



Crossroads of Transportation

Can Brazil's roads and ports overcome decades of neglect?

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Advances in transportation have taken mankind along the road to modernity. However, decay in transportation systems today threatens long-term processes of modernization. Brazil now finds itself at this crossroads. Deterioration of Brazil's transportation network strangles big cities and curtails economic growth as well as foreign trade and expansion of our agricultural frontier. It is hard to find some mode of transportation which does not reduce our quality of life and add to the notorious *Custo Brasil*: the cost of doing business in Brazil. The price of further deterioration in transportation will be much higher than the heavy investment needed to continue along the road toward modernization.

Brazil today is struggling to avoid regression to lower technology levels despite the fact that, in the late 20th Century, it became the first continental nation in history to rely on automobiles and trucks to develop its economy and tie together its territory. This conquest was as important for Brazil as the development of trans-Atlantic navigation was for Europe five centuries ago or the opening of canals in China's interior nearly a thousand years ago.

In trying to build a railroad network in the 19th Century and maintain a modern highway system today, Brazil still faces the classic difficulty of sustaining a complex and expensive infrastructure with low population densities. "Since railways are economical only in densely populated areas, the density of railway networks themselves, measured in meters of railway line per square Km of territory is low in sparsely populated countries, even those at high technological levels," observed the Danish economist Ester Boserup in *Population and Technological Change*. A country with Brazil's natural wealth is economically capable of sustaining a complex and extensive transport network. By 1913 Brazil had built the world's 10th largest railroad system, but this and other forms of transport infrastructure are decaying fast from lack of investment and maintenance. Boserup added: "In all periods of human history wide differences have existed among societies which developed rapidly, stagnant societies, and societies which reverted from more developed to more primitive levels." Brazil must avoid this kind of regression.

As late as the 18th Century, high transport costs prevented most food from being moved more than 15 Km. In pre-industrial Europe, wrote Fernand Braudel in *The Wheels of Commerce*, "When goods traveled, they naturally increased in price the further they went." Railroads opened new horizons everywhere, but in Brazil costly transport and lack of human and financial capital helped to breed long-term inflationary trends. According to the economic historian Nathaniel Leff: "There was virtually no canal construction [and] the country's rivers remained without improvements....Depressed prices in the domestic agricultural sector were reflected in small marginal-value product for labor and repeatedly in widespread substitution of leisure for monetary income. High transport costs for bulky foodstuffs also had an important intersectoral effect. The country's steep price-distance gradients in regional markets limited the economy's capacity to draw on distant supplies in

the face of buoyant demand conditions. Expanding aggregate demand therefore generated inflationary pressures". During World War II, when the United States explored the possibilities of a strategic alliance with Brazil, the head of a U.S. technical mission observed:

Brazil has not got around to building any sort of integrated transport system at all. Most of her hundreds of rivers are laced with rapids and shoals so that freight carried along them has to be frequently portaged. Only on the Amazon...can ocean ships make their way far into the interior. Brazil has not yet made her water highways navigable. Her roads are still the paths of men on foot, of horses, mules and oxen, of wheeled vehicles drawn by animals; they are not yet adjusted to automobile traffic. Her railroads are still largely made up of short lines radiating from the coast towns like sticks of a fan. Only one line crosses the country from east to west; only one inland road of about 125 miles [200 Km] cuts down the windings and twists of the river it parallels along the western border. Rails have not been laid to some of the most important sources of raw materials; still fewer connect the places where they are produced with the places where they are fabricated; fewer still carry them to the consumer.

The isolation of Brazil's continental interior from the world economy presented daunting obstacles. Until 1915, when Col. Candido Rondon completed an 800-mile telegraph line and footpath from the Madeira River in Mato Grosso to Cuiabá, a traveler from the rubber port of Santo Antônio on the Madeira, the main source of the state government's revenues, could only reach Cuiabá, the state capital, by a journey of several months, by boat down the Amazon and along the Atlantic Coast to Buenos Aires and then north along the Paraná and Paraguay Rivers to Mato Grosso. Only in the 1950s did the path along the telegraph line become a road, now known as BR-364, at the same time as access by land to the northern cities of São Luiz and Belém was created by the Belém-Brasília highway. Tragically, these and other major highways are so badly maintained that they are becoming an obstacle to efficient transportation.

For 160 years, Brazilian engineers, politicians and military strategists have shown ingenuity and persistence in devising ambitious transportation plans to overcome the natural and economic barriers to territorial integration. The Transport Ministry recorded no fewer than 27 plans published between 1838 and 1973. The Rebelo Plan (1838) proposed three Royal Highways linking the capital, Rio de Janeiro, to Belém at the mouth of the Amazon River, Mato Grosso in the Far West and Porto Alegre in the far south. The Moraes Plan (1869) advocated a network of interlocking railroads, canals and navigable rivers. The Rebouças Plan (1874), inspired by the U.S. transcontinental railways, designed a tiered system of 10 east-west railroads crossing Brazil in parallel paths. Despite many difficulties and failures, the visionary mystique of these plans was redeemed in the creation of large railroad and highways systems over the next century. The fiascoes won more public attention than the successes.

Rail and river traffic was caught in a tangle of laws and rules from the 1930s that frustrated their development. Cartelizing laws protected port operators and unions and blocked the development of inland and maritime navigation. Because of excessive interference by the state, these two transport systems, normally preferable to road transportation for cargo shipments, were chosen only when there were no alternatives. Cargo became restricted to certain types of commodities such as grains, cement, petroleum derivatives, and mineral and iron, rather than machines, manufacturing equipment, and vehicles whose costs could have been lowered if they were shipped by river or rail. Transportation consumes 20% of Brazil's energy supply, with motor vehicles absorbing 90% of energy used in transportation. A truck of average size consumes 6 to 25 times more energy than water transport and twice as much as rail for moving the same weight.

Neglect and backwardness are expensive. In the United States, a ton of grain for export can reach a port by rail for \$9; in Brazil, the cost to ship by road ranges from \$25 to \$40, as

transportation costs often absorb 8% to 15% of the price of exports. Furthermore, in Santos or Rio de Janeiro, it costs almost \$190,000 to move 300 containers, while in Buenos Aires, the cost is \$98,000, and in Montevideo, \$69,000. In the United States, 25% of freight is sent through pipelines, the cheapest system of transportation available; in Brazil, 3.8%, because of the Petrobrás monopoly and the low use of natural gas. The federal railroad network's annual deficit for the past 15 years was roughly \$380 million. In the 1970s, the Ministry of Transport used the equivalent of 2% of GDP to develop and maintain the transport infrastructure versus only 0.2% today. These figures point to a solution: privatization, already under way. For any solution, public or private, there is a price to pay to avoid a return to more primitive forms of economic life. Some estimates see the need for annual investments of \$12 billion to meet the needs of transport infrastructure. Recently Transport Minister Eliseu Padilha announced that \$8.2 billion will be invested over the next four years in roads, railways, river systems and ports.

Brazil is paying dearly for its wasteful transportation system. To measure the cost, we would have to add the excessive shipping charges, the loss of output inflicted by slower economic growth and the subsidies demanded to offset high transportation costs. These burdens contributed heavily to the shrinking of South America's share of world exports, from 12.5% in the 1950s to 3.5% in 1990. It is hard to understand how these inefficiencies have persisted for so long.

Deteriorating Highways

The World Bank reported in 1988: "The developing world's road building boom in the 1960s and 1970s created an infrastructure that has been crumbling in the 1980s and threatens to collapse in the 1990s if not quickly strengthened and protected. Large road networks, built at great expense, have been inadequately maintained and used more heavily than expected. The result in many developing countries is a network of deteriorating roads. Many roads are in such poor condition that normal maintenance is no longer sufficient or effective." Roughly \$60 billion worth of roads have been lost through bad maintenance in the 85 poorer countries, a loss that could have been avoided with preventive maintenance costing less than \$16 billion. Brazilian roads are part of this problem. The Brazilian economy depends on road transport for carrying 57% of all freight and 96% of all passengers, with a network of 157,000 Km of paved highways and 1.4 million Km of unpaved roads.

The paved network is one-fifth of France's, half of Italy's, and 26 times less than in the United States. Announcing a 150-day program to patch potholes in the 64,000 Km of federal highways, President Fernando Henrique Cardoso lamented:

The potholes make life difficult for motorists, increase fuel consumption, wear out cars, delay freight deliveries and, this part is dramatic, cause accidents and deaths.....The federal government cannot care for all its highways. It has been proven that private enterprise can maintain part of the system. This is happening on roads linking Rio de Janeiro and São Paulo, Rio de Janeiro and Teresópolis, Rio and Juiz de Fora, Osório and Porto Alegre in Rio Grande do Sul and the Rio Niterói bridge. And you who have driven on these stretches can testify to the fact that the toll paid guarantees better roads. We will continue to privatize and to transfer stretches of road to the states.

In 1950-80, Brazil's GDP grew at an annual rate of 7.2%. Fast growth demanded transportation infrastructure that was cheap and quick to build. The only choice available was roads. Road construction was financed by the National Highway Fund, created in 1945 with fuel taxes. In the next three decades, Brazil multiplied its highway network tenfold. By the end of the 1950s, the incipient highway network, made up mostly of dirt roads, precariously supported truck traffic. The new automotive industry supplied the vehicles. Road transport thus provided the basic conditions for development. When President Juscelino Kubitschek took office in 1955, the country had 5,000 Km of paved roads. Four

year later, there were 15,000 Km. However, the paved network has grown slowly in recent years. From 1969 to 1975, the federal network grew by 3,000 Km a year; in 1985-90, by 780 Km. Since then, expansion has been almost nil due mainly to the abolition of the National Highway Fund in 1988.

Of the paved roads, 35% are in bad condition, 34% fair and 31% good. On federal paved highways, 47% have no road signs or signals. For more than 10 years there has been no systematic program of road maintenance, which is done only sporadically or in case of a calamity. Some stretches appearing on maps as paved are so deteriorated that they are now dirt roads. The federal highways are virtually unpoliced. The number of accidents and robberies is growing. Between January 1, 1994 and May 1995, there were 117,331 accidents with 9,724 deaths, an average of 230 accidents a day with 200 people injured and 20 dead, with one of the highest rates of traffic accidents in the world. In 1995, robberies of freight and trucks totaled \$103 million. Television news programs show truck drivers, pressured by competition, trying to stay awake by taking pep pills in a dangerous attempt to make the run from São Paulo to Porto Velho on bad roads in 48 hours. Recently two trucks, both carrying explosive materials, collided on the Belém-Brasília highway, causing a blast that killed 17 people. São Paulo authorities report that trucks carrying dangerous materials are involved in five accidents each month in the metropolitan area.

All this raises freight costs, makes insurance hard to obtain, reduces the useful life of vehicles and increases operating costs. In 1994, of the 73 scales for weighing trucks, only 21 were working. The others were broken. Thus paved roads were eroded by intense traffic of heavy trucks. The 1.4 million Km of unpaved roads are in worse shape, with many of them impassable during the rainy season. The BNDES estimates that the concentration of freight on roads leads to an annual loss of from \$5 to \$7 billion for lack of more economic means of transportation. The ton per Km. cost in Brazil is around \$0.020. In other countries with a big land mass, such as the United States, Canada, and Russia, the cost ranges from about \$0.009 to \$0.012. The deterioration of roads and the lack of investment and maintenance comes from neglect of some basic principles of infrastructure policy as outlined by the OECD:

Transport infrastructure provides capacity (traffic lanes, runways or railway lines), as well as their durability (thickness of pavement). If infrastructure is unpriced, users ignore their contribution to congestion and infrastructure wear in their travel decisions with the result that social costs of transport exceed private costs. In principle, the user and not the taxpayer should pay the full cost of the trip, and the authorities should set congestion and infrastructure wear charges to close this gap (pricing rule)...If the returns to capacity and durability are constant, marginal cost pricing will fully cover capital and operating costs.

The lack of highway investment is provoking the same response as the one for ports and railroads: concessions to private companies. In 1993, the National Highway Department (DNER) began the Program for Federal Road Concessions. By the end of 1996, there were concessions for more than a 1,000 Km, the most important of which was the Via Dutra, the highway linking São Paulo and Rio de Janeiro. The goal for 1997 is 4,000-5,000 Km. Concessions are for 25 years, with revenues coming from tolls.

The program started well. The first concessions are already at work, restoring roads and investing a good deal more than forecast in government budgets. The president of the Association of Cargo Transport for the Vale do Paraíba says that privatization of the Dutra highway increased productivity by 20% and reduced operating costs. The stretches of road conceded to private companies are the busiest ones, giving investors a return on their money while economizing public funds needed to conserve and operate them.

There always will be a large part of the network unattractive to private investors. But some roads with low traffic volume play an important part in local and regional economies. Government efforts will be needed to expand networks by opening roads into new regions

and conserving those roads for which it is responsible. Private concessions will not free the government totally from its investment in roads.

Strangled Cities

At the end of the 1950s, Brazil had no megalopolis. Only two cities, Rio and São Paulo, had more than a million people. Medium and small cities were islands in the vast rural sprawl linked by a precarious network of roads and railways. Many cities had streetcars. In some, the rails were so extensive that, if they had been preserved, they would be respected even today. In Rio de Janeiro, there were more than 400 Km of streetcar lines carrying more than a million passengers a day, almost 10 times the 44 Km of today's São Paulo subway system. Today São Paulo's monstrous traffic jams back up cars and trucks for 120 Km.

In 1960, São Paulo had 164,000 vehicles, or one for every 22 inhabitants. Although São Paulo now has 10,000 Km of paved streets, they are not enough for the city's 4.8 million vehicles, roughly one for every two people. Streetcars were seen as a traffic obstacle by car owners and soon taken off the streets with no thought given to their modernization, as was done in many European cities. With cars given total priority, streets were widened, and viaducts and bridges built until there was no room for any more. Politicians opted for showy projects for surface display instead of caring for existing structures and investing in public transportation. Thus fissures appeared in the Ponte dos Remédios, a bridge on the Marginal do Tiete freeway, that appeared after 30 years without maintenance, causing enormous traffic jams and serving as an alert to the deterioration of 25 of the city's other bridges.

Any work on the traffic problem should be part of a plan with broader scope, which means a policy for urban transportation giving total priority to buses, subways streetcars or trains, either by providing new facilities or upgrading those in existence. While cars carry an average of 1.5 passengers, the average for buses is 60. Economics and good sense points to priority for buses on heavily trafficked and congested streets. The automobile industry was good for Brazil. It created jobs and parts factories and helped to modernize other industries. However, it also brought daily traffic jams, the breakdown of traditional centers and excessive noise and pollution, so that by the mid-1970s federal authorities and a few cities began to become concerned with urban transportation. A National Fund for Urban Transport was created. Hundreds of technicians were trained and a few subways built. Suburban trains were renovated in Rio and São Paulo. The quality of bus service improved. All of this led to a fruitful decade for urban transportation - 1975/1985. But there was no continuity of effort, at first because urban transport was no longer a priority and later because the 1988 Constitution abolished the Fund for Urban Transport.

To make things worse, the automobile industry plans investment at the same rate as 40 years ago: \$21 billion by 2000, adding two million new vehicles a year to already congested streets, with no place to park. Meanwhile, bankrupt state governments are offering billions of dollars in subsidies and incentives to attract automobile manufacturers already burdened with excess capacity worldwide.

There are encouraging signs of declining tolerance for the perverse effects of urban saturation by automobiles. A good example of this is the rotating circulation of vehicles, with one-fifth of all cars and trucks kept off the streets on each workday, started in São Paulo in June 1997. According to opinion polls, 70% of the population supports the rodízio. Originally intended to reduce pollution, popular approval apparently comes from its easing of traffic jams. As Roberto Pompeu de Toledo observed in *Veja* magazine, "this suggests two things of interest not only to paulistas but to Brazilians at large: one in excess there in shortage. The excess is of cars. The shortage is of social solidarity."

Otherwise, monetary stability has stimulated increased travel, both in public and personal transportation. Of all cars now circulating in São Paulo, 20% were produced since 1994. Traffic jams will continue to grow without new investments in mass transportation. Buses and subways could provide alternatives to automobiles, but plans announced so far are

meager and inadequate. For São Paulo, 13 Km. of new subway lines are planned. By the year 2000, if all goes well, São Paulo will have 57 Km of subways, when it should have at least 200 Km. Problems of congested urban transport can be intractable. Large sums can be invested just to prevent congestion from getting worse. In central Paris, preference for using private cars remains strong, despite improvements in public transport, reducing and charging more for parking space, providing express lanes for buses and expanding pedestrian walking areas. These measures may have slowed the rise of car use without reversing it.

Yet the cost of inaction is very high. Investments are expensive and projects slow to come on line. In the present framework of public finance, investments in urban transport will have to come mainly from state and municipal budgets with some participation by the federal government financial institutions. Creating a specific fund as was done in the 1970s would require higher fares and taxes, which is the price to be paid for decades of neglect.

Idle Rivers and Ports

How can a country with such abundant water resources, with an immense coast and so many big rivers, have so little navigation? Only 18% of goods are shipped by water. In the United States, 70% of soybean production is transported on rivers; in Brazil, only 2%. This is a general problem, extending even to Europe's much more developed river and canal system. France's heavily-regulated river-borne freight fell from 14 billion ton-Km in 1970 to six billion in 1993, mainly caused by declining shipments of farm products, petroleum and coal. A big canal linking the Rhine and Rhone rivers is being completed at public expense and is expected to run at a loss.

With a more dynamic economy, greater shipping distances and more abundant water and labor resources, Brazil has more potential for efficient river transport. This is shown in pioneering initiatives such the new shipments of soybeans on the hazardous 1,115 Km of the Rio Madeira from Porto Velho, Rondônia, to Itacoatiara, near Manaus, for loading on ocean-going ships bound for Rotterdam. Using new radar and electronic sensing devices to detect large floating debris and sudden shifts in the Madeira's turbulent course, these barge trains would export three million tons yearly of new tropical varieties of soybeans harvested in pioneer areas of Rondônia, Mato Grosso and Acre. The cost of trucking and barging from the farms to Itacoatiara is estimated by Grupo Maggi, which operates the system, at \$60 per ton, against \$95-\$110 per ton for truck transport to the port of Santos, roughly 40% of the producer's price.

Until now, confused legislation from the 1930s fostered union protection in ports and on ships, pushing up costs and reducing their use for more than half a century. Costly and clumsy port legislation made it easier to use trucks instead of ships, even for distances which at first glance would give coastal shipping an advantage, such as between São Paulo and Belém (3,000 Km). It costs \$110 a ton to send freight by highway from São Paulo to Buenos Aires. By water, it would cost \$60. This will be possible in 1998, when building of the canal lock of the Jupia dam in Paraná is completed. It is part of the Tietê-Paraná waterway which is now operating between the port of São Simão (Goiás) and Pederneiras (São Paulo), reducing the cost of taking the soybean harvest from the south of Goiás to the port of Santos for export. A ship carries the same load as 85 trucks, but consumes only as much fuel as 14 trucks.

A 1966 decree sought to modernize the ports, but was never implemented. In time, it was forgotten, partly because other legal instruments slowly invalidated some of its most important items. Had that decree been enforced almost 30 years before the Port Modernization Law of 1993, we would have a more efficient transport system today.

Since 1808, when King João VI opened Brazil to foreign trade, the ports have been built along rivers and the coast, so that today 35 ports are in operation, excluding special terminals, which is too many. Public resources are pulverized in too many projects instead of

focusing on priorities. Some ports should be closed and new ones built in response to the changing needs of a developing economy.

Almost all ports are run by federal and state governments. Presidents and directors of port authorities are chosen by politicians for political reasons, often without experience in port management. CODESP (the Dock Company of the State of São Paulo) which manages the port of Santos, the largest in Latin America, had eight presidents in the past 16 years. The Federal Constitution empowers the Union to manage all ports, or provide concessions, permission, or authorization for others to do so.

In the 1950s, with water transport declining, the kind of cargo moving through ports had changed. More manufactured and semi-finished goods were sent by road, leaving bulk cargo for water transport. Today, general cargo accounts for only 9% of total port business. The new profile required a rapid change in ship design and port operations to accommodate containers and grain and the larger vessels now dominating ocean transport. Today most Brazilian port loading and unloading equipment and storage facilities are obsolete, and docks cannot accommodate large seagoing vessels.

All of this means higher costs acting as a restraint on trade, mainly exports. According to the World Bank, handling a 15-ton container in Brazilian ports costs three to four times more than in European ports and twice as much as in Buenos Aires. Stowage is \$23 a ton in Brazil, \$4.20 in Hamburg, and \$5.60 in Jacksonville (USA). Costs also rise because of lack of the proper space for storing containers, theft on docks and ships, use of unsuitable equipment, and time lost waiting to unload. A 10,000 ton cargo capacity ship, when idle, can cost \$15-20,000 a day, reaching \$25,000 for larger ships. The Brazilian Steel Institute shows that loading a ton of flat steel in Praia Mole in Espírito Santo costs \$23 versus the average worldwide of \$7. The average cost of bringing steel into port in Brazil is \$22, versus \$18 worldwide. Exporters become uncompetitive. It is as if they pay an extra tax to sell their goods overseas. With most Brazilian foreign trade going by sea, any increase in port costs is a burden, just as any reduction is an incentive.

With the abolition of Portobrás in 1990 and the port modernization law of 1993, the ports began to change. Portobrás, founded in 1975, was a state company that controlled 25 ports. Portobrás was created because the military regime believed that only the government could properly administer strategic installations such as ports. At Portobrás, the new administration did little or nothing to improve ports. Excessive centralization hindered management of daily operations. When Portobrás was dismantled, all its ports passed into the hands of dock companies. But the new management made no improvements. The organizational structure is bizarre. Estrela, a river port in Rio Grande do Sul, is supervised by the Companhia de Docas of São Paulo, the port of Manaus by the Companhia de Docas in Maranhão. One form of centralized administration was replaced by another.

Terminals for Private Use, authorized to handle third party cargoes by the port modernization law, continually increase their market share. Along with the obsolescence of traditional ports, the spread of bulk shipping and containers brought about this apparently irreversible change. Today, more than 500 different types of terminals are in business in Brazil. Private terminals are much more productive than public ports. Antiquated legislation regulating port operations, before the introduction of modern equipment and automation, forced excessive hiring. The port modernization law abolished the union labor monopoly and established the Port Operator, a port management concessionaire. The operators in each port should create an agency for hiring labor. Rates posed another problem. Until the publication of the modernization law, port rates were governed by a 1934 decree, creating uniform procedures for all ports, curbing competition among them. Lack of competition blocked natural selection that would enable only the more efficient ports to survive. Each port charged for services on a cost-plus basis. In many North American and European ports, services are a commercial activity like any other, and prices are negotiated freely without government interference.

Financing for port investments came from the Tax for Port Improvement, created in 1958 from a percentage of the value of cargo shipped. Under the 1988 Constitution, this tax was canceled and replaced by a 20% tax on all port rates (ATP). Resources from ATP were to be used for the conservation, improvement and expansion of port installations. It averaged \$150 million yearly, far short of needs. In 1996, the ATP was abolished.

Privatization of the ports is beginning. Most Brazilian ports are located in highly valued central areas, built through the years to handle general cargo. Modernizing them should center on the specialization and automatization needed to handle bulk cargo and containers which could then free areas for other businesses that today are occupied by warehouses and equipment of little or no use. Investments for modernization cannot be drawn from public funds already committed; they will have to come from other sources. In Santos, notorious for its high costs, investments by private companies appears to be opening the way to a new era. Of the \$1.5 billion to be invested in the port by 1998, only one-third would be public funds.

Restoring the Railroads

In 1835 the government authorized 40-year concessions for companies interested in building railroads linking the capital and the provinces of Minas Gerais, São Paulo and Rio Grande do Sul. Concessionaires were granted a construction subsidy as well as tax exemptions and land beside the tracks. However, the tracks would have to pass through any village, town and private estate mandated by the Crown. In the United States during the same period, the only requirement for railroad building rights was to carry the mail.

The incentives were considered too small and failed to interest investors. In 1852 another law added a guarantee of 6% interest on capital invested to build railroads in any part of the country, profitable or not. Thus from the start, Brazilian railroads did not have to make money. The first person to take advantage of this incentive was Baron Mauá who built 14 Km, the first South American railroad, linking Rio de Janeiro and Petrópolis. By the time the Republic was proclaimed in 1889, other concessions had provided the country with 9,583 Km of track. By 1898, subsidies to private railroads absorbed one-third of the federal budget, driving the government into a wave of expropriations. During the First Republic, the railroad network grew by 240%, with two-thirds of the system owned by the federal and state governments by 1930.

Centralized state control of the railroads was completed in the 1950s. The height of State interference came in 1976 when the government ruled that, except when expressly authorized by the Transport Ministry, government freight could be sent only by rail. At this time, construction of the legendary Ferrovia do Aço (Steel Railway) was started over difficult terrain without detailed engineering plans to carry iron ore from Minas Gerais to the government steel mill in Volta Redonda, Rio de Janeiro. After many delays, construction cost \$4 billion or \$12 million per Km. In a new book, *Transporte e Corrupção*, Lafayette Prado explains:

One deadline after another was postponed. Engineering plans were constantly altered. Landfill stretches were reduced and tunnels widened. Then these decisions were reversed, expanding landfills and viaducts. Cost estimates were constantly changed. One simplification of the route, with construction already underway, wasted work on earth-moving, bridges and viaducts. The flow of funds was always haphazard and construction often stopped. Improvised solutions to obtain national or foreign funding were loudly proclaimed, but ended in nothing.

Brazil's railway system has 30,223 Km of rail lines which, in 1995, moved 260 million tons of cargo. More than half of this total—148 million tons—was carried on the Companhia Vale do Rio Doce's 1,978 Km of rail. The main cargo for the whole Brazilian railroad system was iron ore: 159 million tons. Thus more than half the freight shipped used only 6%

of the rails and 60% was one product. Other cargoes are steel products, petroleum derivatives, lime, mineral charcoal, and grains. Only 10% of the agricultural harvest uses trains. The farmer is forced to market his output by truck, because railroads cannot meet his needs. Long-distance passenger transport is negligible. Suburban trains are uncomfortable, dangerous and often late or canceled, despite huge subsidies.

As in many other countries, Brazil's railroad system has been run by the state, in concessions, construction and management. Creation of the Federal Railway Network (RFFSA) in 1957 put 18 railroads under a single command. In 1971, the São Paulo state railroad (FEPASA) was formed by joining five other railroads. Instead of gaining economies of scale, both companies became even less competitive as political influence in management grew.

The decline of railroads is a worldwide phenomenon, but many countries—even poor ones such as India— have avoided Brazil's calamitous performance. Private U.S. railroads have abandoned passenger service but freight traffic is booming. Neglect of the business side of operation is part of the story, apparently due to a view that it was not fitting for state companies to go after customers, train personnel or adopt new technology. They lost their share of cargo traffic because of poor productivity and equipment idled for lack of maintenance, with nearly 50% of locomotives waiting for parts. Railroads should carry at least 30% of the country's cargo, which would be feasible if more of the harvest is carried and new customers found with goods going more than 500 Km, a distance at which rail is normally more efficient than truck.

RFFSA always operated at a loss. For some of its divisions, expenses were several times more than revenues. Over the past 15 years, the annual deficit was \$380 million. Its survival depended on enormous government subsidies, thus increasing the public deficit. As with almost all state companies, it had chronic debts to the social security agency and its employee retirement fund. In fact, they reached \$1.5 billion and \$500 million, respectively. To make privatization possible, the federal treasury assumed these and other debts, paying social security with 12-year bonds with a four-year grace period.

RFFSA's administrative incompetence is so great that it has \$4 billion in real estate that could be sold to pay debts and implement a modernization program. This option was never considered. The laxness of the railroads has affected the industrial complex related to this sector. In the recent past, the Brazilian railroad equipment industry had capacity to produce 9,000 freight cars and 150 locomotives a year.

It has been in crisis for 15 years due to lack of orders, with idle capacity more than 80%. The only way to revive and expand the railroads is through privatization, already under way. In 1996, a few railways were conceded to private operators. By the end of 1997, the railroad sector as a whole will be in private hands. Concessions are for 30 years. The concessionaire is committed to a program of investments and goals spelled out in its lease. The southern RFFSA network (6,586 Km) is being leased for a minimum price of \$158 million and a commitment to invest \$1.3 billion in 30 years, \$276 million in the first five years. The contract further stipulates that during these five years productivity should be up 60% and accidents down 40%. The Northeast network of 4,600 Km of track, known as RFFSA's Ugly Duckling because of its operational and financial failures, was sold to a group of private investors for only \$14 million.

Since the first concession in March of 1996, the new operators are hiring salesmen to find new customers and buying insurance to protect their assets. They should make a profit in the short term, even without heavy initial investments. Abolishing inefficiencies inherent in public service would include getting rid of excess personnel, renovating locomotives, training employees and improving marketing. Later, increased demand could lead to new investments to upgrade track and rolling stock. The first privatized railroad, Baurú-Corumbá managed a turnaround in only ten months, making a profit with a minimum of investment.

We need more pipelines

One thing that stands out is Brazil's low use of pipelines. Pipelines are the cheapest form of transportation for liquids or gas in bulk. Argentina has a network of roughly 10,000 Km of gas pipelines, so it can use natural gas as the fuel for a fleet of 380,000 vehicles. In Brazil there are only 7,000 gas-powered vehicles. Brazil should have a network of at least 100,000 Km of pipeline instead of only 7,371 today. Initial investments for pipeline construction are high, but operating and maintenance costs are low and accident hazards are few. The reason for their limited use in Brazil is the Petrobrás monopoly. Lack of pipelines not only increases fuel prices and living costs but leads to increased use of heavy trucks, overcrowding and destroying roads while hindering use of natural gas which pollutes less than gasoline. Petrobrás invested little in pipelines and created obstacles for anyone who might want to do so. Argentina wanted to supply gas to the south of Brazil for half the price charged by Petrobrás. Government and businessmen in the region joined forces to construct a gas pipeline, threatening the monopoly. The 1988 Constitution then resolved that only state entities could transport gas through pipelines.

Steps are being taken now to build a denser pipeline network in Brazil, with 2,507 Km in construction, 8,421 Km in the planning stage and 789 Km under study. Among the major projects is a multi-purpose pipeline 976 Km long, with an investment of some \$385 million, linking the Petrobrás Paulínia refinery in São Paulo and Brasília, to carry various types of fuel. Start-up is scheduled for 1997 and could mean an annual economy of \$250 million in transportation costs. The cost of bringing fuel to the region will drop by two-thirds. It also will eliminate 90,000 truck trips a year.

Another pipeline, 394 Km long, was inaugurated recently in Bahia and will save \$20 million annually in road freight. Finally, the most important initiative in this field is construction of a 3,061 Km. gas pipeline between Brazil and Bolivia costing \$1.8 billion, with operation starting in 1999. Another planned gas pipeline would be 3,115 Km linking Salta, in Argentina, and São Paulo. When the Petrobrás monopoly ends, after regulation is completed regarding bids and concessions to private companies for pumping, refining and transporting petroleum products, the national pipeline network should grow rapidly.

Freeing air transportation

Though its overall volumes are small, air transport plays a key role in business and tourism. Only recently has there been some deregulation in Brazil. State control retarded expansion for decades. Airlines were protected from competition among themselves and with foreign carriers. The government made rules for everything from prices and flight frequency to types of aircraft. The cartel charged high fares and gave passengers few options.

In the 1990s, less regulation brought growth of regional airlines, more competition with foreign carriers and more charter flights. With fewer rules, while protected by the government and the domestic market still cartelized, airlines met the challenge of more freedom. The number of companies grew, new services were provided and airlines began to offer discounts. New customers appeared: 75% of the passengers on chartered flights had never traveled by air before. From 1994 to 1995, passenger travel grew by 17% and cargo transport by 13%, while GDP was up 4% and 5%.

Years of protection created a mentality averse to competition, fostering the belief that higher ticket prices generated more revenues, forgetting price elasticity studies elsewhere that found revenue increases based on cutting prices and increasing passengers loads. Companies claim that domestic prices are high because of the cost of fuel, airport facilities, and excessive welfare expenses. Brazilian aviation kerosene costs twice as much as in the United States.

We are heading for lower air fares. The market will grow, reaching figures more in line with

Brazil's size, population and GDP. The number of passengers per year in Brazil is roughly 50 million, less than in any big airport in Europe or North America. Airport services are in the hands of the government, specifically the Aviation Ministry. The federal government manages 64 airports through Infraero, its operating company, while state governments run some smaller airports. The next step is to allow private enterprise to build and manage airports.

We Must Invest More

Brazilian transportation has been crippled by the indifference of successive governments to finding a better way of doing business. Interest of populist politicians in maintaining the status quo held sway, principally for the port sector. Businessmen chose the practical way — using road transportation that eluded government red tape. With union protection and confused laws, increased costs prevailed. The price of inefficiency is very high and paid by the consumer, as producers or sellers cannot cover the outrageous prices charged to ship their goods. Paid, too, by the Treasury, which covers deficits of the sector's state-run companies, and by Social Security, because of the constant default of these companies. All of this adds to the public debt.

The lack of well equipped terminals also makes it difficult to apply intermodality, using different modes of transportation between the starting point of a shipment and its final destination. The total cost of transportation is the sum of diverse factors: the operational cost of the vehicle, the need to stock merchandise, insurance, storage, transshipment, financial costs, losses, damages, and theft. Efficient use of the different kinds of transportation would help to adopt an integrated system.

Within Mercosul, transportation adds unnecessary costs to trade between countries. Past military strategic thinking set up physical obstacles to integration. Today, there are different railroad gauges, loss of time and money with transshipments, excessive red tape at borders, lack of regular ship lines, poorly conserved roads and few alternatives for going from one country to another. Ground transportation between Brazil and Argentina relies on a single bridge with limited capacity. These conditions are quite different from those found in other common markets where the infrastructure and transportation services stimulate integration among the countries.

With efforts equal to the challenges, there will be a great forward step in development on our continent, with Brazil in the lead. This is the vision of Eliezer Batista, ex-President of CVRD, in a new study of Infrastructure for Sustainable Development and Integration of South America. According to Batista, development in South America of new and integrated logistical, energy and telecommunications infrastructure shows "a tremendous potential for synergistic development. Innovations in technology, and changes in national policies for regulation, have opened new opportunities" for creating a big regional market for industrial and agricultural products to generate the economies of scale needed for international export competition. This is starting to happen in the Mercosul, both in trade and infrastructure improvements.

Both Brazil and Argentina have started to grant road concessions to private enterprise and are making road improvement in Mercosul a priority. A 42-km. bridge over the River Plate, linking Uruguay and Argentina, should be open to bids in 1997. Projects to increase traffic capacity and restore roads are in progress. Lanes in the highway from Belo Horizonte to Florianópolis and Osório (RGS), almost 2,000 Km are in the phase of duplication at a cost of \$3 billion. They could evolve into a superhighway between Belo Horizonte and Buenos Aires. Restoring the stretch between Porto Alegre and Uruguaiiana is in full swing. On the third anniversary of the Real Plan, President Fernando Henrique Cardoso called these improvements "the biggest highway project being carried out in the world."

Privatization of transportation could reduce the Custo Brasil by 25% to 30%, if Brazil can realize the efficiency gains achieved after privatization in Britain and Argentina. When an

investor takes over a government service, he generally acquires two parts. The first can be evaluated as a base for pricing its physical assets. The second is an invisible value which could be even greater than the first. The invisible part is created by the unstable nature of public administration, an array of unsatisfactory practices, hard to erase: management with no commitment to continuity, political appointments for technical jobs, excessive red tape, lack of a human resources policy, and little or no concern for the consumer. The gains possible from this invisible part explains why companies chronically doing business at a loss begin to show a profit a shortly after privatization when the only investment is in better management.

We can be sure of the positive influence of privatization on transports only if effective regulatory mechanisms are developed, avoiding the formation of cartels and other instruments of privilege. Since 1990, some initiatives have taken shape such as creation of the Consumer Defense Code (CADE), the Economic Law Secretariat, Associations for Consumer Defense and Small Claims Courts. In privatizing transport infrastructure as well as electricity and telecommunications concessions, Brazil only has begun to face the huge political and technical problems of regulation described here by the OECD:

The traditional theory of regulation takes for granted that policies serve the public interest by correcting some form of market failure. The weakness of this view is that social welfare maximization is rarely the sole criterion for managing the regulation or running a regulated firm. For several reasons, regulation can create, not eliminate, inefficiencies. For example, well-organized groups will tend to benefit more from regulation than broad, diffuse ones and the regulator will seek to preserve a politically optimal distribution of rents across the coalition of well-organized groups. In addition, asymmetric information between the regulator and regulated could lead to badly designed intervention and regulatory constraints [and] could lead to a provision of services which fails to significantly minimize costs. These problems are in addition to the direct costs imposed by regulation.

Transport services have more of this invisible factor than fixed assets sold by the government. How is it possible to measure the losses in ports due to union protection, on roads because of the lack of a minimum of maintenance, and on railroads because of the heavy hand of politics in management? There is no way, and this could be an important factor in increased profitability for concessions, an added stimulus for investment by private companies in transportation.

Changes are inevitable. They are taking place in all branches of transportation. Concessions to the private sector for roads, railroads, airlines and port terminals should improve performance in the short term. In five years or less, we should have a new model for transportation, more rational than the one we have today. Railroads and ship lines should increase their share of the transport business. Costs and shipping time should fall. Use of intermodal transportation should grow. However, one fact stands out: More resources, from either private or public funds, must be invested in developing and maintaining a modern transportation system. If not, we will find ourselves living in a more primitive economy.

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