

***INTER-AMERICAN DEVELOPMENT BANK DOCUMENT***



**BRAZIL**

**REGION DOS LAGOS TOLL ROAD**

**BR-0272**

**ENVIRONMENTAL AND SOCIAL IMPACT REPORT**

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**EXECUTIVE SUMMARY**  
**ENVIRONMENTAL AND SOCIAL IMPACT REPORT**  
**REGION DOS LAGOS TOLL ROAD PROJECT**  
**BR-0272**

The Rio de Janeiro State Government, through its State Public Services Privatization Program, submitted to public tender all services and work related to the repair, maintenance, conservation, operation, construction and expansion of the whole road system, Rio Bonito - Araruama - São Pedro da Aldeia - the Rodovia dos Lagos, with access to the Lakes Region, i.e., highway RJ-124 and the new stretch of highway RJ-106. The consortium, formed by the Brazilian construction companies, Andrade Gutierrez S/A and Camargo Corrêa S/A won the bid and established a company known as Concessionaire da Rodovia dos Lagos S/A-Via Lagos, with the sole purpose of building and managing the highway system for the 25-year concession period.

**PROJECT'S TECHNICAL ASPECTS**

The work of the Rodovia dos Lagos Project was divided into various sections:

- A. **Section 1: State highway RJ-124, from its starting point at the intersection with federal highway, BR-101 (Rio Bonito Municipality) to km 29.3. In this stretch the tollbooth area will be located.** It is a two-lane, paved highway, 7 meters wide, with traffic flowing in both directions.
- B. **Section 2: The 27 km RJ-106 spur road, from km 29.3 of highway RJ-124 to the outskirts of the Municipality of São Pedro da Aldeia, at the intersection with state highway RJ-106.** It consists of a stretch nearly 27 km long, starting from km 29.3 of highway RJ-124 and ending approximately 4 km before the entrance to the town of São Pedro da Aldeia. The road will consist typically of a single paved surface, having 4 lanes, each 3.5 m wide, with traffic flowing in both directions (dual- carriageway), separated by road-studs.
- C. **Section 3: This extends for nearly 4 km from highway RJ-106, at its intersection with the bypass to the entrance to the town of São Pedro da Aldeia.** The final stretch of the Rodovia dos Lagos Project is approximately 4 km long and runs through the center of an urban area from RJ-106 to the entrance of São Pedro da Aldeia.

The estimated period for completion of the work is 21 months. It is estimated that in the initial stage of the work, 495 employees will be needed at various levels, 392 hired directly by the contractor and the rest subcontracted from service companies. It is also estimated that during the construction phase at least 200 indirect jobs will be created.

**LEGAL AND SOCIAL ASPECTS**

With regard to the widening of RJ-124, and construction works of RJ-106 bypass, FEEMA, the state agency responsible for the environmental protection, has requested that EIA/RIMA reports comply with current legislation. These were delivered early June 1997, analyzed, and approved by FEEMA as part of the prior and installation permit process. The Lakes Region communities and non-governmental organizations interested in environmental protection and conservation, have had access to complete EIA reports. Appropriate announcements

were placed in large circulation newspapers. Pursuant to state regulation, and in compliance with requests made by non-governmental organizations of the region, a public hearing was held on September 1, 1997, in the municipality of Araruama.

## **SOCIAL AND ENVIRONMENTAL CHARACTERISTICS OF THE AREA**

The EIA/RIMA reports used two different criteria when commenting on the environmental characteristics of the region; the first, considering the area indirectly affected by the undertaking, and the second, the area directly affected. The area directly affected includes the municipalities of Rio Bonito, Araruama, São Pedro da Aldeia and Iguaba, and the area indirectly affected, those of Saquarema, Arraial do Cabo, Cabo Frio and Buzios, all in the Lakes Region and are part of the local authority district known as ? Baixadas Litorâneas? .

The indirectly affected area has experienced constant population growth since the 1950? s. This is due to the expansion of tourism, in particular, its associated activities such as commerce, service industries and civil construction. The resident population of the area is of around 300,000. The transient population which descends on the Lakes Region during the summer, during vacations and on weekends is on average 2 and 1/2 times larger than the resident population. As far as the sanitation infrastructure is concerned, it is important to point out the deficiencies in the whole region in the supply of water, sewage collection, and the disposal and treatment of solid waste.

The Environmental Protection Zone, APA, of Sapiatiba; located in the **Section 2** of the road; covers approximately 6,000 hectares in the municipalities of Iguaba and São Pedro da Aldeia. APA are conservation areas, the purpose of which is to protect and preserve the environment and its natural systems and, in doing so, to improve the quality of life of the local population and protect regional ecosystems.

## **ANALYSIS OF THE SOCIAL AND ENVIRONMENTAL IMPACT**

The project, as a whole, proves itself to be environmentally sound. However, to complement the analysis already carried out, more detailed studies were requested on the effects of: (i) the relocation of low-income families who live beside the highway, and (ii) a proposal for dealing adequately with the disturbance to the Sapiatiba APA by establishing a process for compensating those affected.

**Impact during the construction phase:** The impact arising from the work is not very significant, it is temporary in nature and is easily mitigated by a series of controls, norms and procedures which the contractors should introduce. The main effects, which will become apparent as the work precedes, will impact the human environment. In particular, these are: (i) an alteration in air quality; (ii) an increase in noise levels; (iii) an increase in erosion; (iv) an alteration in water quality, and (v) the removal of vegetation cover. As for the socioeconomic environment, the effect of the work will be primarily felt in: (i) interference with the water and electricity distribution networks; (ii) a rise in the demand for basic social services; (iii) an increase in traffic volumes and the risk of accidents; (iv) a possible increase in real estate values; (v) an increase in levels of regional income; (vi) a change in taxation revenue, and principally (vii) the relocation of part of the local population.

**Impact during the operational phase:** Undoubtedly, the biggest social and environmental effects will be felt when the undertaking becomes fully operational. These effects can be divided into two main categories: (i) greater tourist activity in the region, and (ii) interference with the Sapiatiba APA. It must be mentioned that one of the main effects on the environment will result from the fact that nearly 25% of the length of the RJ-106 bypass will run through the Sapiatiba APA which, of the remaining areas of natural vegetation found on the mountains, also has a wetlands ecosystem consisting of swamps, some rivers, brooks and streams. In the operational phase, impact on the physical and human environment will not be very significant, the most notable issues being: (i) the

tendency for erosion; (ii) a change in water quality; (iii) a change in pollution and noise levels, and (iv) a tendency for deforestation and the removal of vegetation. As for the impact on the socioeconomic environment, the effects are more significant. The benefits will outweigh the disadvantages and will result in an improvement in the quality of the environment; this can be stated quite categorically. Guaranteeing this forecast, however, will depend on action aimed at correcting and mitigating the environmental impact as described in the project's Environmental Management Plan.

## ENVIRONMENTAL MANAGEMENT PLAN

The Bank requested that an Environmental Management Plan be prepared by an independent consultant to replace the Plan first set forth in the EIA/RIMA, taking into consideration the following most relevant impacts: (i) displacement and resettlement of the population and economic activities along the highway; (ii) the interference of the new highway in the legally established conservation zone - Sapiatiba APA; (iii) the increase in the tourism flow to coastal municipalities attracted by improved accessibility conditions.

As result of environmental impacts identified and other demands for management actions, the following environmental programs have been drawn up:

**Program 1 - Work-related environmental protection and control measures:** The objective of this program is to allow the adequate environmental management of the works of the new highway system in order to control the direct impacts on physical and biotic environment, associated with the implementation of the highway; to maintain unchanged the local environmental quality to the larger extent possible; to adhere to the guidelines drawn up by the Environmental Impact Assessment; and to comply with legal decisions pertaining to environmental issues. The scope of this program is divided into subprograms related to the several types of potential impacts as follow: (i) *erosion control*; (ii) *particulate matter, gaseous discharges and noise control*; (iii) *modified areas rehabilitation*; (iv) *occupational health*; (v) *water quality monitoring*; (vi) *archaeological heritage recovery*, and (vii) *basic recommendations*.

**Program 2 - Displacement and resettlement of the population:** The objective is to perform the clearance of the area under control of the highway authority and implementation of the area for the new stretch, so as to guarantee the correct and adequate handling of the indemnity or compensation of the population affected by Rodovia dos Lagos project, regardless of the legal status of their ownership of properties affected. The scope of this program is divided into subprograms: (i) *purchasing of land*; (ii) *dwelling vacancy*; and (iii) *economic activities ordering*.

**Program 3 - Sapiatiba APA:** The Sapiatiba APA protection program comprises the development of a Management Plan for Sapiatiba APA, including the definition of an environmental zoning for the conservation area, specific guidelines for land use and occupancy, as well as for the control, inspection, environmental education, and scientific research to be developed in the future by means of agreements. The program also comprises the identification of economic activities compatible with APA's environmental protection, such as activities oriented to eco-tourism and environmental education.

**Program 4 - Economic, social, and environmental project for the Municipalities:** The objective of this project is to identify the economic potential of municipalities, by focusing primarily on eco-tourism. This study is expected to define tourism projects or activities steered by the concept of environmental conservation and non-exploitation of natural resources.

**Program 5 - Social communication and environmental education:** The program shall be developed by means of social communication and environmental education campaigns oriented to each target population and to the demand for information related to other activities of this environmental management plan. Social communication

and environmental actions have been integrated into the subprograms: (i) *labor training*; (ii) *displacement and resettlement*; (iii) *highway-bordering activities*; (iv) *Sapiatiba APA*; (v) *tourism and environment* and (vi) *publicity and support*.

**Program 6 - Management and monitoring:** The main objective of this program is to staff Rodovia dos Lagos Concessionaire with human resources for the environmental management of the highway system and to consolidate the company's institutional image vis-a-vis environmental issues. To do so, an Environmental Management Unit shall be created within the Concessionária's framework.

**Costs and physical and financial schedule:** The total cost of the EMP is around 3,255,00 (reais) for a period of 25 years. During the first five years the costs of the EMP will be around 1,770,000 (reais).

## **PROJECT'S SOCIAL AND ENVIRONMENTAL VIABILITY**

Rodovia dos Lagos project is not only a response to the demand for better accessibility to one of the most important Brazilian tourism attractions, but also an aspiration of the whole community. The implementation of said project, added to the enforcement of measures defined by both, Environmental Management Plan and Environmental Impact Assessment, can be deemed to be environmentally feasible. In accordance with numerous studies carried out, the implementation of Rodovia dos Lagos shall be a pioneer experience in the scope of the highway privatization program, likely to be applied to other projects, especially in view of its definition and Concessionaire's commitment to the implementation of relevant environmental programs.

## **RECOMMENDATIONS FOR THE LOAN AGREEMENT**

1. Prior to the execution of the agreement, Rodovia dos Lagos Concessionaire shall submit to the Bank a copy of the Installation Permit for the works;
2. Prior to the first disbursement, the borrower shall submit to the Bank evidence that (i) the Environmental Management Unit of the project has been created, and (ii) negotiations with FEEMA on the definition of an institutional cooperation platform intended for the regulation of Sapiatiba APA have started;
3. Six months after the execution of the Loan Agreement: (i) evidence that together with the Municipality of Rio Bonito, services listed in Program 2 have started, (ii) evidence that together with FEEMA, services listed in Program 3, have started, (iii) ongoing report with information on the implementation of all actions provided for in other Environmental Management Programs;
4. One year after the execution of the Loan Agreement: (i) final report on measures to mitigate impacts listed on Program 2, (ii) report on the situation of Sapiatiba APA regulation, (iii) ongoing report with information on the implementation of all actions provided for in other Programs of the EMP;
5. Two years after the execution of the Loan Agreement: (i) final report on control and mitigation related to the impacts listed on Program 1, (ii) final report on Sapiatiba APA regulation, (iii) results of the overall evaluation of the EMP and (iv) evidence that actions provided for in Program 4 with regard to contacts with representatives of municipalities in the region and relevant local agencies for the performance of studies scheduled have been made.

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**ENVIRONMENTAL AND SOCIAL IMPACT REPORT (ESIR)**  
**BRAZIL**

**RODOVIA DOS LAGOS PROJECT**  
**BR-0272**

**I. INTRODUCTION**

- I.1 This Environmental and Social Impact Report was prepared based on the information contained in the technical documentation submitted by the winning consortium for the bidding of the Rodovia dos Lagos project. Particular attention was paid to the Environmental Impact Assessment, EIA, prepared to comply with Brazilian legislation on the environment.
- I.2 In view of the special characteristics of the Rodovia dos Lagos Project, as described in Part III of this report, it was also necessary to supplement the technical documentation with information obtained from: the Fundação Estadual de Engenharia e Meio Ambiente, (FEEMA, the State Engineering and Environmental Agency), a body responsible for the environmental approval of highways; the State Secretary of Transportation; and the municipalities of Rio Bonito, São Pedro da Aldeia, Araruama and Iguaba, all of which will be affected by the project.
- I.3 Additionally, an Environmental Management Plan of the project (EMP) was elaborated, which set out the respective rights and responsibilities of the various public (Rio de Janeiro State Government, in particular the municipal council of Rio Bonito) and private (Rodovia dos Lagos Consortium S.A.) sector bodies involved.
- I.4 Finally, this Environmental and Social Impact Report was organized following the Bank's guidelines in the following documents: (i) Procedures of the Committee on Environment and Social Impact; (ii) Operational Policy N° 105 - Involuntary Resettlement (Draft No. 9, March 31, 1997), and (iii) Minutes of the Committee on Environment and Social Impact - meeting TRG 12/97 held on April 24, 1997.
- I.5 The ESIR includes in **Section I** all the pre-project considerations, the main technical and operational characteristics, implementation phases, chronogram of the work, costs and associated legal and institutional considerations. **Section II** presents a summary of the main environmental and social aspects of the Rodovia dos Lagos project, in addition to a description of the local environment, the main areas where the project will have an environmental impact and an evaluation of the effects of this impact as identified in the EIA. **Section III** sets out the Environmental Management Plan with the principal measures to be adopted to mitigate and minimize impact on the environment, the costs associated with the work, the timetable, and the names of those responsible for the work. This Section also includes the environmental recommendations which justify the granting of financing. These recommendations, when added to the conclusions of the environmental studies and with the compliance with Brazilian environmental regulations, guarantee both the environmental and social viability of the whole project.

**SECTION I**

**II. PRE-PROJECT SITUATION**

- II.1 The Rio de Janeiro State Government, through its State Public Services Privatization Program, put out for public tender all services and work related to the inspection, repair, maintenance, conservation, operation, construction, and extension of the whole road system, Rio Bonito - Araruama - São Pedro da Aldeia - the

Rodovia dos Lagos, with access to the Lakes Region, i.e., highway RJ-124 and the new stretch of highway RJ-106.

- II.2 The consortium, formed by the Brazilian construction companies, Andrade Gutierrez S/A and Camargo Corrêa S/A won the bid and set up a company known as Concessionaire da Rodovia dos Lagos S/A - Via Lagos, with the sole purpose of building and managing the highway system for the 25-year concession period.
- II.3 The present project forms an integral part of a series of measures which the Rio de Janeiro State Government is taking to raise the profile of the Lakes Region which considers it as a priority area for the development of tourism in the State. The two additional projects of substantial size for the region are the construction of a water and sanitation infrastructure and the development of tourism.
- II.4 The water and sanitation projects consist of a public service and works contract to build, expand, maintain and operate the water and sewage treatment systems. This contract is at present out for public tender as part of the State Public Services' Privatization Program. It will compensate for the current deficiencies in the region both with regard to the regular supply of drinking water and sewage treatment and disposal.
- II.5 Secondly, the Costa do Sol Project is an initiative of the State Committee for the Development of Tourism and will be administered by TurisLagos, an organization set up by the mayors of the 11 towns in the Lakes Region, in partnership with the private sector. The regeneration of the 27 km regional coastlines will attract some US\$5 billion of the investments. The project will benefit the townships of Araruama, Arraial do Cabo, Búzios, Cabo Frio, Casimiro de Abreu, Iguaba, Maricá, Macaé, Rio das Ostras, Saquarema and São Pedro da Aldeia. It is estimated it will take 5 years to complete. The Costa do Sol Project plans to transform the region into a major service, leisure and convention area, with the construction of 15 hotels and resorts, theme parks, a convention center and boating marinas.
- II.6 The proposed improvements will bring significant gains to the economy of the State and to the townships in the Lakes Region. They will help expand tourism, will benefit the resident and tourist population, will help the environment with the reduction in pollution and will produce additional benefits in the form of new employment, both direct and indirect.
- II.7 The ongoing privatization program for the Lakes Region includes improved access to the region as a result of the Rodovia dos Lagos project, the recently privatized Central Electricity Company of Rio de Janeiro, which will improve the distribution of electricity, and the project for supplying water and for treating and disposing of sewage. These are all indicators of the transformation which this region is about to undergo.

### **III. TECHNICAL ASPECTS OF THE PROJECT**

#### **A. Project description**

- III.1 To help understand the technical aspects of the Rodovia dos Lagos Project the work was divided into various sections as follows: (map - Annex 1).

**Section 1: State highway RJ-124, from its starting point at the intersection with the federal highway, BR-101 (Rio Bonito Municipality) to km 29.3. The tollbooth area is located in this stretch.**

- III.2 Highway RJ-124 is a 30-km state road which starts near the urban center of Rio Bonito, at the intersection with federal highway BR-101, and goes as far as the municipality of Araruama. This highway was built

by the Rio de Janeiro State Government in the 60's to facilitate the transport of crops and cattle from local farms. More recently this highway has served as an alternative route linking the Metropolitan Area of Rio de Janeiro with the state coastal plain, thus predominantly serving road users for tourism and recreation.

- III.3 It is a two-lane paved highway, 7 meters wide, with traffic flowing in both directions. There is an unpaved hard-shoulder (packed earth) on both sides of the highway. There are six small bridges and access points not only for highways RJ-106, RJ-128, RJ-136 and RJ-138, but also for various urban and rural areas.
- III.4 Average traffic levels on this state highway, which in 1996 were running at some 11,280 vehicles per day. In typical periods during the year the vehicle distribution consists of: 74% automobiles, 6% buses and 20% trucks. In periods of greater traffic density the percentage of automobiles reaches 90% of the total. Another operational characteristic of highway RJ-124 is that traffic flow, at peak times, is predominantly in one direction. On Friday evenings and Saturday mornings the flow is in the direction of the Lakes Region. On Sunday afternoons and evenings and Monday mornings the flow is in the direction of Rio de Janeiro.

**Section 2: The 27-km RJ-106 spur road, from km 29.3 of highway RJ-124 to the outskirts of the municipality of São Pedro da Aldeia, at the intersection with state highway RJ-106.**

- III.5 Based on the guidelines included in the bidding documents, various alternative routes were considered for the RJ-106 bypass in order to find the best and most suitable option. As part of this exercise consideration was given to current usage and occupancy of the land, the geotechnological peculiarities of the area through which the road will run, the existing road system and the areas where the tree coverage is particularly dense. Taking into consideration the local characteristics, several alternatives were evaluated for each specific subsection of the road, before the final route was defined and chosen. The chosen route is shown in Annex 1 and consists of a stretch nearly 27 km long, starting from km 29.3 of highway RJ-124 and ending approximately 4 km before the entrance to the town of São Pedro da Aldeia.
- III.6 The project is for a Class 1 highway with all its attendant modern characteristics such as an 80-km per hour speed limit, a maximum gradient of 4.5%, and a minimum curve radius of 230 meters. The total area under the control of the highway authority will be 60 meters wide. The road will consist typically of a single paved surface, having 4 lanes, each of 3.5 meters wide, with traffic flowing in both directions (dual-carriageway), separated by road-studs with 2.5 meters wide grassed hard-shoulders on either side.
- III.7 The road will pass over highways? RJ-136 and RJ-138, but there will be no intersections with these roads. To ensure that local traffic on municipal roads and on access roads to local properties is not disrupted, underpasses or flyovers for vehicles and cattle will be built.

**Section 3: This extends for nearly 4 km from highway RJ-106, at its intersection with the bypass to the entrance to the town of São Pedro da Aldeia.**

- III.8 The final stretch of the Rodovia dos Lagos Project is approximately 4 km long and runs through the center of an urban area from RJ-106 to the entrance of São Pedro da Aldeia. The work planned for this section involves repair of the highway, resurfacing and road signaling. The original width of the road is 40 meters.

**B. Construction**

- III.9 The work will be carried out in two phases, as shown below:

**Table 1:** Construction plan stages

<b>Stage 1</b>  (Up to July 1997)	* Repair of state highway RJ 124 * Construction of the tollbooth area (Km 22 of highway RJ-124)
<b>Stage 2</b>  (12 months)	* Widening of nearly 30 km of state highway RJ-124 from Rio Bonito to Araruama, starting at the interchange with BR-101. Two new carriageway ways will be built; * Construction of the new 27 km RJ-106 bypass; * Repair of 4 km of highway RJ-106 from the intersection with the RJ-106 spur-road to the access interchange for São Pedro da Aldeia.

- III.10 Currently the first 30 km of highway RJ-124 are being repaired from its junction with BR-101, in addition to 4 km of RJ-106, between km 105 and km 109. This involves resurfacing work and the repair of hard-shoulders, road signs, bridges, and flyovers. The relevant state agency did not require an environmental permit for this work. Specialist consultants were commissioned by the Concessionaire to prepare a study on the current environmental situation of the highway to establish the company's environmental liabilities.
- III.11 A tollbooth area was built between km 21.2 and km 22.2 on highway RJ-124 for collecting toll fees from road users. Works were completed in July 1997, and toll fees for automobiles are R\$1.60 on business days, and R\$2.70 during the weekends. Next to the tollbooth, the construction of an Emergency Center has been planned to provide road users with both medical and breakdown help. The construction of the tollbooth area has already received an Environmental Permit, as shown in Annex 2.
- III.12 During the widening of RJ-124 and the construction of the interchange with RJ-106 the following work has been planned:
1. Earthworks
- III.13 The total volume of earthworks is as follows in Table 2.

**Table 2:** Volume of earthworks (cubic meters)

<b>WORK</b>	<b>RJ-124</b>	<b>BYPASS</b>
Cuttings	444.456	1.097.188
Landfill	1.203.452	1.238.692
Excavations	770.120	162.719
Waste soil	11.134	21.215

2. Surface drainage

- III.14 For both construction areas and for cuttings and embankments, concrete or grass gutters have been planned, to prevent erosion of exposed surfaces. In addition, there will be drains for the cuttings and embankments, transverse gutters to drain surface water from the road and rapid-draining surfaces.

3. Bridges

- III.15 The plan to enlarge RJ-124 includes the widening of seven bridges which cross the principal rivers. At km 21.2 an overpass will be built, leading to the tollbooth area and at km 29.7 an underpass will be built at the intersection with the RJ-106 bypass.
- III.16 The streams which the bypass crosses will be channeled through tunnels since the flow of water is such that it does not call for the construction of bridges. Three underpasses will be built at the intersection with RJ-136, RJ-138 and RJ-106. An underpass will be built at the intersection with RJ-124 in addition to 11 overpasses for vehicles and 3 for cattle.

4. Work schedules

- III.17 The total time estimated for completion of the work is 21 months. Widening RJ-124 will take 14 months and constructing the bypass will take 16 months.

5. Construction sites

- III.18 In addition to the on-site work and support needed to carry out the two main construction undertakings, the widening of RJ-124 and the building of the RJ-106 bypass, two main construction sites have been planned, one central (administrative/residential) and one industrial. All the administrative and production work as well as the lodging for workers will be situated at the central construction site.

6. Installations

- III.19 The following administrative installations are being planned: offices for the constructor and for Rio de Janeiro State Road inspectors, ambulance and work safety staff, recruitment, transport and site security, and for the storage of materials. Production installations include: carpentry, laboratory and workshops. The following will be built for the workers to ensure their well-being: bedrooms, restrooms, canteens, and a recreation area with full leisure facilities.
- III.20 The industrial construction site will probably be built near the junction with the bypass next to an existing quarry activity. The installations were planned to allow for the mixing of aggregates to be industrialized. The project has tried to link the storing of aggregates with the mixture of bitumen and aggregates and the production of concrete in a continuous industrial process. The installations planned for the industrial site are: stone crushing, aggregate mixing, asphalt and concrete production and the storage of explosives and other materials.
- III.21 Sand and gravel will come from sources close to the highways being extended and built. These sources will be duly legalized by the State environmental agency. Similarly, the larger aggregates which will be used in the construction of the road bed, such as pebbles and gravel, will come from quarries nearby.
- III.22 All waste and discarded material, such as construction site rubbish and cleaning products, will be deposited in appropriate areas previously authorized by the State environmental agency.

7. Labor

- III.23 It is estimated that in the initial stage of the work 495 employees will be needed at various levels, 392 hired directly by the contractor and the rest subcontracted from service companies. It is also estimated that during the construction phase at least 200 indirect jobs will be created.

8. Signaling

- III.24 To avoid the types of problems associated with a lack of safety measures and to ensure the smooth flow of traffic on neighboring highways and roads, a temporary road sign system has been worked out in collaboration with the public road safety and traffic authorities. The areas directly affected by the works will have their own road signs, the planning, installation, and maintenance of which will follow certain criteria such as: clear and precise information of a standard nature aimed at all users of the road system, accurate warnings to motorists of the existence of road works and traffic conditions, traffic flow information, speed limits and other safety warnings, and the appropriate management of traffic to avoid accidents and congestion.

C. Operation and maintenance

1. Operation

- III.25 The Concessionaire has developed a highway system operation's plan that includes the following:

- ? An Information Collection System consisting of: (a) traffic control; (b) weighing station for trucks/cargo vehicles; and (c) an accident registration system.
- ? User assistance services, featuring: (a) medical and mechanical breakdown assistance; and (b) a communication system. These services will function for 24 hours a day, seven days a week.
- ? A toll collection system.

- III.26 The operations costs include: (a) personnel salaries, (b) vehicle acquisition, (c) maintenance vehicles, and (d) vehicle operating costs. In the due diligence review it was concluded that the proposed operating plan had reasonable values for all its costs needed to perform all the tasks required for the efficient operations of the highway. The mean annual cost for the operations tasks is R\$2.14 million, a reasonable value and comparable with other road operations costs.

2. Maintenance

- III.27 The Concessionaire has put together a Maintenance Manual to help in the planning, management, budgeting, control and carrying out of highway maintenance, to preserve the technical specifications of the road and to ensure traffic safety. In broad terms the maintenance of highways can be divided into three different categories.

- (a) **Routine maintenance:** where the work is carried out over a period of time, in accordance with pre-established service levels, in order to maintain the highway structure and equipment in their original condition. Highway maintenance is constant and is aimed at controlling erosion, clearing and looking after the vegetation in the area under the control of the highway on either side of the road, and maintaining the road surface and drainage system.
- (b) **Emergency repairs:** these are carried out to repair, replace, reconstruct or restore to their original state, structures or sections of the road damaged or destroyed by a disaster.

- (c) **Special maintenance:** work needed to preserve the initial investment, such as, for example, the extension or construction of a drainage system, the prevention of erosion or the control of a landslip on embankments.

3. Labor

- III.28 It has been estimated that operating the highway will generate 145 direct jobs at varying professional levels, both in upkeep and maintenance.

4. Management

- III.29 The management of the highway will include the following activities: (i) policing, (ii) control of dangerous loads, (iii) control of access to secondary roads and service areas, (iv) periodic inspections of the main components of the highway structure, (v) management of the environment as set out in the Environmental Management Plan, (vi) accident control, (vii) planning and control of highway maintenance, and (viii) control of areas bordering the road where there is any socioeconomic activity.

#### IV. ENVIRONMENTAL FRAMEWORK: LEGAL AND SOCIAL ASPECTS

- IV.1 The Brazilian National Environment Policy was established by Federal Law N° 6,938/81. Subsequently, it was consolidated in Chapter VI, The Environment, of the Federal Constitution of 1988, Article 225 of which states: *“Everyone has the right to an ecologically balanced environment, the common property of all people and essential for a healthy quality of life, it being the obligation of Government and society as a whole to defend and preserve the same for present and future generations.”* Paragraph one, subsection IV of Article 225 gives Government the right to *“demand, by law, that a study should be made prior to the building of any installation or the setting up of any activity which might have a significantly prejudicial impact on the environment and that the findings should be made public.”*

- IV.2 Regarding the environmental permits, Federal Decree N° 99,247/90, which sets out the rules of the National Environment Policy, states that the construction, installation, extension or operation of any activity which causes, or has the potential to cause pollution must have the prior approval of the appropriate state environment body which is part of the National System for the Environment, SISNAMA. Article 19 of this Decree states that Government, as part of its controlling function, may issue the following permits:

- a. **Prior Approval Permit - LP.** This is issued during the planning activity phase and contains details of the basic requirements which need to be met in the siting, installation and operation of any undertaking;
- b. **Installation Permit - LI.** This authorizes the installation of the undertaking in accordance with the previously authorized Executive Plan;
- c. **Operational Permit - LO.** This allows the activity to commence operations in accordance with the Prior Approval and Installation permits.

- IV.3 Federal Resolution N° 001/86, of the National Environment Council links the granting of operating permits for activities which alter the environment, such as roads with two or more lanes, to an Environmental Impact Study (EIA), and its consequent Environmental Impact Report, RIMA, both of which have to be submitted for approval to the relevant authority. In the case of Rio de Janeiro that

authority is the State Environmental Engineering Agency, FEEMA.

A. State Environmental Legislation.

IV.4 FEEMA was established by State Decree N° 30/75 as the technical and executive body responsible for the State Environmental Control Policy. State Decree N° 39/75 created the State Environmental Control Committee, CECA, as the body responsible for establishing standards. FEEMA and CECA are attached to the Environment Secretary of the State of Rio de Janeiro. The State Council for the Environment, CONAMA, was set up by State Decree N° 12,687/89 as a consultative body.

IV.5 FEEMA established the guidelines, as approved by CECA, relating to EIA/RIMA studies and reports in the State of Rio de Janeiro. In line with Federal Resolution N° 001/86 of CONAMA, permits for roads with two or more lanes or for other activities such as railroads, ports, airports, oil pipelines or gas pipelines, are dependent on the presentation of the appropriate EIA/RIMA studies and reports.

B. Environmental permits for undertakings

IV.6 As far as compliance with environmental legislation is concerned the situation of the Rodovia dos Lagos project is as follows:



**Table 4:** Current permit situations for the various phases

PHASE	FILE N°	PERMIT TYPE	CURRENT POSITION
Tollbooth area	E-07/200.142/97 (Appendix 2)	Installation	Granted: 06/02/97
Repair of RJ 124	Letter, PRES-02/97	Exempt	Authorized: 28/01/97
RJ-106 bypass and widening of RJ-124	<u>E-07/200.186/97</u> (Appendix 2)	Prior Approval phase	EIA: Analyzed and Prior Approval granted 17/09/97

- IV.7 During the first stage of the construction of Rodovia dos Lagos, the consortium had two environmental studies prepared: (i) an evaluation of the main impact on the environment resulting from the construction of the tollbooth with a plan for managing its effects; and (ii) an evaluation of the current environmental liabilities of highway RJ-124 and the measures which are currently being undertaken to repair some of the existing environmental damage.
- IV.8 Preparation of the environmental analysis report on the construction of the tollbooth area led to the granting of the installation permit - LI (Annex 2). This report covered the following aspects: the principal characteristics of the project; an analysis of the environmental, socioeconomic and human implications for the area directly affected by the project; an evaluation of the changes to the environment which would arise as a direct consequence of the project; the suggestion for an Environmental Management Program which would include both preventive and corrective action to minimize any negative environmental impact resulting from the work and proposals for physical and biological surveys to be carried out throughout the 6-month construction period.
- IV.9 For the improvements to highway RJ-124, a report was prepared which identified and analyzed the most important environmental damage issues and proposed how this damage should be repaired. Therefore, the consortium assumed its environmental responsibilities. The report covered the following points: the identification and analysis of all the current alterations to the environment, and an inspection of the terrain to identify environmental responsibilities, and those aspects which might give rise to accidents. In addition, an Environmental Management Program was prepared, setting out the measures to be taken to repair damage to the environment caused by the construction of the highway. Furthermore, a physical and biological inspection plan was produced covering the estimated 6-month construction period.
- IV.10 In relation to the widening of RJ-124 and construction works of RJ-106 bypass, FEEMA has requested that EIA/RIMA reports comply with current legislation. These were delivered early June 1997, analyzed, and approved by FEEMA as part of the prior approval permit (LP) and installation permit (LI) process. FEEMA granted the Prior Permit for these works on September 17th (see Annex 2). Reports indicate that the project has complied with federal and state environmental legislations.
- C. Public involvement in environmental impact evaluation studies
- IV.11 State Law N° 1,356/88 establishes the rules and regulations relating to the preparation, analysis, and approval of EIA reports with particular emphasis being placed on the proceedings relating to public access

to technical documents. The principal points of the law are:

- a. The delivery date of the EIA report, the place, time and period during which the documents will be open for public examination, and the announcement of any possible public hearing which must be published on the front page of at least 3 of Rio de Janeiro State's daily newspapers of major circulation, under the headings "Environmental Impact Study" or "Public Hearing" ;
  - b. At the discretion of CECA, public hearings will be held prior approval of the permit, if it is deemed necessary in the public interest and for the protection of the natural heritage. They will also be held if demanded by: (i) legally constituted non-government organizations, whose aims are the protection of the environment and the representation of the interests of those communities directly or indirectly affected by any project, and (ii) the public prosecutor of the region where the undertaking is planned for;
  - c. The public hearing may not be held during the 30 days subsequent to the date of the publication of the announcement in the newspaper;
  - d. Written representations, sent to FEEMA up to 10 days after the closure of the public hearing, will be taken into consideration when the technical conclusions are drawn up and will be attached to the permit file;
  - e. The contractor will be responsible for all the costs of: (i) the preparation and publication of the EIA/RIMA reports, (ii) newspaper announcements, (iii) analysis and issuing of any publicly-stated opinions on the reports, (iv) the public hearing expenses, and (v) monitoring expenses.
- IV.12 FEEMA has produced Technical Instructions, as approved by CECA, which set out the procedures relating to community involvement in the environmental evaluation process. In Rio de Janeiro State, CECA regulation N° 255/91 sets out the guidelines for holding public hearings as part of the whole process for granting permits for activities which, because of their tendency to pollute, need to present EIA/RIMA reports.
- IV.13 It is important to note that in the case in question FEEMA, in line with State Law N° 1,356/88, asked the consortium for 10 copies of the RIMA report which were then distributed to all the municipalities directly affected by the road-works, to the Environment Committee of the State Legislative Assembly, to the State Public Attorney and to the Brazilian Institute of the Environment and Natural Renewable Resources, IBAMA, the federal government body responsible for enforcing the National Environment Policy.
- IV.14 The Lakes Region communities and non-governmental organizations interested in environmental protection and conservation, have had access to complete EIA reports as these were analyzed by the Environment Committee of the Legislative Assembly. Appropriate announcements were placed in large circulation newspapers. Currently, the analysis of the EIA of Rodovia dos Lagos project has been concluded, and the evidence is the Prior Approval issued by FEEMA. Pursuant to state regulation, and in compliance with requests made by non-governmental organizations of the region, a public hearing was held on 09/01/97, in the municipality of Araruama (see Annex 3).
- D. Specific environmental legislation
- IV.15 In preparing the EIA/RIMA reports, other legal instruments were considered, such as the laws, decrees, regulations and resolutions which make specific reference to the control of air pollution, the removal of topsoil, noise and vibration, the carriage of dangerous substances, and the manufacture of asphalt. It must also be pointed out that in relation to the protection of natural resources, State Decree N° 15136/90

created the Environmental Protection Zone (APA) of Sapiatiba to preserve the region's mountain areas. No guidelines on this environmentally protected area have been drawn up and so there are no rules regulating local economic development activity. The Rodovia dos Lagos will cut through part of the Sapiatiba Environmental Protection Zone.

## SECTION II

### V. SOCIAL AND ENVIRONMENTAL CHARACTERISTICS OF THE AREA AFFECTED BY THE WORK

#### A. General comments

V.1 The EIA/RIMA reports used two different criteria when commenting on the environmental characteristics of the region, the first considering the area indirectly affected by the undertaking and the second, the area directly affected. The area directly affected includes the municipalities of Rio Bonito, Araruama, São Pedro da Aldeia and Iguaba, and the indirectly, those of Saquarema, Arraial do Cabo, Cabo Frio and Búzios, all of which are in the Lakes Region and part of the local authority district known as 'Baixadas Litorâneas'. Annex 4 includes a map of the Rodovia dos Lagos area, showing the principal public highways.

V.2 The structure of this Section of the report on social and environmental characteristics of the area adopted the same criteria as the EIA study. However, two other significant points were also considered: the first, dealing with the Lakes Region infrastructure, and the second, looking at the characteristics of the Environmental Protection Zone (APA) of Sapiatiba, an area which will be affected by the project.

#### B. Area indirectly affected

V.3 The natural attractions of this area have earned it the name of Costa do Sol because of almost constant, year-round sunshine due to gentle onshore breezes. Two of these attractions are the Costa Azul ('Blue Coast'), so named because of the color of the sea, and the Lakes Region, an area of lagoons, linked either directly or indirectly to the sea and separated by sandbanks. These are the main tourist attractions and the principal driving force of local economic activity.

V.4 The climate is relatively dry and warm throughout the year. Average rainfall varies between 42 mm in August, the driest month, and 123 mm in December, the wettest. Average temperatures vary between 69°F and 77.5°F.

V.5 The terrain is gently undulating, the highest point being less than 250 feet above sea level. There are some very low-lying areas scattered amongst the hills where cattle grazing pastures and swamp-lands are to be found. Between Iguaba and São Pedro da Aldeia is the Sapiatiba mountain range rising to over 1000 feet.

V.6 The lakes in the area are very salty, their waters being both calm and warm. The fine, white sandy beaches stretch for miles and the sea, whilst clean, is rough. Near headlands, where important communities such as Arraial do Cabo, Cabo Frio and Armação de Búzios are to be found, the coastline is more indented and there are various small, secluded beaches.

V.7 Of particular note in the region is Lake Araruama, the biggest in the state at 220 sq. km, which developed after the Maçambaba Reef was formed. It stretches from Saquarema toward Arraial do Cabo. The lake is used a great deal for water-sports such as yachting and windsurfing because of the constant winds.

- V.8 The few small rivers which empty into the lake, drain some 430 sq. km of land. The low volume of water flowing out of the lake and the regional climate, with its long periods of very dry weather, making for levels of evaporation greater than levels of precipitation, are the main reasons why the lake is very salty.
- V.9 FEEMA monitors the water quality in only two of the lake's tributaries, the River Maturana and the Mossoró canal. Both have low levels of dissolved oxygen (DO) and high levels of biochemical oxygen demand (BOD) in addition to concentrations of fecal coliform in excess of 1000 NMP per 100 ml. These levels are due basically to the lack of public sanitation in all the townships in the region where less than 3% of households have mains sewage.
- V.10 Water for the whole of the Lakes Region comes from the Juturnaíba reservoir. The Bacaxá River which flow into the lake has levels of OD close to 7.5 mg/liter and levels of BOD less than 2 mg/liter, both within legislative parameters.

C. Socioeconomic factors

- V.11 The area indirectly affected has experienced constant population growth since the 1950's. This is due to the expansion of tourism, in particular, its associated activities such as commerce, service industries and civil construction. The resident population of the area, of around 300,000, represents 76% of the total population of the "Baixadas Litorâneas" Region.
- V.12 Table 5 shows the population distribution in the area indirectly affected by the highway. It indicates significant population growth and, in general terms, levels of urbanization in excess of 90%. The "Baixadas Litorâneas" Region has experienced the highest average annual growth rates in the whole of the State of Rio de Janeiro.

**Table 5:** Population figures for the area indirectly affected by the highway. Urbanization and growth rates (1991)

Municipality	Resident population (91)	Urban population (91)	Urbanization %	% Annual av. growth (80/91)
Rio Bonito	45,161	27,165	60.15	1.10
Squarema	37,888	35,263	93.07	2.72
Araruama	50,024	43,373	73.48	1.55
São Pedro da Aldeia	43,228	34,898	80.73	2.74
Iguaba	7,246	7,246	100.00	-
Arraial do Cabo	19,886	19,886	100.00	2.02
Cabo Frio	76,311	70,613	92.53	5.93
Búzios	8,604	8,604	100.00	-

- V.13 In 1993, in all the municipalities in the "Baixadas Litorâneas" Region, there was 20 historic

monuments, 20 cultural associations, 4 museums, and a network of 233 hotels which included many guest houses as well as numerous bars and restaurants. Every year there are some 70 local festivals and fairs. In Rio Bonito, Araruama, Iguaba and São Pedro da Aldeia there are 5 historic monuments, 5 cultural associations and 39 hotels. Regionally there are 7 urban trade unions, 15 rural trade unions, 2 non-governmental organizations (NGOs), 2 black movements and 30 residents' associations.

- V.14 During the last 20 years tourism and leisure have assumed great importance in the coastal towns. The transient population which descends on the Lakes Region during the summer, at vacation times and on weekends, is on average, 2 and 1/2 times larger than the resident population. Of all residences only 32.9% are occupied on an occasional basis. More than 50% of the economically active population is involved in some form of service industry, with tourism being by far the principal activity.
- V.15 Consequently, because of the amount of property speculation, there has been an upsurge in the number of lots being sold for the construction of houses and apartment blocks, and an increased demand for satisfactory urban services and an adequate road system. This has caused damage to the environment, principally in the lakes, because of the amount of earth being removed and the increase in the disposal of untreated household waste.
- V.16 Besides the urban areas, which are concentrated primarily on the coastal strip and around the lakes, the land is divided into small weekend estates and farms. The main rural activity of this region is cattle raising since the soil is not very suitable for crop growing because of poor drainage and the build up of salts.
- V.17 Farming activity and the lumber and firewood industries led to the almost complete destruction of the local tropical rain forest. The few remaining tracts of forest are found on the steepest slopes of the mountain range where access is extremely difficult. Even so, the trees and vegetation are all of poor quality, secondary growth, the primary forest with its more valuable species having long since disappeared.

D. Environmental protection zone

- V.18 The Environmental Protection Zone, APA, of Sapiatiba, created by State Decree N° 15,136/90, has two of the last remaining tracts of tropical rain forest on the Sapiatiba and Sapiatiba-Mirim mountain range. The APA of Sapiatiba covers approximately 6,000 hectares in the municipalities of Iguaba and São Pedro da Aldeia (Annex 5).
- V.19 APA's are conservation areas, the purpose of which is to protect and preserve the environment and its natural systems, and in doing so, to improve the quality of life of the local population and protect regional ecosystems. APA's can be either publicly or privately owned, both giving the right to exploit natural resources. Activities which cause damage to the environment, such as ground-leveling, mining, dredging or excavation, are not allowed. Any industrial activity which might produce pollution must obtain an environmental permit from the appropriate state licensing and administrative body, which in this case is FEEMA. No urbanization project can go ahead without the prior authorization of the administrative body.
- V.20 The terrain of the Sapiatiba APA mainly consists of flat or slightly hilly pasture on which the main activities are cattle farming, followed by horse breeding or the raising of other smaller animals. The planting of subsistence level crops, such as corn and cassava is also common, as is the growing of bananas, mangoes and vegetables. To the north of the APA there are few inhabited properties but in the south, along highway RJ-106, close to where it is proposed to build the RJ-106 bypass, an extensive area has been divided into building plots.

- V.21 That part of the APA which borders Lake Araruama is urban in nature and densely populated. Near São Pedro da Aldeia, within the APA, there are salt pans on the lakeshore. The area near the Pedras River, to the west of the APA consists of low-income housing and small plots of land, unused plots, and old pasture.
- V.22 The principal problems of the APA, for which there is no Management Plan, are the lack of marked boundaries, poor control, and ineffective policing of the area. As a result, there is deforestation, illegal hunting, and attempts to occupy the land with the intention of building houses.
- V.23 Even though the characteristics of the original vegetation have been substantially altered, there are no apparent signs of soil erosion or other aspects of terrain deterioration in the area. The largely flat nature of the region reduces the likelihood of the erosion process. The basic soil structure, consisting of alluvial and colluvial deposits, provides in general terms the type of geotechnical conditions which are eminently suitable for the construction of highways.
- V.24 Changes to the vegetation cover have led to a reduction in the large population of fauna which once flourished in the area which will be directly affected by the highway construction. Remaining fauna is composed of those animals which are easily adaptable and are commonly found in urban and altered environments, such as small rodents, insects and town-dwelling birds. In the better preserved areas on the slopes and tops of hills and on sandbanks, a richly diverse fauna is to be found, including small mammals such as skunks, armadillos and hedgehogs, as well as various bird and reptile species, including lizards and snakes.
- E. Area directly affected
- V.25 The area directly affected by the works consists of the highways and the controlled strips either side, some 63 hectares, and the tollbooth area, some 23 hectares. This area will cover parts of the municipalities of Rio Bonito, Araruama, Iguaba and São Pedro da Aldeia.
- V.26 The area under direct control of the highway authority includes all those features necessary for the building of a highway such as cuttings, embankments, surface drainage systems, hard-shoulders, highway lanes, service roads, bridges and viaducts. Also included in the directly affected area are the central construction sites, the quarries, extraction sites of topsoil, the place where excess soil will be deposited and respective access roads.
- V.27 On either side of highway RJ-124 predominantly are small weekend estates and farms with fields and pasture, although in some places citrus fruit is grown. There are some marshy or damp areas, noticeable because of the growth of cattails. Here and there are to be found small patches of young secondary forest, full of embaúba trees, and small eucalyptus plantations.
- V.28 Along the stretch of highway RJ-124 which is to be widened, the predominant land usage is similar to elsewhere with the exception of the first two kilometers, near the interchange with BR-101 and in the immediate vicinity of Boa Esperança where there is a concentration of commercial and residential properties. Also, along the whole stretch, near the hard-shoulder on the left side there are some 38 dangerously sited and poorly-constructed stalls, and 27 additional ones on the right side, where without any formal control, people peddle home produce or seasonal fruit.
- V.29 The usage and occupancy of the land at either side of the RJ-106 bypass is very similar to that in the rest of the region; pasture land with cattle and horse breeding, and on some smaller properties and farms, sheep, and goats. Although less common than on other stretches along the highway, there are some citrus plantations. There are plots of land, some abandoned, already divided up into building lots and some secure private estates of weekend houses. Along one short stretch there is a low tension electricity line

which supplies energy to the private estates.

- V.30 The final stretch of the bypass, between the Pedras River and São Pedro da Aldeia, will cut through the APA of Sapiatiba, over fields and swamps near the Sapiatiba mountain range. Between the planned route of the bypass and the existing RJ-106 highway is a mixed area of urban development and pasture, crisscrossed by unpaved roads.
- V.31 From km 105 of highway RJ-106, at the interchange with the bypass to the rotary intersection for São Pedro da Aldeia the road runs through a largely urban area where there are also a great number of commercial establishments. Near the rotary intersection on the left-hand side of the road there are salt pans and on the right, Lake Araruama.

F. Regional infrastructure

1. Basic sanitation

- V.32 As far as the sanitation infrastructure is concerned, it is important to point out the deficiencies in the whole region in the supply of water, sewage collection, and the disposal and treatment of solid waste. The facts indicate a very precarious state of affairs. The State Government has made a great effort to improve water supply and sewage treatment, both of which are in the final phase of privatization. Service level improvement targets have been set.
- V.33 Water supply for the Lakes Region is currently handled by a State-controlled company. Initially the system had the capacity to supply 450 liters per second, but this was subsequently increased to 983 liters per second. Hydrology surveys have indicated that, over a period of 10 years, the Juturnaíba reservoir supplies a minimum of 12 cubic meters per second during the driest times of the year, the winter, which does not coincide with the period of greatest demand, the summer.
- V.34 Over the last few years water supply has been very precarious even during those periods when, to all intents and purposes, supply should equal demand. This is due to poor management of the system, leading to a lack of control over water loss and crises at times of peak demand. Besides this and taking all the municipalities in the survey into consideration, the storage of treated water, which should be around 1/3rd the average daily consumption, is far from being achieved. Statistics show that around 65% of all households have main water. In those municipalities which are in the indirect sphere of influence of the proposed work, on average more than 70% of households are connected to the main water supply, with the exception of Rio Bonito where only just over 44% have main water.
- V.35 The most serious and obvious infrastructure problem in the region is the inefficiency, and in places the inexistence, of the system for collecting and treating domestic waste. In the whole of the ? Baixadas Litorâneas? Region the number of households connected to main sewage is around 3%. In municipalities such as Araruama and Cabo Frio, which are popular tourist areas, where demand for real estate is significant and where there are vacationers throughout practically the whole year, there is no public, domestic sewage network. In Rio Bonito less than 1% of households are linked to a main sewage system. In Arraial do Cabo more than 70% of households treat their sewage in septic tanks and dispose of it in public rainwater drains. In Araruama nearly 60% of all households treat their waste in rudimentary septic tanks with inadequate disposal facilities. In all the municipalities there are a significant number of households without any form of domestic waste treatment.
- V.36 Domestic rubbish is better dealt with by the local public authorities who collect from 70% to 90% of the households in the towns of Cabo Frio and Arraial do Cabo, respectively. Araruama is the town with the lowest urban rubbish collection rate with around 29% of households being served.

V.37 The deficiency in the system for collecting rubbish leads to the uncontrolled dumping of domestic waste in tips whose existence encourages the spread of flies and rats. The inadequacy of the surface water drainage and sewage systems provide ideal conditions for the proliferation of mosquitos. The quantity of flies and mosquitos in Araruama, Iguaba and São Pedro da Aldeia is significant.

## 2. Public health system

V.38 In 1987 the ? Baixadas Litorâneas? Region had 4.9 hospital beds for every 1,000 inhabitants, which is less than the State average of 5.6. In fact, with the exception of Rio Bonito, where there are 24 beds for every 1000 inhabitants, the municipalities in the region have the lowest level of bed availability in the State. In 1995, there were 22 hospitals in the region; 6 private, 1 federal, 11 state and 4 municipal in the towns of Araruama, Cabo Frio, Rio Bonito and São Pedro da Aldeia.

## 3. Education

V.39 According to official statistics in 1991, 78% of the region's population was literate; the second lowest rate in the State. In 1991 there were 457 schools which catered for 95,169 children from preschool to college level. 57% of the schools fell within the municipal system and accounted for 45% of municipal school system also accounted for 85% of the 2,184 children registered in rural schools. The ? Baixadas Litorâneas? Region had only 1 university in 1991, the Cabo Frio Faculty of Philosophy, Science and Arts, a private establishment with 480 students, offering 180 places a year. In 1990, 142 students graduated.

## 4. Communication

V.40 The telecommunication system in the region belongs to the state telephone company, which offers both local, long-distance and mobile-phone services. In 1994, there were 25,892 telephones, 13 exchanges and 469 public pay stations.

# **VI. ANALYSIS OF THE SOCIAL AND ENVIRONMENTAL IMPACT AND ASSOCIATED RISKS**

## A. General commentary on the environmental impact study

VI.1 To evaluate the environmental impact of the project, the company responsible for preparing the EIA report, used their own methodology, using their own software package called ? IDEA,? Environmental Studies Development Tool.

VI.2 The methodology classifies environmental impact according to its intensity, duration, scale and spread, and provides a value for each incident, thus allowing a comparison to be made between current and future scenarios, that is to say, whether the highway is built or not.

VI.3 Although theoretically suitable for comparing various scenarios, this environmental impact analysis method is lacking specific quantitative and descriptive detail, limiting itself to an analysis of some of the more qualitative aspects. For example, there is no quantitative analysis of variations in environmental pollution (noise, atmosphere, or water). Similarly, no quantitative projections were made of the expected increase in the number of tourists to the region as a result of the improvements in access nor of the consequent rise in demand for new urban areas, infrastructure and services.

VI.4 Another shortcoming in the methodology is caused by the way in which different elements of the impact on the environment have been grouped together. This is particularly evident when it comes to calculating



the potential impact value using the Batelle Method. This grouping together of different elements has meant that certain information on some of the benefits and damage has been lost, thus leading in the final conclusion, to a distortion of the facts on the advantages and disadvantages of the project and its alternatives. The method also fails to take into consideration the timing of the various impact factors or any indirect effects.

- VI.5 It is generally agreed, however, that most of the methods used to evaluate environmental impact suffer from a degree of subjectivity which can lead to doubts about the confidence which should be placed in this particular study. In describing the impact arising from this project, two types of problems are indicated where a degree of subjectivity is evident.
- VI.6 The first is found in the list of potential impact factors, where there has been a distortion of the facts about some of the more significant ones, because of the way in which they have been presented. For example:
- a. The need to move an estimated 23 low-income families who live along the RJ-124 highway and to deal with both the formal and informal economic activity found in the same area, was not analyzed as a separate issue. This effectively conceals the significantly negative nature of this action within the overall context of the report.
  - b. In the same way, interference with the environment in the Sapatiba APA, a legally established conservation area, is analyzed only from the point of view of changes in vegetation and the impact on its abundant fauna. Legal and institutional considerations are ignored.
  - c. In other cases, by splitting the analysis into several different aspects and in doing so multiplying the overall number of points allocated to a particular issue, an overestimation of the positive impact results. This is the case in the following:
    - (i) increase in traffic volumes, the risk of accidents, and improvements in the distribution of local produce could have been considered under one heading;
    - (ii) changes in personal income, an increase in the level of employment and the tendency for growth in the commerce and service sector industries could have been analyzed under the general heading of regional economic development.
- VI.7 Another problem occurs when it comes to estimating the extent of environmental impact, which while being reasonably consistent in concept, suffers from a degree of subjectivity in that it measures it only in comparative terms and following the categorization previously mentioned.
- VI.8 Despite these comments on the analytical process, the project, as a whole, proves itself to be environmentally sound. However, to complement the analysis already carried out, newly more detailed studies were requested on the effects of: (i) the relocation of low-income families who live beside the highway; and (ii) a proposal for dealing adequately with the disturbance to the Sapatiba APA by establishing a process for compensating those affected. In the same way, the increase in demand for infrastructure services must be quantified and norms for controlling land use must be established, bearing in mind the increase in tourism and the consequent demand for new housing development. All these points are duly covered in the Environmental Management Plan which is in Section III of this report.

B. Impact during the construction phase

- VI.9 With the opening of the Rio Bonito-Araruama-São Pedro da Aldeia highway system it is estimated that the average daily volume of traffic will grow by between 3.2% and 3.6% a year as a result of the increase in population, urban expansion and growth in the regional economy. As a direct consequence of the improvement in the road system, traffic flow will improve and the number of accidents will be reduced. In addition, pressure on the lakeshore area of Lake Araruama will be greatly reduced because traffic will be diverted to the RJ-106 bypass and therefore allow the development of tourism in more favorable conditions.
- VI.10 Both the resident population of the directly affected area and visitors will benefit from the project. The population on which the construction work will have a direct impact includes those who live and work in rural properties, and in commercial and service establishments located within the area which with the construction of the new highway, will come under the direct control of the highway authority.
- VI.11 The impact arising from the work of building the tollbooth area and the RJ-106 bypass and from widening highway RJ-124 is not very significant, is temporary in nature and is easily mitigated by a series of controls, norms and procedures which the contractors should introduce.
- VI.12 The main effects, which will become apparent as the work proceeds, will impact the human environment. In particular, these are: (i) an alteration in air quality as a result of the dust particles produced by the machines and equipment involved in construction work, because of the gases coming from the asphalt factory and fumes from engines, and because of the solid waste and sewage which will be produced at the central construction sites; (ii) an increase in noise levels as a result of the use of machinery and equipment in the construction process; (iii) an increase in erosion on the sides of cuttings and embankments, leading to soil being deposited in lakes and rivers; (iv) an alteration in water quality as a result of the solids and effluents emanating from the construction site; (v) the removal of vegetation cover, mainly pastures, cultivated land and very immature scrub but with minimal impact on fauna.
- VI.13 As for the socioeconomic environment the effect of the work will be primarily felt in: (i) interference with the water and electricity distribution networks, resulting in temporary disruption to service; (ii) a rise in the demand for basic social services, principally health; (iii) an increase in traffic volumes and the risk of accidents, resulting from the movement of machinery and equipment and road diversions; (iv) a possible increase in real estate value in view of the greater demand for rented accommodation from construction workers; (v) an increase in levels of regional income by virtue of the greater offer of both direct and indirect employment as a result of the undertaking; (vi) a change in taxation revenue, and principally (vii) the relocation of part of the local population, principally those with low incomes, who live beside the highway or who are engaged in some informal economic activity along its length.
- VI.14 It is important to point out that while the work is in progress the effect of the increased demand for labor arising directly from the project (more employment opportunities, demand for commerce and services, increases in taxes etc.) will be positive but will become negative when the project is finished and workers are dismissed. However, increased regional economic activity after completion of the project should minimize this negative effect.

C. Removal and relocation of locally affected people

- VI.15 The construction and operation of the Rio Bonito-Araruama-São Pedro da Aldeia road system will not require the removal of a certain number of people. The area needed for the system comprises the tollbooth complex and the RJ-106 bypass route given that improvements to existing stretches should occur within the limits of the land already belonging to the highway authority.

- VI.16 The procedure for acquiring the necessary land will involve direct negotiation with the owners and include a purchase and sale contract in the name of DER-RJ (State Highways Authority). Initially a survey of the area to be appropriated will be carried out and a register drawn up. Subsequently a valuation will be made by specialists working for the Consortium and the Highways Authority, who will take into consideration the locality of the property, the topography and any improvements which have been made. If no agreement is reached on price, the State Government in the name of the Highways Authority (DER-RJ) will issue an order for the compulsory purchase of the property for use by a public utility. The owners of the compulsorily purchased properties will be compensated according to current legislation.
  
- VI.17 For the first phase of the project, the tollbooth area, the land, consisting of 5 properties, 5 commercial establishments and 2 private dwellings, has already been bought. For the second phase, which involves the widening of the RJ-124 highway and for which the working plans are being drawn up, a register of local properties has already been completed, which shows that within the limits of the area under control of the highway authority there are 23 residences and 46 commercial establishments, all located in the municipality of Rio Bonito.
  
- VI.18 For those cases involving residences the Rio Bonito town council has already finalized its socioeconomic analysis and has set aside an urban area for the construction of low cost housing for those affected.
  
- VI.19 Alongside the highway near Boqueirão, at the beginning of RJ-124, and in Boa Esperança (km 13 of the highway) local residents from the poorest sectors of the community have built houses illegally and are involved in the unregulated economic activity of selling to passing vehicles. This group of people, considered the most vulnerable, will be the subject of a special project aimed at helping them continue earning a living.
  
- VI.20 In order to deal with the negative effects on the formally established commerce of highway RJ-124 and the informally practiced street vending the Consortium will, in the case of the first group, adopt a procedure similar to that used for buying up the properties of those who are to be relocated; residential and commercial properties will be identified and registered, existing improvements will be evaluated and price will be directly negotiated with the owners. In the case of street sellers, a register will be produced and a specific plan for dealing with them drawn up, greater details of which will be found in the Environmental Management Plan, at Section III.
  
- VI.21 The area to be purchased for the RJ-106 bypass totals some 160 hectares of pasture, comprising some 35 small and medium sized properties. The purchase of these properties may necessitate the rebuilding of access roads to properties which have been isolated and to a lesser extent the reciting of some cultivated areas or pastures. Any decrease in agricultural income should be insignificant since most of the area to be appropriated is grazing land, loss of which can be easily compensated for by the more intensive use of the properties remaining pastures.
  
- VI.22 It is important to point out that the RJ-106 bypass will almost certainly lead to a decline in the economic activities which are dependent on the traffic which uses this currently operational stretch of RJ-124. This decline may necessitate the drawing up of specific plans to relocate the affected commerce along the new highway or even to restructure and reposition it to meet new opportunities which will arise as a result of the influx of tourists.

D. Impact during the operational phase

- VI.23 Undoubtedly, the biggest social and environmental effects will be felt when the undertaking becomes fully operational. These effects can be divided into 2 main categories: (i) greater tourist activity in the region

by virtue of the improvements in access and the resultant increase in the demand for housing, commerce, services and public infrastructure to meet it, as well as pressure on natural resources (vegetation, water, conservation areas), and (ii) interference with the Sapiatiba APA.

- VI.24 The main social and environmental impact will undoubtedly arise as a result of the improvements in access arising from the undertaking which will bring to the region amongst other things: (i) a more dynamic tourist industry which will attract even more visitors than at present; (ii) an increase in economic activity linked to tourism, such as commerce, services, hotels and leisure equipment; (iii) an increase in the demand for social services, principally health, education and leisure and their associated support industries; (iv) an increase in the amount of employment available locally for both men and women in civil construction, commerce, service industries and regional crafts etc.; (v) a raising of the level of regional income because of increased economic activity and the greater supply of jobs; (vi) new residents to the area attracted by employment and earning opportunities as a result of the number of tourists, with the consequent increase in the demand for new housing and the services to attend to these new workers; (vii) an increase in the demand for new residential and leisure areas - recreation parks - and for a sanitation infrastructure with its attendant services, such as running water, sewage and garbage collection; (viii) an increase in taxation revenue from various sources; (ix) an increase in pressure on natural resources through the removal of vegetation, either from the remaining areas of original growth or from the lagoons, through hunting or through the pollution of rivers, lakes and beaches amongst other things.
- VI.25 Special attention needs to be given to these issues which, either directly or indirectly, will demand of local municipality administrators greater technical and financial skills than hitherto to control and lessen their impact. Bearing in mind what needs to be done, one of the priorities must therefore be an increase in the capacity of these municipalities to deal in a disciplined manner with the use and occupancy of land to avoid the uncontrolled possession of areas which are not suitable for urban development; and to broaden the base of sanitation services to include the regular supply of drinking water to attend to the seasonal inflow of tourists, the collection and treatment of sewage and the collection and treatment of solid waste.
- VI.26 It must be emphasized that it is not advisable to start a project which facilitates the influx of tourists to a region where the quality of the environment is already considerably compromised if it is not supplemented by environmental control programs and an increase in both the manpower and the ability of the local administration to deal with the issues which will arise. This means that weighing up and balancing the problems arising from the impact on the environment of the highways? operation will be an extremely complex matter given that, in this particular case, a public service will be operated as a concession by a private company set up for this specific end.

E. Environmental protection zone of Sapiatiba

- VI.27 Finally, it must be mentioned that one of the main effects on the environment will result from the fact that nearly 25% of the length of the RJ-106 bypass will run through the Sapiatiba APA which, over and above the remaining areas of natural vegetation which are found on the mountains, also has a wetlands ecosystem consisting of swamps, some rivers, brooks and streams.
- VI.28 The stretch which will be acquired for the bypass is, however, currently occupied by rural properties, where cattle raising is the main activity. Therefore, the building of the bypass will not directly affect the ecosystems which are under the protection of the APA, even though it will make this area, currently difficult to reach, much more accessible. This will make it more susceptible to hunting and the removal of flora. In addition, the highway may encourage settlement of the hillsides, today a rare event, and the draining and filling-in of swamps which are home to fauna characteristic of this habitat. This underlines the need to produce a management plan for the Sapiatiba APA and to equip FEEMA, the conservation agency, for the task of adequately policing and preserving the area. To this end the private sector

responsible for the construction and operation of the road system must be involved.

F. Conclusion

- VI.29 In conclusion, it is evident that in the operational phase, impact on the physical and human environment will not be very significant, the most notable issues being: (i) the tendency for erosion along the whole of the highway, but which should be controlled by the highway maintenance service; (ii) a change in water quality because of the greater volume of effluent flowing from the urban areas which will not be adequately handled by the sewage system; (iii) a change in pollution and noise levels because of the number of vehicles diverting to the bypass, so alleviating potential tourist areas along the lake but increasing noise and air pollution along the bypass, and (iv) a tendency for deforestation and the removal of vegetation with the resultant reduction in fauna principally in the lagoon areas and on steep slopes.
- VI.30 As for impact on the socioeconomic environment, the effects are more significant. The benefits will outweigh the disadvantages and result in an improvement in the quality of the environment, can be stated quite categorically. Guaranteeing this forecast, however, will depend on the actions aimed at correcting and mitigating the environmental impact as described in the project's Environmental Management Plan. In particular this calls for relocation of the affected population, support for reinforcing the administrative capacity of the municipalities affected and effective protection for the Sapiatiba APA.

## **VII. ENVIRONMENTAL FORECAST**

- VII.1 The Environmental Impact Study presents a forecast of what is likely to happen as a result of the construction and operation of this road system. The principal conclusions are as follows:

A. Traffic levels

- VII.2 Extending RJ-124 will increase the highway's capacity to handle traffic, and therefore significantly reduce the probability of traffic congestion at peak periods, particularly on long-weekends and holiday times. On the other hand, when the RJ-106 bypass comes into operation, the distance by road and consequently journey times between the Rio de Janeiro Greater Metropolitan area and the towns in the Lakes Region will be greatly reduced. Furthermore, the vehicles which make this journey will no longer have to use RJ-106 through the urban areas of Iguaba and along the edge of Lake Araruama, which will avoid the present significant disruption to local traffic and dangers to pedestrians crossing the road.
- VII.3 When fully operational, it is estimated traffic volume will rise approximately 3.2% to 3.6% as a result of population growth, urban expansion and the forecast of a significant upturn in the economic activity of the region. The improvements in access to the Lakes Region townships will be an additional factor contributing to the growth in traffic. However, strain on the system should be relatively slight given the increase in road capacity and the improved operating conditions of the highways. On the other hand, there will be a marked reduction in traffic on highway RJ-106, between the intersection with RJ-124 and the new bypass which will mainly handle local traffic.

B. Water pollution

- VII.4 It is expected that with the extension of RJ-124, the construction of the RJ-106 bypass and the planned conservation program, will lead to significant growth in the local economy and an increase in the number of tourists visiting the Lakes Region. Therefore, when the work is completed and the roads are fully operational, any variation in water quality will be as a result of the greater amount of solid waste and organic matter entering the waterways. It must be pointed out that the municipalities which will be affected by the project and in particular their urban areas, currently lack a system for the collection and treatment of sewage and that the disposal of solids is not satisfactorily handled, thus leaving many rivers

highly polluted with organic matter.

C. Air and noise pollution

- VII.5 When the highway enters its operational phase, there will be an increase in the amount of traffic and consequently in noise levels, vibration and air pollution caused by full capacity usage of the highways and by conservation activities. The tendency will be for this type of pollution to increase by virtue of the greater volume of traffic particularly during holiday periods and long-weekends. Even though noise and air pollution will tend to increase no circumstances have been identified which would demand measures to alleviate the situation; the Environmental Management Plan merely suggests monitoring and controlling the impact on the environment principally in and around urban centers.

D. Accident risks

- VII.6 During the construction phase the risk of accidents must increase by virtue of the volume of trucks and road-building machinery and equipment needed for the work and because of the probable traffic diversions and lane closures on highway RJ-124. When fully operational, the risk of accidents will be associated with the expected increase in the volume of traffic and with the carrying and operation of equipment and machinery used in conservation work. There will probably be an increase in the number and type of accidents along the whole of the highway system.
- VII.7 However, the improvements to be carried out on highway RJ-124 should reduce the risk of accidents and particularly their seriousness and consequences, since road-users will have access to both breakdown and medical help. On the other hand, there might be a reduction in the number of accidents on the stretch of highway RJ-106 between the intersection with RJ-124 and the bypass since the volume of traffic will be reduced.

E. Flora and fauna

- VII.8 During the construction phase, with the extension of highway RJ-124 and the building of the bypass, little damage to fauna is forecast since there are very few species in the area. Furthermore, those species of animals which exist locally have fully adapted to coexisting with humans. Therefore, the loss of fauna during this phase will be minimal.
- VII.9 To carry out the work vegetation will have to be removed. This vegetation consists mainly of pasture land, some crops and immature scrub and brushwood on cleared land. Therefore, there should be no negative impact on natural vegetation. After completion of the work, vegetation cover will be replaced on the construction sites and on those areas affected by the project works. Previously, stored organic soil will be used and trees and shrubs will be planted so that the affected areas blend into the surrounding countryside, which is predominantly of pasture for cattle and grasslands.
- VII.10 It is important to mention, however, that nearly 25% of the bypass runs through the Sapiatiba Protected Environment Area which in addition to a mountain range also contains a wetlands ecosystem area, which consists of swamp and some rivers, brooks and streams. A new highway running close to the mountains will facilitate access to them so increasing the possibility of plant removal or hunting. Moreover, the highway may encourage settlement on the hillsides, today an uncommon occurrence, and the draining of swamps which contain typical fauna. It should be pointed out that deforestation and illegal hunting already occur and are cited as the two main problems in this protected area.

F. Economic growth

VII.11 Both the construction and operational phases of this project will lead to an increase in local economic activity. New opportunities will occur for both goods and service industries because of the presence of potential new consumers, the construction workers. Furthermore, the work itself will generate demand for construction materials and lodging and food for workers. When the new road system is fully operational, it is expected there will be an improvement, either directly or indirectly, in the transport of goods. This will open up the possibility of local or regional produce being sent to the centers of greater consumption more quickly and in more favorable conditions of safety than at present.

VII.12 The increase in tourism resulting from improvements in the road system and in the sanitation infrastructure will contribute to the development of both the commercial and service sectors of the towns in the region.

G. Changes in disposable family income

VII.13 Changes in income will arise because of an increase in local and regional salary levels. During the construction phase new workers will be hired and in the operational phase there will be an increase in the regional economy as a result of improved access to the region. Both of these factors will lead to a relative increase in disposable income in the urban areas of those municipalities which will benefit from this project, principally during peak tourist times. Salespeople who live near the highway will see an increase in their income as a result of the greater organization of their activities as proposed by the Environmental Management Plan.

H. Changes in employment demand

VII.14 During the 21-month construction phase nearly 392 new direct jobs will be created and 103 subcontract jobs. University level, technical and unskilled labor will be needed. Since those at university and technical professional level are full-time employees of the construction companies, there will be 172 locally generated jobs for unskilled labor. During the operational phase projections are for the employment of 145 professionals, such as managers, radio operators, traffic controllers, tollbooth employees, road safety operatives, emergency help workers and general staff.

I. Taxation income

VII.15 During the construction phase any change in taxation income will be as a result of the increase in taxes resulting from the work which will be carried out, such as, service contracts, the purchase of materials, income tax as well as the taxes which are associated with the generation of new jobs. In this phase there will also be a reduction in taxes as a result of the loss of productive farm land. However, since the area of productive land to be acquired is small, and it may be possible to transfer production to other areas on the farms, the fall in taxes from this source will be very small.

VII.16 During the operational phase it is expected there will be an increase in the number of third party service areas such as gas stations, restaurants and hotels/motor inns which will, of course, be subject to various taxes. These areas should spring up because of improvements in the transportation of local produce, better local and regional access, a decrease in journey times and improved safety.

J. Strain on basic social services

VII.17 During the operational phase, when the major part of the contract for the Construction, Extension, Maintenance and Operation of the Water Supply and Sewage Collection and Disposal Plants will be carried out, although this work will guarantee water for nearly 85% of the population for the next 25 years and sewage treatment for 65% by the end of the period, local demand for these utilities will outstrip



supply.

- VII.18 It is forecasted that pressure on these essential services will increase because of the extension of highway RJ-124 and the construction of the RJ-106 bypass, with the resultant increase in the number of tourists particularly during holiday periods and long weekends. Indeed this already occurs and will only get worse.
- K. Increase in real estate values
- VII.19 As a result of this project, because of improvements in local and regional access, it is believed that real estate prices will increase. Real estate values will also increase because of improved access to the region via existing highways.
- L. Proliferation of vermin
- VII.20 When fully operational, more people will visit the region because of improved access. Due to this, there will be an increase in domestic sewage and solids, which will provide ideal conditions for the appearance and proliferation of vermin, which are associated with the presence of humans and the lack of an adequate sewage system for the disposal of solid waste.

### SECTION III

#### VIII. ENVIRONMENTAL MANAGEMENT PLAN

- A. Plan framework and objectives
- VIII.1 Considering the environmental studies conducted and the characteristics of Rodovia dos Lagos, the Bank requested that an Environmental Management Plan be prepared by an independent consultant to replace the Initial Plan set forth in the EIA/RIMA, taking into consideration the following most relevant impacts:
- a. displacement and resettlement of the population and economic activities along the highway;
  - b. the interference of the new highway in the legally established conservation zone - Sapiatiba APA;
  - c. the increase in the tourism flow to coastal municipalities attracted by improved accessibility conditions.
- VIII.2 Therefore, an Environmental Management Plan was elaborated for the implementation and operation of the new road system, contemplating the treatment of major environmental impacts assessed so to assist the region in reaching a social and economic development standard that takes into consideration the preservation and improvement of its environmental resources. The Environmental Management Plan consists of a set of measures aimed at preventing, mitigating, or off-setting negative environmental impacts, and maximizing positive environmental impacts, translated into Environmental Programs.
- VIII.3 All environmental programs listed in the Management Plan will be developed by Concessionária Rodovia dos Lagos S/A, and agreements or technical cooperation arrangements may be negotiated with state agencies, universities, and NGOs which performance may maximize efforts to achieve the conservation and regeneration of the environmental quality standards of the Lakes Region.
- VIII.4 The utmost objective of the Environmental Management Plan is the promotion of the sustainable

development of the region, which enjoys a great tourism and landscaping potential, while preserving the environmental qualities and characteristics relevant to its development as a tourism attraction. Other objectives of the Environmental Management Plan are the following:

- a. to guide actions pursuant to the management and control of environmental impacts related to the Rodovia dos Lagos project;
- b. to define an action plan with respective tasks, costs, and schedules;
- c. to consolidate recommendations made by the Environmental Impact Report, Inter-American Development Bank - IDB, and public discussions about the Rodovia dos Lagos project;
- d. to establish a management plan for the project that contemplates the numerous agents involved, and define responsibilities for actions to be implemented and the Concessionária's role throughout the construction and operation of the highway.

B. Environmental programs

VIII.5 As result of environmental impacts identified and other demands for management actions, six environmental programs have been elaborated:

1. Program 1 - Works-related environmental protection and control measures

VIII.6 The objective of this program is to allow the adequate environmental management of the works of the new highway system in order to control the direct impacts on physical and biotic environment, associated with the implementation of the highway; to maintain unchanged the local environmental quality to the larger extent possible; to adhere to the guidelines drawn up by the Environmental Impact Assessment; and to comply with legal decisions pertaining to environmental issues. The scope of this program is divided into subprograms related to the several types of potential impacts.

a. Erosion control subprogram

VIII.7 The objective of this subprogram is to prevent erosion on the sides of cuttings and embankments likely to jeopardize the highway or its neighboring areas. Actions expected include but are not limited to the implementation of surface drainage systems; implementation of surface protection systems; and rehabilitation of landfills and cuttings. Actions under consideration of this subprogram will be performed during the construction phase, lasting throughout the concession period and consisting of routine maintenance activities of the new highway system.

b. Particulate matter, gaseous discharges, and noise control subprogram

VIII.8 The objective of this subprogram is to minimize the air pollution produced by the operation of the equipment and machinery during the performance of the works, as well as to reduce the noises associated with them. Activities expected comprise: permanent adjustment and maintenance of equipment used in asphalt and concrete production, and vehicles and machinery; water sprays on piles of aggregates, on lanes, and on loads likely to release particles; use of coverings on loads to be transported; preventive maintenance of equipment and machinery; compatibility of working hours of machines and equipment in the vicinities of urban areas.

c. Modified areas rehabilitation subprogram

VIII.9 The objective of this subprogram is to establish procedures for the utilization of natural resources necessary for the works, as well as quarrying areas, excavation areas, and waste soil areas. It also provides for the setting of parameters for the recovery of degraded areas, development of projects for waste soil areas, envisaging drainage and reforestation devices for erosion controlling purposes.

d. Occupational health subprogram

VIII.10 The objective of this subprogram is to reduce risks and give relief from accident conditions, as well as to ensure occupational and individual health conditions to all employees during the performance of the works. It provides for awareness and clarification campaigns organized for workers and covering occupational health and safety issues. Details on such actions, and respective costs, can be found on Program 5 - Social Communication and Environmental Education.

e. Water quality monitoring subprogram

VIII.11 During the construction phase, water quality monitoring campaigns will be organized in relevant sites. The collection and sampling of water from main rivers in the directly affected area have been provided for, comprising parameters such as color, turbidity, suspended solids, total and dissolved solids, possibly fats and oils, and total and fecal coliform bacteria in areas close to workshops and construction sites.

f. Archaeological heritage recovery subprogram

VIII.12 This subprogram consists of the possible identification and resulting recovery of relevant cultural assets likely to be threatened by the construction of the highway. The performance of such activity will be commanded by IPHAN - National Historic, Artistic, and Natural Heritage Institute, the governmental agency responsible for the trust and maintenance of the national archaeological heritage.

g. Basic recommendations subprogram

VIII.13 This subprogram comprises the formulation and detailing of basic recommendations pursuant to the diverse procedures to be established during the works. Basic recommendations comprise the main actions pursuant to the performance of works: installation and operation of construction sites; dismantling of construction sites; clearing of service paths and access roads, among other things. These recommendations will be incorporated into the duties of companies responsible, directly or indirectly, for the works, and contents will be transferred to the labor force involved by means of specific training sessions, as set forth in Program 5 - Social Communication and Environmental Education.

2. Program 2 - Displacement and resettlement of the population

VIII.14 The objective of this subprogram is to perform the clearance of the area under control of the highway authority and implementation of the area for the new stretch, so as to guarantee the correct and adequate handling of the indemnity or compensation of the population affected by Rodovia dos Lagos project, regardless of the legal status of their ownership of properties affected. Specific objectives of this program are the following: (i) to promote the betterment of living conditions of the low income population that live irregularly on the existing area under control of the highway authority, by removing them from a risky situation and promoting adequate settlement; (ii) to encourage the development of economic activities by improving the working conditions of those affected by the highway by reordering of their activities; and (iii) give the adequate treatment to appraisals of real estate properties to be affected by this new stretch of the highway. All said actions will be supported by Program 5 - Social Communication and Environmental Education, which sets forth the activities pursuant to the orientation and clarification of the population directly affected by works.

a. Purchasing subprogram

- VIII.15 This subprogram comprises the purchase of lands and buildings, of urban features, and rural areas and improvements. Procedures to be developed comprised the following phases: photographic register of improvement works; social and economic register of owners; register of properties; assessment of title deeds; writing of reports with the appraisal of properties to be forwarded for DER-RJ approval; offer of amicable agreements; possible court proceedings for deposit of indemnity amounts. The performance of this subprogram will involve the participation of DER-RJ.

**Table 6:** Estimated costs for the purchase of these areas are:

Land and Urban Buildings		
I.	Tollbooth area (already built)	R\$ 531,500.00
II.	RJ-124 area	R\$ 220,000.00
III.	RJ-106 bypass area	R\$ 74,000.00
Rural Properties (RJ-106 bypass)		
IV.	Bare land	R\$ 468,000.00
V.	Improvement works	R\$ 312,000.00
TOTAL		R\$ 1,605,500.00

b. Dwelling vacancy subprogram

- VIII.16 This subprogram comprises all residential properties identified in the field that are located in areas deemed to be public, under control of the highway authority. These residences are located in the municipality of Rio Bonito. As this is a public administration issue, it is mandatory that any solution for this impact involve the municipal administration of Rio Bonito while the Concessionaire is involved in the support and subsidies to works to be developed by municipal agencies concerned.
- VIII.17 The City Hall has already conceived a displacement and resettlement project for the population settled in risky areas and it is expected it will meet the needs of residents in the area under the control of the highway authority. The Concessionaire and the City Hall have prepared a register for the characterization of the initial situation to be serviced by the subprogram. General results are the following: number of dwellings identified: 43; number of families registered: 23; number of people: 121. The difference between the number of dwellings identified and the number of registered families is due to the fact that some houses have been abandoned or are under construction, and also because some are not located in risky areas and will be relocated to the same parcel of land, though out of the boundaries of the area under control of the highway authority.

VIII.18 The treatment to be given to the solution of this situation comprises the following principles: to offer adequate dwelling conditions for all those who are displaced; to avoid payments in cash as compensation; to inform the population affected about the works to be performed; to invite the participation of agencies qualified to perform resettlement works, and to offer resettling alternatives by giving priority to sites close to the existing situation. For the solution of cases identified, the City Hall has reserved a publicly-owned area, located in a residential subdivision close to the existing residences of families to be displaced. Said subdivision has been partly inhabited, and infrastructure works offered include public illumination, water supply, health care centers, daycare facilities, and public schools. The City Hall program provides for the construction of four-house modules. Houses will be built by dwellers themselves or by residents in the region, upon support offered by SENAI - Serviço Nacional da Indústria (National Services for Industrial Training), which, by means of an agreement with the City Hall, will offer training sessions to prepare qualified professionals for the region. Dwellers to be resettled will be given preference to attend SENAI training sessions, and the payment of scholarships by the City Hall has been contemplated.

VIII.19 The estimated cost of each unit is R\$8,000.00. Concessionária Rodovia dos Lagos will contribute the logistic support for the performance of displacement and resettlement actions, plus R\$2,000.00 per dwelling unit in building materials, totaling R\$60,000.00, for an estimated assistance to up to 30 dwellings. With the purpose of preventing any deviation from the objectives of the resettlement program, the City Hall will charge a monthly rent of R\$20.00 from the resettled families on a non-transferable basis, granting the right to definitive title deeds to the property at the end of a period of time, estimated in ten (10) years, for a residual value of approximately R\$200.00. Such practice will prevent the development of real estate negotiations involving resettled families, thus assuring their continued stay on the area chosen.

c. Economic activities ordering subprogram

VIII.20 This subprogram comprises all commercial properties located in the area under current control of the highway authority. As in the preceding subprogram, all said properties are located in the stretch located in the municipality of Rio Bonito. Generally speaking, these stalls (? kiosks? ) are very closely located to the existing area, with precarious access, signalization, and parking conditions. This subprogram will also be performed together with Rio Bonito City Hall and its guidelines will be the following: the improvement of social and working conditions of all traders to be affected by highway improvement works; the promotion of a space reordering of these activities so as to guarantee better landscaping conditions, thus appraising local conditions; development of a standard architectural pattern to be adopted by all kiosks on the highway; to relocate to a minimum by trying to keep these activities the closest possible to their original sites; to give different treatment to operations in view of the agrarian status of each owner; and to legalize informal commercial operations.

VIII.21 The registration performed has identified no more than sixty-one (61) operations to be potentially relocated, while approximately fifteen (15) of them were abandoned or the identification of respective owners was not possible. It was also noticed that some owners have more than one operation, which likely facilitates displacement works. A total of thirty-six (36) owners have been identified, corresponding to the forty-six (46) businesses in operation identified.

VIII.22 The project for owners of commercial operations to be relocated and who are owners of land adjacent to the section occupied by the area under control of the highway authority, which has been conceived together with Rio Bonito City Hall, provides for an agreement on the supply of access facilities, signs, and fiscal incentives provided that the joint installation of other commercial ? kiosks? be allowed. This fact will minimize the relocation of those traders who do not have any properties located near the area under control of the highway authority, or those who are settled irregularly.

VIII.23 Preliminary cost estimates have taken into consideration a population of no more than sixty (60) units to be displaced, totaling 540 square meters of construction for new kiosks. Of the total estimated for the performance of works, the Concessionária will contribute with approximately R\$27,000.00, equivalent to 33% of the total, being the City Hall and possible sponsors responsible for the remaining amount.

### 3. Program 3 - Sapiatiba APA

VIII.24 The Sapiatiba APA protection program comprises the development of a Management Plan for Sapiatiba Environmental Protection Zone, including the definition of an environmental zoning for the conservation area, specific guidelines for land use and occupancy, as well as for the control, inspection, environmental education, and scientific research to be developed in the future by means of agreements. The program also comprises the identification of economic activities compatible with APA's environmental protection, such as activities oriented to eco-tourism, environmental education, etc., envisaging the adequate utilization of natural resources as well as the generation of financial resources destined for supporting APA inspection and maintenance activities.

VIII.25 For the elaboration of Sapiatiba APA Management Plan, Concessionária Rodovia dos Lagos will negotiate an agreement or technical cooperation term with FEEMA, the agency responsible for the inspection and maintenance of said protection area. Similarly, other agencies active in the area will be consulted, such as Universidade Federal Fluminense and NGOs, and the latter are likely to be retained for the elaboration of the Management Plan or specific assessments. The Reference Terms pursuant to this study, submitted in the unabridged version of the Environmental Management Plan (Annex 6), will be previously analyzed by FEEMA, in order to comply with its expectations and needs, because pursuant to the Management Plan submitted, said agency will be responsible for APA maintenance.

### 4. Program 4 - Economic, social and an environmental project for the municipalities

VIII.26 The objective of this project is to identify the economic potential of municipalities, especially of those covered by Sapiatiba APA, by focusing primarily on eco-tourism. This study is expected to define tourism projects or activities steered by the concept of environmental conservation and non-exploitation of natural resources. Projects or activities identified by this project will be submitted to tourism agents and operators active in the region, thus expanding the offer of tourism attractions. Similarly, tourism projects will be submitted to industry leaders for possible partnerships intended for the implementation and development of said projects; definition of special incentives exchanged for resources destined for the upkeep and maintenance of Sapiatiba APA, or other tourism attractions and equipment.

VIII.27 This project will be developed together with local and state authorities and trade associations active in the Lakes Region, and focus on the local and regional demand for tourism attractions and possible projects that could be developed, by identifying potential partners and developers.

### 5. Program 5 - Social communication and environmental education

VIII.28 The objectives of the program are: (i) to make permanent and temporary residents, and local and state authorities, aware of the importance of works and of the conservation of the environmental and landscaping heritage for the regional development; (ii) to prevent, among the population directly affected by Rodovia dos Lagos project, any insecurities feeling with regard to policies applicable to purchases of rural areas, displacement and resettlement of families living along the highway, and reordering of formal and informal economic activities; (iii) to guide workers about the importance of environmental conservation; (iv) to prepare local and state authorities to perform the effective environmental management of their respective territories and areas of responsibility, including the promotion of environmentally-sustainable economic activities, the collection of resources for environmental

development and protection, and land use regulation; (v) to make use of adequate signs and inspections to inform the population in general - workers, residents, and highway users - about the boundaries of Sapatiba APA, and the legal restrictions associated with the latter, as well as to disclose its potential for the development of activities closely related to tourism, research, and environmental education; and (vi) to inform road users about operating highway conditions, development of works, traffic changes, and improved safety for users and for the population living in the vicinities of the area under control of the highway authority.

VIII.29 The program will be developed by means of social communication and environmental education campaigns oriented to each target population and to the demand for information related to other activities of this environmental management plan. Social communication and environmental actions have been integrated into the subprograms described below.

a. Labor training subprogram

VIII.30 Basically, the training of workers involved in the Rodovia dos Lagos project will be given in two phases: the first will be intended for the personnel involved in expansion works and implementation of the new highway system; the second, for the highway maintenance and upkeep personnel. For the first group, the technical specifications to be incorporated into the contractual obligations of contractors and other subcontractors for the performance of the works will be presented. Such specifications will cover the compliance with those environmental protection measures set forth in Program 1, and specific training for the distinct functional levels of the teams responsible for the works will be provided, with the objective of informing the labor force about environment conservation and control, and mitigation measures suggested.

VIII.31 Regarding the second group, the focus will be similar, though with greater emphasis on environmental problems that may take place during the maintenance of the highway, such as erosion, contamination of water bodies, development of vector breeding conditions, destruction of vegetation, etc. Maintenance and conservation teams will be trained to perform as environmental inspectors as they are bordering the highway, and procedures for the reporting of environmental hazards to agencies and entities concerned shall be established.

b. Displacement and resettlement subprogram

VIII.32 This subprogram will develop a set of specific actions designed to support the performance of Program 2. Target populations will be owners of rural properties, the population living along the highway, and traders, whether formal or informal, who will be relocated. Clarification about the company's policy for indemnity and/or infrastructure relocation, displacement and resettlement in Rio Bonito, and reorganization of economic activities will be provided to each of these targets.

VIII.33 During the preconstruction stage, all clarification required for the performance of actions pursuant to displacement and purchase of areas will be furnished. During the construction stage, actions pursuant to resettlement and reorganization of economic activities will start in accordance with the schedule set forth in Program 2, being accompanied by actions pursuant to the assistance to families and traders in their move and adaptation to the new living and working site. Such work will be performed by means of meetings with the different groups of interest, personal counseling, and explanatory literature.

c. Highway-bordering activities subprogram

VIII.34 In addition to those actions intended specifically for those traders who will be relocated from the stretch of highway to be expanded, environmental awareness drives will be performed among other traders and

service providers located throughout the road system since they are likely to spread the word about the new approach that is intended for the region. Therefore, campaigns intended for this population will focus primarily on the importance of environmental conservation for regional development. Issues related to treatment and disposal of solid waste and liquid effluents will also be discussed in an effort to curb pollution of water courses and environmental degradation.

- VIII.35 Campaigns are also intended for the integration of these agents in other educational campaigns likely to be developed on a regional basis, such as campaigns related to Sapiatiba APA, the conservation of beaches and lagoons in the region, adequate disposal of domestic waste and sewerage, and environmental conservation in general.

d. Sapiatiba APA subprogram

- VIII.36 This subprogram involves the performance of educational and informational campaigns based on the Sapiatiba APA Management Plan, which is to be formulated. Road users and the student population will be the specific target audiences of this program. Issues to be addressed will be further detailed and listed on Sapiatiba APA Management Plan. The development of these actions will be accompanied by FEEMA and other agencies possibly involved in the Management Plan (Universidade Federal Fluminense and NGOs), in view of its continued performance after the period of responsibility of Concessionária Rodovia dos Lagos.

- VIII.37 Basically, communication media will be the literature distributed at the tollbooth plaza and control stations, in addition to signs along the highway. Information will also be broadcast by local media, with messages aired on radio stations and service messages on local TV stations.

e. Tourism and environment subprogram

- VIII.38 This subprogram comprises a series of educational campaigns oriented to distinct target audiences to be developed pursuant to a timetable to be detailed. Its main objective is to prepare authorities, road users, and the resident population for the increased tourism flow to be registered in the region by virtue of the new road system, with greater emphasis on the need to protect the environmental and landscaping heritage. Main target audiences are the local and state authorities; road users and tourists; the resident population of the directly affected area; community leaders, and the student population.

- VIII.39 Via Lagos will make contacts with local authorities and Trade Associations for the creation of an Association of City Mayors and subsequent opening of *Mercosol Agency*, i.e., a regional tourism authority. The objective of said Association will be encouraging tourism activities in the region, especially during a low season, also by seeking tourists from other Brazilian states, and assessing their profiles and needs. Advertisement campaigns will cover both the media and tourism agencies in other states.

f. Publicity and support subprogram

- VIII.40 All campaigns will be supported by a consulting team in addition to the Environmental Management Unit itself, which will perform the basic activities common to all campaigns, such as qualitative and quantitative opinion polls (already performed); contacts with the trade and media vehicles in the Lakes Region and in the capital city; opening of a stock shot library with photographs and films of the works; implementation of a customer service called *SERV Lagos Informações*; assessment of political, trade, and community leaders; production and release of press releases; preparation of several photo books for the Press and clients; press monitoring by means of press releases and direct contacts; organization and production of support and literature in general; and definition of strategic campaigns.



- VIII.41 Special attention will be paid to the environmental licensing of the new highway, which will reinforce the image of Concessionária Rodovia dos Lagos as the company responsible for environmental issues and will, among its activities, make efforts intended for the conservation and regeneration of the significant environmental and landscaping heritage of the region by assuming a pro-active attitude toward problems encountered.
- VIII.42 The social communication and environmental education subprograms will be developed in two distinct periods: the first period corresponding to the first five years of the concession period, comprising above-mentioned subprograms; the second period corresponding to the remaining twenty years of the concession period, when no less than field labor training, regional eco-tourism, publicity, and environmental education programs will be developed.

6. Program 6 - Management and monitoring

- VIII.43 The main objective of this program is to equip Rodovia dos Lagos Concessionaire with human and material resources for the environmental management of the highway system and to consolidate the company's institutional image vis-a-vis environmental issues. To do so, an Environmental Management Unit will be created within the Concessionária's framework to carry out the following duties: (i) implement the environmental management actions and programs recommended in the Environmental Management Plan, ensuring the material and human resources for its full development; (ii) coordinate environmental management actions by establishing the basic guidelines for their development; (iii) secure a close rapport of the distinct sections of the Concessionária with the authorities and population concerned; and (iv) consolidate the Concessionária's image with environmental protection-related issues.

C. Costs and physical and financial schedule

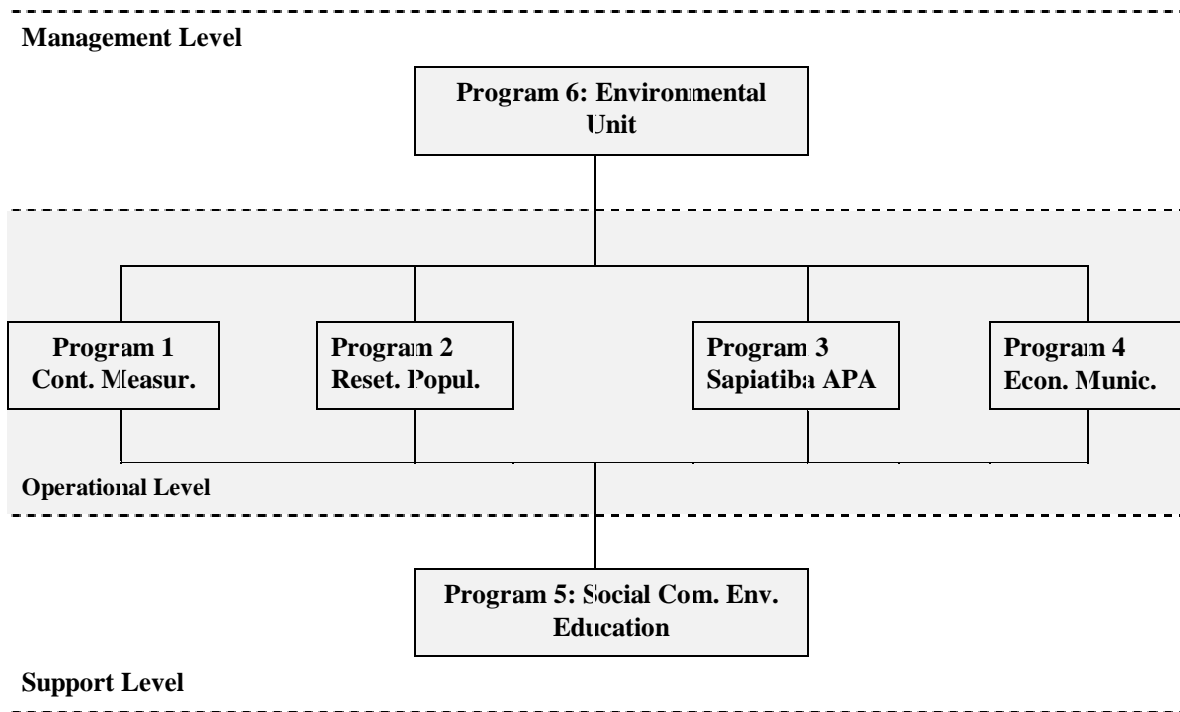
- VIII.44 A summary of costs involved in the implementation of the Environmental Management Plan is found below, as well as the physical and financial schedule of actions set forth in all Environmental Programs, pursuant to Annex 7.

**Table 7:** Summary of costs of the Environmental Management Plan (reais).

<b>Environm. Programs</b>	<b>Costs (1 to 5 years)</b>	<b>Costs (6 to 25 years)</b>	<b>Total</b>
1. Cont. Measur.	231,000	-	231,000
2. Reset. Popul.	87,000	-	87,000
3. Sapiatiba APA	120,000	-	120,000
4. Econ. Munic	90,400	-	90,400
5. Social Com. Env. Ed	990,840	1,355,904	2,346,744
6. Environmental Unit	250,000	100,000	350,000
<b>EMP / TOTAL COSTS</b>	<b>1,769,240</b>	<b>1,455,904</b>	<b>3,255,144</b>

VIII.45 It should be noticed this Environmental Management Plan will be reviewed in two different times - at the second year, and after the first period of implementation (year 5) - where actions deemed to be a priority will be evaluated vis-a-vis findings of studies carried out as well as actions implemented, and alternative or supplemental actions, if any, will be recommended. The figure below shows the Environmental Management Plan organization.

**Figure 1: Environmental Management Plan Organization**



## IX. PROJECT'S SOCIAL AND ENVIRONMENTAL VIABILITY

IX.1 The Rodovia dos Lagos project has been deemed to be environmentally viable by FEEMA, the licensing authority in the State of Rio de Janeiro, and granted the Provisional Environmental Permit on 09/16/97, with basis on the Environmental Impact Assessment submitted, on the additional information requested, and on the findings of the public hearing held. During FEEMA's technical analysis, the extensive disclosure of documentation pertaining to environmental and social impacts was assured throughout the area to be affected by Rodovia dos Lagos, thus ensuring the community concerned the access to the information.

IX.2 The technical assessment and the elaboration of an Environmental Management Plan, under the Bank's guidance, ensure the adequate solution to the major social and environmental impacts of the project in its implementation and operation phases. The EMP elaborated complies with recommendations and requests made by CESI when evaluating the project's Environmental and Social Impact Brief (ESIB), with emphasis on issues related to: (i) displacement and resettlement of the population living on the area under control of the highway authority; (ii) the future condition of street vendors who have taken said area, and (iii) indirect impacts on the environmental protection zone - Sapiatiba APA.

IX.3 Emphasis should be given to Concessionária Rodovia dos Lagos' institutional commitment to the performance of the Environmental Programs introduced by the Plan, especially actions intended for environmental education and social purposes, and the preparation of Sapiatiba APA Management Plan.

IX.4 Measures aimed at mitigating and offsetting environmental impacts have been developed in details and budgeted for accordingly, and respective financial resources have been included among the Concessionaire's expenses and to its budget, as seen on the Physical and Financial Schedule.

IX.5 Rodovia dos Lagos project is not only a response to the demand for better accessibility to one of the most important Brazilian tourism attractions, but also an aspiration of the whole community. The implementation of said project, added to the enforcement of measures defined by both, Environmental Management Plan and Environmental Impact Assessment, can be deemed to be environmentally feasible. In accordance with numerous studies carried out, the implementation of Rodovia dos Lagos will be a pioneer experience in the scope of the highway privatization program, likely to be applied to other projects, especially in view of its definition and Concessionaire's commitment to the implementation of relevant environmental programs.

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

X.1 In order to ensure the adequate implementation of mitigation measures provided for, the inclusion of following clauses to the Loan Agreement is recommended:

X.2 Prior to the execution of the agreement, Rodovia dos Lagos Concessionaire will submit to the Bank a copy of the Installation Permit for the works, issued by FEEMA, the environmental agency in Rio de Janeiro.

X.3 Prior to the first disbursement, the borrower will submit to the Bank evidence that (i) the Environmental Management Unit of the project, set forth in Program 6 of the Environmental Management Plan, has been created; and (ii) negotiations with FEEMA on the definition of an institutional cooperation platform intended for the regulation of Sapiatiba APA have started, as set forth in Program 3 of the Environmental Management Plan.

X.4 Six months after the execution of the Loan Agreement, submit to the Bank:

- a. Evidence that together with the Municipality of Rio Bonito, services listed in Program 2 have started, inclusive of a report on the current status of displacement and resettlement actions, confirming the enforcement of measures provided for in said Program;
- b. Evidence that together with FEEMA, services listed in Program 3, have started, inclusive of a report on studies for the regulation of Sapiatiba APA, as provided for in said Program; and,
- c. Ongoing Report with information on the implementation of all actions provided for in other Environmental Management Programs.

X.5 One year after the execution of the Loan Agreement, the following documents will be submitted to the Bank:

- a. Final Report on measures to mitigate impacts listed on Program 2 -Displacement and Resettlement, comprising dwelling vacancy, reordering of economic activities, and expropriation and purchases of areas;
- b. Report on the situation of Sapiatiba APA regulation, together with FEEMA, showing the eventual completion of services and implementation of actions set forth in Program 3 of the

Environmental Management Plan;

- c. Ongoing Report with information on the implementation of all actions provided for in other Environmental Development Plans.

X.6 Two years after the execution of the Loan Agreement, the following documentation will be submitted to the Bank:

- a. Final Report on control and mitigation related to the impacts listed on Program 1 - Works-related Measures;
- b. Final Report on Sapiatiba APA regulation, together with FEEMA, as provided for in Program 3, informing results and estimates for the approval of said regulation by public agencies concerned;
- c. Results of the overall evaluation of the Environmental Management Plan as provided for, inclusive of analysis of actions developed and a schedule of actions for the coming three (3) years; and,
- d. Evidence that actions provided for in Program 4 - Economic, Social, and Environmental Development, of the Environmental Development Plan, with regard to contacts with representatives of municipalities in the region and relevant local agencies for the performance of studies scheduled have been made.

10/6/97