The IIRSA Guyana Shield Hub: The Case of Suriname

Pitou van Dijck

(deze tekst is een voorlopige versie van een hoofdstuk voor het boek ***Towards a Strategic Assessment of IIRSA Road Infrastructure in South America,*** te verschijnen in 2010.

1. Introduction

This chapter analyses the potential impact of infrastructure plans developed in the context of the IIRSA Guyana Shield hub and otherwise. If realised, these plans will contribute to the accessibility of the inland and to the integration of the small countries at the northeastern edge of South America with the rest of the continent. Traditionally, the societies and economies of the Guyanas have notably been orientated towards the Caribbean and the former colonial powers overseas and have been quite isolated from the rest of South America. This is reflected in the outlay of their infrastructure: possibilities to travel internationally by land to neighbouring countries are limited, and so are the possibilities to travel beyond the coastal zone into the forested inland.

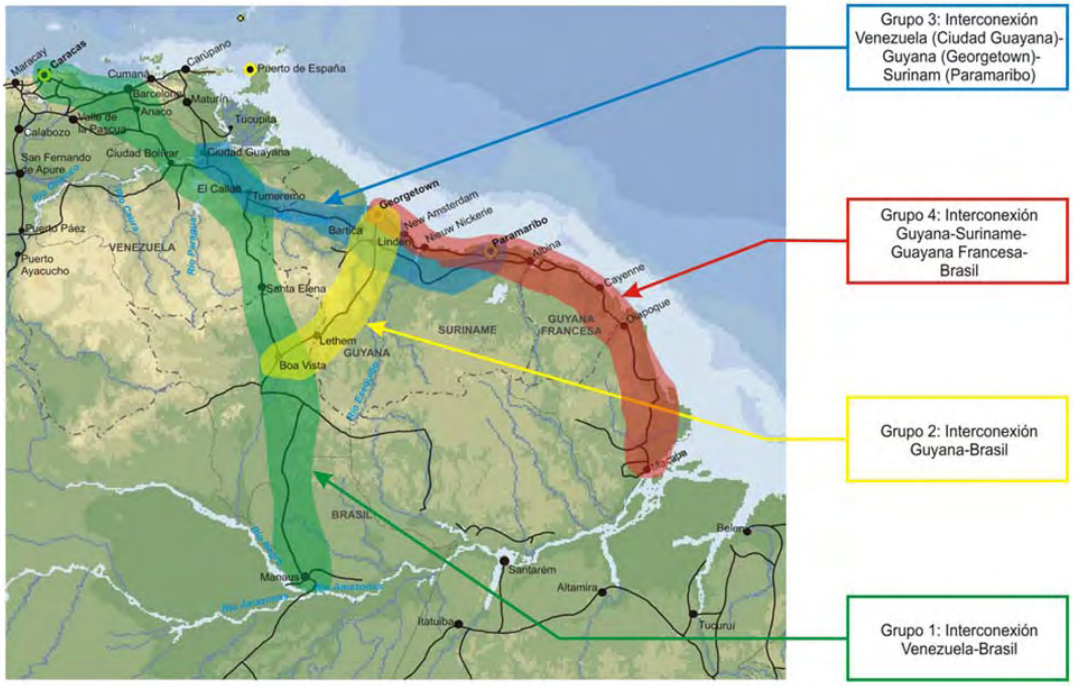
So far, the environment in the countries in the region has been little affected by economic activities such as logging, agriculture, ranching and mining, as compared to many parts of Amazonia. However, legal and illegal economic activities are rapidly spreading throughout the area with serious consequences for the environment. Not unlikely, the roads and other components of the infrastructure plans reviewed in this chapter will affect one of the most pristine and thinly populated stretches of rainforest in all of Amazonia and indeed in the entire world, and will contribute to a substantial land use conversion in the region with loss of biodiversity and biomass.

The study will focus specifically on the potential and risks of the north-south road infrastructure plans and the proposed hydroelectric works in Suriname. Section 2 presents the IIRSA proposals for the region and the IIRSA-related plans for Suriname. Section 3 will deal with the SEA for part of the proposed road infrastructure. Subsequently, the section reviews the terms of reference, the organization and methodology of the SEA, and its major outcomes. Section 4 will focus on other infrastructure plans for the country that are directly or in part related to IIRSA and on the potential implications of these plans and proposals. This section will focus specifically on some proposals for roads and water works with a potentially large impact on the environment of southeastern Suriname. Section 5 attempts at mapping the potential impact of infrastructure plans and related economic activity in the east, southeast and south of Suriname as a contribution to an extended SEA-type of analysis.

2. The Guyana Shield Hub

In the context of IIRSA some interconnections have been proposed between Guyana, Suriname, French Guyana, Brazil as well as Venezuela. Map 1 gives an overall view of the postion of the countries in the Guyana Shield region and the linkages as proposed in IIRSA.

Map 1. The Guyana Shield Hub

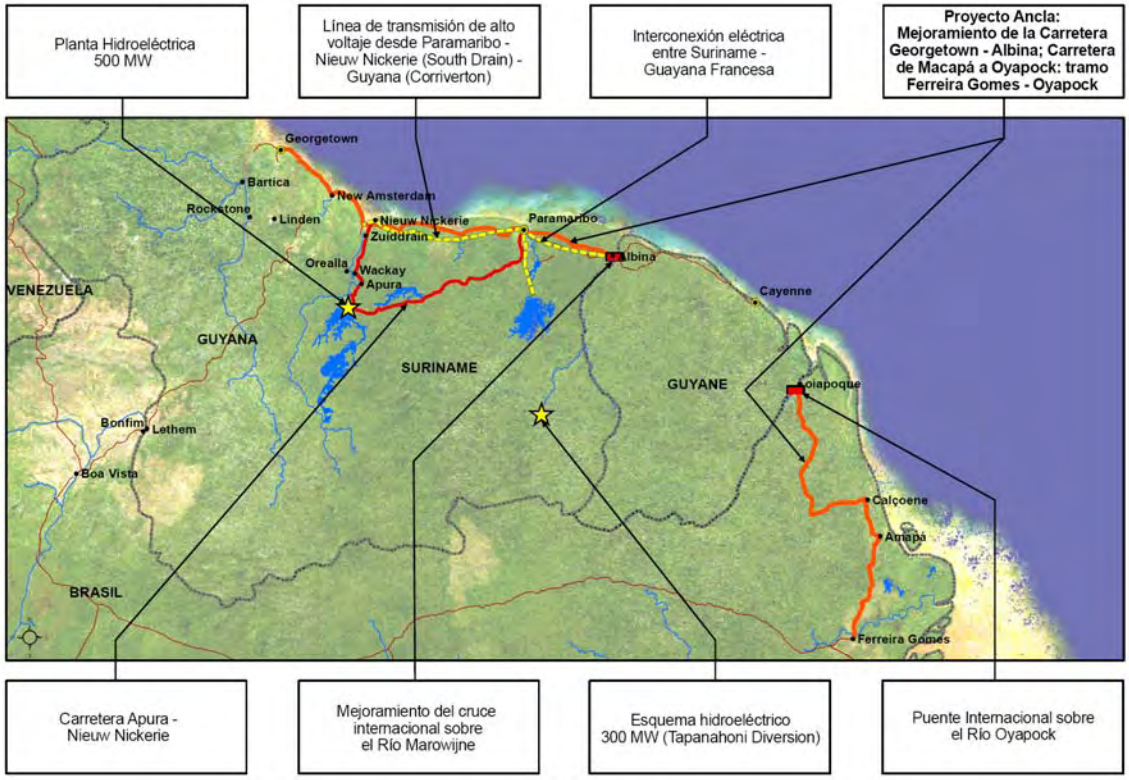


Key elements of the proposed infrastructure system for the Guyanas are the south-north linkages between the heart of Amazonia, Manaus, and the ports and cities at the Caribbean Sea including Caracas and Georgetown; and the northwest-southeast linkages parallel with the coastal line.

The proposals as laid down in the IIRSA Guyana Shield hub link up and partly overlap with a previous proposal by the Brazilian government to integrate northern Amazonia and link the northern part of Brazil with the three Guyanas and the Caribbean Sea by means of a road project labeled Arco Norte. This road project was designed to connect the Brazilian cities of Manaus and Boa Vista with Georgetown, Guyana. The corridor will continue parallel with the coastal line to Paramaribo, Suriname, and Cayenne, French Guyana, re-enters Brazil in Oiapoc and ends at the mouth of the river Amazon in the city of Macapá. The Arco Norte road project is part of a larger programme to integrate the state of Roraima 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 systems will follow the course of the new road as well as a fibre optic cable that will link Boa Vista and, at a later stage, Manaus to the intercontinental fibre optic cable, which passes north of Georgetown.

The main components of the initiatives negotiated in Group 4 of IIRSA are illustrated in Map 2. Two major categories of infrastructure may be distinguished: (1) international road linkages involving the rehabilitation and construction of roads, river crossings and bridges; and (2) hydro-electric schemes and international transmission lines. According to these plans two roads will link Suriname with its neigbouring countries: an improved coastal road, that will facilitate transport from Guyana, after crossing the river Corantijn, from Nieuw Nickerie into the direction of French Guyana. After crossing the border river Marowijne near Albina, traffic can continue from Saint Laurent-du-Maroni into French Guyana and to Brazil. The rehabilitation of the coastal road is considered the most urgent component in the IIRSA programme for Suriname.

Map 2. Group 4 of projects within the Guyana Shield Hub.



A second road links Guyana from Linden, south of Georgetown, towards Orealla and Apura at both sides of the Corantijn border river, and continuous over an existing narrow track through the forest towards Zanderij, the international airport of Suriname south of Paramaribo. From Zanderij, the coastal road may be reached via an existing paved road. A planned road between Apura and South Drain with connection to Nieuw Nickerie will link up with the coastal corridor. Another linkage with the coastal road is envisaged by reconstruction of the existing road from Zanderij via Jodensavanna to Moengo. It should be noted, however, that the status of the proposed innerland road has been changed at the level of IIRSA which reflects the recognition that this component of the IIRSA Consensus Agenda 2000-2010 is no longer recognized as viable. Hence, this part of the IIRSA agenda may be implemented in the future but is not a priority now.

The Suriname Country Paper for IIRSA prioritizes a third international road linkage, the so-called North-South Linkage from Paramaribo along the Brokopondo storage lake southwards to the Suriname-Brazil border nearby the village of Vier Gebroeders at the foot of the Tumucumac Mountain range. However, this proposal has not yet been included in the IIRSA agenda but is still among the priorities of the Suriname government and subject of deliberations as referred to below.

The second component of the IIRSA plans involves the enlargement of Suriname's capacity to provide electricity for domestic and international consumption. In the southeastern part of the country, diversion of the flow of rivers including the Tapanahoni river may contribute to the storage capacity of the Brokopondo lake and enlarge the capacity to export energy to French Guyana and Guyana. In the west of the country, the proposed hydroelectric plant may

contribute as well to energy production and export capacity. These plans have been included in IIRSA presentations of plans and proposals in Group 4 but are not included in the Consensus Agenda 2005-2010

3. SEA for IIRSA road corridors

There are wide differences among SEA studies in approach, comprehensiveness and timing. The SEA of infrastructure in Suriname and Guyana was commissioned by the IDB and the draft report was produced by June 2007. This SEA is not entirely an *ex ante* assessment of planned infrastructure but is in part an assessment *ex post* of infrastructure already constructed. Moreover, this SEA is not so much an in-depth assessment of the potential impact of infrastructure, as is the case with the SEA related to the Corredor Norte, but a type of rapid appraisal, made within a relatively short period of time, using limited amounts of quantitative data and based particularly on available literature and expert judgements. The focus was on a swift identification of the most important opportunities and risks of the corridors, from an economic, social and environmental point of view, as a consequence of which the SEA is more action centred than assessment centred (IDB, 2007, pp 6-7). In the study the entire territory of Suriname and Guyana has been defined as the impact area of infrastructure.

The terms of reference for the SEA take as their starting points the limitations of the existing infrastructure; the lack of human resources to manage, implement and enforce, which, in itself, is a risk factor for good environmental management of the infrastructure programme (IDB, 2006, pp 48-49).

A SEA is conceived as an instrument to analyse upfront the potential risks and opportunities for environmental and sociocultural management of the IIRSA initiative including its alternatives, and is the framework for a Plan of Action to enhance sustainable development related to the planned infrastructure project.

The objectives of the SEA are:

- to identify economic, social, institutional, and environmental risks and opportunities of the IIRSA project upfront;
- to display in GIS maps environmental, socio-cultural and other information related to the area of influence of the IIRSA programma;
- to engage relevant stakeholders such as public institutions, NGOs, civil society, indigeneous communities;
- to generate agreement among stakeholders as to the scope of the management plans;
- to promote coordination among relevant institutions in participating countries;
- to ensure that the results of the SEA are disclosed to the affected populations and the stakeholders. (IDB, 2006, pp 64-65).

For every corridor an economic, social and environmental baseline is to be constructed. Subsequently, a process of scoping and assessing of economic, social and environmental issues has taken place, and finally a plan of action has been formulated to address the most significant of these issues, if action indeed is required to mitigate negative impacts and enhance potentially positive effects.

From an economic and social perspective the coastal corridor is by far the most important of the three corridors as about 80 per cent of the entire population of Suriname is concentrated along this road. A well-functioning road connecting the towns and villages along the coast potentially contributes to the development of the economy as a whole in a significant manner. Although international transportation is limited, reconstruction of the corridor is considered economically feasible. Among the most significant opportunities related to the reconstruction of the corridor are: reduction of travel time and improvement of travel safety; improved access to health, educational and public services; development of eco-tourism in the coastal zone; improved enforcement of legislation; controlled urbanization outside Paramaribo, and national integration.

Much of the environment in this relatively densely populated stretch of land is degraded but there are nevertheless environmental stretches along the coastal line worthwhile safeguarding. Among the most significant risks are flooding and erosion of the road, degradation of shell and sand ridges, decrease of road safety(!), flooding of housing and property.

The inland east-west corridor passes through scarcely populated, savannah and forested areas with little economic activity and consequently little traffic. This condition may change in case bauxite exploitation and related processing will start in the region nearby the old exploration area of Bakhuizen and the transportation system will be activated by using the already existing rail infrastructure between the mining area and the harbour of Apura for shipment to Paranam or elsewhere. The status of these plans is unclear at this moment. The SEA concludes that ‘currently there is no rationale for developing a second corridor between Guyana and Suriname, in addition to the existing coastal road’ (SEA, 2007, p. 24.). Consequently, a negative economic return on road investment is the major economic risk related to this corridor. An IDB strategic study has indicated as well that the feasibility of the project depends on the degree of industrial development in the western area of Suriname. In the area adjacent to this corridor, development of sustainable forestry, better opportunity for law enforcement and fiscal control, and improved access to health and educational facilities are probably among the most significant opportunities of road construction. Clearly, a road through this forested area creates both opportunities for wildlife and forest protection as well as for poaching and fishing.

The third road corridor is the north-south corridor that was proposed in the Suriname Country Paper for IIRSA. However, the corridor was not included in the IIRSA Consensus Agenda. The SEA only analyses the stretch of road between Paramaribo and Pokigron at the southern-west tip of the storage lake, and considers the rest of the trajectory towards the Brazilian border, a stretch of 250 kilometres, as ‘a long-term concept’. Hence, no investigation into potential risks and opportunities related to such a road trajectory has been undertaken.

The stretch of road that indeed has been included in the SEA may be subdivided into three sections. The first section is the already existing paved road between Paramaribo and Paranam, in the economic centre of Suriname. The second section is the already existing unpaved laterite road between Paranam and the dam for the storage lake at Afobaka, which links up with an area where large-scale and small-scale gold mining activity is concentrated. The third section is the unpaved road to Pokigron. In view of the low population density in the areas adjacent to the road and the low traffic intensity of the road, the SEA recommends to make separate feasibility studies of several combinations of the three distinguished road sections, taking into consideration the rapid growth in the Brownsberg area and the role of Pokigron as a service centre for the Upper Suriname river area.

Among the most significant opportunities related to the construction of the north-south corridor down to Pokigron are diversification of economic activity, extension of the urban growth pole of Paramaribo, improved access to health and educational services, and improved telecommunication facilities. Among the major risks are unsustainable forestry, degradation of traditional authority and customs, increased poaching and wildlife trade, increase of area under shifting cultivation and degradation of natural areas. The latter risk holds particularly with respect to extension of the road beyond Pokigron to the south. It should be noted that the actual condition of the corridor is changing rapidly since the SEA was made in 2007 with the start of the pavement of the entire stretch Paranan-Pokigron, which is scheduled to be finalized by the end of 2011.

A summary of the main elements of the plan of action is presented below. These actions aim at enlarging the opportunities created by the roads and at reduction of risks. However, in many circumstances actions are not required as developments may be market driven to a large extent. The proposed actions are related to the coastal east-west corridor and the north-south corridor up to Pokigron. No actions are proposed regarding the inland east-west corridor, which is considered not feasible. All together 12 actions are proposed, only two of which are corridor-specific: the Integrated Coastal Zone Management Plan with Coronie as hotspot, which is related to the coastal east-west corridor, and the Brownsweg-Pokigron Development Plan related to the north-south corridor. Moreover, eight national action plans are proposed: a SEA for the tourism plan; strengthening of forestry and nature conservation; a study on generating funds for maintenance; transitional support for law enforcers and local communities; road safety measures and reduction of ribbon development; environmental awareness activities; assessment of demand and availability of road construction materials; strengthening procedures for environmental impact assessment. Finally there are two action plans at the regional level: a study of international trade opportunities, competitiveness and investment climate; and improvement of border control (IDB, 2007, Table 16, p. 59).

The Brownsweg-Pokigron Development Plan proposes the creation of a special development authority in charge with the infrastructure programme for the Van Blommenstein storage lake and adjacent territories, involving ferry services and roads east and south of the lake to settlements at the shores of the Marowijne River and the Tapanahoni River. Two ferry connections are envisaged: a ferry from Brownsweg to Nassau. From Nassau a road can be constructed to Langatabiki on the Marowijne River with a side track to Nason; a second ferry will connect Brownsweg with Sarakreek. A road can be constructed towards Stoelmanseiland on the Marowijne River. Another road may link up with Drietabiki on the Tapanahoni River. The combination of the north-south road linkage with ferry services would turn Brownsweg into a region-wide centre for transportation, maintenance and storage, as well as a service centre. Further south, Pokigron is destined to become a service centre for the Upper Suriname river area. See Map Infrastructure. Clearly, the pavement of the Paramaribo-Pokigron corridor may have a significant impact not only on the territory adjacent to the road itself but on a much wider area that will become better accessible through related infrastructure. Not unlikely, spread effects will extend to the south of Pokigron into the interior.

4. The wider agenda for the future: interrelated interventions and their impact

As indicated above, the SEA on infrastructure in Suriname and Guyana, commissioned by the IDB, focuses as far as the Suriname area is concerned particularly on road infrastructure development and related risks and opportunities in the coastal area as well as a stretch south

of Paramaribo. The action plans include specific road-related plans for the coastal road, particularly in the Coronie area in the northwest of the country, and a plan for the Brownsweg-Pokigron stretch of the north-south corridor. The latter plan includes corridor-related multi-modal transportation linkages combining ferry and road transportation.

The reasons mentioned in the SEA for not including the inland east-west corridor and the more southern stretch of the north-south corridor towards the Brazilian border in the assessment are understandable but debatable. The future of the IIRSA inland corridor depends critically on the progress made in the realization of plans for exploitation of bauxite reserves in West Suriname. The future of the north-south corridor depends on a multitude of variables including the positioning of Brazil inside or outside the negotiations that are taking place in Group 4 of this IIRSA hub, and on domestic developments outlined below. In view of the ongoing developments in east and southeast Suriname, and plans for infrastructure development in that area, it seems feasible that in the short-term the combination of infrastructure and initiatives in the sector of natural resources may have a significant impact in several locations in this area.

Also it may be noted that the SEA does not review or discuss the plans to increase the capacity to generate hydro-energy in east Suriname, the so-called Jai-Tapanahoni project, and to transmit energy to French Guyana and Guyana. It is true that this project was not included in the project list of the IIRSA Consensus Agenda 2005-2010 but it has been included in the agenda of IIRSA Group 4.

There are several reasons why the likelihood of a significant expansion of infrastructure and the related expansion of the economic, social and environmental impact of such interventions in a wide area to the north, west, east and south of the storage lake should be taken into consideration when designing a SEA for infrastructure in Suriname. Below we shall review developments and plans that may be significant in this regard, and subsequently we shall make steps towards an assessment of the potential impact in the area. Complementary to the results of the SEA summarized in the previous section of this chapter, we present our baseline analysis with a focus on infrastructure plans, in relation with initiatives to exploit the natural resources of the area. These findings will support an investigation into the main economic, social and environmental risks and opportunities, and into the location of key impact areas.

Critical for the economic, social and environmental future of southern Suriname will be the prospects for developing road and energy infrastructure in the region. Infrastructure plans and proposals should be put in the context of production and investment plans of stakeholders in the private sectors. The interventions in east, southeast and south Suriname are not part of a comprehensive or strategic regional development plan but are decisions made by independent stakeholders including the government, small scale gold diggers and large scale corporations involved in gold exploitation, exploitation of bauxite and other natural resources, production of hydro-energy.

Several plans to construct roads in this part of the country have a long history. For instance, in the Multi-Annual Development Plan of 1975 (MOP 1975) the plan for a north-south connection between Paramaribo and the Brazilian border nearby Vier Gebroeders had already been mentioned. Moreover, the proposal to expand the capacity of the Brokopondo storage lake by diverting the Jai Creek was already included in a World Bank study in 1952. More recently, such proposals have been put forward by Suriname in the context of IIRSA Group 4 discussions in the Guyanas.

In more general terms, improved access over the road to southeast Suriname has been included in the the Multi-Annual Development Plan 2006-11. If studies indicate at positive

impact work will start, although no specification is included on the location or type of road. As the main results of enhanced accessability the Plan mentions: improved access to health care and welfare, improved security for the local population, and enhanced control over the small-scale gold-digging activities. Regarding economic opportunities, the Plan refers to improved economic integration, development of non-timber forest products and eco-tourism (MDP 2006, p. 107).

The previous section referred to plans and proposals included in the SEA commissioned by the IDB to introduce ferry services over the Brokopondo storage lake and construct connectiong roads into the interior both to the east and the south of the lake. These areas adjacent to the lake have been opened up already by a large number of tracks constructed by groups of golddiggers active in that area. These tracks facilitate transport of inputs for gold exploitation and the large numbers of individuals active in these small-scale operations.

Several large-scale mining projects to the east of the Brokopondo lake may contribute to economic activity and the need of expanding road infrastructure and energy production and transmission in that area. Nearby Meriam at the left bank of the Marowijne river and more or less opposite to Langatabiki, Surgold Ltd, owned by Alcoa and Newmont, has started activities in preparation of gold exploitation operations, probably in 2013. To supply energy for the gold exploitation operations, a dam may be constructed in the Gran Creek where it passess through the Nassau mountains, before flowing into the Marowijne river.

Moreover, Suralco has undertaken studies in preparation of bauxite exploitation in the Nassau mountains. If exploitation will take place, a road needs to be constructed to connect the exploitation area at Nassau with the refinery at Paranam. Moving along a north-south corridor several steps may be distinguished contributing potentially to the actual development of such a corridor in the course of time.

First, the reconstruction and pavement of the stretch Paranan-Pokigron/Adjorni towards the south tip of the storage lake started recently and is scheduled to be finalized by the end of 2011. Construction is undertaken by a Chinese contractor and financed by the Chinese Import-Export Bank settled by the so-called Dalian III contract (2008-2011). This contract provides for asphalting a 500 kilometer stretch in the provinces of Paramaribo, Para, Brokopondo and Sipaliwini. Several roads will be constructed linking the inland with the storage lake and Pokigron. After finishing the Dalian III contract 1100 kilometres will be asphalted by Chinese companies, within the framework of a settlement between the Suriname government and the China Export Import Bank. No formal SEA procedures have taken place, apart from the rapid assessment for the stretch Paramaribo-Pokigron made in the SEA commissioned by the IDB. The absence of a thorough SEA and the ensuing stakeholder analysis hampers the design and implementation of an adequate action plan to contribute to positive welfare effects and mitigate negative externalities of this road, passing through a relatively densely populated area with large potentials.

Second, the construction of an entirely new segment of the north-south connection towards the Brazilian border will probably become more feasible if the plan for the enlargement of the capacity to produce hydroenergy in the southeast will be implemented, as this will require the construction of roads south of the Brokopondo lake, as shown below.

Third, the continuation of road construction further to the south may critically depend on natural-resource based development plans in the southern part of Suriname. Gold deposits in the south bij de Tapanahoni rivier at about 60 kilometer from the border with Brazil may become exploited. Manganese and iron ore deposits are located in the south nearby the

Tapajai Creek and Upper Tapanahoni river, and west of the Palumeu river at about 30 kilometres from the border with Brazil.

Fourth, Suriname has expressed its preference for a direct road connection with Brazil in the Suriname IIRSA Country Paper (2003), but this has not resulted in a consensus in Group 4. This preference is related to independence from other neighbour's policies in the strategic area of regional insertion. Moreover, in the view of the Suriname government, the road to the south creates the possibility of connecting the region directly with the Brazilian highway system, specifically the BR 163 and BR 210, the so-called Perimetral Norte. Brazil's objections to this proposal are probably linked to the creation of the Tumucumac reserve at the Brazilian side of the Brazil-Suriname border in the early 1990s, and Brazil's priority for the Manaus-Boa Vista-Georgetown hub as an efficient connection with the Caribbean Sea. However, the degree of environmental protection is a political priority that may change in time, particularly since the area has already been damaged by illegal lumbering and gold digging. Availability of natural resources may be a reason to change the degree of environmental protection. Moreover, serious delay in the improvement of the Lethem-Georgetown road may enhance Brazil's interest in an alternative link with the Caribbean Sea.

Plans to enlarge the capacity to produce hydroelectricity by diverting the waterflow of the Tapanahoni River into the Brokopondo storage lake date back to a World Bank study of 1952. Recently, the plans have been brought back to life on the basis of engineering studies by Lothar Boksteen, and have been included in the Multi-Annual Development Plan 2006-2011 (2006).The Plan distinguishes two stages. In the first stage, the waterflows of the Tapanahoni river and the Jai Kreek are diverted into the Brokopondo storage lake to increase its capacity and make better use of the power plant at the Afobaka dam. In a second stage, the waterflow of the Tapanahoni river may be used to generate hydroenergy in additional power plants. The outcomes of studies into the impact of these measures upon the livelihood of communities in the area and on those that are dependent on the water from these rivers will be decisive (2006, p. 117). According to the so-called Tapajai Hydro Plan by Lothar Boksteen, the existing hydroelectricity power plant at the Afobaka dam will be complemented by a second power plant, and six dams with five additional hydro-electricity power plants will be constructed, as illustrated in Map 4. In the rainy season, the latter group of five power plants along the upstream Tapanahoni river, the Jai Creek and Marowijne Creek supply hydroelectricity. During that part of the year the Afobaka plants are not in operation and water is collected in the storage lake. During the dry season, the five plants upstream are not in operation and the two power plants at the Afobaka dam are in use, powered by the collected water in the lake. Both complexes have the capacity to supply 305 megawatt of electricity.

To construct the upstream dams, extension of the road network south of Pokigron/Adjorni will be required: 60 kilometres of road between Pokigron and Semoysi along the left bank of the Suriname river; 45 kilometres between Semoysi and Jai Kreek; and 75 kilometres more between Jai Creek and the Tapanahoni dam. Particularly the road Pokigron/Adjorni to Semoysi will connect many small villages like Abenaston, Malrosey-Kondre, Aurora, Laduwani, Guyaba, Sley, Botopasi, Kamalua, Dan, Pada, Malobi, Marechalkriki, Kumbu, Tumaripa, and Tioboto. Other villages will be connected indirectly, including Pempe, Dahomey, Sola, Dyumu, Godo and Asidonhopo. The stretch between Semooysi and Jai Creek passes through an uninhibited area, be it that golddiggers may be active in that area. Roads and power transmission lines along the roads will require deforestation of approximately 1700 hectares, and inundation will impact on 25,660 hectares more. As a consequence of the creation of the Tapanahoni reservoir at Jai 1, the village of Palemeu with about 250

inhabitants will be inundated. For a brief presentation of these proposals see Multi-Annual Development Plan 2006-2011 pp. 117-18, and Lothar Boksteen, 2009.

If indeed these engineering works south of the storage lake will be realized, the likelihood will be enhanced of opening up adjacent areas between Jai Creek, Dritabiki at the Tapanahoni river and Stoelmansisland at the junction of the Tapanahoni river and the Lawa river. The overall length of such a connection would be about 80 kilometres. Such a road would connect a series of small villages spread in-between like Puketi, Saye, Draai, Asognekondre, Klokondre, Manlobi, Tabbetje, Acote and Pulugudu.

However, the need of capacity enlargement of the Brokopondo lake critically depends on future demand for electricity in Greater Paramaribo, the bauxite processing industry in Paranam and foreign demand for electricity. The future of the bauxite processing industry in particular is among the major unknowns in this context. As the SEA commissioned by the IDB concludes: 'At this moment, there is no clear rationale for these projects and the negative impacts on the locations of Jai Creek and Tapanahoni River are expected to be very significant' (IDB, 2007, p.21). To speed up possible implementation of these energy plans, the Multi-Annual Development Plan proposes to inform the local population about the plan with the objective to make them supporters of the plan; organization of the financing of the plan; start field studies as soon as possible. The expected duration of the studies is about one year and these studies will include a Social and Environmental Impact Assessment. It is estimated that the engineering works will require two to three years, to realize stage 1 of the plan (MDP, 2006, p. 117).

5. Mapping potential interventions and their impact: a baseline study

Next step in the analysis is an attempt at assessing the potential impact of the infrastructural works and mining activities in this area. For that purpose a series of maps has been constructed to facilitate the study of the economic, social and environmental impact of these proposed or planned interventions. These maps facilitate impact analysis by combining characteristics of the potential impact area, like allocation of population, the habitat function of the area, and degrees of tree and plant biodiversity, the allocation of species, with the location of drivers of land use conversion such as road infrastructure, hydroenergy works, and small- and large-scale mining activity.

The mapping analysis takes as the upper extreme of the area under investigation the northern border of the Brokopondo storage lake, the international borders of Suriname with French Guyana as the eastern extreme, the international border with Brazil as the southern extreme and the Van Asch van Wijckgebergte and Ellerts de Haangebergte as the western extreme. However, in case the trajectory of the preferred connection with Brazil would follow the proposed corridor as laid down in the Suriname country paper for IIRSA, the Sipaliwini savannah nearby De Vier Gebroeders would also be part of the potential impact area.

Mapping infrastructure

The proposals and plans for road infrastructure and hydroenergy related engineering works, reviewed in the previous sections of this chapter, are shown in Maps 3a and 3b. The map includes the proposed north-south corridor towards the Brazilian border; the road connections with proposed ferries; the proposed dams and related road infrastructure; as well as proposed connections to open the interior east and south of the lake.

Mapping gold deposits

Suriname's soil and rivers are rich in gold deposits. Approximately 24, 000 square kilometres of Suriname's territory is situated in the geological Greenstone formation that stretches over a surface of about 415,000 square kilometres throughout Venezuela, Guyana, Suriname and French Guyana, as well as northern Brazil. Gold deposits are particularly concentrated in the east and centre of the country, which is as well the most densely populated part of the interior. Map 4a and 4b present the location of gold deposits and exploitation areas.

As the maps show, activities are concentrated in 14 gold-operations areas. Moving from the western edge of the area towards the southeast we cross the basin of the Saramacca river, the Suriname river, Marowijne Creek, Sara Creek, Tapanahoni river, Gran Creek, Djuka Creek, Gonini river, Asisi Creek, Ulemari river, the Marowijne river and the Lawa river. In these basins between 800 and 1200 small-scale gold exploration operations are taking place, each of which involves at least one exploration unit. Most units consist of a group of about six to eight man equipped with a hydraulic machine. Operations are facilitated by easy transportation possibilities over waterways or roads. Construction of new roads will

The dominant groups and tribes living here are Marroons: the Ndyuka Marroons, Paramakaners, Matawai, Aluku, and Saramakaners. The Wayana, a tribe of indigenous people, live in the southeastern edge of this territory. So far, they have not been involved in golddigging. All together, about 50 villages are situated in this territory with approximately 10, 000 to 15,000 Marroons and about 300 indigeneous people living there. Probably about 12,000 to 25,000 people in this area are involved in golddigging operations, 75 per cent of which are foreigners.

As indicated earlier, large-scale open pit goldmining operations by Suralco (Alcoa) and Newmont Overseas Exploration Ltd are in preparation at Merian and Witlage at approximately 30 kilometres north of the Nassau Mountains. In addition, the Gros Rosebel open-pit mine is operated by IamGold, located about 80 kilometres south of Paramaribo at the western edge of the Brokopondo lake.

Mapping population

Map 3b, 4b and 5 show the spatial distribution of the population centres, presented in different settings. Out of a total population of about 493,000 people, 80 per cent live in the coastal corridor with a length of approximately 400 kilometres and a width of about 30 kilometres. Outside the coastal corridor, the population is concentrated in the savannah type stretch south of the corridor, the Paramaribo Brownsweg corridor, and corridors along the Saramacca river, the Suriname river, the Marowine river, the Tapanahoni river, the Lawa river, and in the south along the Curuni river. In the interior live about 8,000 indigeneous people and about 54,000 Marroon. Moreover, 10,000 to 15,000 Brazilians are involved in small-scale goldmining operations.Apart from Brazilians, individuals from the Dominican Republic, Guyana, Haiti, Colombia and Peru are attracted to come and work in the goldsector or in related activities in the interior of Suriname.

Mapping biodiversity

Biodiversity is understood as the variation/diversity in genetic characteristics, plant and animal species and ecosystems in a specific region. To assess biodiversity several yardsticks are in use, including Fisher's alfa, beta and gamma. The alfa

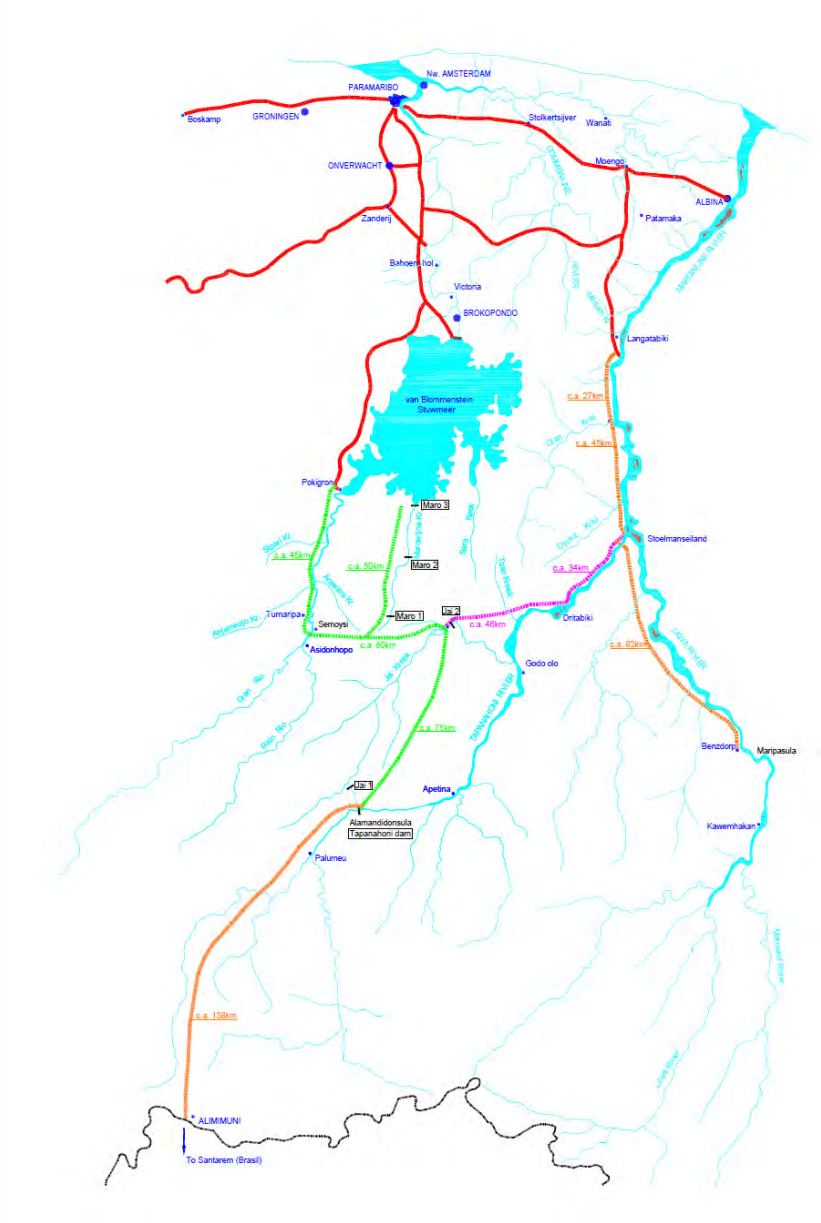
diversity expresses the number of plant and animal species in a specific territory. Many studies express Fisher's alfa coefficients on the basis of randomly selected hectare plots. (Van Andel *et al.*, 2009, p. 6). Beta diversity expresses the spread of the species, the change in composition of species with environmental change and the the degree of uniqueness of species and the endemic character of species in specific areas. Areas that host relatively large numbers of endemic species are considered hot spots. Gamma diversity expresses the variation of landscapes and ecosytems in a specific area. Gamma diversity combines alfa and beta diversity.

It is estimated that about 35 per cent of the flora in the Guyana Shield is endemic and consequently does not exist anywhere else. In view of the low population density and relatively low level of economic activity in the forested sections of Suriname, the forests used to be relatively intact and prospects for protection and conservation used to be good. However, two issues raise concern in this respect. First, the available knowledge of biodiversity in the south eastern forested areas of Suriname is limited, which hampers an accurate assessment of the actual situation. Second, the improved accessibility and growing economic activity in the area increases the likelihood of biodiversity loss including the loss of endemic species.

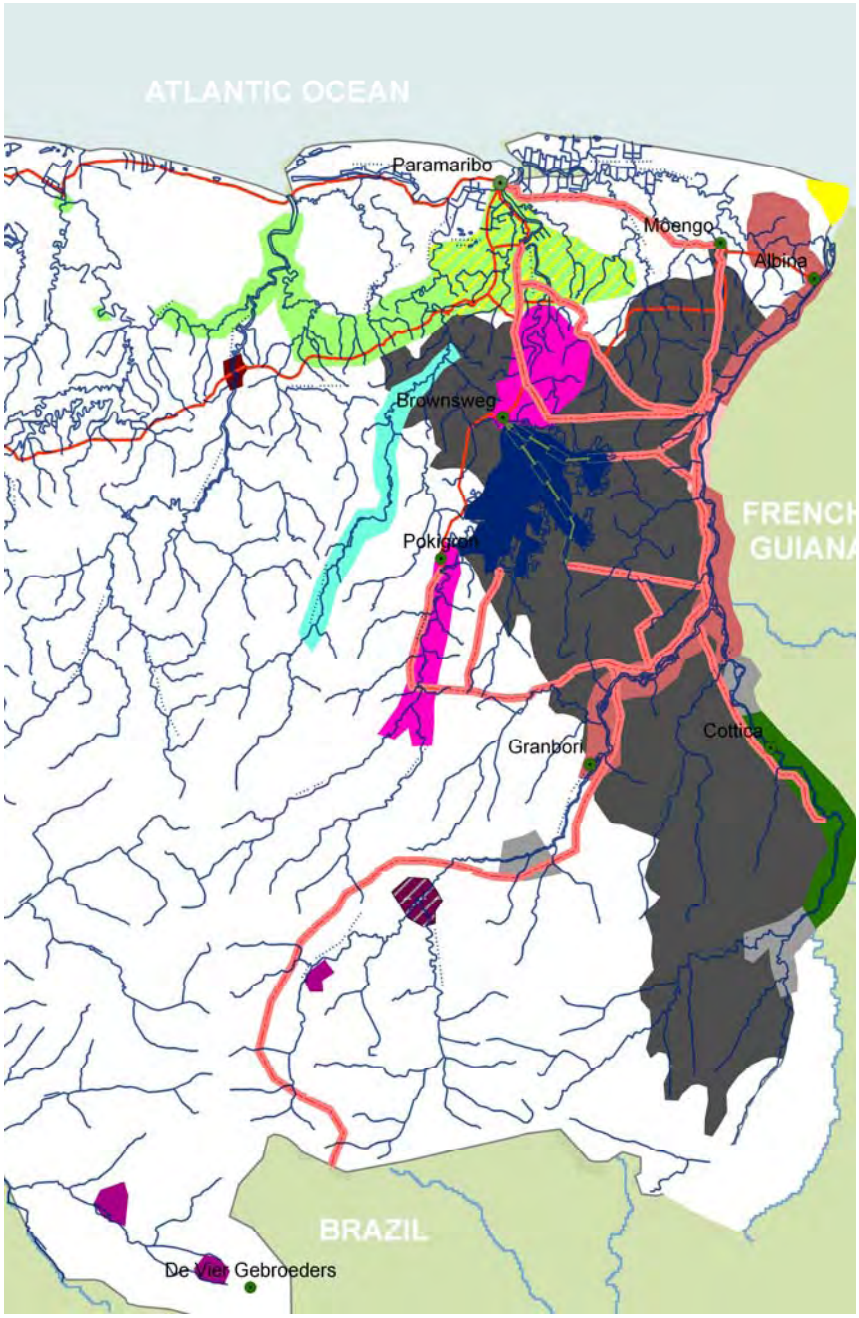
A comprehensive review of the literature shows that the number of inventories of the biodiversity of the forest in this area is very limited, due to lack of roads, poor quality of airstrips and large numbers of waterfalls in the rivers and creeks in the area, which reduce accessibility and increase costs of biodiversity studies. However, recently a series of hectare plot studies have been made at the edges of this area on the basis of which detailed vegetation descriptions were made, specifically in the forests at Brownsberg, the Lely Mountains and Nassau Mountains, along the Gran Rio, as well as on Tonga island in the storage lake. Also, expeditions were organized in the 1990s along the Ulemari river and into the Tumac Humac mountains. Moreover, ethno-ecological studies have been made among the Wayana, the Trio, and the Akurio tribes, as well as the Saramaccaners and Aucaners. Expeditions on the Sipaliwi savannah have shown the diversity in plant species to be 3.5 times as high as on the savannahs in the north of Suriname. A map of botanical species collected in locations throughout Suriname shows that no collections were made along the Goni river and Wilhelmina river between the Lawa and Tapanahoni, and along the Jai creek and the Sara creek.

On the basis of availbable evidence Van Andel *et al*. conclude that the vegetation in southeast Suriname probability differs from the rest of Surinam, mainly because of the monsoon-type climate, a different relief and average altitude, and higher humidity. Map 6 shows Fisher's alfa values for biodiversity in several locations and areas in Suriname and indicates increasing (estimated) biodiversity coefficients in the south and south east. The Lely Mountains show the highest Fisher's alfa coefficients registered in Suriname. On the basis of extrapolations Fisher's alfa values are estimated at values between 48 and 74 at the Upper Tapanahoni, and 48-86 at the Upper Marowijne and Litani (Van Andel 2009, p.15).

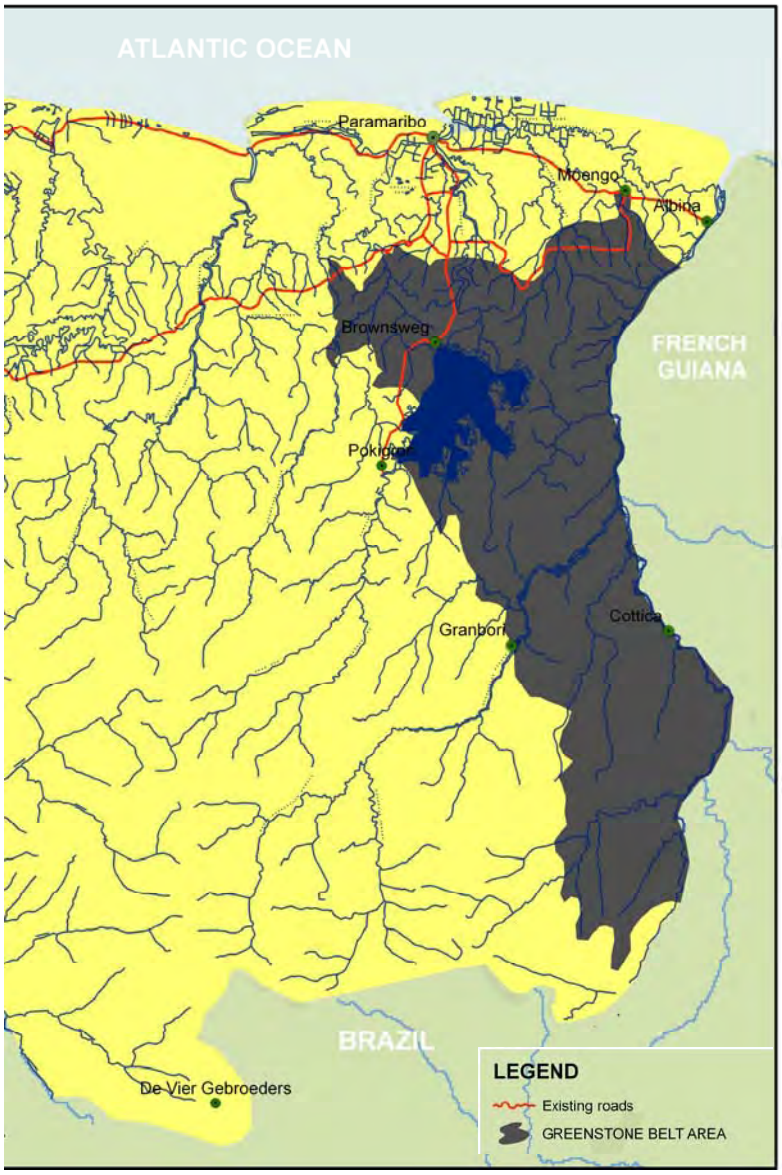
Map 3a. Infrastructure pogrammes, plans and proposals.



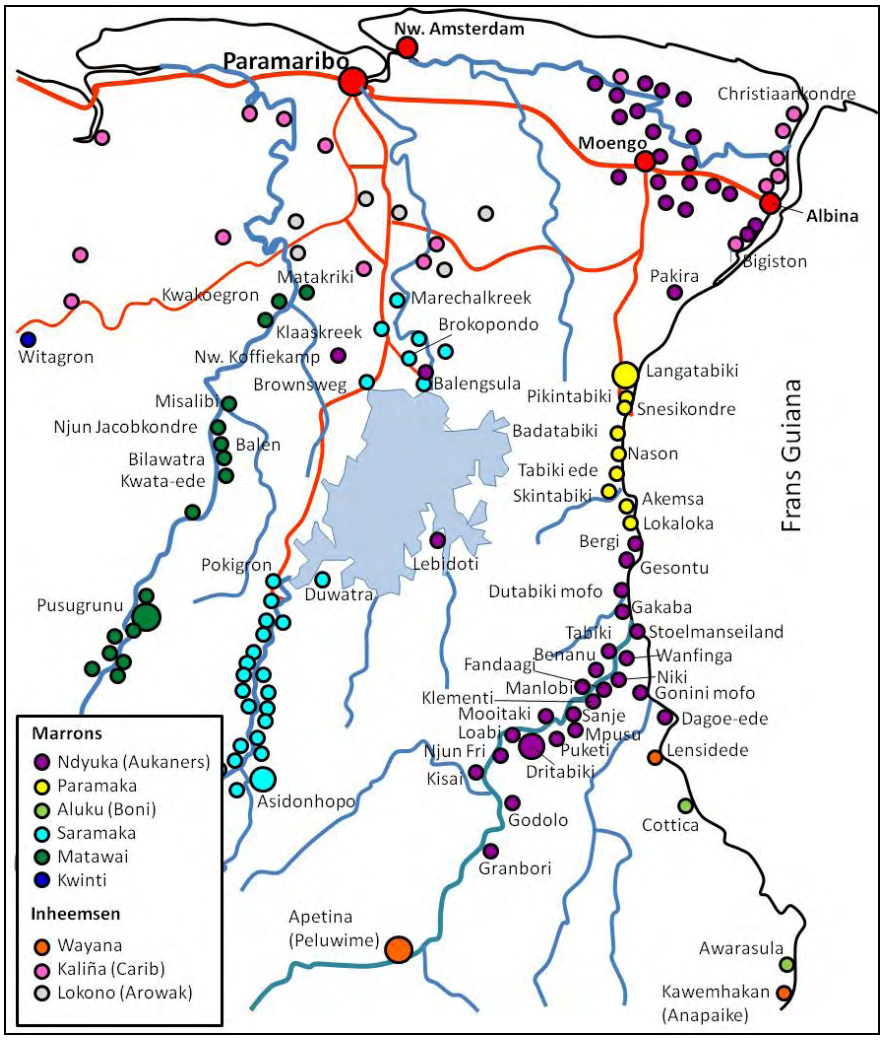
Map 3b. Infrastructure, population centres and gold deposits



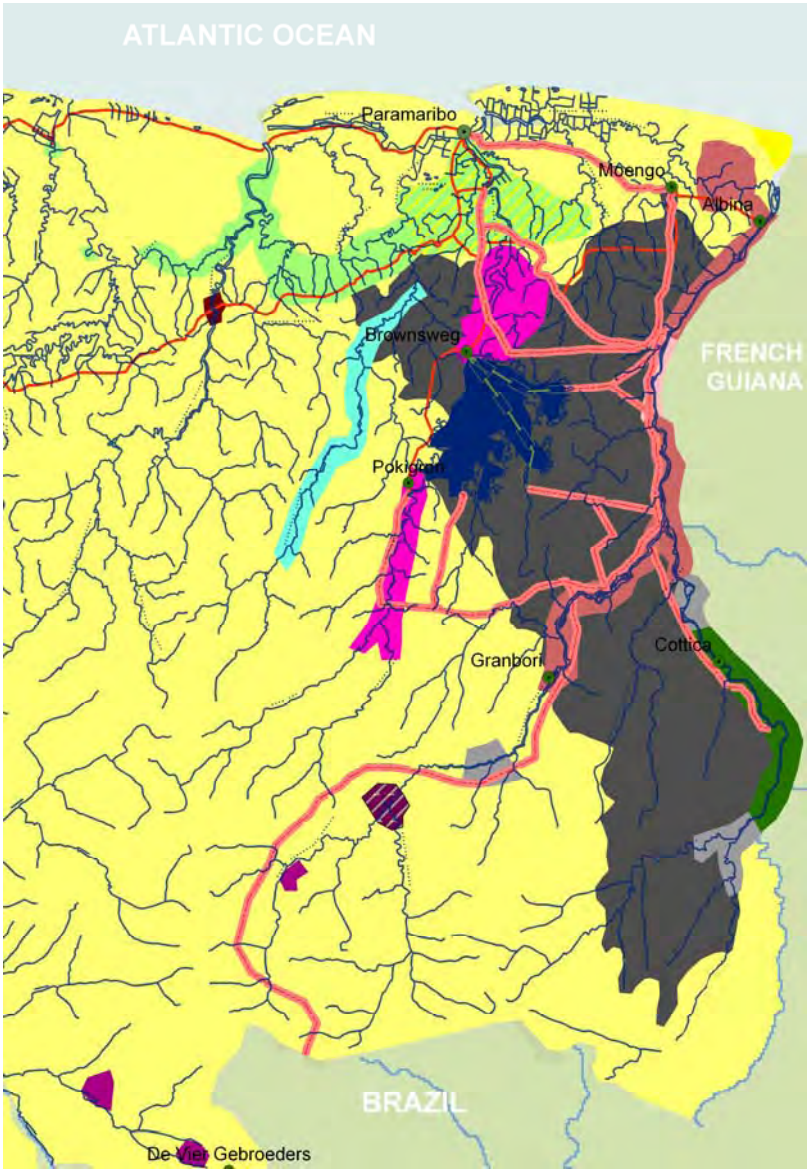
Map 4a. Gold deposits (Greenstone belt)



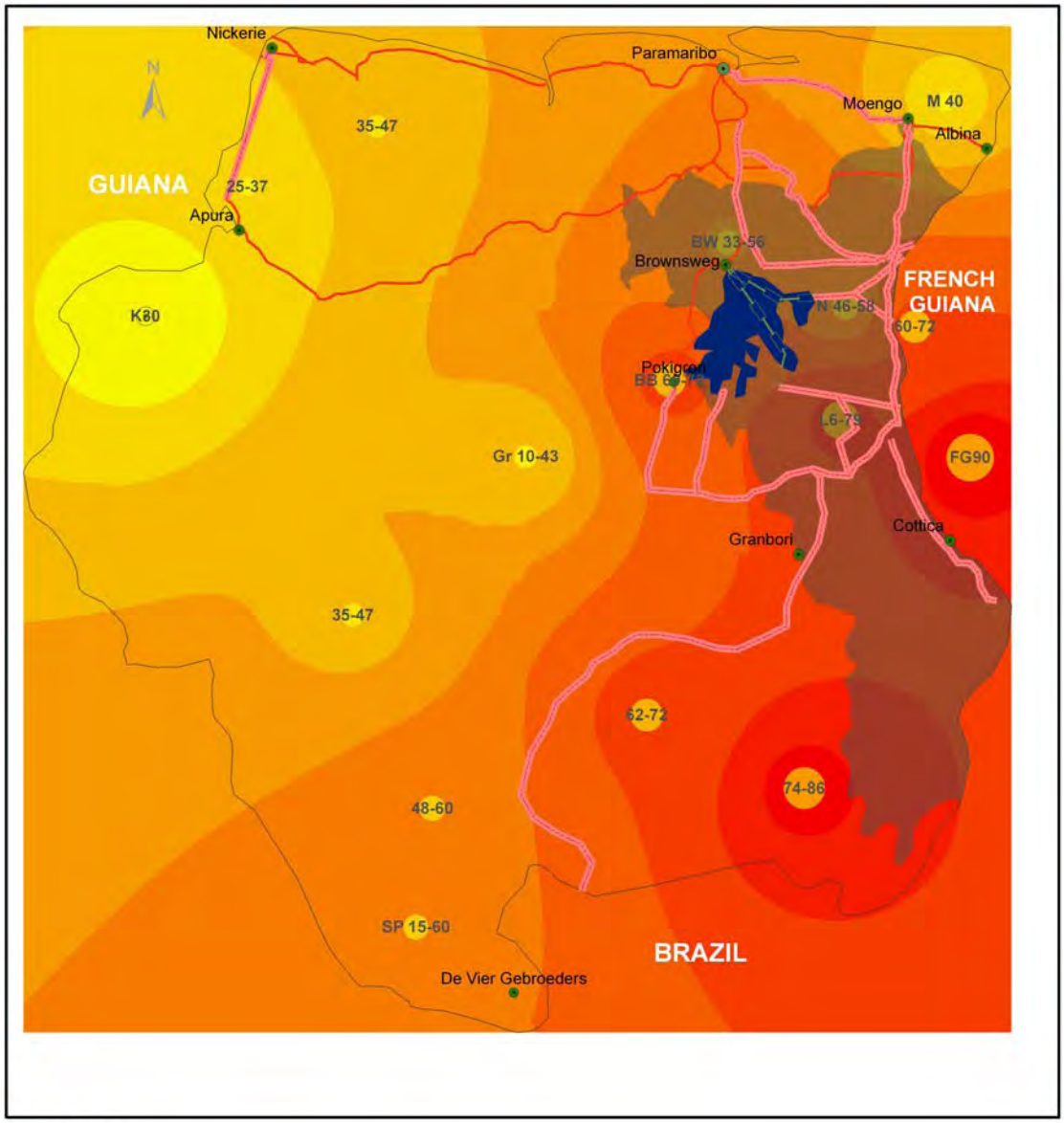
Map 4b. Human settlements in gold deposits area.



Map 5. Spatial distributions of population in groups and types.



Map 6. Suriname biodiversity, measured in Fisher's Alfa.



References

IDB, *Request for Proposals, Regional Support, Strategic Environmental Studies for Guyana and Suriname,* RS-T1239, Washington, D.C., September 2006.

IDB, *Strategic Environmental Assessment (SEA) of Transport Infrastructure Initiatives (among other IIRSA) in Suriname,* Draft report 9S0230, Washington, D.C., 2007.

Republic of Suriname, Ministry of Public Works, *Project IIRSA – Venezuela-Brazil-Guyana-Suriname Axis, Country Paper on Selected National Routes of Suriname,* Paramaribo, July 2003.