

TROUBLESOME CONSTRUCTION

IIRSA AND PUBLIC-PRIVATE PARTNERSHIPS
IN ROAD INFRASTRUCTURE

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PREFACE

This study is the outcome of a CEDLA research project on the potential economic, environmental and social implications of the Initiative for Regional Infrastructure Integration in South America, IIRSA.

Throughout the project, Bertus Meins, Chief Cofinancing Division at the Inter-American Development Bank (IDB) in Washington, D.C., has been extremely helpful in providing information and sharing insights into the development of this major infrastructural initiative. His presentation in Amsterdam in May 2005 for an audience of researchers, civil servants, representatives of the private sector and non-governmental organizations, was useful in clarifying the rationale and dynamics of IIRSA and the potential role of public-private partnerships.

As developments in this field are progressing at a high pace, we are delighted that the finalization of this publication could be realized swiftly. For this, we appreciate the highly professional research assistance and editorial support of Marinella Wallis at CEDLA.

Amsterdam, September 22nd, 2006,

Pitou van Dijck, Amsterdam

Simon den Haak, The Hague

LIST OF ABBREVIATIONS

BEC	Construction Engineering Battalion
BNDES	Banco Nacional de Desenvolvimento Econômico e Social
CAF	Corporación Andina de Fomento (Andean Investment Corporation)
CBA	Cost-Benefit Analysis
CONAMA	Conselho Nacional do Meio Ambiente (National Council of the Environment)
CONSEMA	Conselhos Estaduais do Meio Ambiente
DDA	Doha Development Agenda (WTO)
DNIT	Departamento Nacional de Infra-Estrutura de Transportes (National Department of Infrastructure)
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EVTE	Estudos de Viabilidade Técnico-Econômica (Technical and Economical Viability Studies)
FETHAB	Fundo Estadual de Transporte e Habitação (State Fund for Transport and Housing)
FONPLATA	Fondo Financiero para el Desarrollo de la Cuenca del Plata (Financial Fund for the Development of the Rio de la Plata Basin)
FORMAD	Forum Mato-Grossense de Desenvolvimento Sustentável (Mato Grosso Forum for Sustainable Development)
GATT	General Agreement on Tariffs and Trade
GNP	Gross National Product
GNP-PPP	Gross National Product at Purchasing Power Parity
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (The Brazilian Institute of the Environment and Renewable Natural Resources)
IDB	Inter-American Development Bank

IIRSA	Iniciativa para la Integracion de la Infraestructura Regional Suramericana (The Initiative for Regional Infrastructure Integration in South America)
IME	Instituto Militar de Engenharia (Military Institute of Engineering)
MFN	Most-Favoured Nation
MMA	Ministério do Meio Ambiente (Ministry of the Environment)
NTB	Non-Tariff Barrier
PBA	Programa Básico Ambiental (Basic Environmental Programme)
PER	Programa de Exploração da Rodovia (Highway Exploitation Programme).
PIN	Plano de Integração Nacional (National Integration Plan)
PTA	Preferential Trade Area
SEA	Strategic Environmental Assessment
SEET	State Department of Transport
SEMA	Secretaria do Meio Ambiente do Estado (State Secretariat of the Environment)
SINFRA	Secretaria de Estado de Infra-estrutura (Mato Grosso Department of Infrastructure)
SUDAM	Superintendência de Desenvolvimento da Amazônia (Superintendency for the Development of Amazonia)
WTO	World Trade Organization

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IIRSA: THE PLAN

This study analyses the potential role of Public-Private Partnerships (PPPs) in the *Iniciativa para la Integración de la Infraestructura Regional Suramericana*, The Initiative for Regional Infrastructure Integration in South America (IIRSA).

IIRSA is unique in its size and concept as a region-wide plan for integrated infrastructure in Latin America.¹ The initiative was taken on 31st August-1st September 2000 in Brasilia by the heads of state of 12 South American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela. The Initiative aims at contributing to the integration of infrastructure in the region in support of the region-wide strategy of so-called open regionalism, and to strengthen a comprehensive insertion of South America in world markets. It focuses particularly on improving the interconnections among the national road networks in the countries in the region, improvement of strategic waterways and railways, border-crossing facilities, ports and airports, telecommunications and energy facilities. As of now, the IIRSA Strategic Vision 2020 distinguishes ten hubs:

- Mercosur-Chile hub;
- Andean hub;
- Central Interoceanic hub;
- Central Amazon hub;
- Guyana Shield hub;
- Peru-Brazil-Bolivia hub;
- Capricorn hub.
- Southern hub;
- Paraguay-Paraná waterway hub;
- Southern Andean hub.

Map 1.1 shows in a stylized fashion the location of the major hubs in the IIRSA agenda. Maps 1.2 and 1.3 show in more detail roads and corridors in the Peru-Brazil-Bolivia hub and in the Guyanese Shield hub. By April 2005, the countries reached consensus on an implementation agenda for the period 2005-2010 involving 31 projects related to these hubs.

The overall structure of IIRSA involves three regional development banks: the Inter-American Development Bank (IDB), the Andean Development Corporation (CAF) and the Financial Fund for the Development of the Rio de la Plata Basin (FONPLATA). Moreover, the European Investment Bank (EIB) will be involved in view of its particular expertise in the areas of cross-border financial and legal institutional cooperation. All this does not exclude that at a later stage other official and private financial institutions will be involved. Clearly, co-financing arrangements are actively pursued and so are PPP arrangements.

Infrastructure plays a key role in the process of economic growth. Without efficient transportation and communication systems, economic agents face high transaction costs that hamper production, trade, and consumption, and consequently reduce welfare. Particularly countries that pursue export-orientated development policies may suffer greatly from a lack of efficient (transport) infrastructure (Rozas and Sánchez, 2004; Sanchez and Echeverría, 2003). Transportation costs may be expressed in terms of their import tariff equivalents and their impact on welfare may be considered in similar ways.

Given the new economic context in which Latin American countries have been operating since the introduction of the neoliberal model, and in view of the sheer size of the IIRSA programme as laid down in Strategic Vision 2020, the potential impact of the plan on the region's economic geography may be significant through its stimulus to investment, production, and trade. In this way, IIRSA may stimulate the rise of new centres of economic gravity in South America. At the same time, IIRSA may speed up the transformation of land use and threaten the existence of ecosystems, and with it the public goods these systems deliver to the local, regional and global community, including their function as a habitat for indigenous peoples, animals, and plant species. To stimulate the potential welfare-enhancing effects of IIRSA and reduce its negative side effects on the environment and human welfare, appropriate frameworks are required to integrate in an effective and efficient manner economic instruments that support welfare maximization.

Notwithstanding its unique characteristics, innovative structure and significant potentials for the future development of the continent, hardly any academic research has been published on IIRSA so far. Among the distinctive features of this plan is its ambition to make PPP contribute to its implementation and finance. That dimension in particular is focused on in this study.

Financing infrastructure

Traditionally, roads are considered public goods that are of critical importance to economic development, and consequently their construction, maintenance, and finance have been considered among the prime responsibilities of national or federal governments. In recent years, new forms of delivering and financing these goods have been designed to support infrastructural development within the context of limited budgetary possibilities of national governments and stricter efficiency requirements than applied in the past.

PPPs can be defined as long-term contractual relations between the public and private sector, designed for the provision of public services by the private sector, in which both parties have shared (financial) interests. PPPs can take many forms and have some or all of the following characteristics:²

- transfer of public assets or facilities to a private entity (with or without direct payment in return) and for a certain period of time;
- construction, maintenance, operation, finance and exploitation of these assets and facilities by the private entity;
- leasing of privately provided services by the public sector;
- risk-sharing between the public and the private sector;
- public sector determines output and quality standards;
- public sector regulates prices and tariffs;
- performance-based payment schemes;
- re-transfer of the asset or facility to the public sector by the end of the contract period.

The principal advantage of PPPs is that they enable governments to make use of private sector finance, efficiency and innovation, thereby reducing the costs of infrastructure services for the public sector while at the same time improving quality. By means of innovative public management and scope-design, infrastructure projects can be planned and realized in a way that project-induced value added benefits the public and private entities involved in the project, instead of third

parties. For governments with large fiscal problems PPPs can offer interesting opportunities to elevate infrastructure investments and stimulate economic growth.

However, economic theory and the international experience with PPPs over the last decade also show that PPPs are not a guarantee for high-quality and cost-efficient infrastructure. Negative financial and fiscal consequences of PPPs can be substantial, particularly when the organization and regulation of such contracts are not accurately defined. Moreover, a political preference for private finance and investment can sometimes complicate a proper economic analysis and evaluation of infrastructure projects (Jenkinson, 2003, pp.323-25). The decision making process should start with investigating the social welfare implications of a project and of public investment in it.

So far the experience with financing road infrastructure by means of PPP has been limited. More specifically, such partnerships are only in their initial stages with respect to transborder infrastructural development in South America. To study the potential contribution of PPP to the development of IIRSA, this study draws from the experiences in Brazil for three reasons. First, Brazil is among the major initiators of the IIRSA plan, and a substantial part of IIRSA trajectories or IIRSA-related specific infrastructural projects are located in Brazil's national territory or at Brazil's borders. Second, Brazilian standards and approaches may be a critical point of reference in setting region-wide technical and environmental standards related to infrastructural projects. Third, Brazil has gained interesting experience in the design of PPPs for road infrastructure and in the application of infrastructure-related environmental and social impact assessment procedures³.

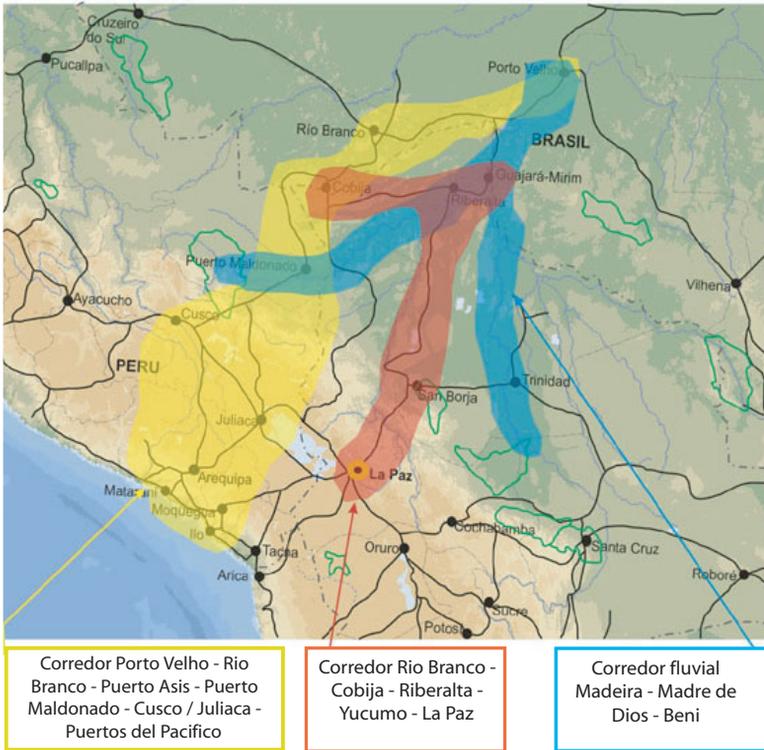
The study is organized as follows. Chapter 2 puts IIRSA into perspective and clarifies its rationale by focusing on the changing position of South America in the international economy and the changing direction of major trade flows. Chapter 3 analyses the need to deepen integration and develop trade-related infrastructure in the new economic context. Chapter 4 presents a theoretical framework for the analysis of the rationale and implications of a PPP for road infrastructure. Chapters 5, 6, and 7 deal with experiences in cooperation between the public and private sector in Brazil: Chapter 5 provides a general overview of the Brazilian approach towards PPP, Chapter 6 focuses on the Programa Estradeiro in the state of Mato Grosso, and Chapter 7 deals particularly with environmental and welfare effects of the BR-163 Cuiabá-Santarém highway. Conclusions are presented in the final chapter.

Map 1.1. The IIRSA hubs.



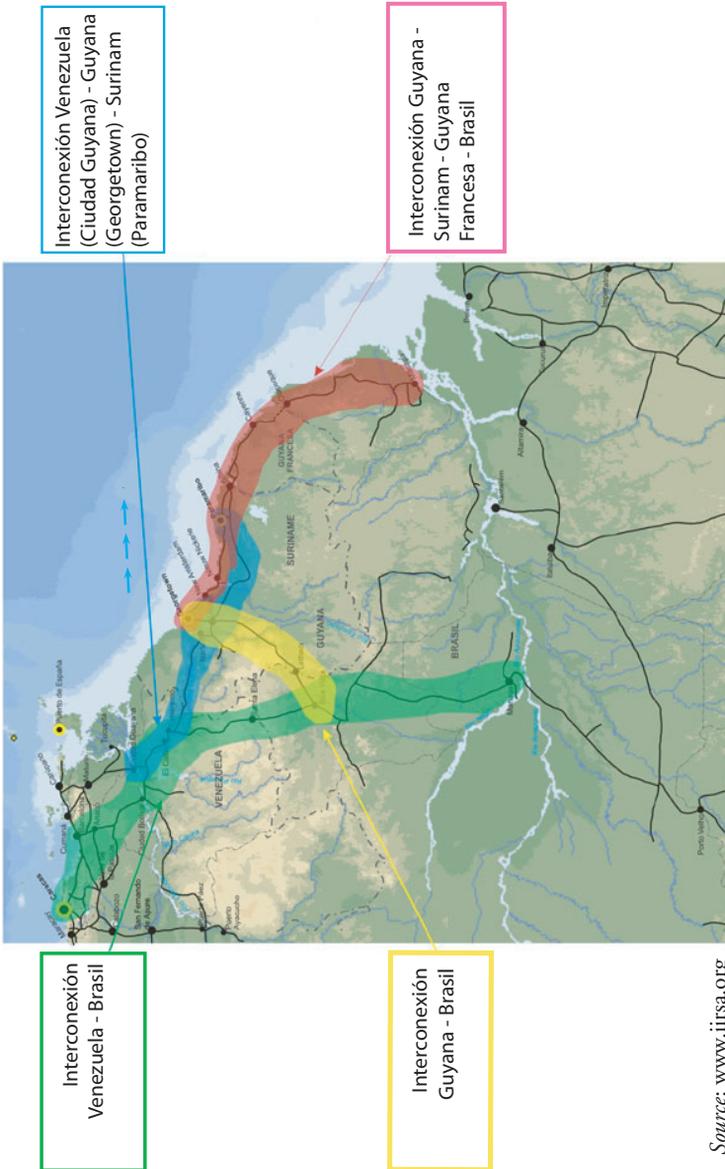
Source: www.iirsa.org

Map 1.2. IIRSA hub: Peru - Brazil - Bolivia.



Source: www.iirsa.org

Map 1.3. IIRSA hub: Guyana Shield.



Source: www.iirsa.org

IIRSA AND THE INTEGRATION OF SOUTH AMERICA IN THE WORLD ECONOMY⁴

IIRSA is part of a comprehensive set of policy initiatives to strengthen the position of South America in the global economy. The new insertion of the region in world markets was initiated by a process of unilaterally implemented trade liberalization, strengthened by group-wise initiatives to improve market access, and locked in at the multilateral level. The ending of the long policy era with a developmental state, which was characterized by comprehensive state interventions and import substitution industrialization policies, was initiated in most countries with the introduction of the neo-liberal agenda in the course of the 1980s and early 1990s. The new stabilization and restructuring policies, aiming at the liberalization of trade and capital movement, privatization, and regional integration, have made the region's prospects to improve the standard of living more dependent on the capability of domestic producers to compete in domestic and foreign markets and to supply worldwide the required quantities and qualities in time. To support domestic producers to meet this challenge, a broad array of measures is required to facilitate trade and enhance trade-related capacity. IIRSA is a case in point.

The renewed insertion of the South American countries in world markets coincides and is partly induced by globalization and the emergence of new centres of gravity in the world economy, offering new trade opportunities and challenges. To put IIRSA in context we present in a stylized fashion the changing position of South America in the world economy and some worldwide longer-term developments having an impact on trading prospects.

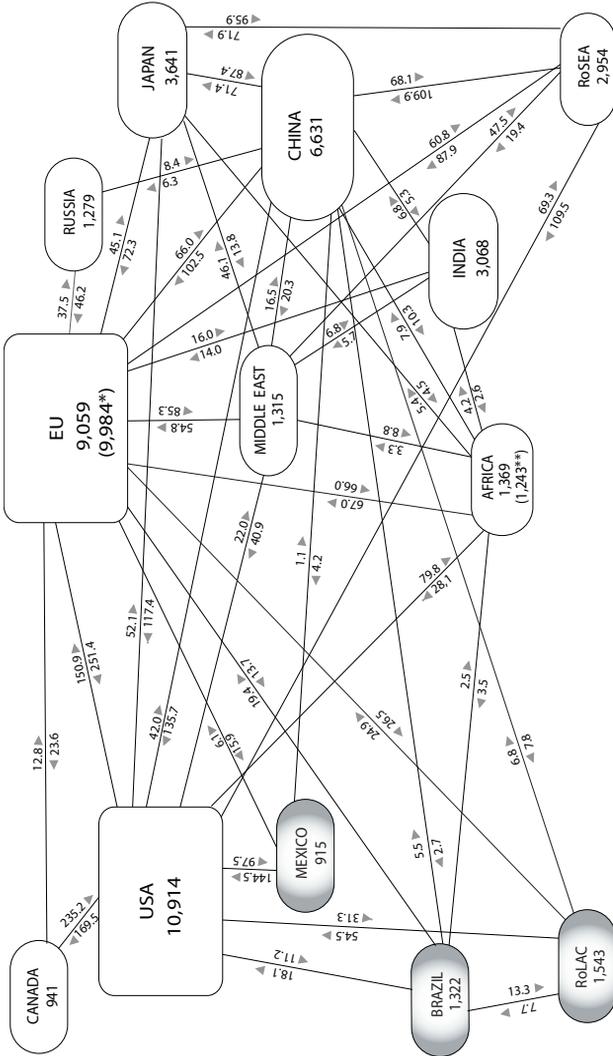
Gravity models of international trade, that were introduced in the 1960s and are actually enjoying a revival in economic literature

and particularly in studies on the impact of regional integration on trade, explain the size of bilateral trade flows by the size of the related economies measured by their overall purchasing power, as well as the levels of income per capita, and distance between trade partners (Linnemann, 1966, and Frankel, 1997). Distance may be conceived as a kind of catch-all term reflecting transport and other transaction costs which have a trade-reducing impact. Costs of domestic and international transport can be expressed in terms of their tariff equivalent. In line with trade theory, tariff and non-tariff barriers (NTBs) to trade in importing countries reduce their imports. Barriers to imports in the exporting economy reflect the bias against exports in the incentive structure of the exporting economy, which has a negative impact on the size of the country's export flows (Linnemann et al., 1992). Some models include variables reflecting similarity in the composition of import demand and export supply of trade partners (Van Beers and Linnemann, 1992). Regression analyses based on this model show the size of markets and levels of income as the most important explanatory variables stimulating trade, and policy-induced import barriers and transportation costs as trade-inhibiting factors.

Figure 2.1 presents the main regions and (groups of) countries in the world economy measured according to their gross national product (GNP) at purchasing power parity (GNP-PPP) and the main international trade flows, in billions of US dollar. As shown, the USA and the EU are by far the largest markets in the world economy and the trade flow between them is the largest interregional trade flow. At the same time a multipolar world economy is emergent as reflected by the size of the economies of China, Japan, and India, and to a lesser degree Russia, Brazil and Mexico. The emergence of these economies has a significant impact on the direction of trade flows and the world trade system, as reflected by the increasing role of South-South trade and particularly of East Asia in world trade.

From the mid 1960s onwards, an increasing number of countries in the Pacific Rim and in South America have started penetrating world markets in a broadening range of labour-intensive manufactured products and manufactures produced with a standardized 'mature' technology. China in particular has become a new engine of growth in the world economy, stimulating trade flows with countries in all regions of the world including South America. As a consequence North-South trade has become more diverse, and both North-South and South-South trade have been strongly dynamized, contributing more significantly to world trade than in earlier decades. Moreover, a

Figure 2.1. GNP of main regions and countries, and trade flows, in billions of US dollar, 2003.



Source: Data on GNP-PPP taken from The World Bank (2004) *World Development Report 2005: A Better Investment Climate for Everyone*, Washington, DC; export data (DOTS) taken from IMF (2004), *Direction of Trade Statistics, Yearbook 2004*, Washington, DC.

Notes: RoLAC = Rest of Latin America and the Caribbean (region less Brazil and Mexico); RoSEA = Rest of South-East Asia (Cambodia, Indonesia, Korea Rep., Lao PDR, Malaysia, Philippines, Singapore, Thailand, and Vietnam).

(*) including the new members since 1 May 2004. (**) Sub-Saharan Africa only.

growing number of developing countries are involved in the international supply of services by means of cross-border trade and activities related to outsourcing, and through the international movement of natural persons. The new insertion of the countries in Asia, Eastern Europe and the former Soviet Union in the world economy, however, not only creates new trade opportunities but also new competition for South America, in a range of non-tropical and tropical agricultural products as well as in the area of labour-intensive manufactured goods, and in manufactures the production of which is characterized by the application of standardized technology.

Reviewing fundamental changes in Latin America's positioning in the world economy since the lost decade of the 1980s, we find that renewed economic growth, unilateral trade liberalization as part of structural reform, the lock-in effect of accession to the General Agreement on Tariffs and Trade (GATT) and subsequent membership of the World Trade Organization (WTO), and the establishment of a spaghetti bowl of preferential trade areas (PTAs) among the countries in the region, have greatly contributed to the economic integration of the region and stimulated intra-regional trade.

The share of intraregional trade in the overall export performance increased significantly during the 1990s. This holds particularly for trade among the member countries of Mercosur and the Andean Community, but not for the CACM group of countries. The expansion of Mercosur with the new membership of Venezuela, and the creation of preferential linkages with Chile and Bolivia may further contribute to that effect.

At the same time, many Latin American countries have been involved in the establishment of special and preferential trade relations with their two traditional major trading partners, the USA and the EU, as well as with the emerging economies of East Asia.

Focusing now more specifically on the position of the two largest trading nations in the region, Mexico and Brazil, we find significant differences in their trade strategies and trade performance. Although the size of Mexico's economy is about 70 per cent of Brazil's GNP at PPP (2003 data), Mexico's exports of 165 billion US dollars exceed by far Brazil's exports of 78 billion US dollars. Put together, the two countries generate 60 per cent of total exports and 54 per cent of total imports of Latin America and the Caribbean.

Traditionally, Mexico's economy has been linked strongly with the US economy through trade and FDI flows, be it that this was limited in the era of import-substitution policies by high import tariffs, frequent

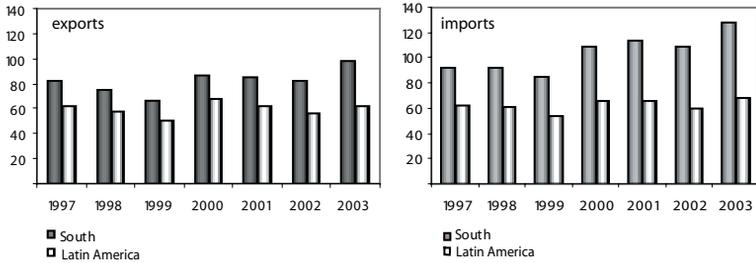
use of NTBs and strict investment regulations. However, integration has progressed rapidly since Mexico's liberalization in the mid-1980s, and more specifically as a consequence of NAFTA. Further reduction of applied most-favoured nation (MFN) rates in the WTO will consequently result in significant preference erosion for Mexico, as simulation of the effects of several packages of liberalization measures in the Doha Round show (Anderson et al. 2006). Although Mexico attempted to diversify its trade and investment position by signing PTAs with the EU and other trade partners in Latin America and East Asia, its orientation towards the USA is still extremely strong. As compared to Mexico, Brazil shows a more balanced distribution of trade among its partners in Latin America, the USA and the EU. Remarkably, notwithstanding the creation of Mercosur operating *de facto* as a customs union, Brazil's trade with Argentina has declined since 1997 (Van Dijk, 2002).

Most other countries in the region show a significantly stronger orientation towards the region itself than Mexico does. However, it is remarkable that notwithstanding a spaghetti bowl of numerous PTAs and bilateral investment treaties among the countries in the region, regional trade in Latin America, both including and excluding Mexico, did not increase but stagnated in absolute terms during the period under investigation (1997-2003), and even declined in relative terms from 29.9 per cent of total exports of Latin America excluding Mexico in 1997 to 20.9 per cent in 2003. A similar declining trend is noticeable in the case of Brazil, the great promoter of integration in the region. As compared to many countries in East and Southeast Asia, Latin America as a whole does not seem to be particularly orientated towards its own region. This need not come as a surprise as the export performance of most countries in Latin America is strongly dominated by commodities, shipped particularly towards the markets of developed countries, with Mexico being the most significant exception.

Trade with Asia, and particularly with China, is dynamic but still rather limited in size. This holds for Brazil and other countries in South America such as Argentina and Chile. Rapidly rising demand in China for natural resources for its industry, and for food and food products including soybeans is directly stimulating trade between Latin America and China, and contributes indirectly to welfare in the region through an upward impact on commodity prices in international markets and consequently to an upward terms-of-trade effect. Buoyant international demand for biomass and biofuels may contribute to that trend in the near future.

The new role of countries in the South in Latin America's trade performance is shown more specifically in Figure 2.2 and Tables 2.1 and 2.2.

Figure 2.2. Latin America in South-South trade, in billions of US dollars, 1997-2003.



Note: Developing countries including Latin America, Africa and Asia and excluding developing Europe.

Source: IMF, *Direction of Trade Statistics, Yearbook 2004*, Washington, D.C., 2004.

The growing significance of China as an importer of South American commodities is also reflected by Brazil's initiatives to strengthen cooperation with China. This would fit in with Brazil's broader policy stance to promote cooperation with countries in the South in order to reduce dependence on the North. Cases in point are Brazil's efforts to create a regionwide PTA in Latin America, its recent initiative to strengthen the functioning of the G-20 in the WTO negotiations, and its initiatives to foster special and preferential bilateral relations with several countries in the South including South Africa and India (Morais, 2002). The rise of China, however, not only contributes to Brazil's export potential but may also jeopardize Brazil's aspirations of becoming a platform for automobile assembly for the international market. Indeed, IIRSA's plans for the construction of several transcontinental roads, linking the Atlantic side of the region with the Pacific, the so-called *bioceánicas*, not only facilitate Latin America's export drive but may also contribute to competition in the regional market by Asia's industry.

As follows from the above, South American countries and the region as a whole are involved in a series of recent initiatives aiming at strengthening their economic relations and improving market accessibility. These initiatives, if successful, will increase and lock in openness, create preferential margins in major export markets, and thus contribute to a new insertion of the region in international markets. Such a new context requires further initiatives to deepen integration, facilitate international transactions and increase competitiveness. IIRSA and related infrastructural projects are cases in point, as shown in Chapter 3.

Table 2.1. Trade orientation of regions and major trading nations: exports by destination, in percentages, 2003.

Values	Developed countries	Developing countries	Africa	Asia	Europe	Middle East	Latin America
<i>Billions of US\$</i>							
World	7,492.4	34.4	1.9	18.5	6.5	3.0	4.6
Developed countries	4,615.9	28.4	1.8	12.3	6.4	2.8	5.0
Latin America	401.2	71.1	1.1	6.3	1.4	1.4	15.6
<i>Millions of US\$</i>							
Brazil	78,462	44.8	3.2	12.5	3.9	4.6	20.6
Venezuela	31,061	24.0	0.1	2.2	0.3	0.1	21.3
Argentina	29,566	66.0	3.7	16.9	2.2	4.4	38.8
Chile	21,464	52.5	0.4	20.8	1.2	1.0	18.0

Table 2.2. Trade orientation of regions and major trading nations: imports by origin, in percentages, 2003.

Values	Developed countries	Developing countries	Africa	Asia	Europe	Middle East	Latin America
<i>Billions of US\$</i>							
World	7,745.3	39.7	2.2	21.5	6.4	3.9	5.6
Developed countries	4,960.9	64.3	2.4	17.4	6.0	3.3	6.3
Latin America	408.9	64.7	1.2	12.8	1.9	0.7	16.7
<i>Millions of US\$</i>							
Mexico	170,546	80.0	0.1	13.8	0.8	0.3	4.7
Brazil	52,105	56.2	6.6	13.0	2.6	3.5	17.7
Venezuela	10,841	54.2	0.2	5.0	0.8	0.3	32.6
Argentina	13,833	41.4	0.8	11.0	3.4	0.4	42.3
Chile	19,413	35.9	1.3	12.9	0.8	0.3	37.7

Source: see Figure 2.2.

IIRSA AND THE QUEST FOR DEEPER INTEGRATION

In support of deeper integration and enhanced insertion in international markets, IIRSA identifies as its priorities harmonization of regulatory and institutional frameworks in the areas of transport, energy, and telecommunications, and the coordination of infrastructural plans and investment. In order to assess initiatives in these areas, some observations are in place pertaining to the rationale and potentials of deeper integration.

In contrast with shallow integration, which is confined to the liberalization of trade, deeper integration may be conceived of as a form of integration that moves beyond the mere removal of trade barriers at the border (Lawrence, 1996). Improvement of customs procedures and other forms of trade facilitation, regulations pertaining to trade-related technical, sanitary and phytosanitary standards, as well as trade-related physical infrastructure may be crucial to enhance the capability of countries to exploit trade opportunities, and to deepen their integration in regional or global markets.

Measures in favour of deepening integration have been introduced piecemeal and at a fairly late stage in the multilateral system of trade liberalization, as reflected by GATT/WTO rules. The Tokyo Round of the GATT (1973-79) included codes on standards, subsidies and government procurement, and the agreements on harmonization of regulations regarding Technical Barriers to Trade, and on the Application of Sanitary and Phytosanitary Standards. With the implementation of the GATT/WTO provisions and rules, differences in national standards are being reduced, thus contributing to the creation of a global 'level playing field'. Deepening integration has progressed as

well in the context of PTAs. This holds particularly for the EU but also for NAFTA and MERCOSUR. Regarding the treatment of standards, several approaches may be pursued ranging from harmonization of standards and technical regulations, measures to enhance compatibility, and mutual recognition of national standards. For a general overview of options see Leebron (1997).

Infrastructural development has traditionally been a key component of enlargement schemes of the EU. Structural and Cohesion Funds aim at improvement of physical infrastructure in order to stimulate development in relative backward areas and convergence across the EU, and equal about a third of the overall EU budget (Lopez-Calva and Lustig, 2003).

Recently, the issues of trade facilitation and trade-related capacity building have come to the fore as major issues in the multilateral trade negotiations on the Doha Development Agenda (DDA) of the WTO. Tedious customs clearance, high port charges and freight costs, and slow handling, add costs to traders and consequently impede trade (Van Dijck and Faber, 2006b).

When analysing the rationale and potential impact of deeper integration, the preliminary question refers to the optimal level on which a regulatory regime or a rule system should be realized. There are no a priori reasons why independent nations should be the optimal providers of these public goods under all circumstances and this holds as well for potential providers at the regional or multilateral levels. In this context, the principle of subsidiarity may be helpful in determining the optimal policy level to provide institutions and regimes.

The first priority in IIRSA is coordination of infrastructure plans and investments. Infrastructure, defined broadly, plays a key role in stimulating economic growth by facilitating production and trade, thus generating income and employment. The concept of infrastructure though is somewhat ambiguous. The World Bank defined infrastructure as 'long lived engineered structures, equipment and facilities, and the services they provide that are used in economic production and by households' (The World Bank, 1994). Other definitions include institutional arrangements, and the availability of financial, intellectual and legal services that are required for production to be efficient.

As outlined in the previous chapter, unilateral and group-wise liberalization has stimulated integration among countries in the region. At the same time, trade with other regions in the world economy has been stimulated by reducing applied MFN rates and interregional PTAs. Rising demand for food products and minerals has boosted particularly

export to the Pacific Rim. As scenario studies of liberalization packages in the DDA show, comprehensive liberalization of markets of agricultural products may stimulate particularly export volumes from Latin America and, moreover, improve the region's terms of trade (Anderson et al., 2006). In the near future, increased demand for alternative energy sources may boost biomass and biofuels exports including sugar and soybeans. The increasing volumes of goods to be transported by the road stimulate demand for infrastructural services.

IIRSA development hubs

The process of selecting priority trajectories, the so-called development hubs or *ejes de desarrollo*, has so far resulted in the identification of 10 trajectories as illustrated in Maps 1.1 - 1.3, Map 3.1 and Table 3.1. Map 3.1 illustrates the location of 31 major infrastructural projects included in the Implementation Agenda 2005-10, as laid down in the first semi annual report of July 2005. Table 3.1 lists 31 approved projects. The list is permanently adjusted and updated. For the most recent information see www.irsa.org.

The actual state of the trajectories as well as their envisaged future functioning differs widely among the hubs. Many parts of most trajectories already exist as unpaved or paved roads, but need improvement, reconstruction, or additional infrastructural works, such as bridges, border crossings, and international connections. In many cases, IIRSA's contribution is particularly in making or improving the cross-border linkages between already existing national road systems. Hence, significant efficiency gains may be realized with relatively small investments.

The major hub in terms of transport flows and traffic is the Mercosur-Chile hub, which links some of the major metropolises and economic centres of South America. The hub connects the industrial areas in the south of Brazil and the north of Argentina, the development of which has particularly been stimulated by the formation of Mercosur. Several other proposed hubs link the Atlantic with the Pacific Oceans in the north, the centre and the southern cone of the continent, as illustrated in the maps. The Andean hub aims at integrating countries in the north-west of the continent by improving the Carretera Panamericana to the extreme west of the continent and the Carretera Marginal de la Selva, which was originally created to facilitate access to Amazonia and to link the Andes countries among themselves. In the north-east, the Escudo Guyanés hub will link the countries on the Guyana Shield,

Table 3.1. List of projects in the IIRSA Implementation Agenda 2005-10, in millions of US dollar.

	<i>PROJECTS</i>	<i>HUB</i>		<i>COUNTRIES</i>
1	Duplicación de la Ruta 14	Mercosur-Chile	370	AR (BR)
2	Adecuación del Corredor Rio Branco-Montevideo-Colonia-Nueva Palmira	Mercosur-Chile	176	UY (AR-BR)
3	Construcción del Puente Internacional Jaguarão-Río Branco	Mercosur-Chile	12	BR-UY
4	Duplicación del Tramo Palhoça-Osorio (Rodovia Mercosur)	Mercosur-Chile	800	BR (AR-UY)
5	Proyecto Ferroviario Los Andes-Mendoza	Mercosur-Chile	251	AR-CH
6	Ruta Internacional 60 CH (sector Valparaíso-Los Andes)	Mercosur-Chile	286	CH (AR)
7	Gasoducto del Noreste Argentino	Mercosur-Chile	1,000	AR (BO)
8	Construcción del Puente Binacional Salvador Mazza-Yacuiba	Capricornio	10	AR-BO
9	Nuevo Puente Presidente Franco-Porto Meira y centro de frontera	Capricornio	55	PY-BR
10	Construcción de la Carretera Pailón-San José-Puerto Suárez	Interoceánico Central	435	BO (BR-CH-PE)
11	Anillo Ferroviario de São Paulo (Norte y Sur)	Interoceánico Central	300	BR
12	Paso de Frontera Infante Rivarola-Cañada Oruro	Interoceánico Central	1.2	BO-PY
13	Construcción de la Carretera Cañada Oruro-Villamontes-Tarija-Estación Abaroa (1° etapa)	Interoceánico Central	60	BO (PY)
14	Carretera Toledo-Pisiga	Interoceánico Central	76	BO (CH)
15	Rehabilitación de la Carretera Iquique-Colchane	Interoceánico Central	19	CH (BO)
16	Rehabilitación del Tramo El Sillar	Interoceánico Central	30	BO (BR-CH-PE)

(continued on next page)

Table 3.1. (*continued*)

	<i>PROJECTS</i>	<i>HUB</i>		<i>COUNTRIES</i>
17	Centro de Frontera de Desaguadero	Andino	7.5	BO-PE
18	Paso de Frontera Cúcuta-San Antonio del Táchira	Andino	2.0	CO-VE
19	Recuperación de la Navegabilidad por el Río Meta	Andino	108	CO-VE
20	Carretera Pasto-Mocoa	Amazonas	183	CO
21	Carretera Paita-Tarapoto-Yurimaguas, Puertos y Centros Logísticos	Amazonas	338	PE (BR)
22	Carretera Lima-Tingo María-Pucallpa, Puertos y Centros logísticos	Amazonas	589	PE (BR)
23	Puerto Francisco de Orellana	Amazonas	105	EC
24	Pavimentación Iñapari-Puerto Maldonado-Inambari, Inambari-Juliaca/Inambari-Cusco	Perú-Brasil-Bolivia	1,055	PE (BR)
25	Puente sobre el Río Acre	Perú-Brasil-Bolivia	12	BR-PE
26	Carretera Boa Vista-Bonfim-Lethem-Georgetown (1° etapa: estudios)	Escudo Guayanés	3.3	GY-BR
27	Puente sobre el Río Takutu	Escudo Guayanés	10	GY-BR
28	Carretera Venezuela (Ciudad Guayana)-Guyana (Georgetown)-Suriname (Paramaribo) (1° etapa)	Escudo Guayanés	0.8	VE-GY-SU
29	Mejorías en la Vía Nieuw Nickerie-Paramaribo-Albina y Cruce Internacional sobre el Río Marowijne	Escudo Guayanés	105	SU-GY
30	Exportación por Envíos Postales para PYMES	TICs	1.2	Todos
31	Implementación de Acuerdo de Roaming en América del Sur	TICs	1.0	Todos

Source: IIRSA, 2005a and www.iirsa.org.

Venezuela, Guyana, Suriname and French Guyana. Although the envisaged hubs link existing infrastructure, the precise trajectories are in most cases not yet determined but are being investigated or negotiated among interested parties.

It should be noted that apart from IIRSA other transnational road projects are under construction that may or may not link up with IIRSA trajectories in the region. Case in point is the so-called Arco Norte road project designed and created by Brazil, linking the northern part of Brazil with the three Guyanas – Guyana, Suriname and French Guiana – and with the Caribbean Sea. The road is under construction, be it that the link along the coast between Georgetown, Paramaribo and Cayenne has existed already for a long time. The road project is part of a larger programme to integrate northern Brazil with Guyana through the construction of a deep-water port, a hydro-electricity facility in Guyana and the development of high-speed dependable communications systems in the region. Transmission lines will follow the course of the new road and so will the fibre optic cable that will link Boa Vista, and at a later stage Manaus, with the intercontinental fibre optic cable, which passes north of Georgetown. Improved infrastructure is expected to contribute to investment in the region in food crops, the tourism sector and particularly in the development of an industrial zone in Boa Vista.

Transnational roads are a form of transnational public goods. More specifically, the roads as envisaged by IIRSA may be identified as regional public goods as benefits are expected to accrue particularly to countries in the region. Hence, regional public goods such as the IIRSA trajectories generate positive and negative externalities in a specific regional context, albeit that the distribution of these welfare effects may differ widely among the countries in the region. Moreover, third countries that are not partners of the regional association may nevertheless benefit significantly from such public goods. This may even create a condition in which the outsider is interested in co-financing the regional public good to speed up or facilitate its realization. Essentially, the concept of coordination of infrastructural plans and investments includes the possibility for financial institutions involved to attract foreign investment through more or less innovative financial mechanisms.

Pure public goods are characterized by non-rivalry of benefits and non-excludability of users. In the case of roads, waterways and other forms of infrastructure, relevant in the context of IIRSA, benefits may rival in case of congestion, and use may be controlled by applying a

toll system. IIRSA roads may be considered ‘regional club goods’ when exclusion is relatively easy and costless and use can be monitored and controlled (Sandler, 2002).

Regarding the potential of investment in infrastructure to generate externalities, private investment in directly productive activities may be triggered, thus generating a crowding-in effect. Essentially, when constructing roads in economically underdeveloped regions, this externality may even be among the basic objectives. This holds particularly for paved roads in areas where alternative infrastructure is of less economic significance, as is the case when only unpaved roads are available.

At the same time, however, roads may also generate negative external effects resulting in a loss of welfare. Cases in point are air pollution and noise, particularly when roads pass through urbanized areas, or loss of environmental services, particularly when roads pass through environmental ‘hot spots’. It is typical of the multifunctional character of such areas that they provide a combination of global or regional pure or impure public goods. This may specifically be the case with roads penetrating pristine and highly vulnerable eco-systems that contribute significantly to the world’s stock of genetic resources and to the sequestration of carbon. To what extent this is relevant in the case of IIRSA projects depends, of course, primarily on the specific trajectory, and on the degree of environment destruction induced by the future road.

Building new roads and moving the geographical frontier of economic activity, particularly in pristine forests, may have a lowering impact on land prices by making new land available and hence stimulates colonization, while, on the contrary, improvement of existing roads may increase land prices by stimulating intensification of land use (Andersen et al., 2002, pp.145-47). Thus, investment in network expansion results in more deforestation than investment in network improvement as the former type of infrastructural investment will enhance the likelihood of deeper penetration into the forest (Gascon et al., 2001, p. 25).

Assessing environmental impact

Statistical studies of deforestation in Amazonia show a high concentration along the expanding road network. In the period 1991-95, 33 per cent of deforestation was concentrated in an area within 50 kilometres of the eastern road network, 24 per cent within 50 kilometres of the central road network, and 17 per cent within 50 kilometres of the

western road network. All together, 74 per cent of deforestation was concentrated within 50 kilometres of the main roads, creating long corridors through the forest. Most new clearing takes place in areas adjacent to areas already cleared, on a moving agricultural frontier, often according to a so-called fish-bone pattern (Alvers, 2002; Andersen et al., 2002, p. 55).

To make a comprehensive assessment of the welfare effects of a road, all costs and benefits need to be included fully. In view of the sheer size and scope of the road projects, an assessment of its probable economic and non-economic impacts exceeds by far the traditional framework for project assessments and evaluations, as provided by costs-benefit analysis. Essentially, a comprehensive ex-ante assessment would require a regional computable general equilibrium model that would allow simulation runs. It should be noted, however, that the capability to simulate the real-world dynamics of such a major investment programme in selected regions is limited. Moreover, the time span of such models does not allow for inclusion of environmental effects and their (second round) economic repercussions. At this stage such model studies have not been prepared in the context of IIRSA.

The methodology of environmental assessments, as applied in the case of World Bank projects since 1989, suffers from limitations when applied to economy-wide or region-wide infrastructural projects. To correct for these inadequacies, so-called Strategic Environmental Assessments (SEAs) were introduced, but experience with the application of the new methodology by multilateral financial institutions in developing countries so far is limited (The World Bank, 2002). A comprehensive assessment of the economic value of the environment is required not only as part of (road) investment procedures, but also as a base for a regional or global payments system for the collective goods a region provides. Such an assessment requires a comprehensive inventory of the many different functions of the forest including the array of direct and indirect use values as well as its optional and existence values.

However, methodological problems make it hard to assess accurately the positive and negative welfare effects of interventions. To start with, many of the markets involved are imperfect, and for many of the eco-services markets do not even exist. The problems of the non-existence of markets are particularly urgent when dealing with the economic valuation of biodiversity. These complications must be tackled in order to make a comprehensive valuation of alternative options for the exploitation of the forest. Moreover, longer-term forecasting of varia-

tions in direct and indirect use values, resulting from future patterns of demand and supply in markets of natural resources and ecological services, are hard to make (Trindade de Almeida and Uhl, 1999; Van Beukering and Van Heeren, 2003).

Second, both the economic response of subjects to new opportunities created by improved access to a region in terms of investment and expansion of economic activity such as nutrient mining and mineral mining, and the implications of such activity for the region's ecology, depend on a large number of interrelated and geographically dispersed factors, which are hard to integrate in a regional development model with economic and environmental dimensions.⁵

Third, the measurement of deforestation, fragmentation, and edge effects, which are due to improved area access and to investment in economic activity, may in itself be complicated and expensive. The Sistema de Vigilância da Amazônia (Amazon Surveillance System) may be useful in the future for monitoring changes in forest coverage. However, combining information from satellite images with land surveys may be complicated.

In view of the methodological problems referred to above, one may question whether there are alternatives available for applying the economic principles and more specifically the price mechanism in order to come to a rational way of exploiting an environment. It is questionable whether discretionary decision-making applied in the context of a zoning policy can be a genuine alternative. The concept of zoning was introduced in Brazil by presidential decree in 1990. National and state-wise zoning commissions were installed but these have been largely inactive (Hall, 1998). Appropriate zoning policy is preferably based on a rational assessment of alternative values of regions and consequently suffers from similar complications related to assessing comprehensively the use value of land. Moreover, the political economy of decision-making complicates an optimal use of natural resources. Interest groups and politicians at the local level usually prefer exploitation of direct-use values and improved links with markets. Mahar (1989) has shown how zoning in Rondonia, which was introduced to protect specific regions with high ecological values, was opposed by farmers, ranchers and loggers – who could not find compensation for lost opportunities – while the positive income effects of zoning were concentrated among civil servants and others in charge of implementing and maintaining the zoning policy. Obviously, there were too few local winners while the losers were not compensated.

Following Schneider (1995, p. 27), zoning will only be of little use if at the same time accessibility to land is improved and land development is stimulated by complementary government policies. Tipping the local decision-making process in favour of sustainable development and protection of an environment will require another balance between economic gains and costs, and the creation of winners at the local level. Introduction of the market mechanism to the extent possible, including payments for environmental services and taxes on negative external effects of specific economic activities, in combination with the provision of incentives at the local level may contribute to a more optimal selection from the different options for land use in areas that are traversed by the development hubs envisaged.

PPP IN ROAD INFRASTRUCTURE: A THEORETICAL OUTLINE

Investments in road infrastructure generally have some essential characteristics in common. First, such investments are quite large and illiquid. Second, the lump sum is indivisible, generally resulting in a limited secondary market. Third, infrastructure provision is characterized by substantial economies of scale. Fourth, they give rise to concerns about monopoly market power. Fifth, their characteristic as basic services implies that their provision is often highly politicized. Finally, infrastructure can generate substantial externalities.

Because of such characteristics, governments entrusted the provision of these goods and services to state-owned enterprises and monopolies during most of the 20th century in nearly all countries of the world. Highways, as well as railroads, energy supply and telecommunications were all in hands of public sector entities, and the investments needed to construct, maintain and operate these goods and services were completely financed with taxpayer's money.

Over the course of the 1980s and 1990s, a significant change occurred in the traditional ideas about the tasks and responsibilities of the public sector. Escalating public debt and fiscal problems, in combination with a demand for higher quality public services, led to a shift of ideological and pragmatic concepts in developed and developing countries. New types of relations and arrangements between the public and the private sectors have come about, which entail a new division of tasks and responsibilities between the two partners (The World Bank, 2003, pp.1-21). Increasingly, the role of the public sector has shifted from supplying to buying (public) services that are privately provided. Although the direct causes for the change of paradigm were actual and

real fiscal problems, there are also welfare-economic justifications for the participation of the private sector in infrastructure provision.

Welfare-theoretical considerations

The idea behind private sector participation in infrastructure is based on the neo-classical efficient market hypothesis. The market – considered as a decentralized system of decision-making – is able to allocate the means of production more efficiently than the government – considered as a centralized system of planning and decision-making – is capable to, and hence contributes more to overall welfare. However, the price-mechanism as it operates in the real world does not always result in socially optimal outcomes as reflected by a Pareto optimum. This holds particularly true in case of market imperfections. Such market imperfections may be caused by a range of factors related to the provision of public goods or services: externalities, monopoly or oligopoly, and imperfect or asymmetric information (Koopmans et al., 1999, pp.3-12; Greenwald and Stiglitz, 1986, pp.229-64; Stiglitz, 1989, pp.11-44). In case of market failure government intervention is required to maximize social welfare. At the same time, government intervention may disrupt the functioning of markets and lower social welfare if first-best instruments are not available or cannot be used effectively and efficiently (Przeworski, 2003, pp.1-16).

Institutional (welfare) economics is about finding the optimal arrangements between the public and the private sector to make both sectors responsible for the tasks they are best able to perform. PPPs are arrangements or ‘institutional designs’ between the public and the private sector by means of which goods and services can be produced in a more efficient way than would be possible by entirely public or entirely private production. In the presence of both market and government failure, PPPs are a second-best alternative for the provision of infrastructure. This is the theoretical rationale behind private participation and PPPs. Thus, from a welfare-economic point of view the public provision of infrastructure – although for long deemed necessary because of the existence of market imperfections – is not the optimal way to produce these goods and services, and a more efficient use of scarce resources is possible by means of PPPs (Laan et al., 2003, pp.1-5).

Taking the before-mentioned considerations into account, we can economically justify PPPs in the case of goods and services generating positive externalities that may come available as public goods; or that demand high and irreversible investments (sunk costs) in combina-

tion with low marginal maintenance and amortization costs (Soares Gonçalves, 2004, pp.12-14).

Market imperfections may be predominant in the area of infrastructure investment, the correction of which requires different types of government intervention. In the case of positive externalities - with social benefits exceeding private benefits - government intervention by using a subsidy is first-best policy. If not, private investments will be below the social optimum level and so will be social welfare (Montoro Filho, 2004, p.14). In case of negative externalities, taxation would be first-best policy. The use of alternative instruments might reduce the net positive contribution of policy and government failure might even reduce rather than increase overall welfare as compared to a situation of non-intervention.

With regard to sunk costs, economies of scale and high entry barriers, which all result in monopoly or oligopoly power, government intervention in the form of competition policy or price regulation is required. By using a combination of regulation and taxes or subsidies, PPPs can provide a second-best alternative that avoids both market and government failure (Akinson, and Stern, 1974, pp.119-128).

Some additional observations are in place regarding the economic characteristics of road infrastructure. Although frequently considered as public goods, roads do not necessarily meet the two basic criteria for public or collective goods, as indicated in the previous chapter. Congestion contradicts non-rivalry of benefits, and in case of a toll-system consumers can be excluded from the use of the road, which contradicts the non-excludability criteria. Economic theory shows that toll-roads cannot be considered public goods. Instead, they belong to the so-called (regional) club goods, the use of which is non-rival – at least up to the point of congestion - but indeed excludable. This means that from a welfare economic point of view, a user charge needs to be applied in order to improve social welfare (Buchanan, 1965, pp.1-14).

Assume that the private sector is able to produce goods and services more efficiently than the public sector, but that the existence of market imperfections inhibits private production of essential goods and services. From this assumption follows the question what the economically optimal arrangement between the public and private sectors will be, and what the most efficient organization of a PPP is. What makes PPPs different from, for example, privatizations or traditional contracting out? Or, more fundamentally, what is the meaning of the concept of PPP and how should it be used?

Exploring the concept of PPP

PPPs can be defined as long-term contractual relations between the public and private sectors, designed for the provision of public services by the private sector, in which both parties have shared (financial) interests.⁶

PPPs differ from traditional 'contracting out' in that PPPs usually entail a combination of different services (design, construction, maintenance, finance) whereas contracting out usually concerns just one service or some relatively simple services. The 'bundling' of various services is one of the reasons for the potential higher efficiency of PPPs. Bundling can improve the efficiency of public investments that contracting services separately can not. By transferring the responsibility for the construction, maintenance, operation and exploitation of a certain road to one single company for a long period of time, an incentive is created for the private party to perform well. Whereas under a traditional (tendered) contract to build a road, the private company has the incentive to do the absolute minimum to meet the terms of the contract and to maximize its profit, under a PPP it has the incentive to use a lifetime costs approach. The company then has good reasons to build an appropriate road that will require the least possible maintenance during the period of the contract (Webb and Pulle, 2002, pp.1-9).

Moreover, the deployment of private capital and the transfer of risks in PPPs are key drivers of efficiency (H.M. Treasury, 2000 and 2004). The use of private finance creates the incentive for the private sector to provide reliable public services for the long-term. The optimal division of risks also lies at the heart of a PPP. The identification of the risks of all the different components of a certain project and the allocation of those risks to the sector that is best able to assess, price and manage them, minimizes costs while improving performance (Grimsey and Lewis, 2002, pp.109-11).

In the literature, several contractual arrangements are identified as PPPs. As Gerrard puts it: 'The spectrum of possible PPPs extends from businesses almost entirely controlled by the private sector, at one hand, to those almost entirely controlled by the public sector, at the other' (Gerrard, 2001).

According to Fay and Morrison, PPPs or concessions give a private investor the right to operate a service over a defined period, usually 15 to 30 years, subject to meeting investment and operating requirements set by the government. They are usually awarded on the basis of a competitive bidding process and do not usually transfer ownership of the

assets employed. Concessions encompass not only the use of existing assets but also greenfield projects, particularly through build-operate-transfer contracts (The World Bank, 2005, p.18).

Estache and Serebriskey distinguish four categories (Estache and Serebriskey, 2004, pp.10-13). The first category is constituted by asset sales or divestitures. These are contracts that transfer the ownership of public assets to the private sector and, hence, all responsibilities and risks are privatized. However, these contracts should be considered privatizations instead of PPPs, since there is no 'partnership' in the sense of shared financial interests or responsibilities.

The second type of contracts is constituted by the so-called greenfield projects. These are contracts for specific projects regarding the construction of new infrastructure facilities such as roads or ports. They take the form of 'build-operate-transfer' or 'build-operate-own' arrangements that can also be 'design-build-finance-maintain' contracts. In these arrangements, the private sector is made responsible for the construction, maintenance, operation, finance or exploitation of infrastructure, say a toll road, for a contractually determined period of time. Since the transfer of risks stimulates private efficiency that is supposed to reduce total costs and to improve the quality of the service, the allocation of risks with the private sector parties is one of the most important characteristics of this form of PPP (Dewatripont and Legros, 2005, pp.121-45).

The third category of private participation arrangements in infrastructure is formed by the service contracts for operation, maintenance or investment. These are the traditional concessions, in which the public sector allows a private entity to operate and maintain a certain public service for a contractually determined period of time and in which the revenues for the private partner are partially or fully paid for by the public sector. According to Estache and Serebriskey, these service contracts are usually of short to medium duration (two to five years) and no substantial transfer of risks from the public to the private sector takes place.

The transfer of risks and the long duration (10 to 30 years) of the concessions or licenses are the basic features of the fourth category of PPPs. These are the contracts that differ from the second category in that they involve already existing assets. They also differ from the third category with regard to the length of the contract period, which can be up to 30 years or even longer. The philosophy behind the last three categories of PPPs is nevertheless the same and is based on the idea of the government 'leasing' privately provided goods and services.

The use of PPPs has serious consequences for the role of government with regard to public infrastructure services. The essential difference is that government no longer is the supplier but the buyer of these services. Government no longer owns physical infrastructure assets - although assets under concession return to the public sector after the contract period - but becomes a purchaser of privately produced and provided goods. Nevertheless the ultimate responsibility for the deliverance of public infrastructure services to the general public remains with the government. In a PPP, the essential role of the government therefore is to define the scope of the project or business, to specify priorities, targets and outputs, and to set the performance regime by which incentives are created for the management of the PPP to deliver high-quality and cost-efficient services. The basic responsibility of the private partner is to deliver the business objectives of the PPP in the most efficient way (Grimsey and Lewis, 2004, pp.94-96; Gerrard, 2001).

Cost-benefit analyses of PPPs in transport infrastructure.

PPPs are, by definition, long-term contracts that are intended to deliver long-standing and durable public services. The long-term character of PPPs forces government to articulate its long-term service needs in the areas of transport and communications. Since government is committing itself to payments for a period of up to 30 years or even more, it has to ascertain (1) why a specific infrastructure project or service is required and (2) why PPP is the best way to materialize this. This brings us to the question whether or not overall social welfare will increase as a result of a certain infrastructure project, and whether or not public investments in for instance roads make economic sense at all.

The first of these two questions needs to be addressed by means of a social cost-benefit analysis. The results of such an analysis provide us with information about the characteristics of a specific infrastructure project. It helps us to determine who will benefit from, for example, a new road, and who will be negatively affected. It provides information about the (regional) distributional effects of new infrastructure facilities, about the effects on the economy as a whole and about the effects on the environment (SACTRA, 1999, pp.40-65; Venables and Gasiorek, 1998). This helps us to determine whether a specific road should be considered a public or a private good. In case a certain road can be classified as a private good, a user charge can be applied. The entirely public provision of such a road would not be reasonable from a welfare-economic point of view.

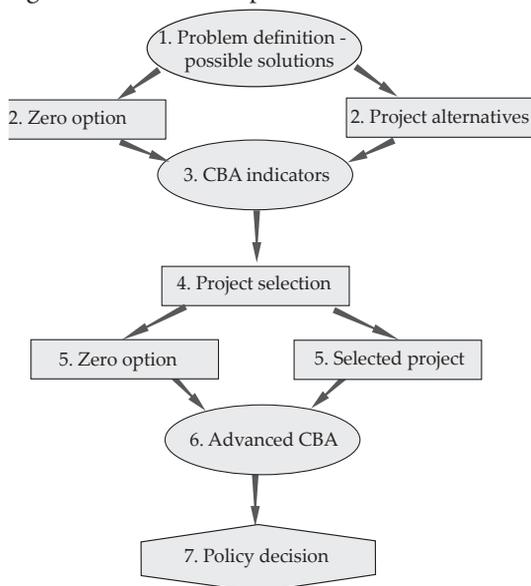
Public investment in infrastructure can generate positive direct effects as well as positive externalities. Positive externalities can become available to economic agents as public goods, thereby triggering private investments and stimulating private productive activities that generate jobs and income. In such cases, (partial) public investment in a road can be reasonable from a welfare-economic point of view.

With regard to infrastructure investment appraisal methods, we can distinguish between the financial cost-benefit analysis (CBA) and the economic or social CBA. In the first type of analysis, only the financial aspects and features of the project itself are examined and the study is limited to the costs and benefits of a specific investment project, the so-called business case. The financial CBA provides information about the expected investment, operation, and maintenance costs of the project, as well as the expected revenues, cash flow and management ratios.

The second type of analysis is the pure economic analysis of an infrastructure project or the social cost-benefit analysis. It is firmly embedded in economic science and is related to the concept of social welfare (Boadway, 1974, pp.926-39; Heertje, 1998, p. D4). It involves the 'inventory and monetary valuation of all the costs and benefits, to whomever they accrue, over the lifetime of the project or policy intervention' (SACTRA, 1999). Although a CBA aims at making monetary valuations of all direct, indirect and external effects of an investment project, there are effects that cannot be quantified or monetized adequately. The economic meaning of a loss of biodiversity may be a case in point. Nevertheless, such effects need be mentioned explicitly in the CBA. In such cases, only alternative quantitative and qualitative information can be generated. Ultimately, the aim of the CBA is not to approve or disapprove of a certain infrastructure project, but to inform policy-makers and the general public about all effects of infrastructure investments. As such, the CBA contributes to higher quality public management and policies, since it provides politicians and policy-makers with first-rate information about the possible consequences of their decisions and adds to the transparency of public governance (Netherlands Ministry of Transport, Public Works and Water Management, 2000, Part 1, pp.1-50).

Within an economic analysis of infrastructure projects, there are three central questions: (1) does the project increase social welfare? (2) does public investment in this project make economic sense? and (3) what is the best way to realize the project? Figure 4.1 offers a schematic overview of the CBA and the different phases of the decision-making process.

Figure 4.1. The CBA-process.



Source: Netherlands Ministry of Transport, Public Works and Water Management (2000).

The following phases are distinguished:

(1). The CBA-process starts with a clear articulation of the infrastructure needs that have to be satisfied and the potential projects that can fulfil those needs. In this phase of the process, answers must be given to questions such as:

-What infrastructure is required and for what purpose? Can existing infrastructure be improved? Are other policy options feasible (pricing, regulation)?

-Which transport modalities are appropriate? What is the capacity and quality needed?

-What is the role of the public sector? What can the private sector contribute? Is PPP viable?

All these questions have to lead to a preliminary selection of a number of projects that have the potential of satisfying the infrastructure service needs defined by the government.

(2) In the second phase of the process, the different project alternatives

as well as the zero-option are analysed. The zero-option is important as it provides the background against which the project alternatives have to be placed. All effects have to be compared with the zero-option in order to get a clear overview. The economic, social and environmental effects of the individual alternatives are qualified, quantified and, if possible, expressed in monetary terms. Among the economic effects, the impacts on the transport sector as well as the users of the road have to be analysed. Social effects include the impacts on the inhabitants of the surrounding areas in terms of health and living conditions. Environmental effects are analysed in an Environmental Impact Assessment (EIA) as discussed below.

(3) The analysis of the zero-option and the project alternatives leads to a number of CBA indicators. On the basis of these indicators, policy makers have to choose the project alternative that offers the highest potential for satisfaction of the infrastructure needs.

(4) It is also possible that the analysis shows that no social welfare increase can be realized, implying that no investment should be made at all. If this is not the case and the best project alternative is selected, the process moves on to the fifth stage.

(5) In the fifth stage, the possibilities for PPP can be explored. This is the phase in which the most efficient financial structure of the project is determined. Also, the question whether or not a public investment in the project makes economic sense is now to be answered.

(6) Finally, a policy decision has to be taken (Kenniscentrum PPS, 2002, pp.8-18; Grimsey and Lewis, 2004, pp.94-95).

Public-Private Comparator and Public Sector Comparator

In order to assess whether a PPP is more efficient than a traditional public realization, appraisal instruments have been developed in several countries such as the United Kingdom and the Netherlands. The so-called Public-Private Comparator is a tool that offers insight into the pros and cons of entirely public versus public-private realization of a project (Kenniscentrum PPS, 1999, pp.5-8; H.M. Treasury, 2004, pp.13-16). It should be carried out early in the investment process in order to structure thoughts and ideas about the possible application of a PPP.

A Public-Private Comparator pays attention to the financial aspects of the investment project, consists of three stages, and analyses topics such as:

- the construction, operational and exploitation costs. The integration of different phases of an infrastructure project creates an incentive for the private partner to work efficiently. Previous (international) experiences with efficiency gains can be used as indicators for the costs of traditional public realization and the potential cost reductions of a PPP;
- the existence of hidden costs. In public investment projects, government usually does not take the costs of its own personnel and overhead into account. To make a fair comparison with a PPP, these costs should be accounted for;
- transaction costs. Due to the highly complicated legal and regulatory nature of PPP contracts and PPP tendering processes, transaction costs tend to be quite high for both the public and the private sectors, or at least higher than in the traditional public alternative;
- the costs of capital. The risks involved in the project determine the costs of capital, and intelligent allocation of risks in a PPP project can reduce these costs significantly. It is often claimed that the government is able to finance investment projects at lower costs than the private sector is able to. This is indicated by the lower discount rate for the public sector. This suggestion however is but a myth (Brealey, 1997, pp.12-28). Since the risks of public sector investment activities are borne by the general public (the tax-payers) who are generally unaware of these risks, their price is not included in the price of capital attracted by the public sector (Van Ewijk and Vollaard, 1999, p.109). Since private companies always put a risk premium on the costs of capital, the public discount rate is artificially lower. In order to make a fair and balanced appraisal of public versus public-private realization of a project, this artificial difference has to be taken into account (Klein, 1997, pp.29-42).

In the first stage of the Public-Private Comparator, all these aspects are qualified and quantified and the arguments in favour as well as against a PPP are summarized. Second, the arguments are valued in monetary terms. In the third stage, financial revenues and costs flows over the whole lifetime of the investment project are estimated and a complete financial outline of the investment project in all the possible alternatives is drawn. If the Public-Private Comparator shows that a PPP will generate higher revenues or lower costs than the public alternative, the realization of the project by means of a PPP is feasible from the point of view of public finance.

The Public-Private Comparator makes an ex-ante comparison of the potential benefits of a PPP contract. However, such benefits are not automatically realized. During the procurement process, constant

attention is needed to safeguard the possible advantages of a PPP. By using financial indicators, the biddings of the different participants in the procurement process can be compared. In order to create a reference point for the government, a Public Sector Comparator can be developed and carried out, which calculates the virtual price of the project in case the public sector would realize it on its own. The Public Sector Comparator determines the 'ceiling value' for the price of a project, above which the PPP alternative is not financially attractive and the public sector should do it by itself in the traditional way. The Public Sector Comparator does not provide technical information or judgments about the various biddings and the technical quality of the biddings has to be examined separately and should be ex-ante guaranteed by clear (technical) quality criteria and indicators in the procurement announcement (Kenniscentrum PPS, 1999, p.8-12).

International experience shows that the best way to assure the quality, value and utility of the type of analysis referred to above is to bring together state-of-the-art economic, technical and administrative knowledge and expertise. The United Kingdom and the Netherlands have created PPP units within the public administration that are responsible for the dissemination of knowledge about these topics within the public sector. Moreover, these units are involved in the conduct and management of PPP processes and are able to control and monitor these analyses. Other institutional and administrative constructions could achieve the same results, but the basic point is that PPPs require specific expertise and aptitude, and consequently highly qualified public servants and policy-makers.

PPPs IN BRAZIL

Brazil had its first experience with PPP in the 1850s. Under the so-called *regime da garantia dos juros*, the Imperial Government and the authorities of the province of São Paulo granted subsidies to nascent railway projects. These subsidies took the form of guaranteed minimum dividends to private companies, and were intended to speed up the pace of railway construction. Although the eventual costs of this policy instrument contributed to some severe financial problems at the turn of the 20th century, these government-supplied dividend guarantees worked quite well as an instrument for attracting and channelling funds into infrastructure. Not even possessing one single railway in 1852, Brazil managed to construct some 20,000 kilometres of track before the turn of the century (Pinto, 1903, pp.182-186; Pandiá Calógeras, 1910, pp.355-57). These railways contributed significantly to the growth of the coffee economy in São Paulo. By reducing transportation costs for both coffee beans and immigrant workers, the *estradas de ferro* boosted productivity and profitability of the sector and stimulated the process of economic growth and development (Saes, 1981).

Until 1945, the general condition of the road system was appalling. The federal government and most state governments lacked sufficient funds to change this situation. With the so-called Lei Jopert in 1945, a new model of highway infrastructure provision was established and a new investment fund, the Fundo Rodoviário Nacional, was introduced. The Fund was financed by taxes on fuels and lubricants, and a significant share of the Fund was transferred to state and local governments. Hence, the Fund became the principal investment source for road investments and the road system expanded and improved significantly over the course of the 1950s, 1960s and 1970s.

During the 1970s, Brazil started to face serious fiscal problems. Nonetheless, economic growth remained strong and the 'economic miracle' continued. In the early 1980s however, growth rates declined steeply and the subsequent recession, in combination with the debt crisis, seriously reduced the tax base of the *Fundo Rodoviário Nacional*. The permanent fiscal problems throughout the 1980s continuously drained the Fund and it stopped functioning by the time of the new Constitution of 1988. Due to these fiscal problems, investment in maintenance, improvement and expansion of the road system declined, resulting in its severe deterioration. During the 1990s, fiscal austerity cut infrastructure investment even more and the actual dire state of the Brazilian road system is the product of 25 years of incessant underinvestment in transport infrastructure (FIPE, 2003, pp.28-31).

Infrastructure shortcomings like the poor quality of roads and insufficient port capacity seriously started to hamper growth of commodity exports.⁷ Since the relative share of transportation costs in total costs is generally higher for low value-added products such as agricultural commodities than for high value-added products, investment in infrastructure could strengthen Brazil's costs competitiveness in primary products considerably, boosting exports even further (Roehner, 1996, pp.339-53). To meet infrastructural demand in the face of limited spending opportunities, the government has identified PPPs as a possible way to increase investment in infrastructure.

Economic reform and the shift towards private participation in infrastructure

Over the course of the 1990s, the Brazilian economy underwent a fundamental transformation with the introduction of a vast programme of structural reform under Presidents Collor de Mello and Cardoso. These programmes radically reduced the traditional role of the Brazilian developmental state as a direct participant in the production process, and initiated a new regulatory role for the government.⁸ With regard to infrastructure the most important policy change was the search for private sector participation in the provision of infrastructure and public services to compensate for the persistent lack of public investment.

An important landmark in the movement towards private participation in infrastructure provision was the approval of the Concessions Law in 1995. This law provides the legal and regulatory framework for the concessions of financially viable public works and services. Highway

concessions were adopted as an innovative instrument to attract private capital and managerial skills.

The first autonomous concession contracts were signed in the states of Rio de Janeiro – the Rio-Niterói Bridge and the Linha Amarela Highway – and Santa Catarina – the Linha Azul Highway (FIPE, 2003, pp.32-34). Comprehensive concession programmes at the federal and state levels were initiated in 1995 after the approval of the Concession Law. Under the auspices of the Programa de Concessões de Rodovias Federais, contracts for five highway tracks with a length of 854 kilometres were signed out of a total of 17,247 kilometres that were analysed. From these 17,247 kilometres 10,379 were considered viable for complete concessions and 6,868 kilometres viable only for maintenance and operation services. In subsequent years, almost 1,500 kilometres of this last category were transferred to concessionaires with general contract periods of 15 to 25 years.⁹ Also, thousands of kilometres of state highways were transferred to private concessionaires over the course of the decade.

The Public Works and Procurement Law (Act 8.666/93) provides the legal framework for the procurement and tendering of public works. The invitations to tender define the particular road trajectory, financial (investment) requirements and technical and construction standards and performance requirements. Contracts were awarded to the bidders offering the lowest toll tariff. Until 2002, the federal highway concession programme was managed and regulated by the Departamento Nacional de Estradas e Rodovias and the Ministry of Transport. Road departments at the state level regulated concession programmes at the state level. After a broad regulatory reform, an independent supervisor was established, the Agência Nacional de Transportes Terrestres, which has been responsible for the supervision of the concession contracts and the performance indicators. Consequently, regulatory reforms in several states resulted in the establishment of the Agência Estadual de Regulação dos Serviços Públicos Delegados in many states (Pinheiro, 2003, pp.14-20).

The main problems faced by both the (federal and state) public sectors and the private concessionaires throughout the years of the concession programmes have been related to the compliance, regulation and supervision of the concession contracts. The most striking example of a dispute over contract compliance was the decision by the government of the state of Paraná to reduce contractually established toll tariffs by 50 per cent. This unilateral decision seriously damaged Paraná's regulatory credibility and reliability. Lawsuits by civil organizations against

toll collection, the elections of 1998, and the economic crisis of 1999, further attributed to serious problems and concerns about the long-term viability of private participation in infrastructure.

Macroeconomic variables such as the domestic interest rate caused financial difficulties for some concessionaires, who faced extremely high capital costs. Financial problems were also related to the immaturity of domestic financial markets (Gheventer, 2004, pp.335-63; Ehrhardt and Irwin, 2004, pp.25-29). Altogether, as has been the case more generally, the most important risks for the success of the concessions were political (The World Bank, 2003).

Notwithstanding serious problems, the length and quality of privately operated highways expanded significantly, as did the total number of vehicles that made use of the highways under concession (Associação Brasileira de Concessões de Rodovias, 2005, pp.10-15). At present, a total of 36 concessionaires are responsible for more than 10,000 kilometres of federal and state highways. More than 600 million vehicles made use of the highways under concession in 2004 and gross revenues amounted to 1.5 billion US dollars. Total tax revenues for the federal and state governments accrued to 194.6 million US dollars. The financial deficits of the concessionaires declined from 890 million US dollars in 2000 to 214 million US dollars in 2004, which is in line with expectations about the arrival at turnkey and break-even points. Moreover, the federal government is at the verge of launching a new phase in the federal highway concessions programme, with the planned tendering of eight more tracks of highway crossing several states.¹⁰

The PPP Law

The legal and regulatory framework for PPPs, established by the Brazilian Congress by means of Act 11.079/04 and ratified on December 30th, 2004, was the next step in the movement towards enlarged private participation in infrastructure provision. By adapting and improving the existing legal and regulatory framework for different types of concessions, the law aims at creating a safer and sounder investment climate for the private sector. Central objective of the PPP Law is improvement of efficiency of public investment and enhancement of social welfare. Important components of the law are rules on transparency of procedures and decision-making, fiscal responsibility, and notes on the sharing and transfer of risks between the public and the private sectors involved in PPP contracts.

The term *parcerias público-privadas* first appeared in the Plano Plurianual de Investimentos (Multi Year Investment Plan) of 1996-99, which was called Brasil em Ação (Brazil in Action). In the next Plan, Avança Brasil 2000-03, PPPs were mentioned more explicitly and prominently. Adequate legislation and regulation, however, was still lacking, which inhibited the establishment of novel and innovative forms of public-private arrangements. As a consequence, private participation remained limited to the hitherto quite common highway concessions and other forms of private participation in the energy and telecommunication sectors.

The PPP Law established the general norms for PPP tenders and contracts with the federal government, states, municipalities and the federal district. It applies to all public entities, agencies and foundations, as well as state-owned enterprises, corporations with mixed public and private capital, and other entities that are directly or indirectly controlled by the federal, state or municipal administrations.¹¹ This law builds upon the Concession-Law (Act 8.987/95) as well as the Public Works and Procurement Law (Act 8.666/93).¹²

The law defines PPPs as concession contracts that can take the form of *concessões patrocinadas* (sponsored concessions) or *concessões administrativas* (administrative concessions). Sponsored concessions are concessions of public services or public works as established in Act 8.987/95 (February 13th, 1995), when they involve – in addition to user charges – a direct payment from the public sector to the private entity. Administrative concessions are contracts for the direct or indirect provision of services to the government, in which the payments to the private partner are entirely provided by the government.

An ordinary concession, defined as the concession of public services or public works (Act 8.987/95), is not considered a PPP when no direct payment from the public sector to the private partner occurs. Brazil therefore uses the narrow definition of PPPs, in which a PPP is:

‘uma forma de provisão de serviços públicos em que o parceiro privado é responsável pela elaboração do projeto, financiamento, construção e operação de ativos, que posteriormente são transferidos ao estado. O setor público torna-se parceiro na medida em que ele é comprador, no todo ou em parte, do serviço disponibilizado. O controle do contrato passa a ser por meio de indicadores relacionados ao desempenho na prestação do serviço, e não mais ao controle físico-financeiro da obra’ (Barbosa de Brito and Pinheiro Silveira, 2005, pp.8-9).¹³

Infrastructure projects that are financially viable therefore continue to be subject to the Concession Law and are not regulated by the PPP Law.

PPPs are not permitted in a number of situations and may not be contracted when (1) the value of the contract or project is less than 20 million reais; (2) the contract period is less than five years; (3) the coverage of the contract is limited to the sole supply of labour, the execution of public works or the supply and installation of equipment. These kinds of services are to be contracted under Act 8.666/93.¹⁴

The law also provides guidelines to be observed when contracting PPPs. First, it states that PPPs are intended to improve efficiency in the fulfilment of the missions of the state and in the use of public resources. Second, the law contains rules about transparency of procedures and decision-making. Together with the guidelines on public procurement and tendering of Act 8.666/93 and Act 8.987/95, these rules should secure the fairness and transparency of the tendering process. The law also states that fiscal responsibility (as defined in the Fiscal Responsibility Act of May 4th, 2000) should be respected and that jurisdictional and regulatory functions cannot be delegated. Further, it stresses the importance and obligation of risk sharing among the public and private sector. As a final guideline, the law states that the ultimate objective of PPPs is to improve the financial sustainability of the public sector and the socio-economic benefits of the partnership projects.¹⁵

As the PPP Law is based on the Concessions-law of 1995, PPP contracts are in essence concession contracts, with some particular features and clauses. General concession clauses clarify for example the (1) object and period of the contract; (2) aim of the contract and nature of the service involved; (3) performance indicators of the service; and (4) the payment-mechanism, and price and tariffs of the service.¹⁶

In addition to the clauses defined in the concessions-law, PPP contracts also have to contain clauses regarding:

- the term of the contract, which must be in line with the amortization of the investment by the private sector, and will stretch over a period of 5 to 35 years;
- the penalties applicable to the public administration and the private partner in case of non-compliance with the contractual obligations;
- the sharing of risks among the parties;
- the forms of remuneration and adjustment of contractual values;
- the mechanisms to preserve and secure the nature and quality of the service provision;
- the way in which eventual public sector payments default is handled

and the guarantees to the private sector by which these payments are secured;

- the criteria for evaluating the performance of the private partner;
- the sharing with the public administration of the economic gains of the private sector resulting from the reduction of credit risks related to the funding contracted by the private partner;
- the requirements and conditions under which the public sector can authorize step-in rights in favour of the financial institutions that funded the special purpose company, with the objective of promoting its financial restructuring and ensuring the continuity of service provision;
- the inspection and due diligence of the assets to be transferred back to the public sector, which will enable the public authority to withhold the final payments to the private partner to the amount necessary to repair any irregularities that may be detected.¹⁷

Private entities interested in participating in PPPs are obliged to set up a Special Purpose Company or Special Purpose Enterprise before any eventual contract is awarded. Again, this is in line with the Concessions Law of 1995. Such a company or enterprise participating in a PPP may be an open capital company, and can as such be a publicly traded enterprise. No matter whether they are publicly traded or not, these companies must comply with corporate governance standards and adopt standardized accounting systems. The public sector is explicitly forbidden to take majority stakes in any such company involved in a PPP.¹⁸ Clearly, if the government attempts to transfer risks to the private sector entity - in the case of PPPs the Special Purpose Company - a majority stake for the government in such a company would inverse the risk transfer, leaving the ultimate risk still with the public sector and not with the private sector. That would mean that one of the main driving forces for PPP efficiency and indeed one of the key justifications for PPPs would be lost (Bing et al., 2005, pp.25-35; Thomson, 2005, pp.116-17). Moreover, important financial institutions such as the Banco Nacional de Desenvolvimento Econômico e Social (BNDES) and private commercial banks are not willing to finance Special Purpose Companies in which the public sector has a majority stake.

The procurement and tendering process of PPPs

A large part of the PPP Act deals with the tendering process and the preparation and organization of the PPP process. Indeed, this has proven to be a critical point in many countries, which has led to vast

costs overruns of more traditional (publicly financed) infrastructure projects. Studies of large infrastructure projects have shown that in many cases the benefits of such projects were severely inflated by public servants and private (rent seeking) interest groups, while the costs of these major projects were generally substantially underestimated. Also, lack of transparency in the tendering process, inadequate output performance specifications, and an insufficient legal and regulatory framework, have contributed to costs overruns, delays and low-quality services (Flyvbjerg et al., 2002, pp.279-95; Flyvbjerg et al., 2003).

Article 10 of the PPP Act establishes the rules and regulations of the tendering process. It states that PPPs have to be procured by means of competitive tendering. The opening of the tendering process requires authorization by the public authority and the Tribunal das Contas da União (National Audit Office). This authorization can only be given if a technical study has demonstrated the convenience and appropriateness of contracting a PPP. Also, an estimate of the budgetary and financial impact during the period in which the PPP contract will be in effect must be presented as well as a statement by the public entity responsible for authorizing the expenditures that the obligations of the Fiscal Responsibility Act are met. Put differently, the law states that any expenses created or increased by a PPP have to be compensated by a permanent increase in revenues or by a permanent reduction in expenditures, so that the fiscal consequences of the PPP are mitigated. In addition, the opening of the tendering process requires an estimate of the long-term flow of public funds necessary for the fulfilment of the financial obligations throughout the term of the contract. Moreover, the infrastructure project has to be included in the Plano Plurianual de Investimentos (Multi Year Investment Plan).¹⁹

Regarding the ecological consequences of the project, the law requires prior environmental licenses or the release of guidelines for the environmental licensing of the project, as will be studied in more detail below. Regarding the transparency of the tendering process, the law requires the invitation to the tender to be submitted to public consultation. It has to be advertised in the official press, in newspapers of general circulation and in electronic media to inform the public at large about the arguments for contracting a PPP, the scope and term of the contract and the estimated value. A minimum period of 30 days, that ends at least seven days prior to the scheduled date for publishing the invitation to tender, has to be respected for comments and suggestions. To increase the transparency of the tendering process, the law defines several guidelines for the technical study upon which the

public authorization is founded. For instance, the evaluation of the long-term public sector commitments has to contain the assumptions and methodology used for calculation and is subject to the general norms for public accounts. Also, an examination of the compatibility with the norms of the Multi Year Investment Plan and the Budgetary Guidelines Act (*Lei de Diretrizes Orçamentárias*) has to take place. Any contract awarded in a fiscal year other than the one in which the invitation to tender was published requires an update of the technical studies and evaluations.²⁰

Article 11 of the PPP Act deals with the invitation to tender. It states that the invitation has to contain a (detailed) draft contract and that it has to indicate explicitly the submission of the tendering procedures to the norms of the PPP Act. Of course, the invitation contains comprehensive information about the technical and financial requirements, parameters and indicators for the PPP. It will also provide information about the use of private mechanisms for dispute settlement in order to resolve conflicts that may arise in relation to the contract. Another important feature of the invitation will be the specification of the payment guarantees to be granted by the public sector to the private partner. Moreover, the invitation has to define the form of presenting the proposals: written proposals in sealed envelopes, or written proposals in sealed envelopes followed by open outcry auction.²¹

Besides the procedures set forth in the public procurement and tendering act of 1993 (Act 8.666/93), the competitive tendering for PPPs may also include other procedures and aspects. For example, the bid appraisal may be preceded by a qualifying stage of technical proposals. Bidders that do not attain to a minimum number of points are disqualified and are subsequently excluded from the following stage of the bidding process. Two measures can serve to appraise the bids of the participants: the bid that requires the lowest payments by the public administration, or the best proposal as a result of a combination of the lowest payment by the public administration with the best technical proposal in accordance with the weights established in the invitation to tender. Bidders have the opportunity to amend their proposal in order to rectify faults and insufficiencies within the time period established in the invitation to tender. After a thorough assessment of all proposals, the contract for the PPP will be rewarded to the private party that has been able to accomplish best the technical and financial requirements.²²

Organization and governance of the PPP process

The management of the federal PPP programme will be in the hands of an inter-ministerial council, the Comitê Gestor. Representatives of the Ministry of Finance, the Ministry of Planning, Budget and Management, and the Civil Cabinet of the President, participate in this committee. The committee is responsible for the definition of priority services to be procured in the PPP format, the establishment of procurement procedures, the authorization for opening the tendering processes, and the approval of invitations to tender. It is also responsible for the evaluation of the contract performance reports and has to report to the National Congress, the National Audit Office and the public at large (on an annual basis) about the performance of the PPP contracts. The Comitê Gestor is supported by the Comissão Técnica das PPPs which is formed by the specialized PPP Unit of the Ministry of Planning.

PPP project proposals have to be analysed by the Ministry of Planning with regard to economic merits of the project. According to law, the project analysis has to show efficiency, defined as the optimization of the relation between the lifetime costs and quality of a project, taking into account all the risks associated with the project. Initially, the analysis was based on the methodology used in the United Kingdom, which was mainly quantitative. The main problems associated with the initial methodology were its excessive focus on numbers, lack of attention for empirical evidence and for experiences with previous projects, and the risk of manipulation of the quantitative results of the analysis (H.M. Treasury, 2004). Hence, a new methodology was designed, which tries to balance quantitative and qualitative analyses as well as empirical evidence and experience from previous projects. The new methodology has to provide answers to three groups of basic questions:

1) Is the project proposal viable?

Are there any legal concerns? Is the proposed contract accurate? Is there a trade-off between operational flexibility and long-term contract cost advantages? How about the supervision of the contract and the performance indicators?

2) Is the project proposal desirable?

What are the construction, operational and political risks? Is it possible to integrate construction, operation, maintenance and finance? Are there any technological innovations? Is the project desirable from a strategic and development perspective?

3) Is the project proposal achievable?

What are the transaction costs? Can the market deal with the risks transferred? Is the public sector capable to realize the project? Is the private sector interested in this project? Will there be enough competition in the tendering and procurement process?²³

The Ministry of Planning is required to use this analysis to make a Public Sector Comparator, as discussed in the previous chapter, but this is hampered by the fiscal problems of the government. Because of lack of public funds to finance infrastructure projects, private sector involvement by means of a PPP is in fact the only possibility to realize a certain project. Put differently, determining the difference between the complete realization of a certain project by the public sector and the PPP alternative is a theoretical exercise.²⁴ The benefits and usefulness of this analysis nevertheless remains the same, since it offers a clear overview of quantitative and qualitative consequences of a certain project proposal.

Apart from the analysis of the Ministry of Planning, the Ministry of Finance has to analyse the fiscal consequences of the project proposal, specifically with regard to the viability of granting public payment guarantees and their form relative to the risks for the National Treasury within the context of the Fiscal Responsibility Act. Article 22 states that the Federal Government may enter into a PPP contract only when the sum of the current expenditures derived from the already signed partnership contracts did not exceed in the previous year one per cent of the net current revenues in the fiscal year. Moreover, the annual expenditures of the contracts in effect in the ten subsequent years may not exceed one per cent of the net current revenues forecast for the respective fiscal years.²⁵ State governments and municipalities that procure PPPs must always, prior to contracting, send the necessary information to the National Treasury Office for compliance with the abovementioned provisions.²⁶

The Fiscal Responsibility Act defines two ways of accounting public spending: as current expenditures (on goods and services) or purchases by instalments (e.g. investment in fixed assets). Current expenditures are accounted for in the current budget plan, future instalments are accounted for as public debt. These provisions imply that all costs of PPPs are considered current expenditures, and not investment to be amortized. This reflects the philosophy behind PPPs, i.e. that the public sector is leasing privately provided services (Barbosa de Brito and Pinheiro Silveira, 2005).

At first sight, Article 22 of the PPP Act may seem rather arbitrary as it is hard to see the economic rationale behind the one per cent

limit established by the law. Economic theory does not provide the logic for such a restraint and only few examples may be found of such a practice internationally. The rationale may be found in the political process: it is quite attractive for politicians to use PPPs as a means of transferring current expenditures and public investments to the future, thereby moving them off-budget in order to bypass expenditures controls and to move public debt off the government balance sheet.²⁷ Although market scrutiny would put an end to such practice rather quickly, investor's confidence could be seriously threatened by this kind of fiscal profligacy, which would seriously undermine the willingness of the private sector to participate in PPPs. More importantly, international financial institutions, as well as international private investors considering FDI in Brazilian infrastructure projects would probably also reject such fiscal misconduct, since it would put their long-term investments at risk.

The comprehensive and detailed analysis of PPP project proposals is by no means without consequences. In December 2005, the number one priority project of the Ferrovia Norte-Sul was eliminated as a potential PPP. This railway project was initially one of the priorities of the PPP portfolio presented by the government in December 2003. Preliminary financial viability studies demonstrated an internal rate of return of less than two per cent, which would make a completely private provision by means of an ordinary concession impossible. Therefore, the only way to realize the railway was by means of a PPP. However, recent studies of the Comissão Técnica das PPPs in cooperation with the CAF using fresh data have shown that the project is privately viable indeed, which makes additional public funding unnecessary. The project proposal is now further being prepared as a 'normal' concession.²⁸ The projects of the BR-116 and BR-324 to improve the highway system from Bahia to Rio de Janeiro and São Paulo is now considered the first Brazilian PPP. The project was launched in August 2006 and should be implemented in 2007.

Financial aspects and creditor concerns

With the purpose of guaranteeing the Federal Government's payment obligations under partnership contracts signed according to the provisions of the PPP Act, the Federal Government is authorized and obliged to fill a Fundo Garantidor das PPPs (the PPP Guarantee Fund) up to a total limit of six billion reais. The purpose of the Guarantee Fund is to offer a *colchão de liquidez* (mattress of liquidity) in order to reduce

uncertainties and risks for private investors. A reduction of risks also reduces the costs of capital, and is therefore important for the efficiency of PPP projects. The Guarantee Fund consists of cash, government bonds, shares of state-owned enterprises and other assets that have a high degree of liquidity. The Federal Government cannot use these assets for anything other than meeting its payment obligations with private PPP investors.²⁹ The *Fundo Garantidor das PPPs* is administered, managed and represented by a financial institution controlled by the Federal Government, the *Banco do Brasil*, which is also responsible for any disbursements, as well as the asset management aimed at promoting the profitability and liquidity of the Guarantee Fund.³⁰ It stands to reason that the very minute the government should make use of the Guarantee Fund, the Federal PPP programme would cease to function, as using the Guarantee Fund would de facto mean that the government would default on its debt and expenditures service.

According to Article 23, the Federal Government is authorized to grant incentives, within the scope of the *Programa de Incentivo à Implementação de Projetos de Interesse Social* (Programme of Incentives for Implementing Projects of Social Interest) for the financial assets in investment funds, which entail credit rights in PPP contracts. This way, projects of important social interest can be realized by means of a partially publicly financed PPP. The *Comitê Monetário Nacional* (National Monetary Council) has to establish guidelines for the concession of credit facilities for financing PPP projects, as well as for the participation of pension funds in funding PPP contracts. General norms regarding the public accounts in relation to PPP contracts are published by the National Treasury Office of the Ministry of Finance. Finally, a limitation regarding credit operations of state-owned enterprises and mixed capital corporations controlled by the Federal Government is made in Article 27 of the PPP Law. Participation of these entities in PPP credit operations cannot exceed 70 per cent of the total sources of the Special Purpose Company. For areas in the north, north-east and central-west regions where the Human Development Index is below the national average, this amount cannot exceed 80 per cent.³¹

In the next chapter, the case of the Mato Grosso State *Programa Estradeiro* will be used to discern several regulatory and financial risks involved in the current Brazilian experience with PPPs.

THE MATO GROSSO STATE PROGRAMA ESTRADEIRO

Mato Grosso is a state of continental dimensions – 900,000 km² or 10 per cent of the Brazilian territory – with all the infrastructure problems related to such a vast area. The network of state roads in Mato Grosso extends over 26,500 kilometres, 93 per cent of which are not paved; only 1,950 kilometres of roads are asphalted. Out of this total network of state roads, 4,390 kilometres account for over 90 per cent of all cargo transport. The road system plays a crucial role in the development of agriculture, the main economic activity in the state. Soya is the major agricultural commodity produced in the state, but cattle, maize, and cotton contribute as well to the regional economy. In 2005, soybeans were grown on more than 5 million hectares, and no less than 15 million tons of ‘green gold’ were produced, 27 per cent of total Brazilian soya production.³² Most of the agricultural commodities are transported over unpaved roads, often in poor conditions, which substantially increases costs of transportation, and consequently reduces the competitiveness of the sector. This state of affairs is all the more awkward as the rainy season starts just before the time of harvesting, when road use is intense.

The Programa Estadual de Recuperação de Rodovias (State Programme for the Recuperation of Roads – Programa Estradeiro) was initiated by governor Blairo Maggi in early 2003. By means of agreements between the state government, municipal governments, and Associações de Produtores de Rodovias (Associations of Road Producers), the available resources of all three entities were combined and directed towards investments in construction and maintenance of the Mato Grosso road network.

In 2003, 197 kilometres of state road were paved by means of partnerships between the state government and Associations of Road Producers, and 340 kilometres of new asphalt were financed with public resources only. In 2004, 567 kilometres of state road were paved by means of partnerships and 233 kilometres were publicly financed. Overall, 1,337 kilometres of paved roads were constructed in the first two years of the Programa Estradeiro, 5 per cent of the state road network of Mato Grosso (SINFRA, 2005).

The state of Mato Grosso was the first to initiate a PPP programme at state level in Brazil. The Programa Estradeiro defines the scope and design of the road projects to be paved and the concession of the roads after construction. It regulates toll tariffs and adjustments, and determines the tasks, obligations and responsibilities of the public and private entities involved in the concession contracts. The main objective of the Programa Estradeiro is to stimulate private sector involvement in the provision of transport infrastructure, as large and persistent budgetary constraints hamper the state government to maintain and expand the Mato Grosso road system.

The Programa Estradeiro intends to establish a new model of PPPs for the provision of roads. Partnerships are formed after a process of meetings and discussion with local producers (farmers, industries, and trading companies), municipal authorities, and servants of the Secretaria de Estado de Infra-estrutura (Mato Grosso Department of Infrastructure - SINFRA).³³ The aim of this process is to draft and improve the proposed project in order to maximize opportunities for the local producers and to minimize the costs of the project. It is however unclear what kind of costs-benefit analysis of potential Estradeiro projects is made by SINFRA and what kind of socio-environmental impact assessments are made, which tends to make the decision-making process opaque and reduces the accountability of the public authorities that are involved.

The division of tasks and responsibilities between the state government, the Associações and municipalities is as follows. The local authorities and producers are responsible for the provision of the road up to a point where it is 'ready for paving'. This means that they are responsible for (re)-opening of the road when the track has been covered with vegetation, for levelling and drainage of the surface, for sub-base and base layers of the road, for equipment and machinery – including 50 per cent of the necessary diesel oil –, and for the workers needed to carry out the works.

The state government is responsible for the technical design of the project, the provision of all the required environmental and other licenses, 50 per cent of the diesel oil for the equipment and machinery used for the project, the paving of the road with asphalt (top layer) and all complementary works, such as horizontal and vertical signalization. This division of responsibilities is remarkable as it makes little economic and technical sense to separate in this manner the different construction stages.

In order to form an Associação, municipalities or groups of producers in a certain region interested in the pavement of a state road have to organize a meeting with all parties concerned in the areas surrounding the road. The Programa Estradeiro defines the next steps in the process:

- a meeting has to be organized to discuss the significance of the proposed road with everyone expecting benefits from the pavement of the road;
- the Associação has to be created using the application form of the State Government;
- an inspection of the road has to be carried out by SINFRA and the State Secretariat of the Environment (SEMA);
- the articles and rules of association, as well as the functions of the directors of the Associação have to be elaborated, using the application form of the State Government;
- the Associação has to be officially registered at the Chamber of Commerce;
- the Associação has to be officially registered at the Federal Taxation Office;
- the Associação has to request the SINFRA to elaborate an official Declaration of Intent that has to be signed by the governor;
- when all these steps have been completed, technical preparations for the project may start;
- the official Convênio or project contract has to be signed by the Secretary of Transport and the governor;
- the work may begin.

According to the initial Programa Estradeiro documents, a toll-collection system has to be implemented after the works are completed. Several categories of vehicles are distinguished for which different toll rates apply, which may differ between roads. Most notably, producers and farmers that have participated in the Association are exempted from paying toll. This is one of the most important features of the public-

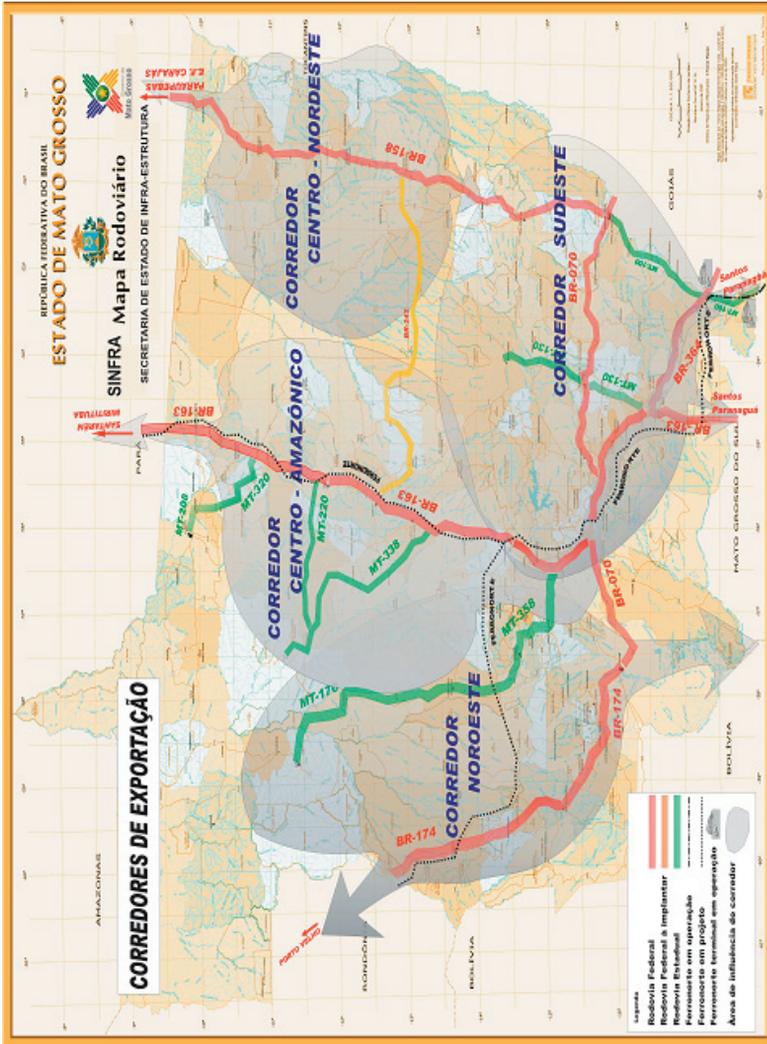
private arrangement that is established by the Programa Estradeiro, which may have significant implications for the financial sustainability of the programme.

As indicated above, almost 90 per cent of all cargo is transported over less than 20 per cent of the Mato Grosso state road network (4,390 km). Map 6.1 shows that the focus of the Programa Estradeiro is on roads composing the Central-Amazonian Export Corridor along the BR-163, which covers the area with the most productive soya plantations and farms. Since land ownership is highly concentrated in this region, a small number of producers and farmers own and live in the surrounding areas of these roads, which account for a substantial part of total traffic on these roads. According to the Programa Estradeiro, maintenance costs of the roads have to be financed by toll revenues. Exempting these producers from paying toll because of their participation in an Association or Consórcio reduces toll revenues considerably, and consequently the financial sustainability of Consórcios. It should be noted that the initial Estradeiro documents state that maintenance costs that surpass toll-revenues accrue to the state government. So, if modest toll revenues do not suffice to cover maintenance costs, these costs are 'automatically' socialized and transferred to the public sector rather than being covered by the main users of the road, particularly the soybean farmers around the road.

Remarkably, the introduction of the toll system has been retarded and its introduction is highly politicized. In 2003 and 2004, at the time the Estradeiro had just started, attention was focused on the construction and paving of roads. In 2005 questions were raised about maintenance and the long-term viability of the programme, but no action was undertaken to introduce a toll-collection system, as in this pre-election year the local politicians did not want to upset voters with an annoying but nevertheless necessary and pre-announced toll-system.

Because of strong links of the agricultural sector with the political elite, the agricultural lobby in the State Assembly and the State Government is powerful. The current governor Blairo Maggi is owner of the Grupo Amaggi, the world's largest producer of soybeans. Maggi, also known as the Soybean King, was elected in October 2002 and inaugurated on January 1st 2003. Moreover, soya farmers hold important political posts at the local level. In municipalities such as Lucas do Rio Verde, Sinop, Sapezal, Sorriso, Rondonópolis and Tapurah, all major centres of soya production, the mayors are large soya farmers. Most of them are directly or indirectly related to Maggi himself, like the mayor of Sapezal, João Cesar Maggi, brother of governor Blairo Maggi.

Map 6.1. Main export hubs in the State of Mato Grosso.



Source: SINFRA.

Governor Maggi has focused political attention on roads and agriculture, particularly soybeans. To generate more public resources for investment in roads, Maggi introduced the Fundo Estadual de Transporte e Habitação (State Fund for Transport and Housing - FETHAB). Investments in roads account for 70 per cent and investments in social housing projects for 30 per cent of the FETHAB funds. The resources for the FETHAB come from a special tax on diesel oil, cattle, cotton, wood and soya. In 2003 and 2004, taxes on soya accounted for nearly 25 per cent of total revenues, taxes on diesel oil for 60 per cent; on cattle for 10 per cent, on wood for nearly 5 per cent and on cotton for less than 1 per cent.³⁵ These figures show that soya farmers only contribute a relatively small share to the FETHAB-investment fund while they are the most intensive users of the roads around the Central-Amazonian Export Corridor.

As shown, the concurrence of economic and political dominance of the soybean sector in Mato Grosso has resulted in a PPP programme with significant weaknesses that are likely to harm public finance and overall interests in the medium term. Moreover, rents are generated and transferred to investments in roads that are primarily important for the soybean sector. Although the Programa Estradeiro produces hundreds of kilometres of asphalt at low costs by means of *compartilhar tarefas* (sharing tasks), as the Secretary of Infrastructure Luis Antônio Pagot puts it, its way of operation is not optimal from the point of view of society at large.

THE BR-163 CUIABÁ – SANTARÉM HIGHWAY: ENVIRONMENTAL IMPACT AND WELFARE EFFECTS

The BR-163 highway between Cuiabá and Santarém is to be constructed, financed and exploited by means of a concession. This major road project is studied to clarify procedures for assessing the environmental impact of roads and for identifying the environmental risks related to such major infrastructure projects. Attention is paid to the legislation concerning EIA. Moreover, the chapter will examine the actual project proposal and the most important studies on the public and private costs and benefits of the highway project.

Roads may induce significant economic and ecological changes along their trajectory, as indicated already in general terms in Chapter 3 of this study and as shown more specifically in a series of studies on roads in Brazilian Amazonia. Their construction or renovation may affect land use and land prices, local and regional economic activities, and by doing so the life of local people and the ecosystem. The most significant and often irreversible impacts are located along trajectories through previously inaccessible areas like pristine forests.³⁶

The theoretical part of our study on PPPs in Chapter 4 indicated that a profound cost-benefit analysis of infrastructure projects is required to assess potential welfare gains. A comprehensive EIA involves 'a thorough documentation of existing conditions, an identification of impacts, and a comparative examination of impacts arising from the road project alternatives.' (The World Bank, 1997, pp.4-11). As such, the EIA is an indispensable part of a social cost-benefit analysis in which the environmental impact is assessed in economic terms as much as possible.

In general, an EIA has three main objectives. First, it intends to present a comprehensible estimation of the possible environmental

impact of an infrastructure project. Second, it can be used to apply an advanced methodology to assess and predict the environmental impact, and to provide possibilities to prevent and mitigate these negative environmental effects. Third, it helps to structure systematically public consultation in a way that enables stakeholders to provide direct inputs to the environmental management process. To be effective, the subsequent stages of the EIA have to be synchronized with the project development process as shown in Figure 7.1.

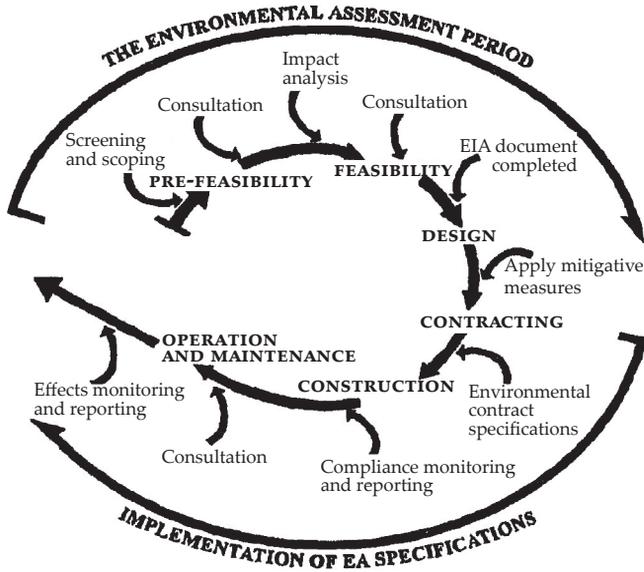
In the first stage of the EIA (screening and scoping), important landmarks such as baseline conditions and spatial and temporal boundaries for the assessment have to be determined. Also, a preliminary evaluation of the magnitude of potential impacts on soils, water resources, air quality, flora and fauna, local (indigenous) communities, cultural heritage, aesthetics and landscape, and noise, has to be provided. This way, the research methodology can be adapted to the specific circumstances of the project and the region.

The second stage of the EIA consists of the actual analysis and assessment of all potential impacts of the project alternatives. This analysis should enable policy-makers to take an appropriate decision on the best project alternative and the optimal project design, taking into account both economic and environmental dimensions (McDonald and Brown, 1995, pp.483-95).

Just as important as the ex-ante assessment of potential impacts and possible mitigation measures is the monitoring of the project in the construction and operational stages (The World Bank, pp.4-11). An important part of the EIA consists of the development and implementation of measures to mitigate negative environmental effects. Moreover, environmental performance indicators can be a part of the PPP contract to create a financial incentive for the concessionaire to monitor environmental impacts seriously.

International experience during the 1990s shows that EIAs can contribute significantly to manage environmental and social risks and to limit the negative impact of road projects. Nevertheless, they also point out that EIAs are less suited for addressing larger development projects and their impact on the macro-economic sector or area-wide level (Kjørven and Lindhjem, 2002, pp.5-6). To address these inadequacies of traditional EIAs, the SEA has emerged as a tool for including environmental concerns into policies, plans and programmes. By using the SEA, a more comprehensive and inclusive approach to large infrastructure and regional development projects is possible. This is particularly important in the case of PPPs, since the design of the

Figure 7.1. The EIA and project development process.



Source: The World Bank (1997).

PPP and the payment system should be related to the distribution of both positive and negative welfare effects of the project. In addition to the environmental impact analysis of the EIA, the SEA consists of a 'systematic and comprehensive evaluation of the environmental and social effects of policies, plans or programmes and their alternatives, resulting in a report that facilitates publicly accountable decision-making' (Ahmed et al., 2005, pp.1-4).

The Brazilian experience with environmental assessment

Since Brazil is a federal republic, the institutional framework for environmental policies, licensing and EIA consists of three levels of government. At the national or federal level, the Ministério do Meio Ambiente (Ministry of the Environment – MMA) is responsible for the coordination of national environmental policies. The Conselho Nacional do Meio Ambiente (National Council of the Environment – CONAMA) is responsible for the legislation and juridical aspects of environmental policies. The Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (The Brazilian Institute of the Environment and Renewable Natural Resources – IBAMA) is an ex-

ecutive agency subordinated to the MMA. IBAMA is responsible for the coordination and integration of actions at the national level. Its most important function is environmental licensing and the review of EIAs (Fowler and Dias Aguiar, 1993, pp.169-76; Gonçalves Egler, 1998, pp.245-425).

MMA and CONAMA have similar institutions at the state level: the Secretarias Estaduais do Meio Ambiente (SEMA) and the Conselhos Estaduais do Meio Ambiente (CONSEMA), while IBAMA is represented by its offices (Superintendências) in the states. Similar entities exist at the municipal level, with slightly different names. The institutions at the municipal level, however, are rarely directly involved in the process of EIA and environmental licensing.

The Brazilian legislation regarding EIA is structured upon CONAMA Resolution 001/1986, which specifies the types of activities that have to be submitted to the EIA-process. During the last two decades, several modifications have been made to the original resolution, but the basic principles have remained the same. The resolution specifies the minimum technical requirements and contents of the EIA. Finally, it states that the EIA has to be conducted by a skilled and multidisciplinary staff that is independent of the project proponents.³⁷ More specifically, the resolution covers most of the necessary aspects for an adequate EIA-practice including: (1) project alternatives; (2) procedures for public participation in the EIA-process; (3) linkages between the EIA and the licensing procedures; and (4) provisions for state and municipal governments to require EIAs and to make supplementary legislation.

However, the main limitations are: (1) the possibility for state and local governments to make their own legislation creates space for inconsistency in EIA-procedures across Brazil; (2) the resolution is quite general and artificial and terms of reference for specific projects are lacking; (3) a non-technical (public) summary of the EIA is not required; and (4) the list of activities subject to EIA is quite limited and rigid, particularly with respect to projects that are likely to generate substantial indirect or cumulative environmental impacts such as large industries and regional plans.

The Brazilian EIA-procedure consists of three stages. Project proponents and developers start the EIA-process by applying for a preliminary license at IBAMA, the so-called Licença Prévia. This preliminary license is given at the stage of the project design and feasibility studies. If the project pertains to the activities regulated by the CONAMA resolution,

an EIA is required for this preliminary license, which is provided after the EIA is approved by IBAMA.

Next, the project proponents have to apply for the Installation License, the so-called *Licença de Instalação*. In order to obtain the license, the proponents have to present the executive project designs as well as the preliminary license to the IBAMA. After the Installation License is granted, the project can start. Once the construction of the project is finished, the operation license has to be applied for. If IBAMA find that all mitigation measures summed up in the EIA have been implemented, the project can come into full operation. Although the operation license is officially a temporary license, monitoring of environmental impacts after the licensing procedure is rare and certainly not a formal practice in the Brazilian EIA-procedure (Glasson et al., 2001, pp.191-225; Reid and Cabral de Sousa, 2005, pp.740-46).

Comprehensive and adequate the legal framework for EIA may seem, the actual Brazilian EIA-practice is rather different. First and foremost, the link between EIA and project design, not to mention project alteration or modification, is weak. In Brazil, the EIA is merely a step in the process of project planning, a sheer autograph that has to be obtained. As a result, the role of the EIA with respect to prevention and mitigation of negative environmental effects is severely limited.

Economic and political pressures contribute significantly to this problem. In general, the lobby by powerful interest groups for roads – like the soya farmers in the case of the BR-163 – starts long before a decision has to be taken. As is the case with the multi-year investment plans, international financing is stimulated and attracted before even a minimal cost-benefit analysis has been carried out, thereby creating a (financial) momentum that cannot be stopped or adjusted by environmental or social concerns. An EIA often is carried out short before the start of a project, when alternatives or modifications are no longer possible.

Second, EIAs in Brazil generally do not cover indirect or ‘dragging’ effects and are of limited scope. Most impacts of roads do not occur at the time of construction and in the direct vicinity of the road. Both time and area demarcation are too narrow. The case of the BR-163 highway is a clear example of these serious shortcomings of the Brazilian EIA-practice.

Another complicating factor is that EIAs have to be paid for by the project proponent. Consultants are regularly pressured to produce favourable reports, since the financial and political stakes in securing project approval are high. By means of nearly impossible deadlines,

influence on draft reports and financial incentives – such as last instalments after project approval –, project proponents tend to manipulate the EIA-process (Fearnside, 2002, pp.738-42).

The BR-163 Cuiabá – Santarém highway

Since 1964, the year the armed forces sent the democratically elected president João Goulart home and established a military regime, the development of Amazonia has been a corner stone of the national development plans. To support national security and territorial integrity, the unity of the nation has been deemed to be crucial, which required Amazonia to become physically and economically integrated with the rest of Brazil.

Under the auspices of the Superintendência de Desenvolvimento da Amazônia (Superintendency for the Development of Amazonia – SUDAM), the Operação Amazônia (Operation Amazonia), the Plano de Integração Nacional (National Integration Plan – PIN), and several consecutive development projects were initiated. Central to all these projects and programmes was the geopolitical concept expressed by *integrar para não entregar*³⁸ (Carvalho et al., 2002, pp.34-45; Mahar, 1989; van Dijck, 2003, pp.101-8).

One of the most visible elements of this endeavour to connect Amazonia with the rest of Brazil is the highway programme launched in the 1970s. Roads such as the Belém-Brasília (BR-010), the Transamazônica (BR-230), the Manaus-Porto Velho (BR-319), the Cuiabá-Porto Velho (BR-364), and the Cuiabá-Santarém (BR-163), opened up Amazonia and had a strong impact on the region by stimulating colonization and deforestation.

The Cuiabá-Santarém highway (BR-163) was constructed during the period 1971-73 by the 8th and 9th Construction Engineering Battalions (BECs) under the command of the colonels De Leo (8th BEC) and Meirelles (9th BEC). The road of over 1,700 kilometres was never completely asphalted, leaving Pará and the most northern part of Mato Grosso with a dirt road of over 1,000 kilometres. Due to harsh weather conditions in the region and a continuous neglect of maintenance over three decades, the quality of the road has strongly deteriorated in the course of time (The Economist, 2004a).

A fully functioning BR-163 would almost cut in half the time required to transport agricultural commodities from Mato Grosso to the international port of Santarém and would significantly reduce transportation costs. Soya farmers in Mato Grosso have been looking forward to the pavement of the BR-163 since president Fernando Henrique Cardoso promised this in the early 1990s.

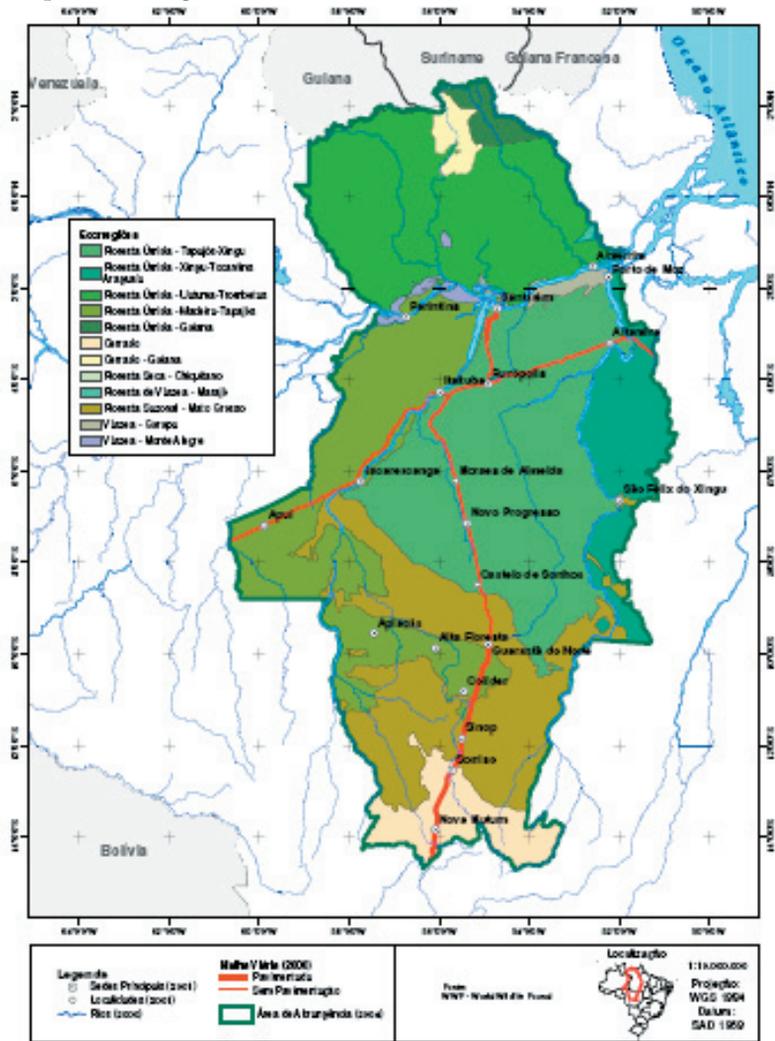
At present, soya and other agricultural products are transported from Mato Grosso to the distant ports of Santos (State of São Paulo) or Paranaguá (State of Paraná), from where it is shipped to Shanghai and Rotterdam. Paving the BR-163 would reduce the distance to the nearest seaport, Santarém, by 600 kilometres and total transport distance over sea by more than 2,000 kilometres, over seven days of sailing. Transport costs per ton would be reduced from 90 to 70 reais. Departing from the current harvest of 5 million ton of soya, this would result in a reduction in transport costs of almost 100 million reais per year. To this may be added reduced freight costs for other agricultural commodities shipped from Mato Grosso, and for electronic manufactures from the Manaus Free Trade Zone that are transported to the Southeast of Brazil, as well as the costs reductions for local transport along the BR-163 (DNIT/IME, 2005. pp.70-88; FORMAD, 2005. pp.1-5).

At the same time however, paving the entire BR-163 is likely to generate significant environmental damage and high social costs. As shown in Map 7.1, the total area of influence of the BR-163 project covers almost 15 per cent of the Brazilian territory. Deforestation, land speculation and illegal logging are feared to aggravate and this may also hold true for CO₂-emissions, loss of unique biodiversity, destruction of non-renewable ecological resources and extinction of tropical species.³⁹ In view of the sheer size of the potential impact of pavement of the BR-163, a comprehensive social cost-benefit analysis is required. Realization of this project by means of a PPP or an ordinary concession, as considered by the Brazilian government, makes such an analysis even more compelling.

CBA of the BR-163 project

The total distance of the BR-163 is 1,756 kilometres, 984 of which in Pará and 772 in Mato Grosso. In Mato Grosso, 712 kilometres of the road up to the town of Guarantã do Norte have already been paved, but due to insufficient maintenance the quality of the road has deteriorated significantly in the past decades. In Pará, less than 100 kilometres have been paved. Departing from Cuiabá, the first 190 kilometres of the road are fairly well maintained. For that reason, the original project and

Map 7.1. Ecological zones intersected by the BR-163.



Source: Ministério do Meio Ambiente (2005).

concession design covers the track from Nova Mutum to Santarém, a distance of 1,537 km. Moreover, another 32 kilometres of road have been included in the project proposal, linking the BR-163/Transamazônica crossing with the town of Miritituba, located alongside the Rio Tapajós and near the port of Itaituba.

Map 7.1 shows the ecological zones intersected by the BR-163. In Mato Grosso the road passes almost entirely through the *cerrado*, a unique ecological savanna zone, home to an abundant number of bird species and other wildlife. The larger part of the overall trajectory, however, passes through transitional and humid tropical forests, highly susceptible to environmental damage.

The EIA for the original project proposal was commissioned by the Departamento Nacional de Infra-Estrutura de Transportes (National Department of Infrastructure – DNIT), carried out by Ecoplan Engenharia Ltd, and published in the year 2002 (DNIT/Ecoplan, 2002). In 2004, DNIT and the Instituto Militar de Engenharia (Military Institute of Engineering – IME) elaborated the Estudos de Viabilidade Técnico-Econômica (Technical and Economical Viability Studies – EVTE), the Programa Básico Ambiental (Basic Environmental Programme – PBA) and the Programa de Exploração da Rodovia (Highway Exploitation Programme – PER).

The purpose of the EVTE is to determine whether realization of the project can be justified from a public point of view (DNIT/IME, 2005, p.13). The PBA consists of a series of programmes aimed at mitigation of the negative socio-environmental effects of the road, including effects on indigenous communities in the vicinity of the BR-163. The PER provides an overview of the technical standards, criteria, and performance indicators that have to be met by the constructors or concessionaire.

As it appears, the EVTE is a comprehensive cost-benefit analysis of the BR-163 project, accompanied by a broad programme to mitigate negative socio-environmental impacts as well as an extensive specification of technical requirements, criteria and performance indicators. If the requirements for such a comprehensive study would indeed be met, all information needed for a successful PPP would be available.

On paper the EVTE, PBA and PER would provide all information required for a successful PPP, but in reality the validity of these studies is undermined by a series of inadequacies, shortcomings and misrepresentations. For a start, it is not clear what the actual demand for new or improved infrastructure in the region at large is and what kind of transport modality could serve such demand best. Clearly, local producers strongly favour paving the road and voice their preference,

Table 7.1. Net present values of benefits, in million reais and in percentages, December 2005.

<i>Product/User</i>	<i>Scenarios</i>					
	<i>Optimist</i>		<i>Neutral</i>		<i>Conservative</i>	
	reais	%	reais	%	reais	%
Soya	6,213,323	88	4,746,203	86	4,128,682	86
Fertilizers	433,955	6	403,963	7	332,023	7
Petroleum products	174,351	2	158,781	3	137,606	3
General cargo	33,545	0	33,545	1	33,545	1
Normal traffic	173,095	2	173,095	3	173,095	4
<i>Total</i>	<i>7,028,269</i>	<i>100</i>	<i>5,515,587</i>	<i>100</i>	<i>4,804,951</i>	<i>100</i>

Source: DNIT/IME (2005).

Table 7.2. Net present values of costs, in million reais and in percentages, December 2005.

<i>Activity</i>	<i>Costs</i>	
Construction	Construction	768,082
	Profit rate (7%)	53,766
	Environment programmes	94,098
	Subtotal	915,945
Restoration / maintenance	Initial restoration	58,459
	Maintenance	1,071,592
	Profit rate (7%)	79,104
	Subtotal	1,209,155
Conservation/ improvements	Improvements of existing tracks	95,462
	Conservation	129,677
	Profit rate (7%)	15,760
	Subtotal	240,899
<i>Total</i>		<i>2,365,999</i>

Source: see Table 7.1.

but this does not take away the need for a sound investigation into actual and future transport demand and the availability of alternatives. The EVTE of the BR-163 refers to several export corridors as project alternatives, but apparently for no other reason than their inclusion in the multi-year investment plan of the federal government.

Moreover, serious questions can be raised concerning the economic assessment of the social costs and benefits of the project. According to the EVTE, all benefits of the road are linked to transportation of five categories of products and road users: soya, fertilizers, petroleum products and related materials, general cargo, and normal traffic. Table 7.1 shows the estimated net present values of benefits, and Table 7.2 shows estimated net present values of costs according to the EVTE.

As shown, the estimated benefits exceed estimated costs, which would justify the project because of its expected net positive contribution to social welfare (DNIT/IME, 2005, p.86). In addition, the EVTE indicates that other factors not included in the simulation study may contribute to the economic viability of the project, and that assumptions underlying the simulations were cautious and conservative, suggesting that the real-world benefits of the project will be even larger. As put in the study:

Não se deve esquecer que além dessas simulações, outros fatores também corroboram para a viabilidade plena do Corredor composto pelas rodovias BR-163 e BR-230, haja vista que durante todo o discorrer dos aspectos apostos neste EVTE, as posições adotadas sempre foram pautadas pelo conservadorismo. Assim, essa conjunção de fatores, aliada às simulações apresentadas, demonstram ainda mais essa viabilidade. Se o aspecto principal abordado no EVTE possuiu conotação puramente técnica que possibilitou a demonstração da exequibilidade do empreendimento, fatores outros, aqui não levados em consideração, ainda poderiam ser agregados aos condicionantes da viabilidade, mormente, aqueles diretamente ligados aos aspectos sociais que a rodovia poderá proporcionar. A Região Sul do Estado do Pará já começa a perceber um crescimento, que facilmente se demonstra não estar inserido em critérios de sustentabilidade. A rodovia poderá permitir o ordenamento de ações em todos os níveis, quer institucional, quer agrário e ambiental. O Corredor certamente tornar-se-á um expoente de desenvolvimento, gerando e deslocando riquezas para aquele rincão brasileiro, permitindo a integração daquela região ao restante do país.⁴⁰ (DNIT/IME, 2005, p.88).

This presentation fails to show the full costs and benefits of the project and is based on a partial instead of comprehensive social cost-benefit analysis that has not included important social and environmental costs. First, only the costs of the environmental mitigation

measures during the construction stage are taken into account and an assessment of environmental effects throughout the entire 25 year period of the concession is lacking. Moreover, no assessment has been made of the effects on land use and land prices in the vicinity of the BR-163; of the effects on the wider transport sector, such as the ports of Santarém, Santos and Paranaguá, or of the social impact of the project on health, economic activities and the labour market in local indigenous communities. Also, no distinction has been made between direct and indirect welfare effects, regional distributional effects, and externalities on a supra-regional scale.

Another fundamental problem concerning the EVTE is the use of a discount rate of 12 per cent (DNIT/IME, 2005, p.72). As indicated in Chapter 4, the rate to discount future benefits should reflect the opportunity costs of capital and a degree of uncertainty. In Brazil, real interest rates have frequently been higher than 12 per cent in recent years, implying that a discount rate of 12 per cent is unrealistically low, which would result in an artificially high net present value of future benefits.

It follows from the above that the EVTE for the BR-163 project falls short of a comprehensive social cost-benefit analysis. At best it is a partial (financial) cost-benefit analysis, be it that its role as a tool for public management is hampered by the incomplete analysis of important effects, the questionable assumptions underlying the analysis, particularly the discount rate of 12 per cent, and the biased presentation of the results.

Concession design of the BR-163 project

After the presentation of the EVTE, PBA and PER in the first quarter of 2005, the Ministry of Transport started to elaborate the concession design for the BR-163 project. On May 17th, 2005, Minister Alfredo Nascimento presented the results of the EVTE, PBA and PER as well as the concession design to the general public.⁴¹ The most important features of the concession design are:

- the object of the concession: construction, maintenance and operation of the road, emergency attendance to the users, implementation of the environmental programmes mentioned in the PBA;
- the toll collection system, in terms of composition of tariffs and tariff adjustment as well as the number and location of collection points;
- performance indicators;

- risks to be carried by the concessionaire, most notably the traffic and Volume risks, exchange rate risks and all construction risks;
- legal body of the concessionaire Special Purpose Company; and
- tender proceedings: the bidder with the lowest toll-tariff wins the tender.

No serious attempt was made to internalize negative externalities such as social or environmental effects or positive externalities such as an increase in land prices. Put differently, not even the option of applying Pigouvian taxes or subsidies was considered, although this kind of analysis is potentially very useful in terms of welfare maximization.

After the so-called Audiência Pública (Public Hearing), the concession design was sent to the Conselho Nacional de Desestatização (National Privatization Council), the federal council in charge of the Programa Nacional de Desestatização (National Privatization Programme). After the Council approved the concession design, the concession and the underlying studies (EVTE, PBA and PER) had to be verified by the Tribunal das Contas da União (Federal Court of Auditors), which has 60 days to verify and approve the studies and the concession design. Subsequently the tender can be launched.

Because of the significant environmental and social effects the project of the BR-163 was expected to generate, a large number of social and environmental organizations started to mobilize civil society shortly after President Lula announced the paving of the road in early 2003. Also, international attention for deforestation in Amazonia rose as reflected by publications in international newspapers.⁴² In the face of severe criticisms, President Lula launched on March 15th, 2004, an initiative to mitigate negative environmental consequences and stimulate sustainable development in the area intersected by the BR-163. An Inter-Ministerial Task Force was established to elaborate a sustainable development plan for the area affected by the paving of the BR-163 in order to mitigate negative effects. Moreover, the Task Force was to organize a series of consultations with the people along the trajectory and with organizations representing civil society.

The Task Force had produced a first report in June 2004, which was used to start a first round of public consultations along the route of the BR-163 in July 2004. From August 2004 to February 2005, a second and more profound sustainable development plan was elaborated, integrating existing plans of the Ministries of the Environment and National Integration. A second round of public consultations was organized after the publication of the second document and was concluded in July 2005.

It is remarkable that since May 17th, 2005, no significant developments had taken place in relation to the BR-163 project and concession for over a year. Although the studies and concession were sent to the Council and the Court, no official progress of the tendering process occurred. Even more telling is that the BR-163 project was not included in the second round of the federal concession programme launched on February 20th, 2006.

Although the work and consultation process of the BR-163 Task Force were highly innovative and groundbreaking in the Brazilian context of development plans for Amazonia, the efforts of the Task Force have so far not resulted in a modification of the cost-benefit analysis or the concession design of the BR-163 project. A combination of pressure from agricultural lobby groups, and political turmoil due to a corruption scandal – the so-called *escandalo do mensalão*⁴³ – contributed to this stagnation.

This stagnation is all the more regrettable when taking into account the results of the study by the Forum Mato-Grossense de Desenvolvimento Sustentável (Mato Grosso Forum for Sustainable Development - FORMAD), which made a serious attempt to compare the private benefits with the environmental costs of the BR-163 project (Alencar, 2005). Using the simulations of Soares-Filho et al. (2004) and several other studies, the authors have made estimates of the total private benefits as well as the environmental damage of the paving of the BR-163.

The study by Soares-Filho and his team is based on the analysis of two alternative scenarios to simulate the impact of potential policy interventions on processes that are impoverishing native ecosystems in the area of influence of the BR-163. In this model, the impact of road paving on (changes in) land use is assessed in economic, demographic and policy scenarios. Two different scenarios were used. In the ‘business-as-usual’ scenario, historical patterns of law enforcement, land speculation, population growth, agricultural extension, and agrarian trends are used. In the second scenario, the ‘high-governance’ scenario, road paving is accompanied by the enforcement of environmental legislation, land-use planning by local governments, support for sustainable land-use systems, and participation of civil society. Under the business-as-usual scenario, total deforestation after 30 years will mount up to 34 per cent, i.e. an area decrease from 386,000 km² to 256,000 km². The high-governance scenario would limit total deforestation to 13 per cent, with an area decrease from 386,000 km² to 334,000 km². This means that, in case of a comprehensive implementation of

Table 7.3. Net present values of private benefits – FORMAD, in million reais, December 2005.

<i>Net present values</i>	
Transport costs reduction soya Mato Grosso	911
Transport costs reduction electronic manufactures Manaus	386
Total benefits	1,297
Construction costs	-618
Maintenance costs	-181
Total costs	-799
Private costs-benefits	498
Environmental damage without governance (business-as-usual)	4,473
Environmental damage with governance (structural mitigation measures)	1,824
Reduction of environmental damage as a result of governance	2,649

Source: FORMAD (2005).

mitigating measures, deforestation could be reduced by 60 per cent (Soares-Filho, 2004, pp.745-64).

The FORMAD-authors depart from the results of the study above to quantify the private economic gains and the environmental costs under the business-as-usual and high-governance scenarios. Construction and maintenance costs are calculated using data and values that are also used in the official EIA of the BR-163 project. The calculation of private benefits is based on official data from the Ministry of Transport about transport costs reduction, traffic volumes and transport modality substitution. The calculation of the total environmental damage consists of several aspects. First, the potential use of the forest as a carbon sink is valued. Second, water-recycling services are valued. Finally, the existence value of the forest is taken into account, as well as the value of prevented carbon emissions resulting from a reduction of forest fires (in the governance scenario).⁴⁴ Table 7.3 presents the net present value of the private benefits as calculated by the FORMAD-authors. In addition, the total environmental damage is calculated for the two scenarios mentioned above.

The implementation of a comprehensive and structural environmental programme, and the governance of the development of the region after paving of the BR-163, would thus result in a reduction of environmental damage of 2.65 billion reais, still leaving more than 1.8 billion reais of environmental costs. Under a business-as-usual scenario,

comparable with the experience of the Transamazônica in which no additional environmental mitigation programmes were implemented, the total environmental costs would amount to nearly 4.5 billion reais.

Even more interesting is the proposal by the FORMAD-authors to include a sustainability tax in the toll tariff for the BR-163 to generate finance for a sustainable development fund for environmental programmes and mitigation measures. By levying a 10 per cent tax on the expected toll-tariff of 40 reais, nearly 26 per cent of the net present value of the private benefits would be transferred to the sustainability fund. A 15 per cent tax rate would transfer 39.1 per cent of private benefits to the sustainability fund, and a tax rate of 20 per cent would transfer 52.1 per cent (FORMAD, 2005, pp.7-23). Regrettably no calculations of the costs of the mitigation measures of the 'high-governance' scenario are made which makes it impossible to calculate the optimal sustainability tax.

Although the FORMAD-study is by no means comparable to a comprehensive cost-benefit analysis, it is the only study available that attempts at applying the polluter-pays-principle to the concession design for the BR-163 project. As such, it provides valuable information about the private benefits and the socio-environmental costs of the road project. Unfortunately, the Inter-Ministerial Task Force has repeatedly refused to develop an alternative to the proposed sustainability tax of the FORMAD-authors.

As a result of a decline in agricultural prices during the harvest of 2005, the agricultural proponents and potential participants in the BR-163 concession were confronted with serious financial problems. In combination with the political crisis of the summer of 2005, no significant developments have occurred in the BR-163 project and the tendering process so far.

FINAL OBSERVATIONS

The study has focused on IIRSA as a unique region-wide infrastructural plan for South America and on the potential contribution of PPP to its development. It presents the rationale of IIRSA in terms of its contribution to the deepening of integration among Latin American countries and the improvement of the potential of these countries to exploit gains from trade by the reduction of infrastructure-related transaction costs.

IIRSA roads and related infrastructure like bridges, customs facilities, ports, and telecommunication may be considered a type of transnational or regional (quasi) public goods or club goods⁴⁵ with expected benefits accruing particularly but not exclusively to the region. As many of IIRSA-related investments aim at the creation or the improvement of linkages between existing national road systems, involving relatively small investments, the potential net economic benefits in terms of net additional income may be substantial. To avoid underinvestment in this type of regional public goods, IIRSA focuses on the creation of financial mechanisms through regional development banks like the IDB, CAF and FONPLATA.

However, outsiders that are not member of the group of 12 South American countries that established IIRSA may at the same time benefit significantly from such public goods and the trade opportunities generated by them. This may even create a condition in which the outsider – a government from outside the region or an actor of the private sector – may be interested in co-financing the regional public good to speed up or facilitate its realization.

In the traditional approach to the creation of public goods or quasi-public goods, governments have the prime responsibility for the construction, maintenance and finance of road infrastructure. In recent years new forms of delivering and financing these goods have been designed to support infrastructural development within the context of limited budgetary possibilities of national governments and stricter efficiency requirements than applied in the past. In such a context, private firms having an interest in the trade opportunities created by IIRSA-related infrastructure may contribute to investment in such roads through some sort of PPP. IIRSA aims at developing this type of innovative financial constructions.

PPPs can take many different forms but can be defined as long-term contractual relations between the public and private sector, designed for the provision of public services by the private sector, in which both parties have shared (financial) interests. In economic terms, PPPs can contribute to the realization of projects that increase welfare for society at large, but that are not financially viable for the private sector alone. At the same time, the public sector can make use of private sector efficiency, which contributes to the efficient use of public money. Hence, PPPs can be an attractive instrument to finance and realize in an efficient manner infrastructure projects with a positive net welfare effect.

So far, the experience with PPP in the sector of road infrastructure in South America is limited and that holds even more for trans-border infrastructure. Clearly, the international dimension of an infrastructural programme adds to its complexity by requiring rules and mechanisms for the distribution of costs, benefits and risks among the governments involved. Moreover, mechanisms are required to deal with differences in national regulations regarding road constructions and related environmental and technical standards.

This study used the Brazilian approach of PPP for three reasons. First, Brazil is among the major initiators of the IIRSA plan, and a substantial part of IIRSA trajectories or IIRSA-related specific infrastructural projects is located in Brazil's national territory or at Brazil's borders. Second, Brazilian standards and approaches may be a critical point of reference in setting region-wide technical and environmental standards related to infrastructural projects. Third, Brazil has developed interesting experience in the design of PPPs for road infrastructure and in the application of infrastructure-related environmental and social impact assessment procedures.

Brazilian infrastructure policy underwent an important shift towards private participation in infrastructural development during the 1990s.

The PPP Law adopted on December 30th 2004 is an important step in this regard. By adapting and improving the existing legal and regulatory framework for different types of concessions, the law is meant to create a safer and sounder investment climate for the private sector. Central objective of the PPP Law is improvement of the efficiency of public investments and the enhancement of social welfare. Important features of the law are the rules about transparency of procedures and decision-making, fiscal responsibility, and guidelines and notes concerning the distribution and transfer of risks among the public and the private sectors involved in PPP contracts.

On paper, the regulatory framework for PPPs and ordinary concessions in Brazil is adequate and complete. However, an adequate regulatory framework for a PPP is by no means a guarantee for a well-functioning PPP. As the analysis of the Brazilian experience with infrastructure projects in this study shows, the potential benefits of PPPs do not come into being automatically. Financial risks and inadequate mechanisms to distribute risks can hamper seriously the accomplishment of higher efficiency in public investments and endanger the sustainability of the PPP programme, as illustrated in the case of the Mato Grosso State Programa Estradeiro.

The assessment of the Programa Estradeiro shows that, instead of 'socializing' the benefits of private sector efficiency, PPPs can also be used to transfer costs from the private sector to the public sector and the community at large. Mato Grosso provides a striking example of a region in which a dominant economic sector, the soybean sector, also holds political power. In order to foster its growth and profitability, soya farmers have engaged themselves in a PPP programme, the outline and mechanisms of which are particularly beneficial to their own interests but much less so to the interests of the wider community, the state of Mato Grosso.

At the same time, environmental impact assessments and social cost-benefit analyses underlying major infrastructure projects are generally deficient and incomplete, which can cause significant environmental damage and negative social effects. As shown in the case study of the BR-163 project, fundamental limitations and weaknesses of the underlying studies are likely to result in a road project that generates large positive and negative welfare effects, which will be distributed asymmetrically. As shown, attempts at realizing a more comprehensive ex ante assessment of effects of the pavement of the BR-163 contribute to a better understanding of its potential impact and the mechanisms required to mitigate negative effects.

With incomplete information about the welfare effects of a project, it becomes almost impossible to design a PPP in such a way that social welfare is enhanced. The main objective of PPPs is nearly impossible to achieve, and its outcomes will be sub-optimal from the perspective of public finance and overall welfare.

The Brazilian government has identified PPPs as a way to increase investments in infrastructure and to improve the quality and efficiency of public spending. As the study shows, this is certainly not a trouble-free mission. Notwithstanding the regulatory and legal improvements that were introduced by the PPP Law, the Brazilian experience shows that several financial, regulatory and environmental risks can seriously harm the potential benefits of PPPs. Moreover, rent seeking and political machinations may undermine the potential benefits of PPPs even further.

Nevertheless, PPPs are promising instruments to improve the efficiency of public investments in infrastructure projects. In addition, they have the potential to attract private capital, which can be used to increase the total amount of investment in infrastructure projects. With financial risks distributed more adequately, and by using comprehensive environmental assessments and cost-benefit analyses, PPPs can produce substantial rewards for society at large.

NOTES

¹ For a detailed presentation of IIRSA and specific infrastructural proposals see IIRSA, 2004; IIRSA, 2005^a and ^b, and the website: www.iirsa.org.

² See for an overview of the literature Linder, 1999; Gerrard, 2001; Pasin and Borges, 2003.

³ For a detailed description of practical methods useful in designing and executing effective environmental assessments of roads see Tsunokawa and Hoban (eds), 1997.

⁴ For a comprehensive version of this analysis see van Dijck and Faber, 2006a.

⁵ For further discussion of these and related methodological problems see May (ed), 1999. For a review of potential effects of road construction in forest areas see Andersen et al., 2002.

⁶ See also Linder, 1999; Gerrard, 2001; Pasin and Borges, 2003.

⁷ 'Logística: um setor à beira do colapso', *Conjuntura Econômica*, Volume 59, Number 7, June 2005, pp.24-40.

⁸ See also Werneck, 1996; Schneider, 1992; Baumann, 2001; Amman and Baer, 2005., pp.421-31.

⁹ GEIPOT. *Anuário Estatístico de Transportes* – various editions. Brasília; Empresa Brasileira de Planejamento de Transportes (GEIPOT), Ministério dos Transportes, various years. See also: www.geipot.gov.br and www.dnit.gov.br.

¹⁰ The second round of the Programa de Concessões de Rodovias Federais was launched on 20 February 2006.

¹¹ Act 11.079/04, Art. 1.

¹² Act 8.987/95, Art.1 and Act 8.666/93, Art.1.

¹³ 'A form of public service provision in which the private partner is responsible for the elaboration, finance, construction and operation of assets that are transferred (back) to the public sector after the contract period. The public sector becomes partner in its role as buyer of (a part of) the delivered service. Contract compliance control is based on performance indicators related to service delivery, rather than the physical or financial control of the asset' (translation by the authors).

¹⁴ Act 11.079/04, Art.2, § 4 – Art.3, Par. 1-3.

¹⁵ Act 11.079/04, Art. 4.

¹⁶ Act 8.987/95, Art. 23.

¹⁷ Act 11.079/04, Art. 5.

¹⁸ Act 11.079/04, Art. 9.

¹⁹ Act 11.079/04, Art. 10.

²⁰ Act 11.079/04, Art. 10, Par. 1-3.

²¹ Act 11.079/04, Art. 11.

²² Act 11.079/04, Art. 12.

- ²³ Barbosa de Brito, B.M. *Avaliação de Projetos Públicos e Ppp*. Paper presented at the seminar 'PPP no setor de Transportes no Brasil', Brasília, 16-19 aug. 2005: www.antr.gov.br/destaques/seminario_ppp/apresentacao.asp.
- ²⁴ See also: Borges, L.F.X. and Neves, C. 'PPP – Parceria Público-Privada: Riscos e Mitigações em Operações Estruturadas de Investimentos de Infra-estrutura', *Revista do BNDES*, Volume 12, Number 23, 2005. pp.73-118.
- ²⁵ Act 11.079/04, Art. 22.
- ²⁶ Act 11.079/04, Art. 28, Par. 1.
- ²⁷ See also: Ter-Minassian, 2004. pp.22-28; Sadka, 2006. pp.17-21 ; Fourie and Burger, 2001. pp.147-168.
- ²⁸ http://www.planejamento.gov.br/ppp/conteudo/Projetos/ferrovia_nortesul.htm.
- ²⁹ Act 11.079/04, Art. 16.
- ³⁰ Act 11.079/04, Art. 17.
- ³¹ Act 11.079/04, Art. 23-27.
- ³² Soyatech, Inc. *Soya and Oilseed Bluebook 2005*. Via: www.soyatech.com/bluebook/statistics/index.ldml. Last checked on 01-02-2006.
- ³³ In 2004 the State Department of Transport was transformed into the *Secretaria de Estado de Infra-estrutura* (State Department of Infrastructure – SINFRA).
- ³⁴ SEET, *Programa Pró Rodovias – Programa Estradeiro*. Mato Grosso, SEET, 2003
- ³⁵ Arrecadação FETHAB 2003-2005, available online at: <http://www.sinfra.mt.gov.br/conteudo.php?sid=38&parent=38>. Last check on 01-06-2006.
- ³⁶ See also: The World Bank, 1997; Nepstad et al., 2000, pp.1-24; Peres, 2001, pp.217-19; Fearnside, 2002. pp.735-47; Kjörven and Lindhjem, 2002 ; The World Bank, 2005.
- ³⁷ CONAMA Resolução 001/86, 23 de Janeiro de 1986. Available at: <http://www.mma.gov.br/port/conama/res/res86/res0186.html>.
- ³⁸ according to UNEP's explanatory translation: *integrate the Amazon into Brazil to save it from falling into foreign hands*.
- ³⁹ See also: Soares-Filho et al., 2004. pp.745-64 ; Fearnside and Laurence, 2002. pp.61-65 ; Nepstad. et al., 2002. pp.629-31.
- ⁴⁰ 'It must not be forgotten that, apart from these simulations and the careful and conservative assumptions underlying the EVTE-analysis, other factors also contribute to the full viability of the Corridor composed of the BR-163 and BR-230 highways. Together with the presented simulations, these factors demonstrate this viability even more. Since the principal (technical) analysis of the EVTE already demonstrated feasibility of the project, other factors that are not taken into account here, especially those directly related to social aspects, may even increase feasibility further. The Southern Region of Pará is now starting to experience growth that, as is easily demonstrated, is not inserted into sustainability criteria. The highway could facilitate the coordination of actions on all levels, be it institutional, agrarian or environmental. The Corridor will certainly become an engine of development, generating and relocating wealth to this outer rink of Brazil, enabling the integration of this region with the rest of the country.' (translation by the authors).

⁴¹ http://www.transportes.gov.br/Audiencia/Aviso163_230.htm.

⁴² L. Rother, 'Relentless Foe of the Amazon Jungle: Soybeans', *New York Times*, Sept. 17th, 2003 ; E. Linden, 'The Road to Disaster', *Time Magazine*, Volume 156, Issue 16, 2000 ; 'Asphalt and the Jungle', *The Economist*, Volume 372, Issue 8385, July 24th, 2004.

⁴³ The term for this vote-rigging mechanism has been introduced in the English press as '*big monthly allowance*' and '*vote-buying*'.

⁴⁴ Margulis, S. *Causas do Desmatamento da Amazônia Brasileira*. Brasília, The World Bank, 2003.

⁴⁵ For a review of issues related to the provision of regional public goods see Estevadeordal et al., (2002).

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