Analysis of the Environmental Impact Study (EIA/RIMA)
for
the Araguaia-Tocantins Hidrovía Project

A Report by a
Blue-Ribbon Panel of Independent Experts

the Cebrac Foundation

Brasília
March 2000
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With Support of:

Rede Cerrado

Agência Ambiental de Goiás

Simpósio Brasileiro Ambientalista do Cerrado
The biodiversity of the Cerrados (savanna) Bioma and their importance for Brazil are very significant. The flora of the Cerrados is considered the richest of the world’s savannas. Its diversity of vertebrates is very great, with more than 400 bird species, 67 types of non-flying mammals, and 30 species of bats in the Federal District of Brasilia alone. The wealth of invertebrates is also incredible, with high indices of endemism (WWF, 1995). In three orders of insects, Lepidoptera, Hymenoptera, and Isoptera, the species present in the Cerrados represent 47% of all fauna estimated to be found in Brazil. There are at least 52 endemic species of reptiles and amphibians (MMA, 1999). The Cerrados have one-third of all of Brazil’s biodiversity, and 5% of the world’s fauna and flora (WWF, op. cit.). The First National Report for the Convention on Biological Diversity (MMA, 1998) mentions, furthermore, that the biodiversity of the Cerrados is at least as rich as that of the Amazon.

The Cerrados are the spinal cord of the Brazilian hydrographic system. Its headwaters supply our three great river basins, and its rivers serve in this way as corridors for the flow of genes, contributing to increase the genetic variability of species. Besides this, by representing the central bioma of Brazil and South America, and by being in contact with practically all the others, its role in ecological equilibrium and maintenance of biological diversity is fundamental.

All this biodiversity, besides being fundamental for ecological equilibrium, represents an enormous economic potential, in the form of active ingredients for medicines and other substances, raw materials, and “genetic banks...that merit greater importance than they are afforded when they are reduced to charcoal production and enormous plantations of monocultures” (Castro apud Consórcio Museu Emílio Goeldi, 1999: 34).

It should not be forgotten that all this biodiversity has a direct connection with – and, in many cases, a direct dependence on – the ways of life of traditional populations, such as Indians, riverbank dwellers, and quilombolas. Their ways of life frequently include productive systems that contribute toward maintaining this diversity, and are the result of precious knowledge accumulated over generations.
Introduction

The implantation of the Araguaia-Tocantins hidrovia is one of the projects of the Brazilian presidency’s Multiyear Plan 2000-2003, baptized “Advance Brazil”, which define the Federal Government’s priorities for this period.

This independent study, supported by a coalition of civil society organizations and one state environmental agency, with technical and executive coordination by the Brazilian Center for Reference and Cultural Support Foundation – CEBRAC – focuses on the second, and most recent version of the Environmental Impact Assessment presented by the Araguaia-Tocantins Waterway Administration (Ahitar). Our studies were based upon an authenticated copy of the EIA text provided by Ibama, the Brazilian Environmental Protection Agency.

The objective of our analysis is to evaluate whether or not this study meets the necessary criteria for an EIA under Brazilian law, and whether it demonstrates the social, economic, and environmental impacts and feasibility of the project, evaluates existing alternatives to the hidrovia project, and whether it proposes satisfactory measures to avoid and mitigate its impacts.

Our evaluation is not merely based on an environmental point-of-view, but rather on an overall analysis of the project. It examines questions relating to the use of public resources, social infrastructure, quality of life of the population, generation of jobs and income, and principally on the designing of strategies which could create sustainable human development in the region, benefitting the majority of its population.

The hidrovia EIA has been the object of legal controversies. The Federal Attorney-General’s office opened an investigation based upon charges by four of the seven anthropologists who conducted studies for the EIA that their reports were substantially altered in the final version of the study, so as not to express conclusions demonstrating the infeasibility of the hidrovia project. Further controversy involved the government’s restriction of required public hearings to a few remote towns where there is perceived support for the hidrovia, ignoring the considerable public interest throughout the region for an open debate on the project.

We hope this document will be able to provide information upon which Brazilian society and concerned citizens around the world, may be able to base informed opinions regarding the Araguaia-Tocantins hidrovia project.
EXECUTIVE SUMMARY

In 1995, Ahitar – the Araguaia-Tocantins Hidrovia Administration – delivered the first version of the Environmental Impact Study (EIA), accompanied by the Environmental Impact Report (RIMA) to Brazilian environmental authorities, soliciting a Construction License for the Araguaia-Tocantins industrial waterway project, or “hidrovia”. The EIA/RIMA was prepared by the Foundation for the Support and Development of Research (FADESP) of the Federal University of Pará state (UFPA).

During hearings in the Environment Commission of the Federal Chamber of Deputies, in November, 1996, the EIA and RIMA were severely criticized for their extensive and unacceptable gaps and gross errors, and for their use of scientifically and technically questionable methodologies. Based upon these shortcomings, and negative opinions from the Indian Protection Foundation, Funai, and the Environment Agencies of Goiás and Mato Grosso states, the Brazilian Environmental Protection Agency, Ibama, found the document to not be in compliance with Brazilian law, and the studies were rejected. The second version of these studies, also prepared by FADESP/UFPA, were delivered to Ibama in May, 1999.

This independent study, with technical and executive coordination by CEBRAC, analyzes the most recent version of the text presented by Ahitar as an Environmental Impact Study. Partners in the preparation of this independent report are the Instituto Sócio-Ambiental (ISA), the Worldwide Fund for Nature (WWF Brazil), International Rivers Network (IRN), the Brazilian Environmental Symposium of the Cerrado, the Rios Vivos Coalition, and the Cerrado NGO Network (Rede Cerrado). These studies also received support from the Environmental and Natural Resources Agency of Goiás state.

In order to carry out these studies, highly qualified specialists were contracted to analyze specific parts of the EIA and RIMA. The texts they produced comprise this volume. The professionals who took part in this study are:
- A. Tadeu C. Veiga, geologist, Geology and Geomorphology;
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- Marcos Martins Borges, geographer, Tourism;
- Maurício Galinkin, engineer and journalist, general coordinator of the study, Analysis of Economic Feasibility, and
- Susana Lara Resende Leuweenberg, biologist, Avifauna;

The objective of this study is to produce a detailed analysis of the EIA, verifying whether the impacts the hidrovia could cause are satisfactorily presented, and whether the study meets the legal requirements for a document of this type. In this way, we hope to provide information by which Brazilian society may correctly form its opinions regarding the hidrovia project.
The Araguaia-Tocantins Hidrovia Project

The Araguaia-Tocantins hidrovia project has as its objective the creation of an industrial waterway for transporting cargo, in order to lower the cost of exporting grains from central Brazil to external markets. In the process, the hidrovia seeks to stimulate the expansion of the agricultural frontier in the Cerrado region and the supply of grains, particularly soybeans. It does not seek to meet the already existing demand for cargo transport in the region.

Ahitar’s studies state that engineering works will be necessary along more than 1,782 km. (1,115 miles) of the Araguaia and das Mortes river systems. However, there are gross discrepancies between figures provided for the cost of this project and the volume of dredging and rock removal which would take place to implement it. Its costs, in the initial phase, are estimated to be R$127.3 million (about USD$68 million - EIA, Vol. 1, p. 116), or as little as R$74.6 million (USD$41 million – p. 51 of Vol. 1). Prior estimates from other official sources, covering all phases of the project, reached about R$800 million (USD$570 million), including navigation locks at Tucuruí dam but excluding ports, roads and railroads.

According to information in the EIA, the das Mortes River would have traffic of barge convoys between Nova Xavantina, Mato Grosso, and its confluence with the Araguaia River, just above São Felix do Araguaia, Mato Grosso (552 km). In order to guarantee a minimum draft of 1.5 meters year-round, 56,502 cubic meters would be dredged and 5,909 cubic meters of rock outcroppings would be exploded, according to data in Vol. 1, p. 116. However, in Vol. 2, chapter 1.8, these engineering works are listed as still lacking details as to the volumes of sand and rock that would be removed.

The Araguaia River would be the object of engineering works to guarantee a draft of 1.5 meters year-round between Aruanã, Goiás, and Xamboiá, Tocantins, an extension of 1,230 km (770 miles). Dredging would be carried out at 24 sites (1,043,670 m3) and rock removal at 26 sites (415,215 m3), according to information on Vol. 1, p. 116, or dredging of 4,613,270 m3 and rock removal of 699,000 m3, according to Vol 2, chapter 1.8.

The stretch of the hidrovia on the Tocantins River would begin at Miracema do Tocantins, Tocantins state, continuing for 420 km. (270 miles) to Estreito, Maranhão. While Vol. 1, p. 116 states that there will be no engineering works, Vol. 2 states there will be 600,000 cubic meters of dredging, and rock removal at Corredeira Pedras and Ilha dos Campos, without defining the volume involved.

Besides these engineering works, buoys and navigation aids will be implanted along the three rivers. New ports are being planned at ten cities along the river, but they are excluded from consideration in the EIA, and their costs are not factored in. The terminal port will be at Xamboiá, where a connecting road will permit transferring cargos to Imperatriz, from where the Carajás railroad will be used to transport cargo to the maritime port of Itaqui, near São Luis, Maranhão state.

The extension of the hidrovia to Belém, Pará state, by constructing navigation locks at Tucuruí dam, and extensive dredging and rock removal, particularly at the Santa Isabel rapids, are left to be carried out at an undefined point in the future.
Serious Direct and Indirect Impacts

The chain of impacts provoked by the engineering works needed to implant this project, as well as by the economic activities the project proposes to stimulate, will produce broad changes in the river systems in question, with effects that could extend into the Amazon. The ways of life and the well-being of indigenous and riverbank dweller populations will be seriously affected, as the bases of their diet will suffer significant changes. The entire populational dynamic of the Cerrado regions of Goiás, Tocantins, and Mato Grosso states will be affected, as a result of changes in the social relationships of production, increasing pressure on the social infrastructure of urban centers in the region via migration provoked by the hidrovia and related agricultural projects.

The impacts of agriculture based upon extensive grain monocultures are already well-enough known in other regions that this proposal should, at least, be discussed with greater caution. In the first place, uncontrolled deforestation has the direct consequence of loss of precious parcels of biodiversity, besides opening the path for erosion and impacts on water resources. Add to this improper techniques of soil management which cause substantial losses in fertility, aggravated by uncontrolled irrigation which can cause salinization of soils. Data cited in Brazil’s proposal for Agenda 21 estimate that for each ton of grains produced in the country, 10 tons of fertile soil is lost. Another source mentions the leaching of 25 tons of soil for each hectare cultivated.

Uncontrolled irrigation contributes to the contamination of water resources, whose quality is adversely affected by the quantity of sediments swept away as a function of exposed soils and the absence of barriers to the free flow of water, since for most of the year the earth has no vegetation cover. These sediments, besides causing the siltation of watercourses, frequently contain large quantities of fertilizers and agrotoxics which seriously affect aquatic food chains and the health of wildlife. Since fish serve as a food source for human beings and other animals, the entire food web of a region is affected.

The increase in sediments raises the turbidity of the water, modifying habitats and making them unfeasible for certain species, while favoring others. Serious ecological unbalance, with chain reactions in many ecosystems, can result from these unpredictable alterations. The greater presence of chemical elements found in agriculture fertilizers, such as phosphorous, sulphur, potassium, and nitrogen, initiate processes of eutrophication of water bodies. Species of algas proliferate, consuming a large part of the oxygen available in the environment, which can cause fish kills.

Less availability of water as a result of its over-consumption by agriculture, and its impacts on aquifer cycling directly affect human populations. During the last dry season, the Attorney General’s Office of Goiás state required the shutting down of irrigation spigots in order to guarantee urban water supplies.

From the social point of view, the impacts of grain monocultures are just as serious. The so-called “modernization” of agriculture has generated unemployment in rural areas, since it is technologically intensive and therefore feasible only on large estates. The result is that small family farmers are generally obliged to sell their farms to the large landholders. This increases the concentration of landholdings, and begins a process of an exodus from the countryside, a principal characteristic of the history of Brazil in the second half of the twentieth century.
A study by WWF Brazil shows that the ratio of workers per area of land decreased from 7 per 100 hectares (250 acres) of land in 1970 to 4 per 100 hectares in 1985 in the Cerrado region. The relationship between work force and area effectively planted declined from 44.7 workers per 100 hectares to 24.5 in the same period. If we consider only those modern agriculture areas already consolidated, leaving aside new areas being opened, these numbers decrease from 21.3 to 14.5 workers per 100 hectares planted. Our studies show that the type of production which the hidrovia plans to stimulate, in its initial phase, would consume one million hectares, while employing only 4,000 permanent workers, or one worker per 250 hectares, plus 6,630 seasonal workers (8 months per year). In total, including temporary and permanent work posts, there would be one worker employed for each 94 hectares (235 acres) planted.

The effects of this dynamic on urban centers are well-known. Incapable of absorbing all the available labor force, urban infrastructures will be further over-taxed, with deficits in health, education, and sanitation services, among others. The slums of these cities will grow in population, with an increase in misery and unhealthiness.

On the other hand, the works necessary for the implantation of the Hidrovia project will have equally damaging effects. The most serious impacts will result from the removal of rock outcroppings—which represent obstacles to navigation—from the rivers, and dredging extensive stretches of the riverbeds to maintain a deeper navigable channel.

Of greatest concern are the interventions proposed for the Araguaia River, given its complex and unstable environmental dynamic. Removing rock outcrops north of the Bananal Island and at Conceição do Araguaia, Pará state, will completely alter the hydrologic dynamic and the geomorphology of the river. These rocky ledges function as natural dykes, regulating the flow of water and sediments. Dynamiting the outcrop downstream from the Bananal Island, for example, would drain upstream areas, while those downstream would suffer flooding and siltation caused by the increase in the flow of water and sediments. Some riverbank towns could suffer serious losses, with part of their territory submerged.

The changes caused by the hidrovia will be serious for aquatic fauna. Fish, for their reproduction and growth, depend on lagoons along the river which are formed during each cycle of flooding and low water. The disappearance or change in the dynamic of these environments could seriously endanger the ecological processes of aquatic populations.

Aquatic fauna depend on food which is carried to the river bed from the rivers’ floodplains, during each of these high and low water cycles. The alterations induced by the removal of natural dykes could therefore seriously reduce the availability of nutrients since the trend will be to reduce the floodplain area. Added to this is the effect of dredging the riverbed, which certainly will increase the turbidity of the water, besides taking out organic material that is deposited on the river bottom, where normally it is sought by various animal species.

In the region of influence of the hidrovia are 30 indigenous areas, with 11 distinct ethnic groups who directly depend on fish for their survival. In this way, the hidrovia could be placing the survival of entire indigenous ethnic groups at risk. Besides, there are also the riverbank dwellers, equally linked to the aquatic fauna for their subsistence. The
hidrovia’s effects on fish populations could also indirectly affect birds and mammals who feed on fish.

The interventions could also place other already existing economic projects at risk. For example, the great increase in sediment flows could adversely affect the functioning of the Tucurui hydroelectric dam, on the lower Tocantins.

Besides this, alterations in the river’s scenery could put tourism based on fishing and aquatic leisure, extremely significant in terms of income generation and employment in the region, at risk. Holidays on the Araguaia River also have an enormous cultural importance, especially in Goiás state.

The operation of the hidrovia will also have impacts. The increase in the human presence and in traffic on the river will certainly cause changes in the habits of fauna. Besides, when ports and shipyards begin operations, water pollution will increase, as a result of inadequate disposal of and accidents involving chemical products. It is also well-known that waterways suffer from chronic spills of oil and fuels from boats and ports. This can also harm aquatic populations.

**The Araguaia-Tocantins Basin**

Within the context of the Cerrados and Brazil as a whole, the Araguaia-Tocantins basin stands out for its singularity, and for its ecological and environmental complexity.

The Araguaia and Tocantins comprise a mosaic of ecosystems interconnected by the drainage system of the rivers. In their area of influence are found Cerrados, wooded Cerrados, semi-deciduous forests, gallery forests, bottomland, meadows, and grasslands – all the biogeographical systems of the Cerrados, truly the areas of transition between the great biomes of Brazil, the interface with the Amazon; the arid lands of the Northeast; and the Pantanal wetlands of Mato Grosso.

The Araguaia River has a very high level of endemism of fish species, with approximately 30 species catalogued which are only found in this ecosystem. The drainage of the Araguaia and das Mortes Rivers may also be an important international corridor for bird migrations which has been studied very little. In its area of influence, the basin also is home to important indigenous areas and conservation units, such as the Araguaia National Park on the Bananal Island, a Ramsar Site for protected wetlands, and the Emas National Park, which protects the headwaters region of the Araguaia.

This demonstrates the importance of this area in regional, national, and even global terms, and underscores the need for the Araguaia and Tocantins river basins to be seriously evaluated on a solid scientific basis. The value of its biodiversity, and its fundamental role in the dynamic of Brazilian ecosystems demands greater depth of scientific analysis and greater precaution than indicated in the Environmental Impact Study for the Araguaia-Tocantins hidrovia. This is even more so in the light of international commitments which Brazil has made, such as the United Nations Biodiversity Convention and Agenda 21. It is the great environmental complexity of the region which determines its high vulnerability to impacts. Any interference could produce a chain of effects with serious consequences for the entire basin and bioma.
Figura 2 - Geossuturas ativas e principais zonas de sedimentação continental quaternária
An Active Geological Formation

The complexity of the region originates in its unusual geological and geomorphological constitution. Different from other great Brazilian river basins, the Araguaia-Tocantins system does not flow over sedimentary terrain. This basin lies in an area situated between two very old portions of the Brazilian continental crust, made up of very old layers. It is a still-active geological area in the process of settling, which defines its environmental dynamic (Veiga, Chap. 1, figure 2).

In order to understand the magnitude of the potential impacts of the hidrovia, most of which are either not analyzed or are treated in a superficial way in the EIA, it is first necessary to understand the similarities and differences between the Araguaia and Tocantins rivers. The Tocantins is a plateau river, vigorously erosive but stable, with pronounced embankments and generally clean waters, indicative of the small load of transported sediments.

The Araguaia, in its lower course, also acts as a plateau river, predominantly erosive. However, in its middle and upper courses, it is a floodplain river, capturing, depositing, and reshaping a great load of unconsolidated sediments, on lands which are undergoing geological lowering. Together with its tributary, the das Mortes River, the Araguaia drains an active sedimentary basin, a huge area of deposition of sediments in the process of formation, which corresponds to the floodplain of the Bananal Island.

It is well-known that floodplain rivers are unstable and do not permit the carrying out of engineering works (dams or canals, for example) in any part of the world.

The Araguaia has a windy bed and permanently muddy waters – indicative of its great load of transported sediments. The river removes sediments deposited upstream and transports them for redeposition in flooded areas, on a continuous and large-scale process. Its floodplains are on lands “geologically lowered, delimited by huge transversal discontinuities, which correspond to geological faults filled by rocky dykes” (Veiga, chapter 1). These dykes function as natural barriers, damming sediments which, in turn, function as regulators of water levels downstream.

There are two types of floodplains on the Araguaia – one from the pleistocene age (more than 10,000 years old), which today is being reshaped, and which is controlled by dykes north of the Bananal Island; and another from the holocene age (less than 10,000 years old), which is being developed immediately downstream from the Bananal Island, terminating at the dykes in front of Conceição do Araguaia (Veiga, Chap. 1, figure 4). The young sediments are rapidly reduced from this point on, forming a plateau.
Geological-structural outline of the Araguaia Basin
(superimposed on Geological Map of Brazil by Schobbenhaus et al., 1981)
A Sensitive and Complex Environmental Dynamic

In function of these geological and geomorphological characteristics, there is a complex environmental dynamic which is responsible for the enormous biological diversity and the diverse natural processes of the basin.

The floodplains and their sediments in a constant process of erosion, deposition and reshaping create a diversity of natural environments over space and time – areas which are periodically or permanently flooded while others remain dry; areas with different mineral substrata forming varied soils; dynamic complexes of deposition and removal of sediments and retention, storage, and transport of water. The floodplains exhibit biological forms and ecological processes which are adapted to the specific conditions of each environment.

This environmental complexity is extremely susceptible to any kind of interference. An alteration of one of its components could produce profound changes for an entire region. For this reason, based upon the actions proposed for implantation of the hidrovia project, the Araguaia River is the area of greatest concern.

Given the differences in the hydrological and geomorphological dynamic between plateau and floodplain rivers, the impacts of the interventions on the Tocantins River would tend to be more localized and would affect a more limited area. However, the grave nature of the potential impacts on the Araguaia Basin certainly argue for a re-evaluation of the entire hidrovia project.

Serious Alterations in the River Dynamic

The interventions proposed for the hidrovia involve removal of natural rocky dykes, which are seen as obstacles to navigation. However, it is not considered that the waters which will be liberated by the widening and deepening of the river bed will tend to transport greater loads of solids over greater distances, which can have environmental consequences and could affect the hidrovia project itself.

This intervention in itself could mean a broad reorganization of the entire river system, with environmental and social consequences of great concern.

Among the most serious potential effects of these interventions are:

- destabilization of sediments and drainage of flooded areas upstream;
- sedimentation and flooding downstream;
- a broad reorganization of the river system, with destruction of habitats and the resulting loss of biodiversity and natural resources, affecting riverine populations and other agricultural projects and infrastructure projects.

The removal of rocky ledges north of the Bananal Island, whose effects could be aggravated by the simultaneous dredging of the river bed, could cause the drainage of the entire pleistocene basin upstream, causing flooding and sedimentation of
downstream areas. Removal of rocky ledges and barriers represents a break in the base level of the river, which will affect the dynamic equilibrium of its system.

Without the dykes to regulate the flow of water and of sediments, the pleistocene alluvia will become destabilized and will be carried by the increased water flow in the direction of the holocene basin downstream. This part of the river, in turn, will tend to become flooded and silted up by the greater volume of water and sediment load.

In this way, “the project of regularizing the navigable channels will not only affect the course of the principal rivers and their banks, as indicated by the EIA, but the entire river system they are a part of, including the eroding banks, the floodplains, and the lower course of their tributaries” (Veiga)

**Volume of Dredging Underestimated**

As explained, the sedimentary layers (from the Quaternary period, which includes the Pleistocene and the Holocene) are very important considering their dominance in the geological make-up of the area. Still, they are looked at only superficially in the EIA, where more attention is focused on the ancient soils of the region.

Furthermore, the interventions proposed for the river systems are not quantified in the studies. There are merely technical parameters or indications of volumes for some of the works. “It really is not an analysis of a project, but rather of an outline or idea of an hidrovia, discussed in a preliminary way (Veiga, Chap. 1).

In the Environmental Impact Report (a summary of the EIA), only the total volumes for the works are presented, with discrepancies when compared with those of the EIA, and without any indication regarding the parameters and criteria upon which the calculations are based.

The volumes predicted for dredging are small and are apparently incompatible with the actions proposed, even when considered that there are extensive stretches of the rivers where the natural channel already meets the technical specifications of the project. Besides, the studies do not consider the possible aggravation of natural conditions, in relation to transport and deposit of sediments caused by the breaking of baseline conditions through rock removal.

In synthesis, the EIA foresees an initial total of 5.2 million cubic meters of dredging (4.6 million cubic meters on the Araguaia and das Mortes, and 600,000 cubic meters on the Tocantins). The lack of data for some stretches indicates that this volume is merely the minimum amount to be dredged for the implantation of the hidrovia. Despite this fact, the RIMA and the EIA (Vol. 1) present much lower estimates, equivalent to 1.1 million cubic meters to be dredged on the Araguaia and das Mortes, with no dredging to take place on the Tocantins.

With a lack of detailed information on the project, we performed calculations based upon a dredging section 50 meters wide and one meter deep. In less than 100 km, 5 million cubic meters would be dredged. If the depth of dredging were greater, this
amount would be even greater. However, engineering works are foreseen along 1,200 km (750 miles) of the Araguaia, not to mention the das Mortes and the Tocantins.

By comparison, a tin mine at Pitinga, Amazonas, processed an annual volume of 10 million cubic meters of ore, corresponding to the small and medium-sized alluvial deposits in a limited area, while the alluvial deposits of the Tocantins and Araguaia are enormous.

Maintenance dredging of the channels will require, during each annual cycle, the removal of volumes at least as great as those of the initial dredging, if not greater. The extreme dynamic and transport capacity of these rivers, recognized in the EIA, raise fears concerning the project’s technical feasibility and, if the costs of maintenance dredging are taken into account, the economic feasibility of the undertaking.

Finally, there is also a significant discrepancy between the EIA and RIMA as to how much of a volume of rocks will be removed. The EIA cites the volume as 699,000 cubic meters, while the RIMA considers a total of only 421,124 cubic meters to remove on the three rivers.

“Learning by Doing” is Irresponsible

The Environmental Impact Study admits that the engineering know-how regarding operations of this type is still limited, and mentions the need to “learn by doing”, particularly regarding the dredging of the river bed to maintain the navigation channel. This is, at the very least, irresponsible. To act on a methodology of trial and error in an area of such vulnerability cannot be a procedure to be adopted by authorities who take the responsibility of their decision-making power seriously.

Independent of the volume of resources allocated, the project could turn into a great adventure, with doubtful results, and with unforeseen financial and environmental costs.

Fish Species at Great Risk

The impacts of these alterations on the dynamic of the river system, and on the fish species in the basin may be extremely serious. This is an extremely biodiverse area, with a high degree of endemic species, of enormous natural value.

Rock removal and dredging will affect the environment which provides adequate conditions for the reproduction of these populations and for their nutrition, among other biological and ecological processes.

“The seasonal variation in the level of water in the flooded zones and in the lakes along the rivers modifies the physical, chemical, and biological characteristics of these environments, creating conditions favorable to the survival and the growth of fish larva whose eggs are deposited on the riverbed” (Peret, Chapter 2, p.2)
In the high water season, these eggs are carried to the lakes, generally abandoned meanders, along the margins of the river. The larva remain there when the low water period isolates these lakes from the principal bed of the river – with security and with their nutrition guaranteed by the limnological conditions which favor the development of phytoplankton and zooplankton – until the following year, when they are already able to survival on the riverbed.

Those lakes which are permanently connected with the main stem of the river also serve a relevant ecological function, serving principally as a refuge for young individuals against predators.

Lowering the baseline level of the river and destabilizing its sediments through rock removal and dredging will certainly influence these processes, altering the entire dynamic of nutrients in the rivers and lakes.

Lowering the riverbed and increasing stream flow will mean that many of these lakes may be drained, especially in the southern area of the Bananal Island, thus eliminating the conditions for reproduction and refuge for fish populations. Greater sediment flows downstream will also affect the physical-chemical conditions on the holocenic plain, with equal impacts. The possibility of altering the levels of flood and low water pulses is also of concern. Explosions for rock removal can contribute to draining lakes by fracturing rocks which sustain them, causing them to drain via underground aquifers.

The flooded areas serve a fundamental role in providing nutrition for fish in the principal riverbed. Low light penetration and water velocity, among other physical characteristics make the river dependent on organic material from outside its bed to maintain its biomass. This material is carried from the floodplain to the riverbed at the end of each flood season.

The natural dykes represented by the rocky ledges are barriers which regulate stream flow and maintain this organic material on the bottom, available for fish populations. Its removal will also have serious effects on the nutritional dynamic. In the same way, dredging the riverbed, besides increasing the turbidity of the water, will remove this source of nutrients.

The passage, maintenance, and construction of grain barges will certainly mean an increase in pollutants – oils, grease, fuels, and metals. These substances cause deformations in the gills of the fish, affecting their respiratory functions. The result is an impact on their growth and, consequently, on their reproduction since their fertility is directly linked to their size. In none of its studies did Ahitar mention a system for quantitative control of these activities, nor a system of treating the waste the barges will produce.

**Underestimated Impacts**

The EIA does not predict these impacts and it underestimates the vulnerability of the system and the dimension of the effects of the interventions. The project’s direct area of influence will certainly not be limited to the river bed of the Araguaia and its banks, but rather will extend throughout the floodplain and surrounding ecosystems of the
Araguaia and its tributaries. In this sense, it is important to note the limited extent of knowledge that exists about the natural processes of the Araguaia River. Research to-date has been narrowly focused and limited – further reason for caution in interventions affecting the river dynamic.

Area of Direct Impact of the Project based upon extension of floodplain, not considering broader socio-economic and environmental impacts (superimposed on map from EIA)

Environmental alterations which for whatever reason will take place will establish a new point of stable equilibrium in the populations of species, but will modify the curve of survival. If one plans to interfere in an environment which could affect the equilibrium number of a population, this intervention should be gradual, especially if there is insufficient information about the species’ reproductive dynamic and its survival mechanisms. Once this point of equilibrium is passed, even if the agent which causes this modification of the curve of survival is removed, the population will tend toward extinction.
Environmental management of fish species must take these characteristics into account. Any interference must be gradual, so that new equilibrium points may be established, avoiding large population variations which may lead to population instability. Regarding all these serious possibilities, the EIA is merely descriptive regarding the physical environment and fauna, lacking deeper analysis. It provides little insight into the environmental dynamic of this extremely rich region, and treats the project’s impacts in a superficial way. Mitigatory measures, when mentioned, are only generic in character.
Even the characterization of fish species and populations in the EIA is inadequate. The methodology used is based upon collection in only one period of the year, at only five locations, all rocky ledges, and only using one type of capture mechanism. This does not contemplate the high seasonality of the characteristics of ictiofauna in this area which has already been demonstrated in other studies (Costi et al., 1977). The changes in the composition and proportion of populations vary significantly between the rainy and dry season and during the reproductive periods.

![Figure 3 Seasonal variation in quantity of fish by species](image)

The EIA states there are no significant differences between fish species in different parts of the basin. This information contradicts even the limited data from the fish collections, which show high indices of dissimilarity of fish in different areas of capture. The basin must be conceived as differentiated, and a management plan must be prepared which takes these differences into account.

Aquatic life is a fundamental axis of the food chain, and of other ecological processes in the region. Whatever changes which take place will affect all biodiversity and natural processes in the Tocantins-Araguaia basin.
Threats to Turtle Breeding Areas

The EIA is superficial regarding possible impacts of the project on turtle populations. These constitute an important food source for both indigenous and non-indigenous populations, as well as influencing ecological processes along the Araguaia. More than 20 years of studies by the National Center on Amazon Turtles (Cenaqua), of IBAMA, demonstrate a clear connection between the presence and transit of humans on river beaches and the diminuation in their use by turtles for egg laying (Cantarelli & Iriraqua, Appendix 1).

These animals demand very specific environmental conditions for their reproduction, growth, and maintenance. The removal of gallery forests, among other actions which could occur with the implantation of the hidrovia, could directly affect the biological and ecological processes of these populations, since the diversity of species is based on limnological conditions and those of sediment transport and deposit.

Cenaqua’s studies also show that fuel washed up on beaches causes turtles to immediately abandon these egg laying areas. As intensive navigation produces, on industrial hidroviagas, chronic contamination of rivers by oil and fuel spills which are difficult to monitor and to clean up, we could witness the disappearance of turtles along the entire course of the das Mortes, Araguaia and Tocantins rivers.

Sedimentation will definitely increase, with removal of river bank forest cover, as well as with inadequate soil management in areas transformed into large-scale agriculture. Shallow rivers have higher water temperatures and greater evaporation, significantly modifying the environments used by turtles, who remain in deeper pockets of water before their egg laying period.

This behavior can also be affected by dredging the river bed. The turbulence of motors and the possibility of turtles being run over by vessels can also destructure their populations.

If the spoils from dredging and rock removal are deposited on beaches, the alteration of these environments can also have serious impacts on the reproduction of turtle species. The turtles recognize the beaches where they were born, and always return there to lay their eggs.

Finally, deepening the navigable channel can also cause concentrations of fish in these places, making turtles more susceptible to fishermen’s hooks, nets, and gaffs.

Impacts on Human Populations

The EIA itself confirms that the project will certainly have impacts on the food, and consequently on the health of riverine and indigenous populations. 30 indigenous populations, of 11 distinct ethnic groups live in the area of influence of the project (Ramos, Chap. 5). The health impacts alone on the population of 13,300 indigenous people should cause a re-examination of alternative means of pursuing the objectives of the hidrovia project. The EIA ignores the way-of-life of non-indigenous populations, and the impacts they could suffer as a result of environmental alterations.
While the EIA analyzes the possibility of increased pressure on their territories, many of which are not yet legally protected, it does not establish satisfactory mitigatory measures, nor does it propose solutions for the impacts on indigenous cultures which would be caused by a migration of non-indigenous populations to the area.
<table>
<thead>
<tr>
<th>Name of Indigenous Lands</th>
<th>Ethnic Group</th>
<th>Legal Situation</th>
<th>State</th>
<th>Area (ha.)</th>
<th>Population</th>
<th>Source /Date</th>
</tr>
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<td>141904</td>
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<td>1989</td>
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<td>Avá-Canoeiro, Javaé, Karajá Tapirapé</td>
<td>Legal registration partially finalized</td>
<td>TO</td>
<td>1358499</td>
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<td>1994</td>
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<td>Javaé</td>
<td>In identification / interdicted</td>
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<td>145080</td>
<td>95</td>
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<td>Funil</td>
<td>Xerente</td>
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<td>TO</td>
<td>15703</td>
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<td>Kraolândia</td>
<td>Karahó</td>
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<td>Xambioá</td>
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<td>Xerente</td>
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<td>1994</td>
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</table>

Contact with non-indigenous populations causes the beginning of a process of cultural disintegration. When indigenous people are thrust into the capitalist economic dynamic, it is generally at a strong disadvantage relative to other groups. They also face the possibility of conflicts with land grabbers, ranchers, and miners.

The study does not mention the impacts of the possible decrease in game and fish on river bank dwellers. Nor is there any inquiry to determine those populations which are socially, culturally, and economically dependent on the rivers. A greater concern regarding these populations would have led the project proponents to calculate their long-term demand for game and fish resources.

In order to mitigate the recognized impacts on indigenous people, the EIA proposes the creation of two work groups – an Interinstitutional Work Group and an Executive Work Group for Indigenous Affairs. While the responsibilities of each is not clear, the study states that “one indigenous person from each area (10)” will take part in the Executive Group. In reality, there are 30 areas affected. This will result in a situation where it will be very difficult to select who will be the indigenous representative on this Group.

In terms of resolving problems of land demarcation, the EIA says “the Transportation Ministry should carry out actions to provide incentives to and to support Funai in the legal regularization of all indigenous lands in the area of influence of the project”. Yet, the mitigation plan does not establish a commitment by the project authorities to regularize land titles in the area, only manifests their intention to collaborate with a process already mandated by law for many years. The project proponents would also have no responsibility to meet the costs of these actions.

The EIA identifies general measures for mitigation, but comments a fundamental error regarding indigenous peoples – it generalizes about them, ignoring the fact they consist of 11 diverse societies with cultural, social, and environmental characteristics that are distinct.

The Tourism Economy at Risk

Fishing tourism provides an important source of income in the region. Research carried out in July, 1999 by Grupo Nativa, an NGO from Goiânia, found there to be 9,000 tourists camping at 400 separate campsites along the river from Barra do Garças, Mato Grosso to Luis Alves, Goiás. Luis Alves, with only 1,200 inhabitants, also has 339 hotel and resort beds, with an occupancy rate of about 80% between May and October. Data from the Goiás State Association for Sport Fishing show there to be 1,200 beds for tourists in the municipalities of Aruanã, Cocalinho, Bandeirantes, and Luis Alves. A conservative estimate indicates the presence of at least 135,000 tourists per year in these four municipalities alone. Considering the entire area of direct influence of the hidrovia, this number increases to about 470,000 tourists, who spend about R$ 28.1 million (USD$15.6 million), and generate 776 direct jobs and 2,329 indirect jobs (Borges, Chap. 6)

The disregard shown by the EIA in terms of its analysis of tourism and leisure is unacceptable. Conclusions supposedly based on a study by Grupo Nativa completely
invert its original sense, not only invalidating the contextualization presented, but also raising ethical questions regarding the bias of the EIA.

The EIA alternately denies and affirms the dimension of tourism in the region, always without using empirical data, and fails to present a concrete estimate of the importance of tourism for the Araguaia-Tocantins basin.

This appears to be, on the one hand based upon the EIA’s need to minimize the importance of the impacts of the implantation of the hidrovia. On the other hand, when the importance of tourism is confirmed, the EIA tries to corroborate the hypothesis that the hidrovia could bring still more development to the region, promoting the growth of tourism, incredible as this may seem. The EIA states that increased navigation on the river could also be used to bring more tourists, quoting the affirmation made by an Italian minister in 1918.

The role of maritime transport for tourism in Brazil is minimal. According to Embratur (1999), only 2.2% of national tourists use this mode of transport. Even on the Amazon River, “which has a connection to the ocean and the ability to accept large-scale vessels, the significance of tourism by river is minimal when compared with the total volume generated by tourism in hotels, resorts, or lodges (Embratur, 1998).

It would be difficult to find a concrete example of an industrial waterway which has promoted an increase in tourism similar to that mentioned by the EIA. Examples such as the Mississippi River show that cities along hidrovias specialize in industry and services, not in tourism.

Nevertheless, the sub-item “Interference in fishing activities” in the EIA admits that the impacts of the hidrovia on fishing, leisure, and tourism will be accentuated. It divides the negative impacts on tourism, leisure, and entertainment into three phases – during implantation, operation, and maintenance of the project. The EIA states that impacts on the Araguaia will be accentuated, while those on the Tocantins and das Mortes will be “moderate” and “weak” respectively.

Among the principal impacts listed are the diminished offer of fish, and reduction of space for sport fishing, caused by noise, movement, and water turbidity; visual intrusions represented by new infrastructure and by the passage of barges, directly interfering in the tourist experience; and as the possibility of collisions between tourist boats and cargo barges.

It is contradictory to, on the one hand affirm that the project will affect in an accentuated way those characteristics of the Araguaia River which attract tourists – beaches, fishing, untouched scenic beauty, and tranquility – and to say at the same time that the hidrovia will benefit tourism.

Faced with the dimension of the potential impacts of the hidrovia on tourist activities, the mitigation measures presented in the EIA are simply palliative. None of them can minimize the related impacts. Concerning impacts on fishing, for example, the EIA proposes that engineering works be undertaken in periods which do not coincide with the tourist season, and as quickly as possible. This appears to be an attempt to hide the impacts, rather than truly mitigating them. Even worse is the fact that, by avoiding the
fishing season, engineering works could take place during the reproductive season, with an even greater impact on ichthyofauna.

The EIA is also deficient in the manner in which it attempts to limit the impacts of the hidrovia relative to tourism to riverbank communities. Tourism is an activity which brings economic benefits to a wider area. The tourist spends money in his home city preparing for his trip, during his travels, and at his destination.

The hidrovia also conflicts with other development projects of the federal and state governments. The Multi-Year Plan 1997-2000 includes a plan for “Sustainable Development for the Araguaia River” focused on stimulating ecotourism and sustainable agricultural practices. The Cantão Tourism Pole, near the Bananal Island, is being financed by the Inter-American Development Bank. Finally, the Prodetur project, which includes the Araguaia River, has budgeted USD$287 million for tourism infrastructure. If the hidrovia is implemented, it will conflict with these other activities, resulting in an enormous waste of public resources and public and private actions.

**Predatory and Unsustainable Development**

The Araguaia-Tocantins hidrovia project does not have as its premiss the solution to transportation problems in the Central-Western region, as one might think. On the contrary, the hidrovia envisions only the promotion of “development” of the Cerrados, seen as an agricultural frontier, stimulating above all the production of commodities for export.

This is an outdated concept, based on the idea of “bringing development” to a region. This process does not consider the potential of regions, nor their fragilities from all points of view. The proposal of the hidrovia is based upon needs which are foreign to the population of the Cerrados. These include the growing reluctance of developed nations to pay the environmental costs of production processes.

The inadequate management and use of soils, characteristic of modern agriculture in Brazil, causes nearly incalculable losses for the country through erosion and loss of fertility. Data cited in the thematic document on “Sustainable Agriculture” of Brazil’s Agenda 21 program inform that in Brazil, for each ton of grains produced, ten tons of soils are eroded (Sparovek e Valques Filho *apud* Consórcio Museu Emílio Goeldi, 1999: 9). Other data mentioned by the same document estimate losses on the order of 25 tons of soil per hectare cultivated in the country (IAC *apud* op. cit.). Besides this, “soils cultivated by conventional methods also liberate carbon to the atmosphere” (*Op. cit.*), directly contributing to the greenhouse effect. Studies also indicate that the quantity of carbon liberated by tilling the soil and exposing it on a planetary basis is greater than that resulting from burning fossil fuels (Reicoski *apud* Consórcio Museu Emílio Goeldi).

The abuse of agrotoxics on farms also has serious effects on fauna, flora, water resources, human health, and biodiversity. Its application, generally without adequate controls, causes the appearance of pests and species which are super-resistant with complicated, unpredictable effects on the food chain and other ecological processes.
TABLE 1
Agrochemical Use in Soy Cultivation in the Cerrados
for production of 2.2 million tons

<table>
<thead>
<tr>
<th>Name</th>
<th>Quantity per ha</th>
<th>Total for 1 million ha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Herbicides</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lexone (Metribuzin)</td>
<td>0.4 kg</td>
<td>400,000 kg</td>
</tr>
<tr>
<td>Trefan (Trifluracina)</td>
<td>2.0 liters</td>
<td>2,000,000 liters</td>
</tr>
<tr>
<td><strong>Fertilizers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formula: 00-30-15 (N-P-K)</td>
<td>350 kg</td>
<td>350,000 t</td>
</tr>
<tr>
<td><strong>Insecticides</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorsban 4E (Chloropirifos)</td>
<td>0.25 liter</td>
<td>250,000 liters</td>
</tr>
<tr>
<td>Nuvacron (Monocrotofos)</td>
<td>0.6 liter</td>
<td>600,000 liters</td>
</tr>
</tbody>
</table>


Another potential problem which will increase as a result of extending the area in the Cerrados of production of grains is unplanned, uncontrolled irrigation. “In the State of Goiás alone, there are now more than 80,000 hectares in irrigation. Based upon each central system consuming on average one liter of water per second and per hectare, the total consumption is 288 million liters – or 288,000 cubic meters per hour. Based upon an average of 12 hours per day of use on each system in certain periods, there are 3.45 billion liters of water used daily in irrigation in Goiás state alone – about 20 times the domestic daily consumption of one million people living in the capital city, Goiânia. Lacking knowledge regarding the aquifers of the region, their areas of recharge and discharge, their internal cycles, and their support capacity, this is a risk.” (Novaes and Novaes, 1998).

It is of great concern that none of these serious potential impacts is analyzed in a systematic and consistent way in the EIA for the hidrovia.

Nor are the possible consequences of the increase of mechanized agriculture on the social and economic dynamic of the Cerrados analyzed. Medeiros (1998) cites unemployment as a consequence of the development of intensive agriculture in the Cerrados, given its incapacity to absorb all demand for jobs in the rural area, leading to migrations to the cities or new agricultural frontiers, and an increase in the concentration of land holdings.

Impacts on Urban Areas

During the decades of the 1970’s and 1980’s, there was a strong process of urbanization in the Cerrados region. Today, nearly one-quarter of its population is concentrated in the metropolitan regions of Brasília and Goiânia. The effects of this unplanned growth of urban centers are seen in increasing violence caused by the incapability of these cities to absorb the labor force, in the over-taxing of public education and health infrastructure,
in misery and social exclusion in urban slums, and in the overall degradation of the urban environment.

Goiânia, for example, registered population growth of 88.4% between 1970 and 1980, growing from 380,773 inhabitants to 717,526. Brasília grew 119%, from 537,492 to 1,176,935 inhabitants. During the same period, São Paulo grew by 43% and Rio de Janeiro by 19.7%. In 1996, according to the census, Goiânia’s population grew to 1,004,098 and Brasília’s to 1,821,946, an increase of 27% and 54% respectively in relation to 1980.

<table>
<thead>
<tr>
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<tr>
<td>Rural</td>
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<td>2,635</td>
<td>2,430</td>
<td>1,754</td>
<td>1,635</td>
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</table>

Source: IBGE
n.b.: Beginning in 1991, the total is affected by the fact that the state of Tocantins was created from part of Goiânia in 1988. Tocantins is considered to be part of the Amazon region, and its urban population of 530,000 and rural population of 389,000 (1996) is therefore not included in this table.

The data in Table 2 show the impacts of the modernization of agriculture, with a resulting exodus from the countryside to the cities, resulting in unplanned urban growth, and intense growth of slums.

The EIA does not analyze the impacts of the possible repetition and increase of these processes in the areas of influence of the hidrovia on education, health, and sanitation infrastructure. The study should also predict the need for public health services, given the fact that increased deforestation will provide conditions for propagation of diseases, such as yellow fever, malaria, leishmaniosis, schistosomiasis, and cholera.

The Agricultural Frontier and Its Impacts on Biodiversity

Given these possible impacts, it is worth asking what the impacts of the implantation of the hidrovia project will be on the Amazon region. Its geographic proximity to the region where intensive agriculture is being implanted could certainly accelerate the expansion of mechanized agriculture, with serious effects on biodiversity.

Deforestation of new areas for agriculture in the Cerrados will have very serious impacts. Besides causing changes in the relationship between emission and absorption of CO2, removal of vegetation and burning will contribute to the greenhouse effect, not to mention social problems caused by the production of charcoal associated with these processes, and resulting child labor, semi-slave and slave labor, and terribly unhealthy working conditions. Removing the plant cover will also alter the albedo of the region – that is, the index of reflected luminosity, which is proven to generate micro-climatic alterations, principally the heating up of the atmosphere.
Last, but not least, deforestation has enormous impacts on biodiversity. Clearing and opening new areas for monocultures implies an accelerated loss of species, through their direct elimination, through their disappearance and through fragmentation of their habitats. Numbers vary, but Assad and Lopes Assad (apud Consórcio Museu Emílio Goeldi, 1999) consider that only 7% of the Cerrados have not yet experienced some type of intensive or extensive exploitation. Another fact is that only one-third of the Cerrados exhibit relatively low human influence. This is precisely the area where the hidrovia would be implanted. Data from Brazil’s Space Research Institute INPE, cited by Novaes and Novaes (op. cit.) reveal that more than 60% of the vegetation of the Cerrados has already been removed through its economic exploitation.

**Reduction of Fauna**

It is important to recall that the state of knowledge regarding the wealth of animal species in the region is still very low. However, there is sufficient data to demonstrate its importance. This should mean taking extreme caution when dealing with interventions which could impact animal life, as the United Nations Convention on Biological Diversity, of which Brazil is a signatory, recommends.

The principal impacts on animals would certainly be caused by an increased human presence, whether by transport activities on the rivers or by intensive agriculture in the region. It should not be forgotten that impacts on fish stocks could also seriously affect land and air species which are dependent upon them for their food source.

For mammals, an increase in river traffic could cause a decrease in their use of these environments and the interruption in their river crossing routes, which represents the fragmentation of their habitat area, and a cut in gene flows. Increased urbanization and occupation would certainly mean an increase in hunting and illegal traffic. Of greatest concern is the fact that increasing the area planted in monocultures has an enormous potential to destroy and fragment habitats, as well as the resulting damages to food chains through the simplification of agroecosystems and the possibility of contamination of animals by uncontrolled use of fertilizers and pesticides.

Despite this, “the environmental impact studies on mammals are limited to descriptive surveys, partially based upon field samples (only with bats) and, for the most part, to unsatisfactory questionnaires and literature searches” (Leeuwenberg, Chap. 4).

The bibliographical survey omitted relevant studies, such as the Macro-zoning of the State of Mato Grosso and studies carried out by the State University of Mato Grosso on the Rio das Mortes wetlands. Important research on habitat fragmentation were also omitted (Lovejoy and Oren, 1981; Lovejoy, 1985; Malcolm, 1990 and Offerman et al, 1995, among others).

Sampling used in the study cannot be considered representative in scientific terms. Only two points for were used on each river, and only in already degraded areas, and the EIA does not even furnish a description of the characteristics of the sites. “The period of the sampling was only three months, ignoring the rainy season, the reproductive period for most species, and the significance of this period for their circulation and consequently for the possibilities of capture or viewing these animals in the carrying out of the
sampling. The data therefore has no validity, and is of no value in any comparative analysis. Furthermore, the sampling does not include groups such as rodents and marsupials, where one can find endemic species of the Cerrados, threatened with extinction and indicative of its great biodiversity” (Leeuwenberg, Chap. 4).

Finally, the questionnaires used for complementary information are not referenced in terms of where they were used nor their representativity. There is no classification of people interviewed in relation to populational and/or social groups, such as fishermen, riverine dwellers, or indigenous people.

**A Direct Threat to Protected Areas**

The EIA failed to map the current situation of the natural habitats in the area of influence of the hidrovia. This would be necessary in order to detect the sites with greatest fragmentation and areas relatively preserved, and therefore more susceptible to the impacts of the hidrovia.

Nor did the EIA even take into consideration the protected areas along the rivers. The study, for example, does not mention the fact that the hidrovia will pass alongside the Araguaia National Park, 1.2 million hectares in size, nor the other conservation units which could be affected by its impacts: Coco Javaé's Ecological Station, Pimentel Barbosa Indigenous Reserve, Extreme North of Tocantins Extractive Reserve, Lajeado State Reserve, Ciriaco Extractive Reserve, Mata Grande Extractive Reserve, Tapirapé-Aquiri National Forest, Tapirapé Biological Reserve, Igarapé Gelado Environmental Protection Area, Serra Azul State Park, Serra da Tabatinga Environmental Protection Area, and Serra Azul Environmental Protection Area, among others.

The EIA also did not take into consideration the recommendations of the document “Priority Actions for the Conservation of Biodiversity of the Cerrados and the Pantanal Wetlands” (MMA, 1999), edited by PRONABIO, of the Environment Ministry. This work, based on the enormous wealth of fish in these bioma, emphasizes the importance of establishing means of conserving aquatic biodiversity, and calls attention to the fact that there are very few genuinely aquatic areas that are protected. In relation to mammals, the EIA states that “the differences already found in the specific composition and in the abundance of species in different areas of the Cerrados indicate that the protected area is absolutely insufficient” (op. cit.).

In this sense, the following areas within the area of influence of the hidrovia project are considered priority areas for the conservation of the biodiversity of the Cerrados: Rios das Mortes Wetlands, the region of Nova Xavantina/Areôes, Coco Javaé's, the middle Tocantins River, the middle Araguaia River (“from the das Mortes river to the Bananal Island, region of the principal concentration of floodplain lakes, the mouth of tributaries, and floodplains”), the upper Araguaia river, and the headwaters of the das Mortes River. The entire Tocantins River drainage between Palmeirópolis, Goiás, and the bend of the Araguaia is considered as a priority area for conservation of reptile and amphibian diversity, given the strong anthropic presence there.

At no time does the EIA analyze the effects of hidrovia engineering works on floodplain lakes and the flood plain itself for animals and birds. Since they are areas of
reproduction for fish, amphibians, reptiles, and aquatic birds, these sites of ample food sources also attract the presence of many land animals.

The occurrence of mammals of particular value is not systematically linked to their remaining habitats, as one would expect of a careful study, but instead are mentioned only generically. Hunted species of high vulnerability, such as the deer, wild boar, and anteater, which should have received greater attention, as should various species threatened with extinction according to the criteria of the IUCN, such as the marsh deer, giant river otter, and armadillo.

The EIA is contradictory when it states that “wildlife in this region present ample indices of simplification...” in function of uncontrolled human occupation, of poor resource management practices, and other infrastructure mega-projects on the one hand, but later states that “the Araguaia River is located in the transition region between the Cerrados and the Amazon rainforest, characterized by a high diversity of habitats, and consequently by a highly diversified animal community”.

What could truly be pointed to as simplification of species diversity should serve for a greater detailing of those areas of the Araguaia that are still relatively preserved and of high ecological value, so that conservation units and corridors of vegetation could serve to effectively protect the remaining flora and fauna of the region.

Bird species are scarcely included in the EIA. Impacts could result from the same processes relative to mammals – reduction in fish stocks on which birds feed, impacts of more intense use of the rivers and their banks, and the increase of plantations causing the elimination or fragmentation of habitats.

The role of birds in controlling pests should not be forgotten. Impacts on their populations could represent potential problems for agricultural activities.

“Field work for the EIA in relation to birds were certainly limited, both in terms of time and in space, as well as in the capture methodology itself...An area of such magnitude, which includes all the phytophysionomias of the Cerrados and transition areas with the Amazon and scrublands of the Northeast, including wetlands of high ecological value – lakes, flood plains, seasonal beaches – cannot be sampled in only two points along each river.

“In the same way, sampling did not contemplate the high seasonality of avifauna, and the period of sampling was unacceptably short, principally if one takes into consideration:

- the strong seasonality of flood plains found along these rivers, which are certainly utilized by diverse species;
- the marked existence of two seasons, dry and rainy, with the field studies including only the former, and;
- the existence of diverse migratory movements of birds, which also contribute toward the high seasonality of diverse species in the region. The studies require at least one annual cycle. (Resende, Chap. 3)”
There is no information in the EIA regarding the size of areas where sampling occurred, nor their distances from human concentrations, land uses, vegetation, levels of fragmentation and degradation, levels of human impacts, the distance between collection points within each area, as well as the exact location of these collection points. No studies were made in areas of native vegetation in order to compare these with areas in differing levels of degradation. There is no detailed description regarding field expeditions, such as the number of people involved, the number of sites where nets were used, the size of the mesh of nets used; and habitats for each type of netting. Bird habitats differ according to vegetation. There are species which only use the canopy of trees, while others use lower strata, or remain primarily on the ground. The capture methodology should address these differences. The EIA does not make it clear whether or not this was contemplated.

The descriptions of sampling list only the number of individuals of each species captured at each of the points. These numbers have no value or utility for analysis or for comparison. For example, there are areas of high species diversity, despite having a small number of individuals.

There was no concern with migratory species, even though there is important evidence, still little studied, of a migratory bird route from the northern hemisphere to this region. Species such as the “fishing” eagle (Pandion haliaetus), threatened with extinction, and the “trinta-réis-boreal” swallow (Sterna hirundo) and the “batuiruçu” (Pluvialis dominica) all migrate from the northern hemisphere and depend on the rivers and wetlands along the Araguaia and das Mortes rivers (Sick, 1981).

**No Contingency Plans for Accidents**

The EIA considers the possibility of accidents taking place during the operation of the hidrovia only in passing. Serious environmental and social consequences could take place if the hidrovia were used for transporting toxic products such as fertilizers and agricultural pesticides. The study mentions only that if such accidents were to occur, a local Fire Brigade (if it exists, of course, but very few cities in the region have Brigades) would be called, as well as environmental regulatory authorities. The minimum one would hope would be the elaboration of a contingency plan for such accidents, as well as information as to where there are Fire Brigades – voluntary or professional - along the river systems.

**A Project Which Makes No Economic Sense**

Certainly, with all the impacts which could take place as a result of the implantation of the Araguaia-Tocantins hidrovia, the project should be reconsidered. But, even without taking social and environmental impacts into account, the economic feasibility of the hidrovia is in itself questionable. The analysis of this aspect in the EIA can, at the very least be classified as shoddy.

First of all, there is no analysis of international market tendencies to know whether, in fact there is a demand for the projected growth in agricultural commodities. At no time
are the consequences of this increased offer on the prices of these products considered, nor whether this growth is, in itself feasible.

Moreover, the idea in the EIA that Brazil must insert itself into the economic globalization process at any cost by producing export commodities is highly questionable. The United Nations Development Programme’s Human Development Report for 1999 (PNUD, 1999) shows, for example that agricultural commodities are at their lowest price level in the past 150 years. In the same way, its data clearly shows that integration into global markets does not necessarily imply economic growth or human development. The combined GNP of the Sub-Saharan nations of Africa is comprised of 30% exports, against only 19% for the OCED countries – those most industrialized. Despite this fact, Sub-Saharan Africa has some of the worst indicators of misery and living conditions.

Economic “integration” has meant greater concentration of income, favoring the wealthiest. The ratio of income between the 20% richest in the world and the 20% poorest, which was 30 to 1 in 1960, doubled to 60 to 1 in 1990. This ratio increased to 74 to 1 in 1997.

Globalization tends to favor this concentration by the manner in which information becomes more and more the principal productive force. As the developed countries have the greatest share of patents, and research and development activities, certainly this trend will continue.

Even those who, like Manuel Castells (1996) believe in the need to insert developing countries into the globalization game, also point to the risks of insertion at any cost. According to Castells, people and countries define their social and economic situation today in function of a new international division of labor, in which those who gain ground are those who work using a high degree of information. Production of raw materials and industrial production are steadily losing ground in the globalized economy.

The benefits of the hidrovia will be enjoyed by only a small number of individuals and companies. Data cited in the EIA point to the existence of only 52 farms of 500 hectares or more in the region (Quadro 12, Estrutura Fundiária ao Longo do Araguaia-Tocantins, Vol. 6, p. 146), the minimum size considered necessary for viable production on the scale required by the principal product, soy. Even these data are not trustworthy, since the Brazilian Geographic Service, IBGE, has indicated there are 4,000 properties of this size in the region, based upon the Farming Census of 1995. Besides these large landowners, the only other beneficiaries of the hidrovia will be those few companies that operate transportation services along the waterway, sellers of agricultural chemicals and related materials (such as seeds, fertilizers, and herbicides, which represent 65% of the costs of growing soy), and service and equipment providers. (Galinkin, Chapter 7)

On the other hand, all indications are that the costs of the hidrovia project will not be borne by its beneficiaries, but rather will be entirely socialized by the Brazilian people. Despite the fact that the EIA provides few details regarding mitigatory measures for the project, it indicates that public agencies will be responsible for carrying out these mitigation measures. These measures should be clearly defined before the project receives any environmental license, so that they can be monitored.
At the very least, the methodology for declaring the project to be economically feasible is outdated. The Brazilian productive model has been profoundly reformulated, particularly through the privatization of state companies, and the role of the State as an economic agent has narrowed. In this context, the fact that the costs of an undertaking conceived to attend the perceived needs of a limited number of private interests would fall upon the State, and consequently on Brazilian taxpayers, makes no sense.

The calculation of economic feasibility of the hidrovia in the EIA is carried out simply by comparing the “savings” in the project’s transportation costs in relation to other modes of transport with the costs of constructing the project. This comparison, however, fails to take into account the existence and operation of the North-South Railroad, which is identified at the beginning of the EIA to be the great competitor of the hidrovia (Galinkin, chapter 7).

Nor are the social and environmental costs to the public, in part discussed here, taken into account - even less the investments which would be necessary for the infrastructure needed to permit the hidrovia to function, such as connecting roads, ports, and rail links. Nor are mitigation costs included in cost-benefit analyses. The economic analysis assumes that the country as a whole will benefit from the project, when in fact all indications are that only a select few will benefit.

There are also significant contradictions. The EIA states it is partially based upon Valec’s study of the North-South Railroad (Valec,1999), but it uses data inconsistent with that of the Valec study, saying that the hidrovia will attend a flux of transportation from south to north when the Valec study points to the demand within the region for transport from north to south.

A comparison between costs for transporting soy via the hidrovia or by the Ferronorte railroad from Nova Xavantina to Rotterdam, the Netherlands shows that the hidrovia would be more costly by a significant margin. According to the EIA, shipping soy via the hidrovia, through the port of Itaqui will cost USD$125.50 per ton, while multimodal transport (road/rail) using Ferronorte and the port of Santos, São Paulo, would cost between USD$86.40 and USD$91.64 per ton (Galinkin, chapter 7) – the hidrovia would be 36-45% more expensive than Ferronorte, a railroad now largely built. The Ferronorte data uses “retail” freight rates, while large-volume shippers would undoubtedly negotiate even lower rail freight charges.
## COMPARATIVE COSTS

### Hidrovia Araguaia-Tocantins and FERRONORTE

<table>
<thead>
<tr>
<th>Mode</th>
<th>Origin Destination</th>
<th>Nova Xavantina (Mato Grosso)</th>
<th>Ponta da Madeira (Maranhão)</th>
<th>Via Hidrovia Araguaia-Tocantins</th>
<th>Nova Xavantina (Mato Grosso)</th>
<th>Santos (São Paulo)</th>
<th>Via Ferronorte</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nova Xavantina (Mato Grosso)</td>
<td>Ponta da Madeira (Maranhão)</td>
<td>Via Hidrovia Araguaia-Tocantins</td>
<td>Nova Xavantina (Mato Grosso)</td>
<td>Santos (São Paulo)</td>
<td>Via Ferronorte</td>
</tr>
<tr>
<td>Mode</td>
<td>Km</td>
<td>US$/t</td>
<td>US$/tku</td>
<td>Km</td>
<td>US$/t</td>
<td>US$/tku</td>
<td></td>
</tr>
<tr>
<td>Hidrovia</td>
<td>1.300</td>
<td>32.50</td>
<td>0.025</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td>300</td>
<td>25.20</td>
<td>0.084</td>
<td>417</td>
<td>9.80</td>
<td>0.0235</td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td>600</td>
<td>38.40</td>
<td>0.064</td>
<td>1.600</td>
<td>33.34</td>
<td>0.0208</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>96.10</td>
<td>-</td>
<td>-</td>
<td>43.14</td>
<td>47.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port or Transfer costs</td>
<td>7.20</td>
<td>-</td>
<td>-</td>
<td>14.80</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total FOB</td>
<td>103.3</td>
<td>57.94</td>
<td>91.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maritime freight to Rotterdam</td>
<td>22.20</td>
<td>28.90</td>
<td>62.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>125.50</td>
<td>86.84</td>
<td>91.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The consideration of alternatives to the project in question, a legal requirement for an EIA according to resolution 001 of Conama, is absent in the EIA. Ahtar’s study simulates the construction of a railway along the west bank of the Araguaia River, which they state would “lose” to the hidrovia in terms of environmental impacts. There is no explanation of why this comparison is not made in relation to the already existing North-South Railroad project, on which information is available, and which is cited in the EIA as one of the most important sources of data demonstrating the demand for transport services.
The Fadesp/Ahitar EIA, desperate to demonstrate the economic feasibility of the project, sought support in Valec’s study for the North-South Railroad. However, they forgot to compare their results with those for this railway. These numbers show that the Araguaia-Tocantins hidrovia has no chance of competing with the North-South Railroad, since the multimodal transportation cost using the hidrovia would be at least 67% above that of the railroad, as can be seen in the following table:
Araguaia-Tocantins Hidrovia and North-South Railroad
Comparison of Transportation Costs

Indicator: **rail costs = 100**

<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>Flux Belém</th>
<th>Flux São Luís</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>324</td>
<td>319</td>
</tr>
<tr>
<td>Multimodal hidrovia Araguaia-Tocantins</td>
<td>237</td>
<td>167</td>
</tr>
<tr>
<td>North-South railroad</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Galinkin, Chapter 7, tables 5 and 6

The alternative of not going ahead with the hidrovia project, which must be considered, was not analyzed. A study of this type should ask whether a large-scale project, for which there will only be demand during certain months of the year – the period of harvesting and shipping grain production – makes sense. Furthermore, one can ask whether a project of this size should be undertaken to attend a demand for still non-existent cargo, when there clearly are current deficits in transportation and communication facilities for nearly the entire population of the region, which would not be met by the proposed industrial hidrovia.

The hidrovia is not the best solution for the development of the Cerrados and the Central-Western region. Nor can it be stated that it is a viable alternative. Other paths for the region need to be considered, which do not degrade the environment and which do not decrease the value of the human and natural capital found there.

**Alternatives for the Cerrados**

Development should be considered in terms of its relationship to the quality of life it provides for people in a determined space. It cannot be envisioned simply as economic growth. In this sense, more recent concepts understand the socioeconomic dynamic of a territory to be narrowly linked to the “social capital” found there.

Social capital is expressed in the “characteristics of social organization, such as confidence, norms, and systems, which contribute toward increasing the efficiency of society, facilitating coordinated actions” (Putnam, 1996). These are the characteristics which orient the use which each region will have for land, its natural resource base, and for the human capital present there.

For Abramovay (1999), social capital works within the environmental factors present in a region, adding value and turning it into a base for innovative activities. This vision goes beyond a strictly territorial view of development, incorporating the social component as an essential determining factor. Even more importantly, it permits us to think of a territorial base as being tightly linked to and dependent upon the social fabric upon which it works. For this reason, any development proposal must have as one of its bases the generation and mobilization of social capital.
Environmental questions have been placed within two contexts which essentially downgrade the value of the natural wealth of the Cerrados. These cerrados are portrayed as obstacles to development, by the manner in which they impose restrictions on the use and occupation of the territory; and as a form by which export products have higher value, since the degradation of the Cerrados is not calculated in economic terms nor incorporated into the market value of these products. This depletion, added to the exploitation of human capital of the Cerrados in the form of non-qualified and poorly-paid workers are two of the principal pillars which have guided development plans of the region and the country.

This clearly is an unsustainable path, generating environmental alterations which are many times irreversible, and worsening the level of misery and concentration of wealth.

For these reasons, and in agreement with the “Sustainable Agriculture” document of Brazil’s Agenda 21 proposal (Consórcio Museu Emílio Goeldi, op. cit.), new development models for the Cerrados must be the starting point and springboard toward the valorization of its natural resources and human capital, rather than the contrary. Toward this end, the study proposes a “moratorium for the Cerrados”. Any increase in production (Agenda 21 does not specify any type of production) should be based upon increasing productivity through new technologies or on the intensification of activities, rather than based upon occupying new areas.

The strategy for the productive dynamic of the region should be based upon overcoming the vision that the Cerrados are a poor ecosystem, whose destruction should be part of the price to be paid for the preservation of Amazon. Another important premiss is that the Cerrados should not be understood only “as a frontier whose central vocation is the production of commodities, but rather that their value should be recognized as being derived by the wealth and diversity of the ecosystems existing there.” This pre-supposes that “populations living in sensitive areas...are partners in the preservation of biodiversity and rather than being condemned to social extinction by a concept of progress that underestimates the wealth (including economic) contained in local resources” (op. cit.).

“A sustainable economic dynamic for the Cerrados should be based upon the best use of productive resources in areas already exploited (whose production could increase significantly, above all through the consortium of ranching and farming, as a means of recuperating degraded pastures) and, on the other hand, in taking advantage of the natural wealth” of the region (op. cit.) in activities such as tourism.

The Cerrados can be considered as the last great expanse of arable lands in the world which is still not fully occupied. But beyond this, it is an area of extremely valuable biodiversity. For this reason, the region should be part of a national sustainable development strategy - rather than being seen as an area to be occupied at any price – so that its enormous potential for generating wealth and human development for the country may be fully utilized and maintained for future generations.

For a development model based upon the natural and human vocation of the region, the production and dissemination of information is fundamental. It should be remembered that knowledge regarding the natural processes of the Cerrados is still incipient. If the proposed investment in the Araguaia-Tocantins hidrovia was instead used to create a
network for research and the collection and dissemination of information, positive steps could be taken toward the development of the Central-Western region and the country.

Conclusions

The potential impacts of the engineering works planned for the implantation of the Araguaia-Tocantins hidrovia need to be addressed. Its construction could result in serious impacts on the Araguaia river system, with negative effects being felt throughout the Araguaia-Tocantins basin, and possibly throughout the Cerrados and the eastern Amazon, as well as on other projects planned for the region. These changes would also have serious consequences on the human populations of the region, caused by environmental alterations, above all the possible decrease in the offer of fish and game resources and in the project’s impacts on other significant economic activities such as fishing, principally sport fishing, and tourism, important sources of income for the region.

Beyond this, the stimulation of grain production, which is the principal stated objective of the hidrovia, will certainly generate enormous negative impacts on the environment and on the populations of the Cerrados. The “modernization” of agriculture, along the lines by which it was carried out in other areas of the Cerrados, is having serious effects, such as deforestation and the loss of biodiversity, erosion and loss of soil fertility affecting water resources, and through sedimentation, uncontrolled irrigation, and reckless use of fertilizers and pesticides, among other consequences. In social terms, monocultures have meant more intense concentration of landholdings and have proven incapable of providing employment in the countryside, generating migratory fluxes toward the cities, and more intense and chaotic urbanization.

The Environmental Impact Assessment for the Araguaia-Tocantins hidrovia fails to meet minimum legal, technical and scientific requirements. It uses flawed methodology, ignoring important impacts. Its analyses do not contemplate the complexity – and thus the fragility – of environments, nor their great natural wealth, above all in the Araguaia river basin. The texts presented do not consider the possible impacts of the modernization of agriculture and the increase in areas of grain monocultures, which would be stimulated by the hidrovia – above all, on the populations of the Cerrados. Mitigation measures, when presented, are unreal, placing responsibility on public organs, far beyond their capacity. By placing the onus for mitigation on public institutions, the project unacceptably burdens society for a project which benefits only a select few.

In addition to these impacts and the inadequacy of the EIA, the development model behind the hidrovia must be questioned. This model fails to consider the natural vocation of the region and its natural, social, and cultural characteristics. The paradigm of “bringing development to the wild interior” (Moraes, 1997), which today appears to permeate the notion that many sectors of the State and the private sector have for development, runs counter to concepts upon which there is today a broad consensus, such as in Agenda 21. These emphasize locally-based development which does not degrade the environment and which equitably benefits all sectors of society.
An emphasis on local, community-based development should not override a discussion of regional and national projects of integration, but these should be designed via an ample public debate and decisions regarding them should be made with participation by all sectors of society.

Natural wealth should not be seen as an obstacle to development, nor should ecosystems and human capital be exploited merely to increase the value of export products.

Brazil has based its development and its competitiveness in international markets on using accounting methods which exclude the environmental and social costs of its production. This is certainly an unsustainable model, because natural resources cannot be exploited indefinitely and social inequalities infinitely expanded and perpetuated.

Our natural wealth should be the springboard toward a different type of development – serving as its central axis, rather than its fuel. Gilberto Freyre spoke decades ago of Brazil’s need to think of itself as a “tropical society”, a way of thinking which is echoed in the contemporary concept of Ignacy Sachs of a “civilization of biomass”.

The simplification of biodiversity, implanted by monocultures in Brazil, has always resulted in social simplification – a few get richer, and the number of the poor and miserable increase. This is not the way to turn our country into a Nation.
Bibliography


CEBRAC Foundation – Blue-Ribbon Experts Panel