred to above.

6.10 Plant Construction

(1) Construction System

Of the 2 alternative systems of (a) conventional piece-meal installation at site and (b) platform-mounted system of bringing in the Plant installation to site already completely mounted on a floating platform, the alternative (b) has been selected, for the advantages it offers in terms of shorter required construction period, lower construction cost, freedom from dependence on available local infrastructure and skilled labor.

This selection is justified from the financial analysis presented further on in Chapter 8., which is undertaken on both systems (a) and (b) above for purpose of comparison between the 2 systems.

(2) Construction Period

The period required for construction is estimated to be 33 months from the contract effectuation, including 3 months for test operation if system (b) is adopted for construction, and in the case of system (a) the corresponding period will be 45 months.

Consequently, assuming the contract for plant construction to become effective on July 1, 1984, the plant will enter commercial operation on April 1, 1987 with system (b) adopted for construction, and on April 1, 1988 with conventional system (a).

(3) Scope of Construction Work

Work requiring to be done in association with the Plant construction will include dredging, excavation, foundation, buildings, installation of equipment, road, building and other civil work, for most of which amply qualified contractors are available in Ecuador and installation will be undertaken with supervisory services provided by the equipment manufacturer.

As integral part of the Plant, there will be furnished and installed equipment covering the following functions (common to both cases of corrugating medium and printing/writing paper production, except where otherwise specified):

- Felling, logging, transporting and logging road construction
- Log handling and chipping
- Cooking and refining
- Washing and screening
- Bleaching (for printing/writing paper only)
- Stock preparation
- Paper making and finishing
- Chemical recovery
- Bleaching chemical preparation (for printing/writing paper only)
- Power generation and distribution
- Electrical equipment and instrumentation
- Process water treatment
- Plant effluent treatment
- Plant air service system
- Plant outer piping
- Maintenance shop
- Laboratory
- Firefighting
- Communication equipment
- Office facilities
- Vehicles
- Industrial platform and ancillary installations.

As an associated work, followings will be covered:

- Dredging and excavation
- Civil work, including foundations
- Buildings
- Installation and adjustment
- Access road construction
- Battery limit fencing.

6.11 Organization and Staffing

To organization described below has been drawn up on the basis of studies made on the actual organizations observed in various paper mills operating in Ecuador.

The organization is divided into 2 major divisions charged respectively with forestry and manufacturing operations.

(1) Forestry Division

The Division undertakes the operations cited in Section 6.8 of (a) felling, (b) logging and log conveyance, (c) forest conservation, (d) reforestation, (e) administration and general services.

These 5 departments are staffed by a personnel numbering 205, supplemented by a subcontracted labor force of about 330 undertaking manual work in reforestation.

(2) Manufacturing Division

This Division comprises the 4 departments for (a) production, (b) administration, (c) maintenance and (d) labor, health and safety, with a total personnel of 543 for the case of corrugating medium production and 679 for printing/writing paper production.

(3) Total Employment

The foregoing personnel figures add up to an aggregate permanent staff for the 2 divisions of 748 for corrugating medium and 884 for printing/writing paper, which,

with the additional subcontracted labor force of 330 in both cases, will provide work, respectively, for approximately 1,100 and 1,200 persons.

The above work force is estimated assuming the adoption of 24-hour operation of the Plant in 3 shifts.

(4) Training

Selected staff will undergo professional training, which will commence 3 years before Plant commissioning.

This selected staff will number 162 in the case of corrugating medium and 301 for printing/writing paper, to complete their training course 2 months before the commissioning.

Of this staff, 30 will in both cases undergo a 6-month training course abroad in special skills.

(5) Technical Assistance

After commencement of Plant operation, technical assistance by foreign experts will be provided during a period of 4 years on key matters in both administrative and technical aspects.

The technical assistance will extend to 44 persons in the case of corrugating medium and 50 persons for printing/writing paper.

6.12 Plant Operation

The Plant is envisaged to operate with capacity utilization factors gradually rising to full capacity with succeeding years, in the following manners:

(1) Platform-mounted Construction System

– 1st. year	65% capacity
– 2nd. year	95% capacity
– 3rd. year onwards	100% capacity

(2) Conventional Piece-Meal Construction System

-	1st. year	60% capacity
-	2nd. year	85% capacity
-	3rd. year	95% capacity
-	4th. year onwards	100% capacity

The above learning curve data have been derived from analysis of actual records on initial plant operation obtained in the past in Latin American countries on installation constructed by both systems.

7. Total Investment Cost

The total investment cost for Project implementation has been derived separately for the 4 cases tabulated below, representing different combinations of marketed product and system of plant construction.

- Case "A"

Product	Corrugating medium and sawlog
Production capacity	39,600 tons a year
Construction system	Platform-mounted

- Case "B"

Product	Corrugating medium and sawlog
Production capacity	39,600 tons a year
Construction system	Conventional piece-meal

- Case "C"

Product	Printing/writing paper and sawlog
Production capacity	23,100 tons a year
Construction system	Platform-mounted

– Case “D”

Product	Printing/writing paper and sawlog
Production capacity	23,100 tons a year
Construction system	Conventional piece-meal

The financial analysis has been conducted with the view to determining the best combination of product and construction system, and the combination thus selected has been further subjected to economic analysis – including sensitivity analysis – to evaluate the Project for its national and social impacts.

7.1 Total Investment Cost

(1) Basic Assumptions

The investment cost analysis has been conducted assuming that a turn-key lump-sum contract for implementing the Project is brought into effect on July 1, 1984.

The cost estimates are based on currency value prevailing in December 1982.

For purposes of cost estimation, the currency exchange rate adopted is:

$$\text{US.\$1} = \text{¥230} = \text{Sc.33.}$$

(2) Total Investment Cost

The total investment cost thus analyzed is presented in the Table on the following page, together with detailed breakdown.

It is revealed that the lowest cost is demanded for the Case “A”, followed in increasing sequence of cost by the Cases “C”, “B” and “D”.

7.2 Financing

Based on consultation with the Ecuadorian counterpart, the funds required for Project implementation are envisaged to be financed by funds on hand and by long-term and short-term loans in the following proportions.

– Equity (Funds on hand)	20%
--------------------------	-----

Summary Breakdown of Total Investment Cost By Case

(Unit: US.\$1,000)

	Case "A"	Case "B"	Case "C"	Case "D"
<u>Plant Cost</u>				
Equipment & machinery	51,470	38,066	61,679	43,566
Equipment erection	4,690	6,848	5,527	7,806
Site preparation	1,866	11,414	1,866	11,641
Civil works & building	7,565	10,729	7,565	11,094
Ocean freight & insurance	2,315	2,739	2,745	3,150
Inland transportation	-	9,587	-	9,678
Contingency	2,227	2,824	2,570	3,062
Sub-total	70,169	82,207	81,952	89,997
<u>Land Acquisition</u>				
	5	5	5	5
<u>Preoperation Cost</u>				
Preinvestment studies, tendering & evaluation, project implementation	4,190	5,410	4,659	5,768
Recruitment & training	300	300	362	362
Contingency	135	171	150	184
Sub-total	4,625	5,881	5,171	6,314
<u>Interest During Construction</u>				
	10,122	17,545	11,822	19,265
<u>Initial Working Capital</u>				
Spare parts	1,679	1,679	1,823	1,823
Cash	7,779	7,575	9,124	8,865
Sub-total	9,458	9,254	10,947	10,688
Total Investment Cost	94,379	114,892	109,897	126,269

Note: Import tax and duties will be exempted, as stipulated by the "LEY DE LA CORPORACION FINANCIERA NACIONAL"

- Long-term loan 80%

The conditions of long-term loan are:

- Interest 11.0% per year
- Repayment 10 equal installments on capital in 10 years
- Grace period 3 years after commissioning of Plant.

Short-term loans will be obtained on the terms of:

- Interest 14.0% per year
- Repayment Lump-sum settlement in the following year.

8. Financial Analysis and Evaluation

8.1 Basic Conditions Assumed for Analysis

(1) Operating Cost

Annual plant operating cost estimated for the years after the Plant has entered normal operation, and during the initial years prior to attaining stable operation, are respectively detailed in the 2 Tables in the following pages.

The currency value adopted in this analysis is that prevailing on the year of Plant commissioning, the same currency value being adopted for all the remaining years covered by the analysis.

The plant utilization factors attainable during the initial years prior to stable operation is, as given in Section 6.12 of Chapter 6. "Summary of Study".

- For Cases "A" and "C" (platform-mounted construction)

1st. year	65% capacity
2nd. year	95% capacity
3rd. year onwards	100% capacity

**Summary Breakdown of Annual Plant Operating Cost
after Attainment of full Production**

(Unit: US.\$1,000)

	Case "A"	Case "B"	Case "C"	Case "D"
<u>Variable Cost</u>				
Raw materials cost	748	748	3,863	3,863
Timber dues	(86)	(86)	(86)	(86)
Imported softwood pulp	(-)	(-)	(3,115)	(3,115)
Reserved cash (Reforestation)	(662)	(662)	(662)	(662)
Auxiliary materials cost	5,182	5,182	6,985	6,985
Chemicals	(3,202)	(3,202)	(5,182)	(5,182)
Fuels	(1,584)	(1,584)	(1,318)	(1,318)
Sub-materials	(396)	(396)	(485)	(485)
Total Variable Cost	5,930	5,930	10,848	10,848
<u>Fixed Cost</u>				
Labor cost	5,532	5,532	6,506	6,506
Management cost	777	874	906	970
Insurance	(561)	(658)	(656)	(720)
General expenses	(216)	(216)	(250)	(250)
Repair and maintenance	1,679	1,679	1,823	1,823
Total Fixed Cost	7,988	8,085	9,235	9,299
<u>Technical Assistance</u>	(-)	(-)	(-)	(-)
Total Operation Cost	13,918	14,015	20,083	20,147

**Progress of Annual Operating Cost during Transient Initial Years of
Operation before Attainment of Full Production**

(Unit: US.\$1,000)

	1st. year	2nd. year	3rd. year	4th. year	5th. year and after
Case "A"					
Variable cost	3,857	5,634	5,930	5,930	5,930
Fixed cost	7,988	7,988	7,988	7,988	7,988
Technical assistance	2,704	1,644	1,078	548	—
Total Operation Cost	14,549	15,262	14,996	14,466	13,918
Case "B"					
Variable cost	3,559	5,043	5,634	5,930	5,930
Fixed cost	8,085	8,085	8,085	8,085	8,085
Technical assistance	2,704	1,644	1,078	548	—
Total Operation Cost	14,348	14,772	14,797	14,563	14,015
Case "C"					
Variable cost	7,051	10,304	10,848	10,848	10,848
Fixed cost	9,235	9,235	9,235	9,235	9,235
Technical assistance	3,016	1,900	1,078	676	—
Total Operation Cost	19,302	20,439	21,161	20,759	20,083
Case "D"					
Variable cost	6,511	9,218	10,304	10,848	10,848
Fixed cost	9,299	9,299	9,299	9,299	9,299
Technical assistance	3,016	1,900	1,078	676	—
Total Operation Cost	18,826	20,417	20,681	20,823	20,147

- For Cases "B" and "D" (conventional piece-meal construction)

1st. year	60% capacity
2nd. year	85% capacity
3rd. year	95% capacity
4th. year onwards	100% capacity

(2) Product Sales and Assumptions Adopted

The estimated year-to-year sales of Plant products are presented in the Table on the next page.

The assumptions adopted in deriving these figures are that:

- All products are sold in the domestic market, which is assumed to maintain a demand exceeding the envisaged rate of production (see Section 6.2 of Chapter 6. "Summary of Study").
- Prices – as for the currency value – are those prescribed for the year of plant commissioning, and are maintained at the same level throughout the Project life.

The prices for the year of commissioning are derived from those prevailing at end 1982, i.e..

US.\$430 per ton for corrugating medium
US.\$851 per ton for printing/writing paper
US\$28 per m ³ for sawlog/plywood material.

(3) Other Conditions

The other conditions assumed are:

- | | |
|-----------------|------------------------------|
| - Project life | 15 years after commissioning |
| - Business year | January 1 to December 31 |
| - Taxes | |
| Corporate tax | 20% |

Schedules of Annual Sales for Four Cases

(Unit: US.\$1,000)

	1st. year	2nd. year	3rd. year	4th. year	5th. year and after
Case "A"					
Corrugating medium	16,552	24,911	26,517	26,572	26,572
Sawlog/plywood materials	1,444	2,173	2,313	2,318	2,318
Less sales expenses	370	557	593	594	594
Total Sales Revenue	17,626	26,527	28,237	28,296	28,296
Case "B"					
Corrugating medium	15,279	22,309	25,132	26,517	26,572
Sawlog/plywood materials	1,333	1,946	2,193	2,313	2,318
Less sales expenses	342	499	562	593	594
Total Sales Revenue	16,270	23,756	26,763	28,237	28,296
Case "C"					
Printing/writing paper	20,217	30,427	32,388	32,456	32,456
Sawlog/plywood materials	1,444	2,173	2,313	2,318	2,318
Less sales expenses	216	325	346	347	347
Total Sales Revenue	21,445	32,275	34,355	34,427	34,427
Case "D"					
Printing/writing paper	18,661	27,249	30,698	32,388	32,456
Sawlog/plywood materials	1,333	1,946	2,193	2,313	2,318
Less sales revenue	199	291	328	346	347
Total Sales Revenue	19,795	28,904	32,563	34,355	34,427

	Tax exemption	During 10 years from commissioning
	Other taxes	All exempted
-	Worker dividend	15%
-	Depreciation	Period of depreciation term and average values at term are as given in the following Table.

Depreciation and Amortization

Item	Period (Year)	Salvage Value (%)	Method
1. Machinery & Equipment of Forest Operation			
a. Log handling equipment (Skidders, loaders, etc.)	5	0 (Zero)	Straight line
b. Transportation equipment (Trucks, vehicles, etc.)	8	0 (Zero)	Straight line
c. Other facilities	15	0 (Zero)	Straight line
2. Machinery & Equipment of Mill	15	0 (Zero)	Straight line
3. Civil & Building	40	0 (Zero)	Straight line
4. Preparation Cost	10	0 (Zero)	Straight line
5. Interest During Construction	10	0 (Zero)	Straight line

Remarks: Land acquisition, site preparation and initial working capital are non depreciable.

-	Working capital	As given in the following Table.
---	-----------------	----------------------------------

Working Capital

1. Current assets	
a. Cash	One month of fixed production cost
b. Accounts receivable	One month of annual sales revenue
c. Products inventory	Half month of annual production cost
d. Materials inventories	One month for raw materials cost and three months for auxiliary materials cost
e. Work in progress	Negligible
2. Current liabilities	
a. Accounts payable	One month for raw materials and auxiliary materials cost

8.2 Financial Analysis

The financial analysis is based on discount cash flow method applied to the cases defined at the head of this Chapter, to derive the internal rates of return, the financial statements and indicators.

The results of analysis are presented in the Table on the following page.

It is revealed that only for Case "A" are the cash flow and other financial indicators found to present generally sound lines, with internal rates of return appreciably higher than in the other 3 cases, and indicating a profitability that would justify the investment.

The other cases cannot be considered to present the requisite aspects for a project justifying investment.

In the following sensitivity analysis, therefore, the Case "A" alone is taken up for examination to complete the financial evaluation.

8.3 Sensitivity Analysis

The foregoing financial analysis has indicated the Case "A" – i.e. plant construction by platform-mounted system and producing corrugating medium – as the most suitable form for the Plant.

Parametric analysis has been conducted on the Case "A" to determine the sensitivity of internal rate of return to variations of $\pm 10\%$ to the external factors of:

- Sales price
- Investment cost
- Operation cost (limited to variable expenses)
- Interest on long-term loan.

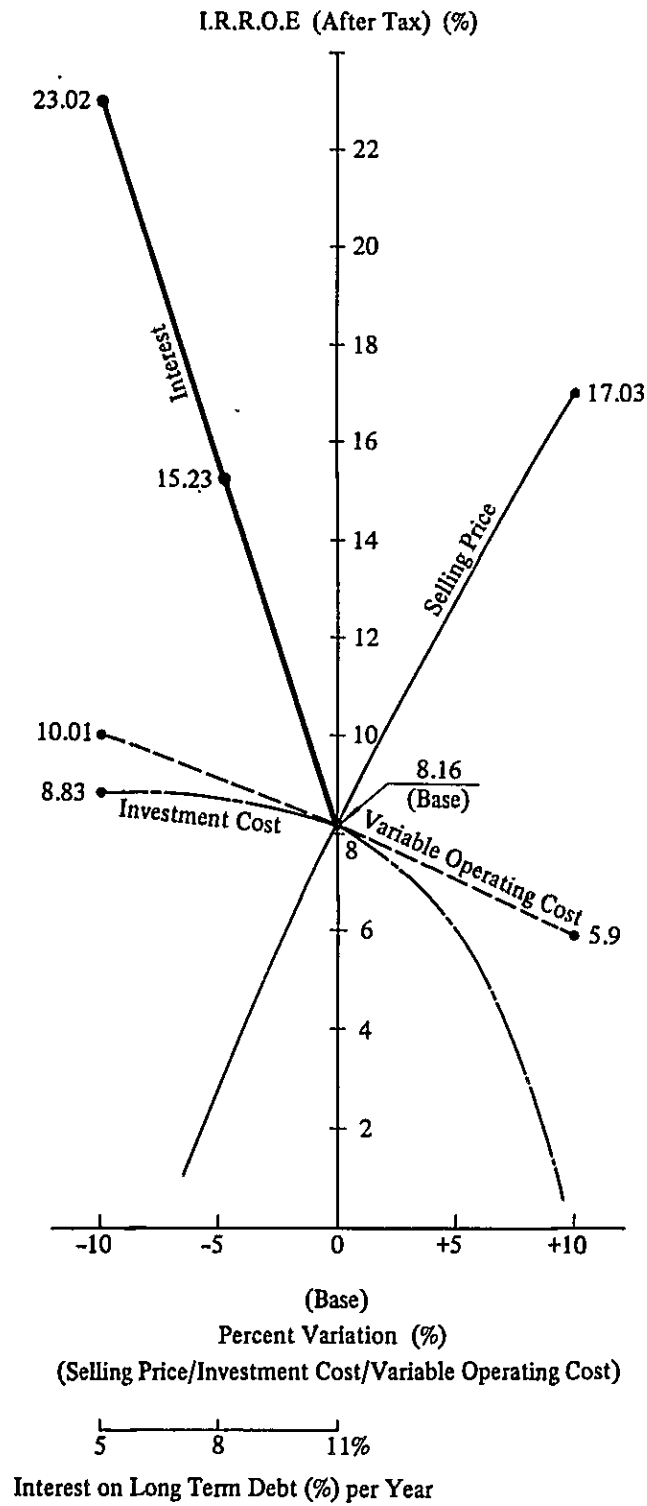
The results of the sensitivity analysis are presented in the diagrams shown in the pages 37 and 38.

What calls for note here is that, apart from the expected sensitivity shown by the profitability to change in price, a decisive influence is also exerted by the conditions of long-term loan.

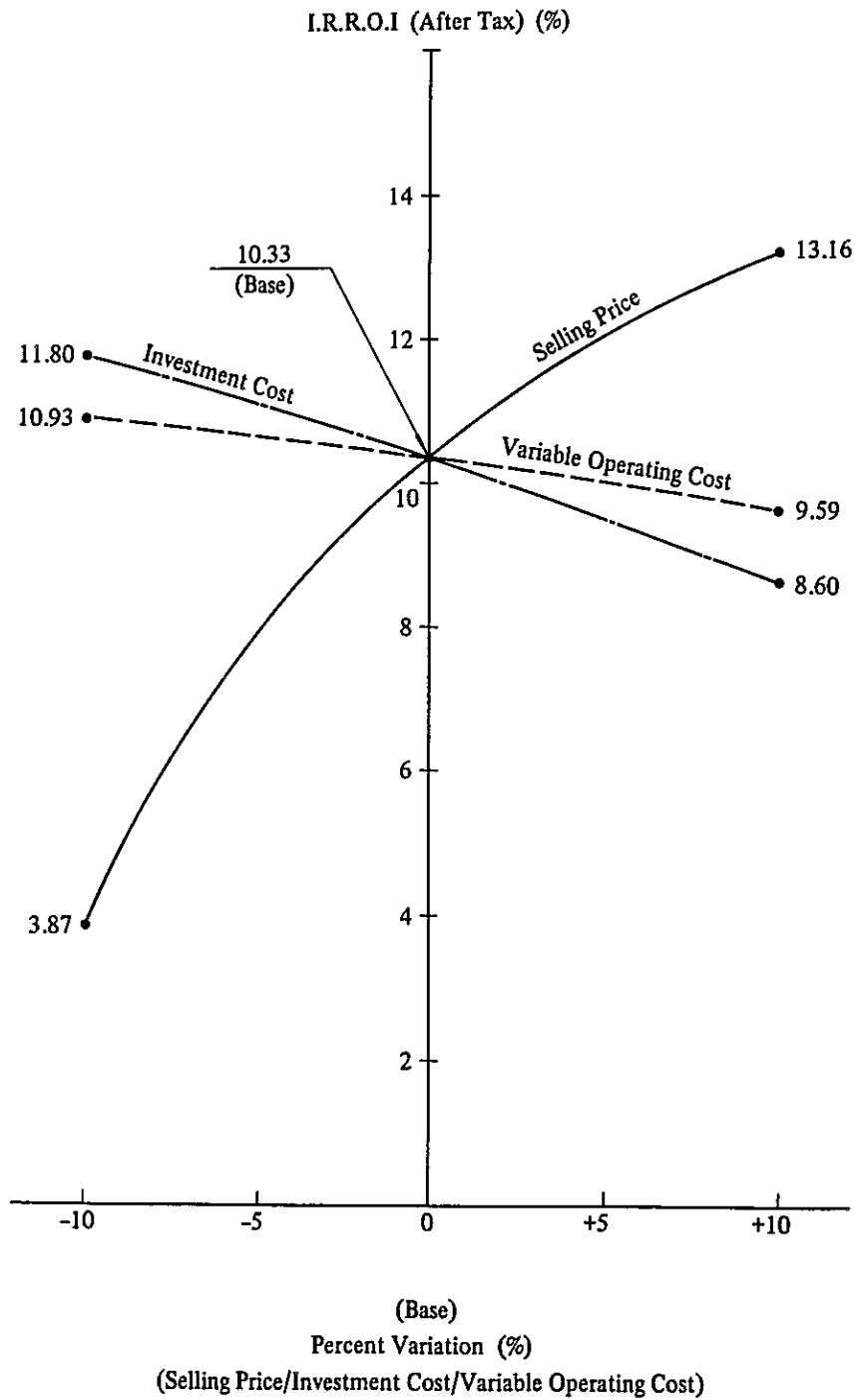
Summary of Profitability and Financial Indicators

Item	Case "A"	Case "B"	Case "C"	Case "D"
Investment cost (US.\$1,000)				
Equity	18,876	22,978	21,979	25,254
Debt	75,503	91,915	87,918	101,015
Total	94,379	114,892	109,897	126,269
I.R.R.O.I (%)				
Before tax	10.62	0.91	6.76	0.00
After tax	10.33	0.91	6.60	0.00
I.R.R.O.E (%)				
After tax	8.16	0.00	0.00	0.00
Payout period (Year)				
Before tax	8.19	-	10.33	-
After tax	8.19	-	10.34	-
After tax profit to sales revenue (%)	8.7	-	-3.6	-
After tax profit to stock holder equity (%)	14.2	-	23.7	-
After tax profit to share capital (%)	12.9	-	-5.6	-
Break even point (utilize %)	84.3	-	101.6	-

**Summary of Sensitivity Analysis
(I.R.R.O.I to Variation of Financial Parameters)**



**Summary of Sensitivity Analysis
(I.R.R.O.E to Variation of Financial Parameters)**



Thus, if this interest could somehow be reduced to 5%, the internal rate of return on equity will at once attain 23.02%.

Under such circumstance, even a price reduction to the extent of 10% could still ensure an internal rate of return exceeding 12%.

9. Economic Analysis and Evaluation

The Case "A" (plant construction by platform-mounted system and producing corrugating medium) – found best from financial analysis – has been evaluated from the standpoint of national and social interest in respect of public benefit expected from its implementation.

The economic impact has been evaluated from the anticipated effect on the balance of foreign trade, and also from an analysis of the internal economic rate of return reflecting the economic premiums of:

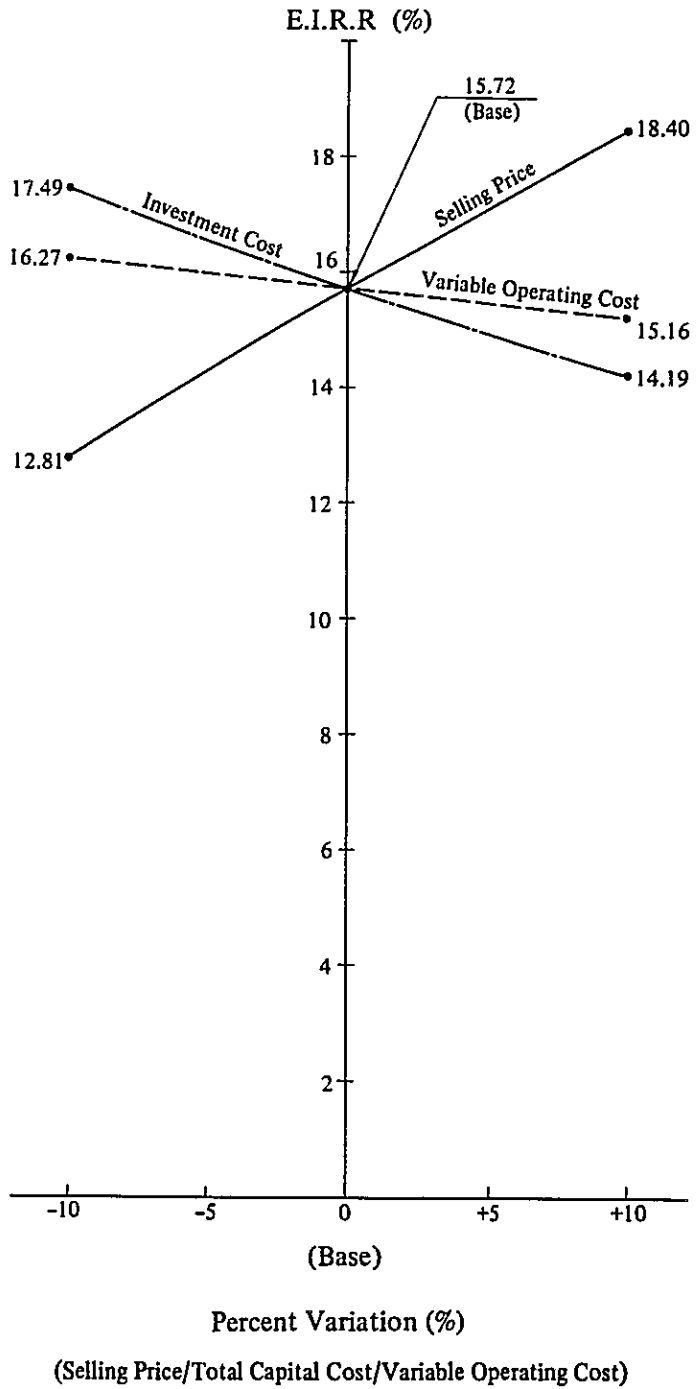
Foreign currency	0.50
Skilled worker	0.00
Unskilled worker	(-)0.60
Fuel oil	0.50
Other indigenously procured materials	0.00.

The results of analysis, presented in the diagram on the next page, reveal that the economic internal rate of return comes to a figure of 15.72%.

The sensitivity analysis, also performed, indicates that a reduction of 10% in selling price would still leave approximately 13% economic internal rate of return, which exceeds the corresponding internal rate of return on investment of 10.62%, thus conclusively evidencing the very significant contribution to Ecuadorian national economy that can be expected from this Project.

In respect of the beneficial effect on the balance of foreign trade, it is seen from the Table presented 2 pages further on that more than US.\$153 million should be accumulated during the life of this Project, which is definite proof of the immense contribution to savings in foreign currency that will be brought by the successful implementation of the Project.

**Summary of Sensitivity Analysis
(E.I.R.R to Variation of Financial Parameters)**



Net Foreign Currency Flow

(US.\$1,000)

Year	Input (A)	Output (B)	Balance (A-B)	Cumulation
-4 (1983)	1,057	1,311	-254	-254
-3 (1984)	13,379	15,574	-2,195	-2,449
-2 (1985)	32,361	34,498	-2,137	-4,586
-1 (1986)	28,706	25,967	2,739	-1,847
1 (1987)	16,552	14,352	2,200	353
2 (1988)	24,911	14,635	10,276	10,629
3 (1989)	26,517	14,391	12,126	22,755
4 (1990)	26,572	21,546	5,026	27,781
5 (1991)	26,572	23,863	2,709	30,490
6 (1992)	26,572	19,472	7,100	37,590
7 (1993)	26,572	18,641	7,931	45,521
8 (1994)	26,572	17,810	8,762	54,283
9 (1995)	26,572	16,980	9,592	63,875
10 (1996)	26,572	16,149	10,423	74,298
11 (1997)	26,572	15,319	11,253	85,551
12 (1998)	26,572	14,488	12,084	97,635
13 (1999)	26,572	13,658	12,914	110,549
14 (2000)	26,572	5,277	21,295	131,844
15 (2001)	26,572	5,277	21,295	153,139
Total	462,347	309,208	153,139	-

10. Concluding Remarks and Recommendations

- (1) Integrated assessment – based on technical, financial and economic criteria – of the alternative products of kraft liner, corrugating medium and printing/writing paper has yielded the conclusion that a pulp and paper plant constructed on the platform-mounted system to produce corrugating medium is positively feasible.
- (2) The outline of the most suitable Plant is as follows:

– Plant name	Corrugating medium manufacturing plant
– Production rate	39,600 tons/year (120 tons/day)
– Yearly operating days	330 days for plant operation 220 days for logging operation
– Raw material	Mixed pulpwood from Cayapas Forest Concession
– Plant site	San Lorenzo
– Plant construction system	Platform-mounted construction system
– Plant construction period	33 months from the contract validation, including 3 months for test operation
– Total investment cost	US.\$94,379,000
- (3) The present Project amply satisfies all of the four conditions that require to be met to qualify as Ecuadorian national project.
- (4) The 39,600 tons a year of corrugating medium envisaged to be produced by the projected Plant matches the amount of this material expected to be imported into Ecuador in 1990. Thus, the projected Plant should prove to be in a position to completely replace this imported material with indigenous product, without concurring with any other Ecuadorian manufacturer.
- (5) The sawlog and plywood materials derived in association with the operation of the Plant in manufacturing corrugating medium will find an outlet in the San Lorenzo district, where sawmills and plywood factories are currently in operation.
- (6) The envisaged forest lot in the Cayapas Forest Concession carries amply adequate forest volume to keep the project Plant stably supplied with raw material throughout its years of operation.

- (7) The Concession carries timber containing wood species that are suitable as pulpwood, as well as other species adapted to use as sawlog and as veneer.
- (8) The location near San Lorenzo envisaged for siting the Plant is extremely well suited from considerations of pulpwood supply, plant construction by platform-mounted system, and of regional economical development.
- (9) Felling is envisaged to proceed by wholesale deforestation, followed by reforestation to the extent of 600 hectares annually.
- (10) The platform-mounted system is the most suitable for constructing the projected Plant, this system of construction should permit the Plant to attain production at 100 percent plant capacity within 3 years of plant commissioning.
- (11) Additional employment opportunities numbering approximately 1,100 will be newly created by the implementation of this Project, to exert a significant beneficial impetus to regional economic development.
- (12) The total investment cost for implementing the Project is estimated at US.\$94,379,000.

The financial and economic analyses are based on the assumption of financing with funds on hand and with long-term loan, in the proportion of 20 : 80.

- (13) The Plant realized as described above has been shown to promise an internal rate of return on investment before tax of 10.62%, and an economic internal rate of return of 15.72%, as well as saving foreign currency during Project life exceeding US.\$153 million.

These results of analysis indicate this Project to be immense benefit to the Ecuadorian economy upon successful realization.

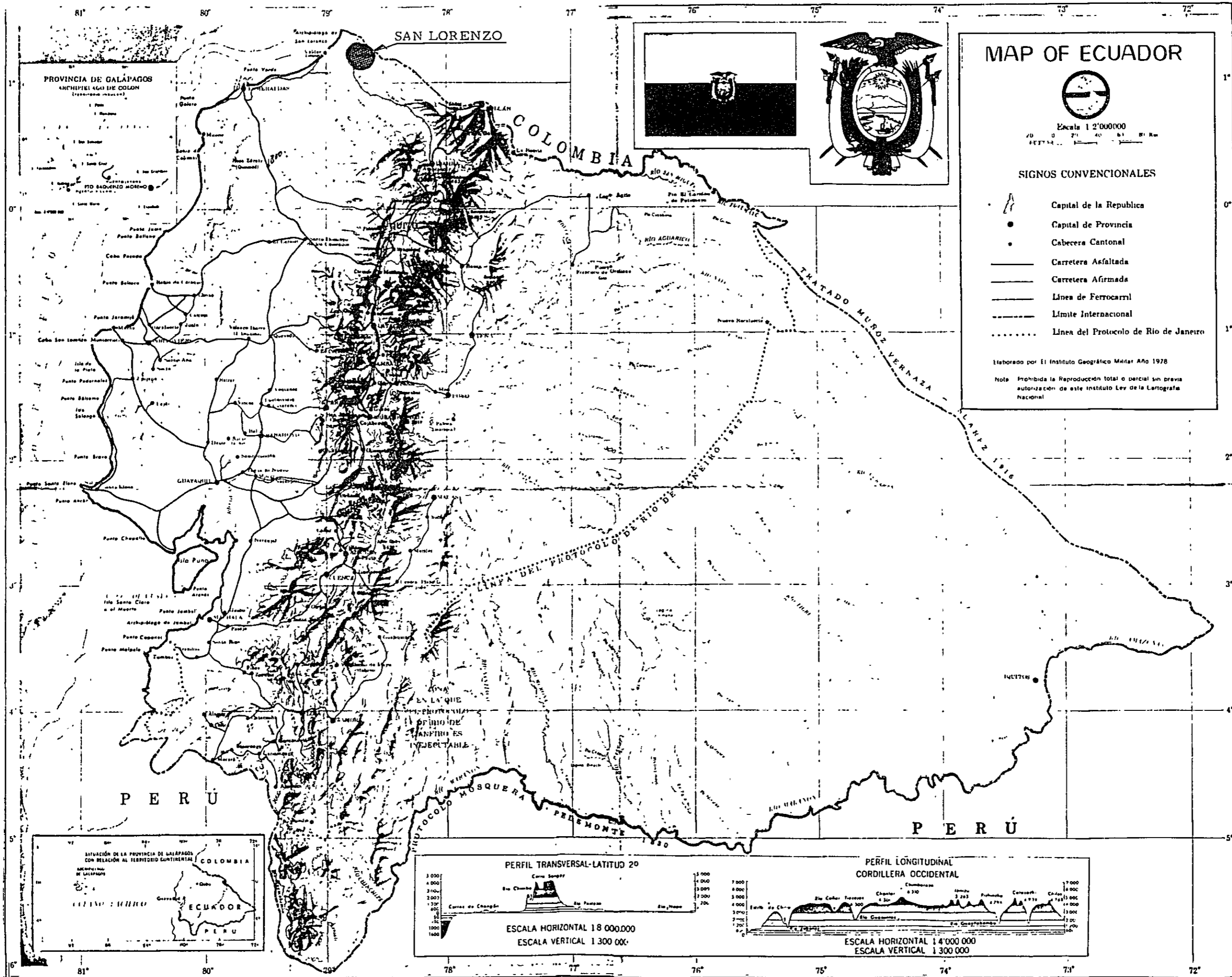
- (14) Concomitantly, operation of the envisaged Plant will aid in the assimilation of advanced papermaking technology, and the reforestation activities will further enhance the level of silvicultural techniques in the country.
- (15) The foregoing observations lead to a solidly justified recommendation for prompt and firmly supported authorization on the part of the Ecuadorian Government to

take this Project in hand.


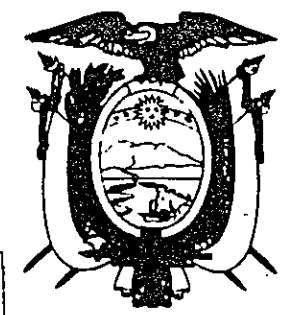
(16) For smooth implementation of the envisaged Project, it will be indispensable to realize the following conditions.

- To establish concrete plans for Project implementation at the very earliest opportunity, and to immediately initiate action for securing the necessary funds.
- To make every effort to secure long-term loans at advantageous conditions, in order to ensure stabilized financial position for the Project operation.
- Immediately upon decision to implement the Project, to carry out a detailed hydrographic survey of the water channels around San Lorenzo along the waterway to be followed by the floating platform, together with similarly detailed survey of the plant site subsoil, including boring tests, as well as investigation of the underground water sources.

The detailed topography of the land in and around the plant site should also be surveyed.











MAP OF ECUADOR

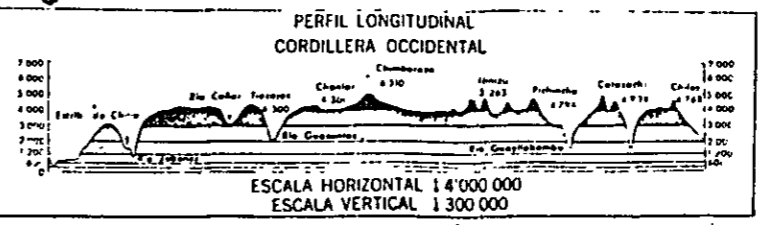
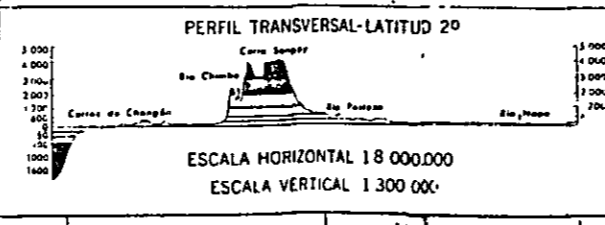
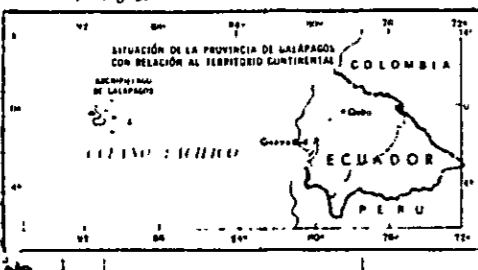
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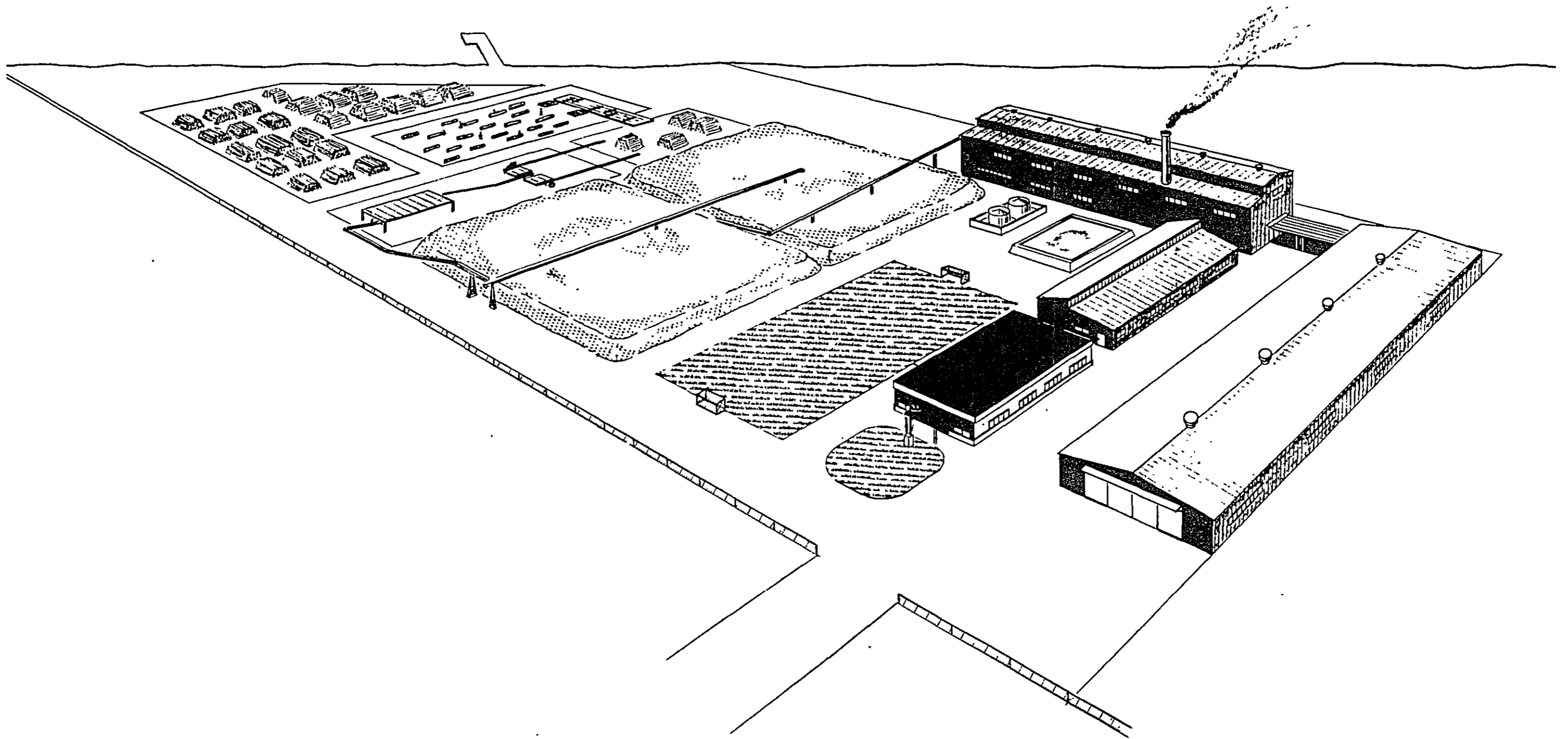
SIGNOS CONVENCIONALES

-  Capital de la Republica
-  Capital de Provincia
-  Cabecera Cantonal
-  Carretera Asfaltada
-  Carretera Afirmada
-  Línea de Ferrocarril
-  Límite Internacional
-  Línea del Protocolo de Rio de Janeiro

Elaborado por El Instituto Geográfico Militar Año 1978

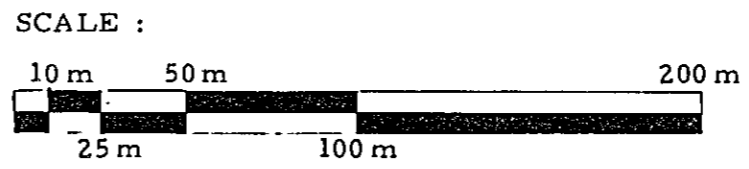
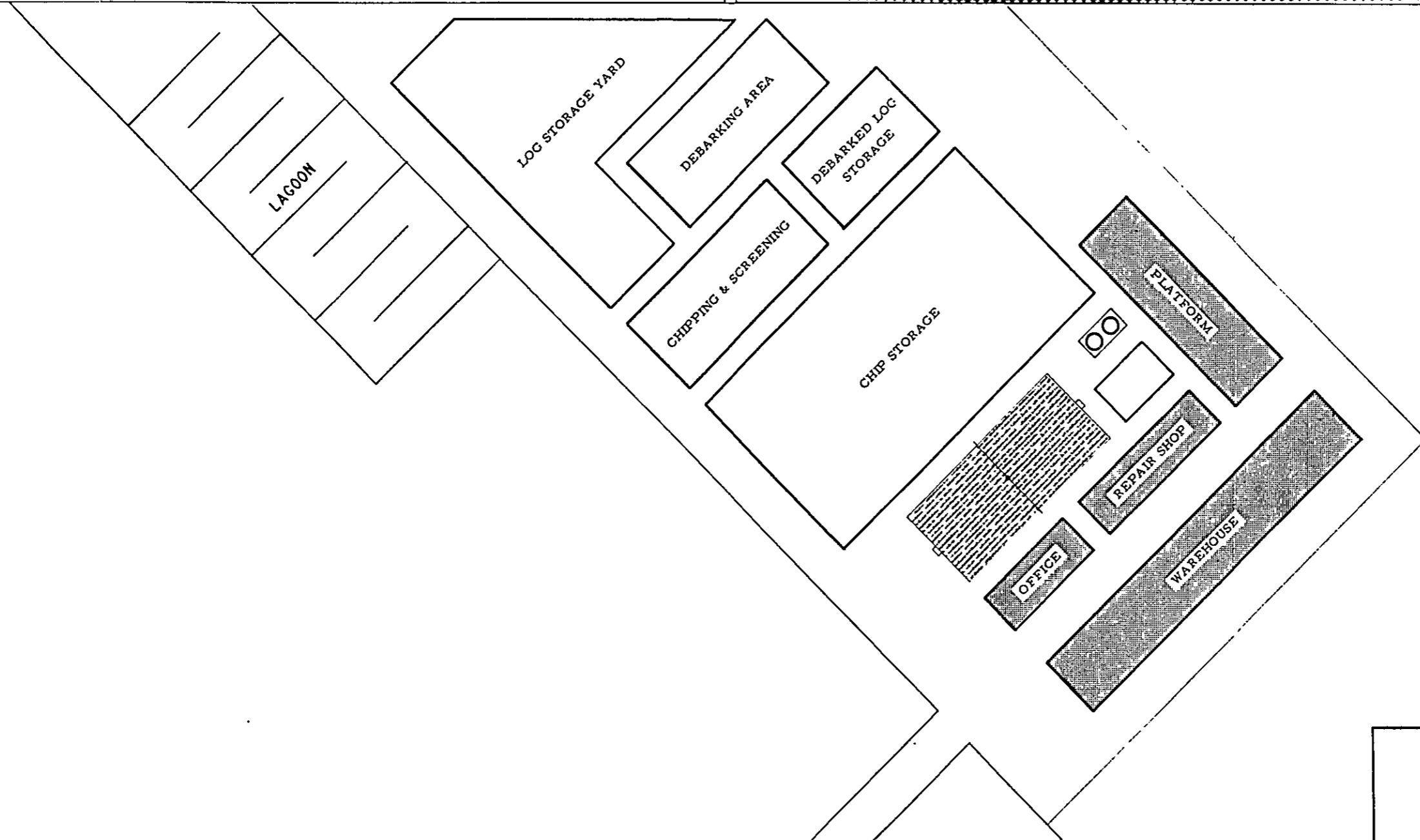
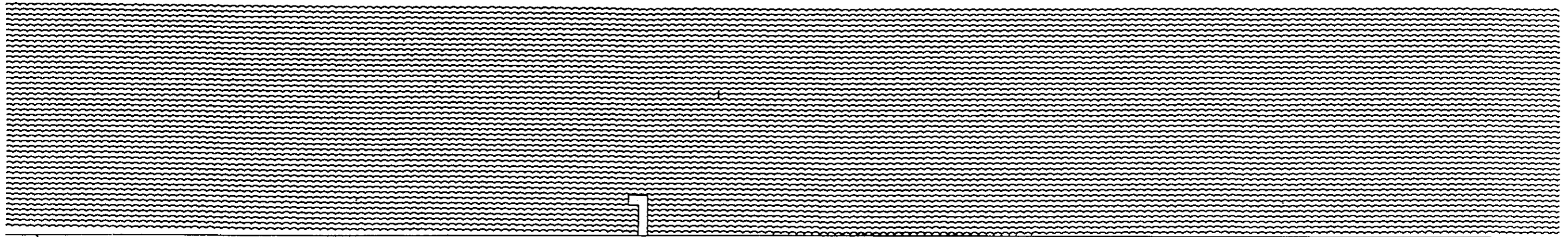
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GOVERNMENT OF ECUADOR
 PULP & PAPER PLANT
 BIRD'S EYE VIEW

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