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The South American Hidrovia Debate

by Jennie S. Hughes and Paul C. Huszar

The Paraná and Paraguay river system serves an area of 1.75 million square kilometers with a population of over 17 million in Argentina, Bolivia, Brazil, Paraguay, and Uruguay. The river system has been used since the pre-Columbian era as a waterway. Over time, ports and other navigational improvements have been constructed, but at present the overall system is poorly maintained and has seriously deteriorated. Figure 1 shows the area.

Stimulated by the formation of the Southern Cone Common Market (MERCOSUR) in 1991, the La Plata Basin countries of Argentina, Bolivia, Brazil, Paraguay, and Uruguay are considering ways to improve navigation on the Paraná-Paraguay Waterway. MERCOSUR represents Latin America's largest industrial base, with a market of nearly 200 million people and a gross regional product of $427 billion per year. Moreover, it seems likely that MERCOSUR will eventually be linked with the Andean trade pact between Bolivia, Colombia, Ecuador, Peru, and Venezuela in a vast continental trading area. On a broader scale, negotiations to create a hemispheric market have already begun between countries of the North American Free Trade Agreement (NAFTA) and MERCOSUR (Smith and Pearson).

Poor transportation infrastructure impedes more trade in the region and the economic growth that trade would promote. Latin America has seriously neglected transportation for at least the past fifteen years. The World Bank estimates that approximately $14 billion per year must be invested until the year 2005 to remedy this neglect (Burki and Edwards). Within MERCOSUR a number of transportation projects are either currently underway or are in the planning stages. Perhaps the most ambitious and controversial of these projects is the Paraná-Paraguay Waterway project, simply referred to as Hidrovia, the Spanish word for waterway.

Here, we review the debate over the Hidrovia project, particularly the way costs and benefits have been included in the feasibility analysis. Analyses of Hidrovia that ignored the environmental costs of the project concluded that the project is economically feasible. However, when these environmental costs are counted, the project is economically unacceptable. Resolution of this debate will not only determine the fate of the Hidrovia, but may also set the standard of analysis for large-scale projects in South America in the future.

Hidrovia

Hidrovia would make the 3,440 killometers (km) length of the Paraná-Paraguay river system from Nieva Palmira, Uruguay, to Cáceres, Brazil, navigable year-round. At present, vessels of up to 100 meters in length can navigate only the first 453 km up to Corrientes, Argentina, and then smaller vessels must be used to reach Asuncion, Paraguay. Further upriver passage becomes extremely difficult as cargoes must be loaded and unloaded repeatedly from shallow barges to get past rapids and narrow straits. Navigation, especially upstream of Corrientes, is often suspended due to low flows during the dry season. Dredging, course changes, and hydraulic structures would be necessary all the way to Cáceres to allow navigation by convoys of barges of at least 500 tons (Jelen).

The construction costs of Hidrovia would exceed $1 billion and maintenance costs would be another $3 billion over the next twenty-five years (Internave Engenharia). Funding for the project would come from the Interamerican Development Bank and the MECURSOR countries.

As initially conceived and still perceived by some, the Hidrovia project would entail two phases. The first phase would make channel and port improvements on the river system from Santa Fe, Argentina, to Corumbá, Brazil. The second phase would involve more extensive engineering works and modification of the river system from Corumbá to

Cáceres, Brazil. The second phase was the focus of most of the early environmental criticism of the project and, for the moment, has been dropped from consideration. However, there are major economic interests, including Brazilian soybean producers, that may continue to promote the second phase at some point in the future.

Soybean export interests and the Pantanal

As figure 1 shows, the Corumbá to Cáceres reach of the Paraguay River passes through the Pantanal. According to Margolis, the Pantanal is easily the most spectacular wetlands in the Americas and, likely, the world. The largest concentration of animals in the American continent is supported by the Pantanal's immense system of marshes, lakes, and rivers. The Paraguay River, which drains the Pantanal, carries a phenomenal 45 billion cubic meters of water per year. During the rainy season, the area of the Pantanal exceeds 200,000 square kilometers, an area larger than England (Margolis).

The Pantanal is home to over 400 species of fish, 600 species of birds, and 1,000 species of butterflies. It contains 134 of the world's most endangered species of mammals, including the pampas deer, giant anteater, jaguar, and giant otter (Heath).

The Pantanal also moderates flows south of the confluence of the Paraná and Paraguay rivers at Corrientes. The Pantanal acts as a "sponge" to soak up the heavy flows on the upper Paraguay and later releases them as the flows slow on the Paraná. These offsetting peaks ensure constant water flows throughout the year from Corrientes to the Atlantic Delta.

Navigation through the Pantanal, however, would open a vast area of existing and potential soybean production to intraregional and international markets. In recent years, Brazilian soybean production has been expanding in the states of Mato Grosso and Mato Grosso do Sul directly to the north of the Pantanal. Harvests in these states represented 17 per-

Figure 1. Paraná and Paraguay river system

Ariel view of the Paraquay River in the Pantanal. The many curves present a nightmare for navigation.

Courtesy of Enrique Bucher

cent and 10 percent, respectively, of Brazil's 1992 production (Abrams, Bartoli, and Stern).

Brazil, with nearly 19 percent of the world's soybean production, ranks second to the United States with 51 percent of world production, and is growing rapidly. Over the period from 1970 to 1992, Brazilian land in soybean production grew from less than 2 million hectares to over 10 million hectares, production increased from slightly more than 2 million metric tons to nearly 22 million metric tons per year, and annual exports expanded from 0.23 million metric tons to 4.5 million metric tons (Abrams, Bartoli, and Stern).

Currently, 90 percent of the cargo from Mato Grosso and Mato Grosso du Sul travels by truck to the Atlantic Ocean at a cost of $60 to $90 per ton, depending upon the condition of the road. Super highways and a transcontinental railway have been proposed but remain in the talking stages. Moreover, river transportation is far cheaper, with costs in the range of $30 to $50 per ton. One relatively small 2,000 ton barge can carry the equivalent of seventy trucks (Margolis).

In order for these regions to be accessible to river transport, however, extensive navigational improvements must be made between Corumbá and Cáceres, through the Pantanal. Within this reach, the natural course of the river has many bends, protruding rocks, and fluctuating depths which impede cargo transportation.

Construction of Hidrovia threatens the ecology and hydrology of the Pantanal, primarily by accelerating the flow of water through the region. Moreover, better transportation, along with drainage of the wetlands, is likely to induce accelerated encroachment of soybean producers into the Pantanal.

Feasibility studies

The government of Brazil initially commissioned a study of the Hidrovia project to estimate its physical and economic feasibility. A second study conducted by Wetlands for the Americas raised serious questions about the ecological and economic feasibility of the project and resulted in broad-based support for a more complete evaluation of the project. The preliminary results of the current evaluation of the project are now available, but it seems to be as flawed as the initial study.

Internave study

The first feasibility study, commissioned by the Brazilian government and conducted by the Brazilian firm Internave Engenharia, was released in 1992. The analysis only estimated benefits from savings in transportation costs and compared them to the costs of construction, maintenance, and equipment necessary for the project (Internave Engenharia).

Internave calculations are based upon two scenarios: without MERCOSUR and with

Capibara (who make their home in the wetlands).

Courtesy of Enrique Bucher

MERCOSUR. The differences in the two scenarios reflect shipping costs and levels of trade. The without-MERCOSUR scenario assumes that growth in shipping will continue at 1991–92 rates. The with-MERCOSUR scenario assumes that growth in shipping will increase with the MERCOSUR agreement.

Internave calculated an internal rate of return (IRR) of 16 percent without MERCOSUR and 23 percent with MERCOSUR. Bucher et al., however, found arithmetic errors in these calculations. More importantly, they found that environmental costs and development benefits were ignored in the original study.

Wetlands for the Americas study

A year after the Internave study, Wetlands for the Americas commissioned an analysis of the potential environmental costs and benefits of Hidrovia. Wetlands for the Americas is dedicated to the conservation of wetlands in the Americas. Wetlands for the Americas was established as the successor to the Western Hemisphere Shorebird Reserve Network (WHSRN) in 1992 because of a growing demand for WHSRN to take on broader wetland conservation needs, particularly in Latin America.

The team of scientists involved in the Wetlands study included ecologists, economists, and biologists from both Argentina and the United States. They conducted the analysis on two levels. First, the net returns were recalculated using the same data presented in the Internave report. Due to a lack of the necessary environmental and socioeconomic data for the Pantanal, assessment of those actual costs and benefits was not possible. Instead, the analysis identified the likely environmental costs and estimated their economic value, which would make Hidrovia uneconomical.

Recalculation of the Internave data found an IRR of 6 percent without MERCOSUR and 14 percent with MERCOSUR (Bucher et al.). The Interamerican Development Bank, the project's primary source of funds, requires a minimum net return of 12 percent and would not fund Hidrovia without the formation of MERCOSUR.

The Internave study also overlooked environmental costs associated with Hidrovia. If inclusion of environmental costs increases the overall cost of the project by just 20 percent, then the IRR of the project will fall to 11 percent, even with MERCOSUR. A 20 percent increase in project costs equals $40 million per year over the life of the project (Bucher et al.).

The Wetlands for the Americas study outlined a number of potential environmental costs associated with construction and operation of the Hidrovia project and concluded that these environmental costs would easily exceed $40 million per year.

Erosion/siltation/pollution. Navigation by large barge convoys would increase erosion of the river's shoreline and bottom. This would likely increase the level of suspended solids in the river, decreasing aquatic organisms and water quality for human and industrial uses. Additionally, induced development and, in particular, enhanced soybean production would escalate rates of soil erosion and, consequently, the siltation levels in the river.

Tow traffic in the river would likely lead to additional chemical pollution and spills. Combined with pollution from MERCOSUR-induced mining and mineral extraction operations, the river faces an even greater likelihood of deteriorating water quality.

Vector-borne diseases. Hidrovia will likely encourage large-scale migration and settlement along the length of the waterway. Increased travel and migration could create health problems, especially those associated with vector-borne diseases, such as malaria, yellow fever, dengue, and forms of leishmaniasis. Massive migrations of people from areas where diseases are endemic to areas where they are not could expose the non-immune people to the

The Wetlands for Americas Analysis Team

The Hidrovia study was conducted by a team of seven consultants with more than 150 years of combined experience in river project analysis. The team consisted of four ecologists, a biologist, an economist, and a GIS specialist. Their affiliations include Universities of Cordova, Litoral, and Corrientes in Argentina, Colorado State University, Wetlands for the Americas in Argentina and Massachusetts, and Woods Hole Research Institute in Massachusetts.

Their objective was to provide a preliminary assessment of Hidrovia's potential environmental impacts, based on the important issues identified in the terms of references for prefeasibility studies for Hidrovia prepared by the Interamerican Development Bank and the United Nations Development Program. Coupling appropriate research and analysis tools from the four disciplines with satellite imagery, site visits to the Pantanal and to the Paraguay/Panama Basin, a thorough literature review, and recommendations from other local and international experts, the team conducted a two-part analysis:

- estimation of the potential specific regional impacts of the Hidrovia as well as the combined physical, biological, and human impacts affecting a whole system; and
- an economic feasibility analysis of the Hidrovia including a review of the existing Internave analysis and suggestions for the form and data requirements of a complete analysis of the Hidrovia project.

The team concluded that the Hidrovia project has the potential to create a wide variety of negative environmental impacts in the Pantanal. A review of Internave's economic analysis revealed arithmetic errors that inflated the internal rate of return of the Hidrovia project. Even more important, the Internave analysis omitted the potential environmental costs. Wetlands for the Americas recommended that a feasibility analysis, inclusive of all economic and environmental impacts, be conducted before the project is undertaken.

Courtesy of Enrique Bucher

Egrets at home in the wetlands of the Pantanal.

disease and escalate transmission—a phenomenon already witnessed in the Amazon region.

Hydrological impacts. The proposed changes to the river from Cáceres to Corumbá would alter the hydrology of the Pantanal. As a result, water would flow more rapidly through the Pantanal region, changing the flooding/flushing patterns between the wetlands and the tributary channels, reducing the sponge effect, increasing the chances of flooding due to an overlap of peak flows on the Paraguay and Paraná rivers, and shortening navigable periods.

Loss of biodiversity. Perhaps one of the most profound impacts of the Hidrovia would be its effects on biodiversity in the Pantanal. Changes in the hydrological patterns, degradation and loss of habitat, resource exploitation, spread of exotic species, and chemical and organic pollution are critical in determining the rate of freshwater extinctions, and all of these factors are likely to intensify with the Hidrovia project.

Many fish depend on a complex pattern of breeding and feeding migrations between the mainstream and temporary ponds created by seasonal flooding. These fish will suffer from changes in the hydrological system of the waterway. Physical changes in the rivers and alterations of the hydrological regime may also increase mobility of floating vegetation, which interferes with navigation and reduces oxygen vital to fish survival. Large fish, including some that are of considerable economic importance such as the Dourado and Surubim, are likely to be the most severely effected.

Current studies

In response to the Wetlands for the Americas study, as well as pressure from environmental organizations such as the World Wildlife Fund, the Interamerican Development Bank (IDB) rejected the findings of Internave Engenharia and called for a more complete and accurate study of the project. The IDB is providing approximately $7.5 million for an engineering/economic feasibility study and an environmental impact study (EIS). Also, the project has been scaled back to eliminate the Corumbá and Cáceres reach through the Pantanal.

The preliminary results of the engineering/economic study are now available (Hidroservice et al.). The new study continues to ignore the environmental costs identified in the Wetlands for the Americas study. Moreover, the analysis is conceptually flawed.

The only environmental costs included in the Hidroservice et al. evaluation are losses to commercial fishing due to decreases in fish populations during dredging of the river. Moreover, these losses are assumed to occur only during the construction period; long-term losses due to the destruction of breeding grounds and reduced breeding populations are ignored. Since the current EIS has not been completed, its findings are not integrated into the economic feasibility analysis, nor, according to reports out of the Executive Planning Committee for Hidrovia, does there appear to be any intention to include them in the future.

At the conceptual level, rather than a "with and without" analysis of the project, the Hidroservice et al. study compares a case without the risk of navigational interruptions due to low river flows with the case of constructing the project. In order to remove the risk of navigational interruptions, however, significant investment in channelization would be necessary and, indeed, represents a significant portion of what is the Hidrovia project. By removing these costs from the analysis, the Hidroservice et al. evaluation inflates the net benefits of the project. When the costs of removing the risk of interruptions to navigation are included in the costs of the project, the project fails to have an internal rate of return greater than 12 percent and is unfeasible by IDB guidelines.

Conclusions

The current feasibility study still fails to adequately include environmental costs and seems intentionally to bias the analysis in favor of adopting the project. Moreover, many members of the Executive Planning Committee for Hidrovia appear inclined to start construction even before the environmental impact study is completed, let alone included in the feasibility study.

On the positive side, the undertaking of an environmental impact study for a South American

project is noteworthy. In the past, projects in South America have not had to withstand the environmental scrutiny that United States projects undergo. Indeed, until Wetlands for the Americas commissioned their study, with other studies following, there had been little public awareness of the Hidrovia plan formulated by Internave Engenharia and, at the time, supported by IDB.

With public awareness and debate, positions on the project are changing. After the Wetlands for the Americas study, the Executive Planning Committee for Hidrovia reversed their endorsement of the Internave report and said that they considered it merely a discussion paper. At an April 1995 meeting of the committee in Puerto Suarez, Bolivia, delegates from the five participating countries spoke of adapting ships to the river and rejected "macho" engineering to channelize and straighten the river for the ships. Perhaps further public debate will persuade the committee to rethink their current support for the Hidroservice feasibility study.

Also subsequent to the Wetlands for the Americas study, the Interamerican Development Bank (IDB) reversed their acceptance of the Internave report. Manuel Farina, chief of the Technical Cooperation Division for the IDB, stated that the bank will not finance the project without a serious environmental assessment and that "we learned our lesson" (Margolis). Presently, the IDB is critical of the Hidroservice feasibility study and reportedly is demanding that it be redone to address environmental concerns.

Furthermore, the current president of the Intergovernmental Commission on Hidrovia, Ambassador Marcelo Jardim from Brazil, stated at a World Wildlife Fund press conference in Washington, D.C., last year that Brazil is opposed to the alteration of the Pantanal by large-scale engineering works. This is a dramatic shift in the attitude of the Brazilian government, which only a few years ago was ignoring international protests of the destruction of Amazon rainforests.

The ultimate outcome of the Hidrovia debate is still uncertain. But it is clear that it has altered, likely permanently, the format for how South America considers its mega-projects. The debate has become more public than in the past, and nongovernmental organizations and others are openly and effectively influencing the decision process. ◘

■ For more information

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Courtesy of Enrique Bucher

Ariel view of the Pantanal which acts as a sponge to hold in the water from the river upstream.

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