Draft Country Environmental Profile

Version 4th February 2004

1. Executive summary

Will be incorporated when document is finalised.

2. Background

This Country Environmental Profile was constructed to accompany the Joint Annual Review as a mandatory annex. As there are no previous country profiles available for Suriname, the main sources for the information provided in this profile were the consul tees and the documents they have provided: NIMOS, IDB, STINASU, the Dutch Embassy (Dhr. Noordam), Stichting Schoon Suriname, UNDP, WWF, Conservation International, Ministry of ATM (these still need to consulted). The profile is based on the current information available. As there are a number of areas were information was unavailable, this draft environmental profile is in certain areas incomplete. We recommend that the draft CEP will be reviewed by a consultant to fill in the blanks and add some more depth to the profile.

2.1 Physical conditions

The Republic of Suriname is situated along the north coast of South America between 2-6° N and 54-58° W, bordering in the east with French Guiana, in the south with Brazil, in the west with Guyana and in the north with the Atlantic Ocean. The historical borders of Suriname are established either by rivers or by watershed, in the east and west by the Marowijne and Corantijn Rivers respectively, and in the south by the watershed between the Amazonian basin and the basins of the Suriname Rivers.

The second of the three Guianas in size and population, it has a human population of approximately 433,000 in a land area of 166,000 km², the largest concentration being in Paramaribo, the capital of the Republic Suriname. Suriname is one of the least densely populated tropical rainforest countries in the world. It also has the world's highest percentage of intact tropical rain forest, with 80 percent still in pristine condition.[1] The total forest area in Suriname is 90% of the land area.

According to the physic geography Suriname is located within the limits of the Guiana plateau, its low land that presents, except for the lower coastal area in the north, a huge Guiana shield. This shield is composed of Precambrian rocks eroded and deeply weathered for the largest part. Although in descriptions of this region of the term "mountainous" are used, in fact this term is applied to formations with relatively low peaks above mean sea level. Several formations form a chain of mountains stretching over the whole centre of the country up to the southern border. The remaining region of Suriname, except for the coastal low lands is characterized by a wide spread of monotonous landscape about 200 –350 meters above mean sea level, including small hills, separated by narrow swampy depressions, which are well drained by complex system of water ways.

[1] Conservation priorities for the Guyana Shield: 2002 consensus, Conservation International

The climate of Suriname is one of a semi humid type with two rainy and two dry seasons, where rainfall may vary in the coastal area from about 1500mm to 3000mm, resulting in many rivers, swamps and creeks.

2.2 Economic trends

In 2003 authorities have taken strong steps to stabilize macroeconomic conditions following a sharp depreciation of the currency and a rise in inflation in 2002. Real GDP growth slowed from 4.5 percent in 2001 to 3 percent in 2002. The 12-month inflation rate in June 2003 stood at 28.4 percent. Due to a fire in the General Bureau of Statistics newer statistics are currently unavailable. A positive economic outlook depends largely on the government's ability to maintain currency stability and control inflation.

One of the trends in the Surinamese economy is that mining is becoming an even more significant part of the GDP. A Canadian mining company, Cambior, opened its Gross Rosebel gold mine in the first quarter of 2004. The mine has a projected capital budget of US$ 95m, output during its first year of operation should reach 270,000 troy ounces. Cambior intends to explore a wider area around the mine to identify further reserves for projects expansion from 2005. It aims to increase ore extraction to 16,000-18,000 tonnes per day. The company performed its own Environmental Impact Assessment on the planned mining operations. In addition, Suralco started a reconnaissance programme of bauxite resources in western Suriname. This programme will take 12 months to complete after which a feasibility study for an alumna plat with a capacity of 1m tonnes will be conducted. Bauxite reserves are believed to be close to 300m tonnes in Western Suriname. Suralco will also investigate the possibility of building a hydroelectric plant and an aluminium smelter in western Suriname. Owing to renewed interest in the hydroelectric potential of western Suriname, NIMOS will evaluate an environmental impact study of the Kabalebo hydroelectric project, which was prepared in 1979-1981. Canadian consultants will also look at the EIA of the Gross Rosebel project and the oil drilling activities of Staatsolie Maatschappij Suriname.

Moreover, small-scale gold mining has gained increasing importance in Suriname, both as a source of subsistence for an estimated ten thousands of people and as cause for environmental degradation. Gold mining activities are mainly concentrated within areas of Eastern Suriname, better known as the Greenstone Belt, which is rich in biodiversity and inhabited by a variety of tribal communities and covers approximately 15% of Suriname's landmass. Mercury pollution of soil and water leads to harmful effects on humans, especially those who are directly and indirectly exposed to mercury i.e. the gold miners and the communities in the vicinity of gold mining activities who depend on the water and food from areas polluted by mercury. As mercury accumulates in the food chain and in the human tissue the long-term effects of mercury contamination are more serious than the short-term effects.

The rice industry in Suriname continues to suffer from low market prices for rice, which according to the farmers are below current production costs. While most farmers continue to operate, they are increasingly focussing on other activities as well such as cattle-farming. The state-owned banana producer, Surland expects to resume export sales in February 2004, after closing down operation in April 200 with debt of an estimated US$ 21m and laying idle for nearly two years. Surland has now replanted 370 ha, and will

have 2350 ha under cultivation by 2005. Helped by special EU assistance available for traditional banana exporters, an investment programme of EUR 13m is being executed.
In January 2004, the National Assembly has approved an agreement with China's Zhong Heng Tai Investment Company for a major palm oil project in eastern Suriname. The total concession area is 526 km2, with a palm oil production area of 400 km2. After an initial phase of forest clearing, a nursery with a capacity of 160,000 plants in year one will be established. This will rise to 640,000 plants in year three. Field planting must begin in year three, covering an area of 10 km2. Palm oil factories will be opened in years six, then eleven and twelve in line with growing plant maturity.
Timber extraction will forma an important component of the project as forests will need to be cleared to provide room for the oil palms to grow an the factories to be built. There have been concerns from environmentalists about the sustainability of clearing a large part of the forest to make room for the project. Some local organisations have asked the Organization of American States and international conservation organisations to lobby against the plan. Some conservationists suggest that the area would be better used to develop sustainable forestry, eco-tourism and water conservation.

2.3 Social conditions

The US Census Bureau of Statistics estimated Suriname's population at 433,682 in mid-2002. Most of the population lives in the coastal zone, with just under half living in the capital, Paramaribo and its outskirts, leaving large areas of the interior almost entirely uninhabited.

Suriname is well known for its ethnic diversity with the human population composed of Indigenous & Maroon peoples, Creoles (one-third), Indians (one-third), Javanese and Chinese. Also, there are smaller ethnic groups, which have their roots in Europe and the Middle East. Due to the gold rush in the 1990s, Brazilians have settled in the country and are well integrated in the population.

The official language is Dutch. Form most Surinamese3 the mother tongue is Sranan Tongo, an English-Based Creole language. Manu Surinamese of Asian origin speak Sarnami-Hindi or Suriname-Javanese. The population is roughly 40% Christian, 33% Hindu and 20% Muslim.

Suriname is ranked 74th out of 173 countries in the human development index of the UN Development Programme, which puts it in the medium development band, six places below Venezuela and five places below Colombia.

Economic crises and periodic interruptions of aid flows since the early 1980s have severely constrained the government's ability to invest, particularly in public services and infrastructure. Education, including higher education, is free. Primary school education is compulsory for children between the ages of six and twelve. Three-quarters of school-age children are in primary or secondary education. Based on survey evidence, the illiteracy rate in 2001 was an estimated 14% of the total population. State spending on education was equivalent to 3.4% of GDP in the period 1990-2000.

Despite the lack of public investment in Suriname's healthcare and the heavy loss of trained personnel through emigration (an estimated 82% of nurses that were trained between 1970 and 1998 were working overseas), the country's healthcare indicators are generally comparable with those of its Caribbean neighbours.

2.4 Environmental awareness

The environmental awareness in Suriname has not yet fully developed. However, an increasing number of environmental programmes is run by several local organisations.

NIMOS

- The NIMOS institute organised five workshops in the past two years to construct and create awareness for a newly to be adopted environmental law.
    1. Brainstorm session with local lawyers on the new law
    2. Regional workshop on legal environmental framework
    3. Draft the legal framework
    4. Background behind legal framework
    5. Environmental legislation awareness plan
- In addition, the institute made a film on the new environmental law to be used as a promotional item. Before the law was drafted, NIMOS visited almost all districts in Suriname to create awareness of the environment.
- In 2003 an awareness officer was hired, who visits the districts, runs awareness programmes in schools and has constructed an awareness strategy.

Stinasu and Nature Conservation (Natuurbeheer)

Stinasu and Natuurbeheer are currently in the process of merging their awareness programess. Both organisations run programmes at primary and secondary school focussed on nature conservation and biodiversity

Stichting Schoon Suriname (SSS)

Still needs to be completed

2.5 Administrative and legal context for environmental protection

Currently Suriname's administrative and legal context for environmental protection is insufficient. The current laws in the forms in which they exist were created to regulate the various sectors, but are not sufficient to accommodate environmental management. The current legislation is fragmented and dispersed over various sectors. It also lacks subsidiary legislation and regulation, is out of date, fails to use implementation and enforcement powers.

On June 4th 1998, a Technical Cooperation Agreement (TCA) was signed between the Inter-American development bank (IDB) and the Government of Suriname to support the development of a national legal and institutional framework for environmental policy and management. The total cost of the project was 1.3 Mio EUR, of which the European Commission contributed EUR 590,000. The institutional framework has been set up and a draft Framework for Sustainable Environmental management has been prepared which

will resolve a number of the above-mentioned issues. The expected passing date of the law is July 2004.

3 State of the environment

3.1 Physical environment

Climate

Suriname has a humid tropical climate, with an average annual rainfall ranging from 2000 to 2500 mm, an average maximum temperature of 31oC, while the average minimum temperature centres on 23oC. The relative humidity is very high: 70-90 percent. As a result of crossing the Inter-Tropical Convergence Zone (ITC-zone) over Suriname two times a year, four seasons can be distinguished, i.e. a long rainy season from April to the middle of August, a long dry season from the middle of August to the end of November, a short rainy season during December and January and a short dry season during February and March. Extremely dry seasons rarely occur.
The following rainfall zones can be distinguished;

a coastal strip in the district of Coronie with an annual precipitation average of 1,500 - 1,750 mm
b. a coastal strip around the town of Nieuw-Nickerie with 1,750 - 2,000 mm
c. north and west Suriname: 2,000 - 2,250 mm
d. southeast Suriname: 2,250 - 2,500 mm
e. central Suriname: 2,500 - 3,000 mm

Currently the pressures on climate in Suriname are not high. The absolute and relative amounts of GHG emitted into the atmosphere are low. However the bauxite industry is planning further expansion and a new smelter is planned to process the larger amounts of bauxite to be exploited. For the new smelter there will be an additional need for a hydro-energy lake as is planned in the Kabalebo River near the border with Guyana. Taking these developments into account the emitted GHG will be doubled. While the absolute number of GHG emitted will remain low the relative number (emission) per person will become high.
While Suriname signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratified it in 1997, there is not yet a clear policy on climate change. There are some policy statements, but these are insufficient for there are no mechanisms provided to implement these statements. Moreover, they are too generalized for a clear directional route to mitigate the man-induced source of climate change and adapt to the adverse effects of climate change. In the Government Statement 2002-2005 it is stated that all the multi-lateral agreements, including the environmental conventions, will be implemented efficiently and effectively. In the Multi-annual development plan 2001-2005 the policy statement of formulating regulations with regards to climate change is included, which should be implemented by assessing the consequences of climate change for adequate riverbanks and coast and coast protection and the development of an adequate strategy. However, so far no funds have been released to realize the means.

Air quality and odour

While the general assumption is that the air quality in Suriname is of a high standard as approximately 90% of the country is uninhabited and there is relatively little heavy industry, there has never been an overview study to verify this. Neither is there a law setting a standard for air quality.

Water quality and resources

Here follows a description of Suriname's water resources of marine, surface and ground water.

1.Marine Water Resources

Suriname's part of the Atlantic Ocean extends from the coast to the boundary of the Exclusive Economic Zone (EEZ) at 370 km offshore. This area is subdivided into two zones:

- The Deep Sea, located between the northern boundary of the EEZ and the Continental Shelf (approximately 150 km offshore). This area with depths of over 4,000 m covers 75,000 sq. km.
- The Continental Sea, located between the Continental Slope and the coast. From the edge of the Continental Shelf (between 200 m and 100 m depth) the sea floor gradually rises over a distance of 150 km up to the coastline. The Continental Sea covers about 65,000 sq. km.

Three sub-zones, each approximately 50 km wide, can be distinguished:

-Outer Zone or Blue Water Zone between the Continental Shelf and the 60 m depth contour (25,000 sq. km.).

-Middle Zone or Green Water Zone between the 60 m and 30 m depth contour (20,000 sq. km.). The water in this zone is coloured green and it has a rather deep light penetration compared to the next (Brown water) zone.

-Inner Zone or Brown Water Zone. This zone, between the 30 m depth contour and the coastline, covers about 20,000 sq. km. The brown water is filled with mud from the Amazon River, brought by Guyana Current that flows from east to west. Light penetration is less than 10 cm. Within the Brown Water Zone, the Surinamese Territorial Waters are found: a 22.2 km wide zone along the coast, with an area of about 8,500 sq. km. Within the Territorial Waters, the shallower coastal waters (between the 6 m depth contour and the coastline) are known as the Shallow Sea Zone. The zone of the Shallow Sea is 7-18 km wide (about 12 km on average) and measures about 4,500 sq. km.

2. Surface Water Resources

Suriname's water bodies on land include rivers, swamps, and lagoons/lakes. Certain wetlands are being protected under the RAMSAR Convention; however, a national comprehensive inventory of wetlands has not yet been executed.

The main rivers of Suriname are (from west to east): the Corantijn (including the rivers Sipaliwini, Curuni, Lucie and Kabalebo), Nickerie, Coppename, Saramacca, Suriname, Commewijne and Marowijne (including the rivers Tapanahoni, Palumeu, Ulemari, Litani and Lawa).

The sources of the Corantijn River are located near the boundary with Brazil in the Acarai Mountain. The tidal influence can reach the Cow Falls during periods of low flow,

some 210 km from the river mouth. The Nickerie River originates in the Bakhuys Mountain. The tidal influence can reach the Stondansi Falls during low flow. The sources of the Coppename River are in the Wilhelmina Mountains. The tidal influence can reach as far as Kwintikriki Falls during periods of low flow. The Saramacca River emerges in the central highlands of the country (the Emma Range and the Van Asch van Wijk Mountains). The length of the river is approx. 460 km. During periods of low flows the tidal influence can reach Kwakugron (km 220).

The sources of the Suriname River are in the Eilerts de Haan Mountain range. It is the only partly regulated river in Suriname. In 1964 a dam was constructed for hydropower at Afobaka, resulting in the 1560 km2 Brokopondo Lake. The salt intrusion during periods of low flow is perceptible just upstream of Paranam. When the reservoir was constructed, the vegetaition drowned, resulting in low oxygen content in the Suriname River downstream of the Brokopondo reservoir. Between Afobaka and Paranam, there is a recovery of oxygen content as a result of oxygen uptake from the air, while between Paranam and Paramaribo there is again a decrease which is caused by discharge of wastewater. Because of its relatively low oxygen content, the Suriname River cannot absorb any more domestic and industrial wastewater and still support aquatic life. The drop in oxygen content downstream of Afobaka must have considerably reduced the possibilities for commercial fisheries.

The Commewijne River originates in the Hok-A-Hing Mountains and is the only river without rapids in its upper course. According to the data available at the Hydraulic Research Division the salt intrusion during dry seasons extends to Tamarin (approx. 10 km down-stream of the Cottica River).

The most important sources of the Marowijne River are in the mountainous highlands bordering on Brazil. The estuary of the Marowijne River is located downstream of the Armina Falls, about 90 km from the outfall. The salt-intrusion in the Marowijne estuary is perceptible during dry seasons up to several kilometres upstream of Albina.

Swamps

Across the country, swampy areas border the rivers or creeks in certain localities. Extensive swamps occur only in the Coastal Plain. The largest and most inaccessible swamp is the Peruvia swamp in the district of Coronie. The Nani Creek and the Coesewijne River areas are also known for their large swamps.

Lagoons/Lakes

Many salt- and brackish-water lagoons are located just behind the coastline. The largest of them is Bigi Pan. In Suriname; the only natural lake is the small Nani Lake (northwest Suriname). Many man-made lakes have been constructed in recent times. The largest of them is the Brokopondo Reservoir, covering 1560 km2

3. Groundwater Resources

On the basis of the type of aquifers, two main areas can be distinguished: the Coastal Zone and the Interior. The following aquifers can be distinguished in the Coastal Zone:

Burnside Formation (A-sands aquifer):

This aquifer contains fresh water in many places, including Paramaribo, north of Lelydorp village (depth 120 -160 m), Nieuw Nickerie (depth 340 m). North of Paramaribo the water becomes brackish.

Coesewijne Formation:

The top of this aquifer is found at a depth of 15 m in the Old Coastal plain, dipping to 70 m at Paramaribo and to 230 m at Nieuw-Nickerie. This aquifer contains mainly fresh groundwater and becomes brackish north of Paramaribo.

Zanderij Formation:

The Zanderij sands form an aquifer with commonly good water properties. In the Young Coastal Plain, however, the aquifer mostly contains brackish water.

Drinking water for coastal areas is being extracted from the Burnside Formation, Coesewijne Formation and Zanderij Formation aquifer. Little is known about groundwater of the Interior, which may be present in the weathered overburden, fracture zones in the bedrock and in alluvial deposits along major rivers.

Future developments, as population growth and urbanization, will enhance the impacts on the existing water resources of the country. However, the largest impact on the existing water resources remains the ongoing change in the rainfall patterns of the climate. Under these circumstances resources of freshwater availability for agricultural purposes, hydroelectric power an navigation will be seriously affected. The northern part of district Coronie might become even semi-arid region of Suriname.

Decrease in rainfall pattern will also affect transportation as rivers are used as waterways to transport people and goods to the various locations in the interior. Decreased freshwater discharge will be compensated in the lower courses of the rivers with salt-water intrusion from the Atlantic Ocean. Saltwater intrusion will also be enhanced due to the withdrawal of freshwater from the rivers for irrigation purposes.

An efficient utilization of water resources should be installed. In this respect a total assessment of all the available water resources in Suriname is needed followed by a national water policy including regulations on water withdrawals from water bodies and the discharge of effluents within the different river basins. Regarding the potable water supply in urban areas, efficiency improvements in production and distribution of potable water is needed. It is reported that the loss of potable water due to leakage in the piping system is about 3—40%.

An additional concern for the water resources is the increasing activities in informal gold mining. The small-scale gold miners use mercury to detect gold. This mercury pollutes the rivers, which are used as a source of drink water in the interior and fishing source. No extensive studies have been conducted so far, to detect the extent of the pollution of mercury in the interior.

Noise and vibration

There has not been a study concerning the noise and vibration in Suriname, so little is known on this subject. There are regulations for companies on the maximum amount of decibels to be produced but not for citizens. There is a Nuisance Act but enforcement appears to be poor.

Geology, topography and soils

Suriname has a total land area of 166,000 sq. km., with a geomorphologic subdivision into four landscapes, from north to south as follows:

1. The Young Coastal Plain
2. The Old Coastal Plain
3. The Cover Landscape or Savanna Belt
4. The Interior

1. The Young Coastal Plain

The Young Coastal Plain borders in the North to the Atlantic Ocean and in the South to the Old Coastal Plain. From East to West its width increases from 10 to 40 km. The altitude varies from 0-2 m above mean sea level. The oldest part of the young coastal plain was formed during a transgression period (pyrite rich soils), while the younger parts were deposited during a period of a rather constant sea level (little pyrite). As a consequence of the processes of sedimentation and soil formation various soil types occur in the Young Coastal Plain, ranging from sand (shell), clay (ripened and unripe) to peat. In several parts the clay plain is intersected by low, narrow sand ridges, and locally by ridges consisting mainly of shells and shell fragments. The maximum thickness of the sand ranges from 1.10 to 6.70 m. With the exception of variable pH the clay soils in general have moderate to poor physical properties.

2. The Old Coastal Plain

The Old Coastal Plain with a width of about 20 km lies 2-10 m above the mean sea level. In the South it borders the Cover Landscape or Savanna Belt. The northern part of the Old Coastal Plain consists of a complex of eroded sand ridges, while the rest is a dissected plain of silt loams and silt clays. The sands have moderate to poor chemical properties and good to poor physical properties, while the plain of silt loams and silt clays has a rather low pH and moderate to poor fertility. Furthermore, the Old Coastal Plain in Suriname has been divided into two sub-landscapes, namely Lelydorp Landscape and Para Landscape. Narrow swamp zones sometimes separate the individual surfaces, varying greatly from one hectare to some hundreds of square kilometres. It is not a continuous zone of deposits like the Young Coastal Plain. However, sand ridges and clay may occur. Another characteristic of the Old Coastal Plain is the occurrence of erosion gullies, to a certain extent filled up with greyish soft clays (Mara deposits).

3. The Cover Landscape or Savanna Belt

The Cover Landscape or Savanna Belt is the result of the serious erosion of the Guiana Shield in the Tertiary Period. It occupies a more or less continuous belt along the full width of Suriname, with an estimated area of about 10,000 sq. km. and it is also known as the Coesewijne formation. The Belt is a dissected plain, 5-10 km wide in the east and 60-70 km in the west, with elevations varying from about 10 m in the north to 50 m in the south, consisting mainly of sandy to sandy loam soils. The soils of the Savanna Belt are subdivided into bleached and unbleached soils. The bleached soils consisting of more than 99 percent of silica (SiO_2) are extremely infertile. The unbleached soils consist of sandy loam to sandy clay loams, with some occurrences of brown sands. These soils,

with generally lighter textured top soils and good physical properties are chemically very poor.

4. The Interior

Approximately 80% of Suriname is the Interior, which consists of deep, weathered residues as part of the Precambrian Guiana Shield. The parent material is mainly metamorphosed igneous and sedimentary rock. The Interior is undulating, hilly and mountainous and has elevations varying from 50 to about 1230 m above sea level. The soils are generally well drained and consist of reddish brown and yellow coarse sandy loam to sandy clays. Bleached soils also do occur locally on poor sandy parent material. Shallow gravely soils also do occur on steep slopes. The occurrence of iron and or quartz gravel in the soil profile, especially on hilltops is evident. In general the soils have a low chemical status.

Natural disaster risks

Suriname does not experience natural disasters. It lies outside the hurricane belt, there are no volcanic eruptions, earthquakes or extensive droughts. At the most there is some minor flooding, but never at the level of endangering men. However, there is a threat of man-made disasters, whether or not environmental related. Of few occasions this triggered the discussion on the need of a national disaster relief plan, resulting in some initial initiatives. Although, some draft plan with respective legislation was prepared, this never led to any adoption by the government.

3.2 Biological conditions: biodiversity, ecology and nature conservation

Biodiversity

The Guyana Shield offers significant opportunities for conservation. With the highest percentage of intact tropical rain forest on Earth, as well as the lowest population density of any tropical rain forest region, the Guyana Shield is one of the world's last great wild places, with a significant biodiversity.

The number of species of flora and fauna in Suriname is estimated at 670,000. Approximately 9600 are known of which an estimated number of 75 are endemic. Most inventories have taken place around the urban centres of the Coastal Plain and well accessible airstrips in the Interior. Large areas of the Interior, including the mountain ranges, remain completely unknown for their flora, fauna, ecosystems and ecological relations.

Table 1 Rare and endangered species of fauna in Suriname

Scientific Name	English Name	Sranan(-Tongo)/ Dutch Name
Mammalia	**Mammals**	**Zoogdieren**
Pteronura brasiliensis	Giant Otter	Bigiwatradagoe/ reuzenotter
Trichechus manatus	Guianan Manatee	Seku/zeekoe

Panthera onca	Jaguar	Jaguar
	Cock of the rock	
Aves	**Birds**	**Vogels**
Jabiru mycteria	Jabiru	Blasman/jabiru
Oryzoborus crassirostris	Larged-billed Seed-finch	Twatwa/ zwarte bisschop
Harpia harpyja	Harpy eagle	Loiri Aka/ harpij arend
Reptilia	**Reptiles**	**Reptielen**
Lepidochelys olivacea	Olive Ridley Turtle	Warana
Amphibia	**Amphibians**	**Amphibieën**
Denodobatus azureus	Blue Poison Arrow Frog	Okopipi/ Blauwkikker
	Black Caiman	
	Giant armadillo	

Source: NIMOS, Conservation International, WWF

Ecosystems

The following ecosystems are described according to relationships rather than their presence in the four landscapes.

1.Marine Ecosystems

The Ocean area stretches from the coastline up to the boundary of the EEZ. This system may be subdivided into:

- **the Deep Sea**
- **the Continental Sea which can be divided in the three sub-zones:**

Outer Zone or Blue Water Zone

Along the edge of the Continental Sea (fossil) coral reefs are found overgrown with algae and sponges. Crabs and worms are common. Among the fishes, red snapper are common above the fossil coral reefs

Middle Zone or Green Water Zone

Due to the abundance of algae, the colour of the water in this zone is green. The fauna in this zone consists of shrimp species (brownies, spotted browns), crabs, lobster, worms, jellyfishes and sponges

Inner Zone or Brown Water Zone

The diversity of animals is rather low; only shrimp species, catfish, and commercial fish such as sea trout, gaffop fish, butterfish, and weakfish are found. Shellfish and worms inhabit the bottom.

2.Brackish-water and Estuarine Ecosystems

The ecosystems of saline and brackish wetlands cover an area of about 3,250 sq. km. On the mudflats along the coast, black mangrove (Avicennia germinans) is the first vegetation that grows. It forms an almost uninterrupted belt of forest along the coast. On the soft tidal mudflats many species of benthic diatoms are found in high densities. Tanaids constitute the staple food for most species of shorebirds that feed on the tidal

mudflats. The zone above and below mean high water level is inhabited by many crab species, especially fiddler crabs (Uca spp.). The firm and tough clay banks along erosion coasts are characterized by the occurrence of some relatively large, hole-dwelling decapods. Furthermore, the estuarine zone, important as spawning and nursery ground, is home to shrimp, snook (Centropomus spp.), Brazilian mullet (Mugil brasiliensis), and the tilapia (Oreochromis mossambicus) that has been introduced. In the river mouths mainly catfishes such as Arius spp. are caught. More than 4 million shorebirds, 600,000 ciconiiform birds, 100,000 ducks, 100,000 larids and skimmers, and 30,000 other birds are present in the saline and brackish zone. Suriname is of extremely great importance as breeding and feeding area for the South American endemic Scarlet Ibis (Eudocimus rubber). This area is by far the most important wintering area too within South America for shorebirds breeding in the boreal and arctic regions of North America.

During the process of silting up, the saltwater lagoons become overgrown by halophytes such as Sesuvium portulacastrum, Batis maritima and Sporobolus virginicus. Salt-tolerant grasses and/or ferns such as Eleocharis mutata, Cyperus articulatus, Paspalum vaginatum and the fern Acrostichum aureum invade the brackish lagoons.

Swamp scrub grows in scattered locations all over the marshes. Within these marshes, as they move inland due to accretion, freshwater marshes develop richer in variety of species such as Cyperus articulatus, Leersia hexandra, and Typha angustifolia, and three species of armoured catfishes (Hoplosternum littorale, H. thoracatum and Callichthys callichthys).

Along the muddy downstream riverbanks of the brackish coastal area, red mangrove forests (Rhizophora species) are found. In the mouth of the main rivers the Guiana White or River Dolphin (Sotalia fluviatilis) may occur, while the American Manatee (Trichechus manatus) inhabits the main creeks and swamp creeks.

The few high sandy beaches are important nesting places for the Green Turtle (Chelonia mydas), the Leatherback Turtle (Dermochelys coriacea), the Olive Ridley (Lepidochelys olivacea), and occasionally the Hawksbill (Eretmochelys imbricata), while they are good habitats for the Iguana (Iguana iguana) as well.

Due to mudflats in front of the sandy beaches, ridges are formed on which forest adapted to the dry conditions (xerophytic forest) develops. Coastal ridge forests change into high dry land forests as they move further inland as a result of accretion; some become high seasonal swamp forest, depending on the fluctuations of the water in the soil.

The Red Howler Monkey (Alouatta seniculus) and the Jaguar (Panthera onca) are common on the sand ridges. Locally, there are also good populations of White-tailed deer (Odocoileus virginianus) and Agouti (Dasyprocta leporina).

3. Freshwater Wetlands

Grass and shrub swamps Fresh water grass and shrub swamps occur practically only in the Young Coastal Plain. They are of a mixed composition, but sometimes they are dominated by species such as Typha angustifolia, Cyperus giganteus, Leersia hexandra, Thalia geniculata, and Montrichardia arborescens. The grass and shrub swamp vegetation in the Old Coastal Plain is poorer of species, often dominated by Eleocharis interstincta, Lagenocarpus guianensis and/or Rhynchospora gigantea. In these swamps several bird species have their habitat, for instance the Purple Gallinule (Porphyrula martinica), the Grey-Necked Wood-Rail (Aramides cajanea), the Striated Heron (Butorides striatus), and

the Snail Kite (Rostrhamus sociabilis). Other animal species that live in these swamps are: Capybara (Hydrochaeris hydrochaeris), Spectacled Caiman (Caiman crocodilus), Anaconda (Eunectes murinus), Pipa Toad (Pipa pipa) and several swamp fish species such as armoured catfishes and several Cichlidae species.

In the northern freshwater marshes of western and eastern Suriname, Erythrina glauca forests are found. Pre-Columbian ridged fields have sometimes been found in such forests. In the Young Coastal Plain in the central part of Suriname, where ridged fields are almost absent, low swamp forests are found, similar in environment but richer in species. Salt-tolerant Chrysobalanus icaco and Annona glabra trees predominate. The composition of these swamp Chrysobalanus-Annona forests shows a strong resemblance with the undergrowth of Mauritia flexuosa palm forests. However, these palm forests are generally found further inland in permanent freshwater swamps, where, especially in the western part of the country, they are the breeding habitat for the Blue-and-Yellow Macaws (Ara ararauna). Mauritia flexuosa forests presumably originated in periods of frequent burning; these fire-resistant palms must have been selected by such a process so as to form single-species forests. During a prolonged absence of fire, Mauritia flexuosa forests become richer in species until mixed high swamp forests are formed. Elsewhere, in the younger part of the Young Coastal Plain, extensive Triplaris surinamensis forests are found. Most of these forests, which grew after the intense peat fires of 1926, no longer have dense canopies because of recent peat fires (1964). However, some of these forests have become richer in species in the absence of fire and resemble mixed high swamp forests. In shallow marshes with annual surface water fluctuations between 0 and 80 cm, a low swamp forest develops, dominated by Pterocarpus officinalis and/or Tabebuia insignis. This low swamp forest gradually changes into a type of higher swamp forest consisting of species such as Virola surinamensis, Symphonia globulifera and Euterpe oleracea. In deeper marshes with annual surface water fluctuations varying from 0 to 2 m or more, a Dalbergia glauca scrub develops first. This scrub gradually develops into another type of high swamp forest: Crudia glaberrima - Macrolobium acaciifolium forest. Low swamp forests cover about 3% of Suriname.

In the shallow freshwater swamps of the Coastal Plain, mixed Virola surinamensis-Symphonia globulifera-Euterpe oleracea forest, which is relatively rich in species, forms the vegetation at the final stage of succession (climax). Sometimes, the Hura crepitans may dominate. These Hura forests serve as a foraging area for the Blue-and-Yellow Macaws (Ara ararauna). In the deeper swamps of the coastal plains, the species poor Crudia glaberrima-Macrolobium acaciifolium forest is the climax vegetation. Characteristic of this forest is a light canopy of xeromorphic leaflets, while Euterpe palms as well as substantial undergrowth are lacking. Along creeks and rivers of the Savanna Belt and the Interior, Virola - Symphonia- Euterpe swamp forests are also found, there however enriched by a great number of species from the surrounding high dryland forest. Very sporadically, Pentaclethra macroloba trees dominate the swamp forest. Swampy areas are inundated most of the year, so that a peat layer is formed on the mineral soil. As a rule, this peat layer does not dry up during the long dry season (August through December). However, if the rains fail to appear in the next short rainy season (December through February) and the next dry season is really dry, a dry period of 8 continuous months may be created. During such periods, the peat layer desiccates and pegasse fires

can transform extensive areas of high swamp forest into marshes. Peat fires occurred in 1912, 1926, 1940 and 1964. High swamp forest still covers about 2% of the country.
The animals occurring in grass and scrub swamps are less common in low and high swamp forests. The animals that have been observed in these forests are more associated with trees, like monkeys, sloths, tree snakes, and woodpeckers.
High seasonal swamp forests, also called marsh forests, are found on poorly drained soils: low ridges, levees of rivers, and plateaus of the Coastal Plain, as well as along creeks and rivers in the Savanna Belt and the Interior. During the rainy seasons, the soil may be totally inundated. In the dry seasons the soil never desiccates. The micro relief of the soil surface consists of a so-called kawfutu (cow's foot) structure: a pattern varying from small knobs to polygons several meters wide. In the rainy season, small gullies between these structures contain surface water and the structures themselves may be inundated temporarily. However, peat is not formed. Species diversity is intermediate between that of the high swamp forests, and the high dryland forests. Marsh forests are usually rich in palms, among which Attalea maripa and Euterpe oleracea. In the undergrowth there are many broad-leafed monocotyledons, such as Heliconia species and Ischnosiphon species. Although marsh forests usually have a mixture of species, on ridges near the coast they have brackish to fresh groundwater, Hura crepitans trees dominate isolated forests. Scattered on the levees of the Corantijn, Nickerie, Coppename, and Saramacca rivers Mora excelsa trees predominate.
In many places on the old ridges in eastern Suriname, the Parinari campestris makes up the canopy. Marsh forests consisting mainly of Pentaclethra macroloba trees occur along the middle course of the Suriname River. Marsh forests cover 3% of the country.
Along creeks in the Interior, Virola-Symphonia-Euterpe swamp forests are found, enriched by a great number of species also found in the surrounding high dryland forests. Creek forests along watercourses in the savanna areas in the Savanna Belt are often reduced to Mauritia-palm gallery forests as a result of frequent peat fires.

4. Savanna (Xerophytic) Forests

High and low savanna (xerophytic) forests cover at least two per cent of the country. In Suriname, the forest transition from savanna to high dryland forest is usually referred to as savanna forest. The high savanna forest is a two-storied dry evergreen formation with a dense upper canopy, reaching 25-30 m in height; it commonly occurs on deep white sands. Although high savanna forests are usually mixed in composition, in many places such trees as Eperua falcata, Humiria balsamifera, Dimorphandra conjugata, Swartzia bannia, and others dominate them. The low savanna forests or savanna woods are usually considered a succession stage between shrub savanna and high savanna forest, a succession that can only take place in the absence of fires. They vary in height from 10-20 m, but do not have different storeys. It is a very dense, closed formation and generally fairly homogeneous. In low savanna forests, the species mentioned above (with the exception of Eperua falcata) can dominate, while Clusia fockeana, Licania incana, and other trees may also dominate. In the hilly/mountainous areas in the Interior, with their thin soils on laterite, conglomerate, dolerite, granite, grey sandstone etc. savanna forests formed primarily of the species belonging to the Guava family (Myrtaceae), are found. Such savanna forests are known as mountain savanna forests.

The savannas in Suriname have been pretty well studied upon, especially their vegetation. Suriname has only two major types of savannas: tree savannas and shrub savannas. Tree savannas are savannas with scattered trees or small forest islands. Shrub savannas are savannas that accommodate scrubs or scattered forest islands. Tree savannas are usually found on soils, which do not desiccate too strongly during the dry season (clay or loamy soils), while shrub savannas are found on soils, which dry out for some period each year (extremely well-drained soils or soils with an impermeable layer at shallow depth). In Suriname the savannas can be classified in ten different types, mainly based on their soil and vegetation. Three types occur in the Old Coastal Plain, three in the Savanna Belt, and four in the Interior. Sipaliwini Savanna, the largest, is situated in the southern part of the country and designated as a Nature Reserve. It has an area of 650 sq. km, while the area of the other types varies from 10 - 400 sq. km. Large mammals do not occur on the savannas, except for the White-tailed Deer (Odocoileus virginianus). The savanna fox (Cerdocyon thous) is very rare. Several species of birds can be noticed in the savannas. The Redfoot Tortoise (Geochelone carbonaria), three lizard species and some snake species represent the reptiles. The endemic, and very rare Blue Arrow-poison Frog (Dendrobatus azuereus) is the best-known amphibian to inhabit the most southern Sipaliwini savanna. In the absence of fire, savannas may progress to the forest stage. Tree savannas first become overgrown by a low secondary vegetation, then by secondary forest, and finally by high dryland forest or high seasonal swamp forest, depending on the water capacity of the soil. Shrub savannas give way to high scrub, which gradually changes into low savanna forest and finally becomes high savanna forest. Savannas are found scattered over the whole Surinamese forest area. In spite of their isolated locations, their species show striking resemblance, a holdover from the time when an extensive savanna area covered much of Suriname during Pleistocene savanna climates. Only 1 % of Suriname may properly be considered savanna.

5. High Dryland (mesophytic) Forests

The largest part of Suriname, about 80% is covered by high dryland forest. These forests perform well on the well-drained soils of the higher ridges, levees, and plateaus of the Coastal Plain, the loamy sands of the Savanna Belt and in the Interior. The high dryland forests occur from sea level up to 400-600 m. The general characteristics are the presence of a high and dense canopy at 20-45 m and emergent trees up to 50-60 m. Species diversity is enormous (between 100-300 tree species per hectare).

In western Suriname, in the Savanna Belt, species such as Mora gonggrijpii, Aspidosperma excelsa and Ocotea rodiaei can form isolated stands. In the hilly interior, small concentrations of trees such as Vouacapoua americana, Manilkara bidentata or Bertholletia excelsa are found.

In these forests large mammals occur, such as the South American Tapir (Tapirus terrestris), two species of peccaries, large cats, and also eight species of monkeys. At least 500 bird species have their habitats in the forests in the Interior, the most spectacular being the macaws, the parakeets, and the toucans. Hardly anything is known of the distribution and habitats of the reptiles and amphibians.

Lower montane forests occur from approximately 400 m up to 1,230 m. These forests are scattered on the highest hills, often overlain by a lateritic crust. Mosses, liverworts and vascular epiphytes are abundant. Some species of trees may be dominant. The vegetation

of the upper reaches of the Tafelberg is a mosaic of elfin woodland and lower montane rain forest. The forests on this tepui are somewhat different from those that are on other high points in the country.

6. Open Freshwater Ecosystems

The following classification of freshwater habitats is a provisional one, since the ecosystems have been hardly studied. It is based mainly on hydrological and morphological characteristics.

The fresh water types can be classified as black water, clear water and white water. Black water has a dark brown colour, a very low concentration of dissolved minerals, and has a high acidity (pH 3.8 - 4.9), due to dissolved tannins leached out of the leaf litter. The rivers and creeks in the white sand Savanna Belt are black waters. Clear water is greenish to transparent, with no suspended particles and a concentration of dissolved minerals that may range from very low to relatively high, and a pH that ranges between very acid and neutral (pH 4.5 - 7.8). Examples of clear water types are the rivers and creeks south of the Savanna Belt. White water (the lower courses of the larger rivers) has a milky white to grey colour due to the suspended inorganic material, and contains a relatively high concentration of dissolved minerals and has a pH of about 7.

Water plants present under the shelter of the shores of rivers are free-floating plants such as Eichhornia spp. Pistia stratiotes and Salvinia auriculata, but also soil-rooting species with free-floating leaves like Nymphaea spp.

If favorable light conditions prevail, richly variegated water plant vegetations may develop with species such as Cabomba aquatica, Nymphoides indica, Nymphaea spp., and Utricularia spp. However, near cultivated areas due to eutrofication free-floating species such as Pistia stratiotes and Eichhornia crassipes along with species such as Salvinia auriculata, Azolla caroliniana and Ceratopteris spp. can be found, while along the shore a strong development of grass mats may be seen. In heavily shaded creeks near densely forested areas, Toninia fluviatilis, a water plant, occurs.

Some of these rivers are well-known habitats for threatened mammals such as the manatee (Trichechus manatus), and the Giant Otter (Pteronura brasiliensis). The rivers in the Coastal Plain and Savanna Belt are well known for their populations of the Spectacled Caiman (Caiman crocodilus), and the Dwarf Caiman (Paleosuchus palpebrosus), while the Smooth-fronted Caiman (Paleosuchus trigonatus) occurs mainly in rivers and creeks in the Interior. The fresh water fish species are more or less well known (app. 420 species), although several rivers have not yet been inventoried.

In the Interior, where rivers have worn their channels in the Guiana Shield, numerous rapids and cataracts occur. These form the characteristic habitat of the Podostemaceae plant family. The rocks and huge stones in the rapids and cataracts are overgrown with many green Algae, which are grazed by several species of fish mainly of the Loricariidae family. Also many small fishes, known as aquarium fishes, do occur here. Species of the Podostemaceae family are the main food source for the Myleus rhomboidalis fishes, which are very common in these habitats. Other well-know fish species are the electric eel (Electrophorus electricus), several species of piranhas of the Serrasalmidae family, and members of the Erythrinidae and Characidae families.

Their is one natural lake, the Nani Lake, which is well known for the population of the Giant Otter (Pteronura brasiliensis).

Most man-made aquatic habitats in cultivated areas, such as trenches, irrigation channels and puddles, are characterized by strong eutrofication and high light incidence. In these circumstances free-floating, light and nutrient loving water plants like Eichhornia crassipes and Pistia stratiotes grow abundantly, together with such species as Azolla caroliniana, Salvinia auriculata and Ceratopteris spp. A special case is the Brokopondo reservoir covering 1,560 sq. km. Once the dam had been closed in 1964, the developing lake made a good habitat for Eichhornia crassipes and Ceratopteris pteridoides. These species developed explosively and in the middle of 1966 they covered 53% and 22% of the then lake area. Other strongly expanding species were Lemna valdiviana, Spirodela intermedia, and, along the shores, Utricularia gibba. In 1972 Eichhornia crassipes was confined to the youngest parts of the reservoir, whereas Ceratopteris pteridoides had disappeared. The most abundant fish species in this Reservoir are the piranhas (Serrasalmus spp.) and the Cichla ocellaris. There are many canals in the coastal area. Two of the larger ones are the Corantijn Canal in NW Suriname and the Saramacca Canal, connecting the Suriname River and Saramacca River.

3.3 Socio-economic conditions, socio cultural conditions and human health

Socio-economic conditions

The US Census Bureau of Statistics estimated Suriname's population at 433,682 in mid 2002, a very sparsely populated country. About 98% of Suriname's population is concentrated in the coastal zone, especially in the districts of Paramaribo (the capital city) and Wanica.

The combined population density of the districts of Paramaribo and Wanica totals 464 persons per sq. km. The remaining 2% are spread along the rivers in the Interior. The average population density for the entire country is 2.6 persons per sq. km. The development of the population of Suriname since the independence in 1975 is characterized by a relatively small increase from 370,000 to 433,682 in 2002. The small increase is due the fact that after the independence many citizens emigrated to the Netherlands. Population growth slowed to 0.8% between 1996 and 2000 from 1.2% between 1990 and 1996.

Table 2 Population and Human Major Economic Activities in Suriname

Ecological zones	Area in km²	Estimated total population	Type of inhabitants	Population Density pers./km²	Key Economic activity
Ocean Zone	75,000	n.a.	n.a.	0	Fisheries Navigation
Continental Shell Zone	65,000	n.a.	n.a.	0	Fisheries Navigation Oil exploration/exploitation
Young	10,000	400,000	Urban & rural	40	Urban development,

Coastal Plain			Indigenous, Maroons		Industry, agriculture, oil exploration, bauxite mining, forestry
Old Coastal Plain	10,000	10,000	Rural	10	Agriculture, oil exploration, bauxite mining, forestry
Savanna Belt	10,000	10,000	Indigenous, Maroons Miners & Garimpeiros	10	Agriculture, gold mining, forestry
Interior	136,000	5,000	Indigenous	0.03	Hunting, gold mining

Source: NIMOS, ABS

The population is ethnically diverse: around one-third are Creole descendants of African slaves; another one-third is descended from Indian indentured labourers who arrived after 1873; and one-sixth is ethnically Javanese. There are also Chinese, Guyanese and Brazilian minorities. In the interior, there are communities of Amerindians and Maroons - the latter of which are descendants of slaves who escaped to the forests.

Suriname's economy is a small economy well endowed with natural resources, highly dependent on international markets, and vulnerable to external shocks. Agricultural, forestry, fisheries, mining (bauxite, gold, granite and other minerals) and petroleum resources characterize the country. The coastal zone is Suriname's backbone and source of the socio-economic dynamism. More than 90% of the various economic activities in production, manufacturing, horticulture, agriculture, financial and banking services, and government (public) services take place here. Both population and industrial infrastructure are concentrated in the coastal zone especially in the districts of Paramaribo and Wanica.

Mining is Suriname's leading economic sector, accounting for 15% of GDP in 2001. Bauxite, which is processed into alumina, is the most important mineral product, followed by gold and crude oil. Agriculture accounts for 9% of GDP. GDP per capita amounted to US$ 1,735 per capita in 2001.

An integrated land-use planning in Suriname is missing. However there are some directives given by the various ministries, according to which land use activities as well as in the coastal zone as in the interior of the country are carried out. As main land use type in the coastal area are found agriculture, including aqua culture, livestock and fishery, whereas shifting cultivation and wood logging are land use type experienced in the interior.

The land rights of indigenous peoples and maroons are acknowledged through (peace) treaties signed during colonial and recent times. However, government through appropriate legislation does not fully acknowledge the rights of indigenous peoples and maroons. The Government's position that indigenous peoples and maroons are

permissive occupiers of state lands contradicts the Government's formal obligation to allow indigenous peoples and maroons to own, use, and peacefully enjoy their traditional lands, as stipulated by Human Rights Instruments to which Suriname is a contracting party. Both the Inter American Commission on Human Rights and the UN Committee on the Elimination of Racial Discrimination have recently, each as a result of formal complaints by representatives of indigenous peoples and maroons in Suriname, taken the human rights situation in Suriname under their consideration.

Roads are the main mode of transport. There is a road network covering around 8,837 km of roads, of which about 26% was paved in 2000. A bridge across the Coppename River was completed in July 1999, linking the roads from Paramaribo to Nickerie in the west of the country. Another bridge across the Suriname River, connecting Paramaribo toe eastern Suriname was completed in May 2000. Guyana to the west and French Guiana to the east can be reached by ferry.

The rivers are an important means of transport for alumina cargo and for remote interior communities. The major seaport is Paramaribo. The Nieuwe Haven port terminal at Paramaribo handles an estimated 500-600 vessels per year. A EUR 29.8 million, EU financed port investment and modernisation programme is planned. The signing of the Financing Agreement for the project is foreseen in the beginning of 2004.

The state-owned electricity company, Elektriciteit Bedrijven Suriname (EBS) supplies electricity in the urban areas of Suriname and is responsible for the generation, transmission and distribution of the energy. The company operates generating plants at Paramaribo and Nickerie, which supply 15% of its capacity. 85% of its power comes from the 189 MW hydroelectric power station of Suriname Aluminium Company (Suralco). A new 161 KV transmission line, with finance from China, will be installed in 2004, which will reduce the loss of power on the connection to Paramaribo. Currently the EBS is not able to supply all its (potential) customers.

Suriname is self-sufficient in oil and has reserves of an estimated 170m barrels. Staatsolie, the state-owned oil company is the sole oil producer. Of the total production in 2002, 60% was refined locally, 22% was sold to the bauxite-alumina industry, and the rest was exported to Caricom markets. The growth of the oil industry will depend largely on the success of exploration activities, both onshore and offshore. Studies by the US Geological Survey and Billiton also indicate promising oil and gas prospects offshore, however so far no firm proposals were received for the exploration of these fields.

A regulation adopted in 1938 forbids private well construction and rainwater storage, requiring the people to have their houses connected to the distribution system of the Suriname Water Company in urban areas. The water supply in the urban areas comes from several aquifers found in the coastal area of Suriname. Through several wells groundwater is withdrawn at an average of about 0.66 m^3/ sec. The supply of potable water faces scarcity problems during the dry periods and extremely dry years. The wells located near the coastal line are subjected to salinity. Here salt intrusion plays a major role. The increase of sea water level will further enhance this intrusion. Also mining of

ground water from confined aquifers enhances the salt intrusion. In the interior, the main source of water supply is the local rivers. Pollution of the rivers through informal gold mining might become an increasing problem.

After a water supply system was installed in Suriname in 1933, the privies in the backyard were replaced by flushing toilets and the excreta were disposed in septic tanks. The effluent of the septic tanks flows in to the closed sewerage system. As of 1997, 63% of the urban population and 34% of the rural population has access to sewerage disposal services[2]

As planning and construction of the sewer system have not kept pace with the increasing urbanization, Paramaribo has traditionally been confronted with a drainage problem. Lack of funds in the preceding two decades has resulted into poor maintenance of the sewer system, the pumping stations and the sluices. The result is frequent flooding of streets and premises and overflow of septic tanks and sewers, especially after heavy tropical rains.

Most of the institutions within the Water Supply and Sanitation sector are weak. They are affected by lack of necessary financial means, lack of sufficient qualified personnel and clear legislative direction.

The main crop farming which is done on a large scale in Suriname is rice, banana (Surland has restarted operations in 2002 and expects to begin exporting bananas in 2004) and oil palm (recent initiative of oil palm project in Patamacca by Chinese company). The main threats from crop farming are pesticide use, deforestation and water pollution. The Ministry of Agriculture, Animal Husbandry & Fisheries is responsible for both the agricultural policy and regulating the trade and use of agrochemicals. Research on pesticide residues and the effects thereof is impeded by the lack of sufficient equipment and skilled personnel. Regulating pesticide imports, handling and use is also a constraint due to lack of funds, manpower and the revision of the Pesticide Law. Besides institutional strengthening in order to monitor and enforce laws, items that need to be addressed in legislation are: formulation of pesticide residue standards; banning of the importation of expired chemicals; third party certification of imported chemicals to ensure quality control and correct labelling; creation of buffer zones to protect habitations from aerial spraying; issuance of licenses and regulation of aerial spraying;

Although almost 90% of Suriname, approximately 15 million hectares, is densely forested, forestry and wood processing have contributed modestly to the GDP. Currently, the total exploitable area in forestry and wood processing is approximately 4,600,000 hectares. While the sector has an immense growth potential, actual economic exploitation appears to be facing the following constraints: relatively small log dimensions and the extreme interspersion of species, difficulties of inland transportation, the location of Suriname away from major export markets an the difficulty to get workers to settle in remote forestry areas devoid of elementary infrastructure.

[2] Draft National Assessment report Barbados programme of action +10 review

The main environmental threats of forestry are the waste generated by the sawmills (recovery is only 35-40%). Weak soils are easily damage by heavy logging equipment. A problem that could develop in Suriname is forest resource depletion caused by illegal logging, trespass, and over exploitation of the forest resources by villagers and individual farmers living in and around the forests.

Bauxite mining in Suriname dates from 1916. Suralco was incorporated in 1957 and the Brokopondo Agreement signed in 1958 when there were no requirements for environmental protection. Later a joint venture was established with Billiton. The Brokopondo agreement was re-negotiated in 1994 at which time requirements to improve environmental performance were included. IN the absence of Surinamese standards, Billiton agreed to follow parent company standards and Suralco to follow the Alcoa health, safety and environment systems.
Impacts from bauxite mining and processing that have been identified in a study in 1999, which still included the smelter which has been shut down in the mean time, are:

- large areas of red-mud disposal in abandoned open pits and in red mud lakes. Red mud is composed predominantly of iron, aluminium, silica, calcium and sodium, and is classified as non-hazardous;
- Lesser quantities of other wastes such as spent pot liners (SPL's). Carbon pot liners, used to hold alumina, cryolite solution during processing, are regularly replaced and the SPLs tipped. SPLs contain cyanide, fluorides and heavy metals and are classified as hazardous in the USA. The bauxite sector is likely to have disposed of several thousand tons of SPLs during each year. However, the closure of the smelter will have eliminated SPL waster. Disposal was to a lined landfill;
- Abandoned open pits, which fill with water and become breeding ground for mosquitoes. Suralco is said to have a programme to eliminate closed water systems but in 1999 this was not yet complete. Mine water recharge is also acidic;
- Alkaline effluents with suspended solids due to starch and sand content.

The study concluded that whilst the bauxite sector is taking responsibility for environmental protection, it is using a number of different standards, some of which may be inappropriate for Suriname. This is not to suggest that these standards are inadequate, but there is clearly a need for harmonisation and for Government to decide which standards are appropriate.

For the Gros Rosebel goldmine, which started its mining operations in 2004 an extensive Environmental Impact Assessment was conducted by Cambior, the Canadian mining company itself. Gros Rosebel is using cyanide leaching techniques. Potential impacts of the mining operations are ground disturbance, dewatering, transport, use and storage of cyanide and other materials, impacts related to tailings disposal as well as dust, noise, deforestation and visual impacts. It is our understanding that Canadian consultants will take a look at the EIA of the Gross Rosebel project to asses it thoroughly.

Gold mining, especially small-scale gold mining, has gained increasing importance in Suriname, both as a source of subsistence for an estimated ten thousands of people and as cause for environmental degradation. Gold mining activities are mainly concentrated within areas of Eastern Suriname, better known as the Greenstone Belt, which is rich in

biodiversity and inhabited by a variety of tribal communities and covers approximately 15% of Suriname's landmass. Many of the negative environmental effects and related health hazards from small-scale gold mining and processing are the direct an indirect consequence of poor mining and processing methods. These result in the destruction of rivers and creek valleys, uncontrolled use of mercury, the open burning of the gold amalgam and the direct release of mining waste water into the surrounding open waters. Hardly any rehabilitation of mined land is done.
There is no environmental control an no awareness of the scale of the problem as resources are inadequate to measure impact. To-date there has been no full-scale mercury monitoring programme of the 3 major rivers, plus streams, lakes, bio-monitoring, etc. Some projects, which included sampling and analysis of sediments, waters and fish, human hair and urine to detect mercury levels, have been completed. However, these were small-scale and did not form part of a structured programme to assess mercury in the environment. It is estimated that between 20 and 30 tonnes of mercury (based on an Hg/Au ratio of 1:1), have been discharged into the environment annually during the last 8-10 years. Technology to prevent, or at least largely minimize, such impacts is available and plans have been designed to introduce applicable methods to gold miners through awareness campaigns and training, unfortunately without much success. Complicating factor is the illegal nature of the activities and the financially and institutionally weak government, incapable of regulating the sector. WWF has a project planned to make the miners aware of substitutes for mercury in mining gold. However, not only should future discharges be prevented, but one should also focus on remediating the effects of past discharges.

The overall responsibility with respect to the tourism sector in Suriname lies with the Ministry of Transport, Communication & Tourism. In carrying out this task, the Ministry is supported by the Suriname Tourism Foundation as an integral part of the department. The Suriname Tourism Foundation is committed to the sustainable development of the tourism sector with an emphasis on community-based driven initiatives especially of those within the Interior. Momentarily, the Foundation is implementing a National Integrated Tourism Development Programme 2002-2005 that is financed by both the European Union and the Government of Suriname.

Suriname possesses the resources, among others the high percentage of pristine rainforest and a unique cultural heritage, to develop specialty tourism of considerable value. Low-volume, high value tourism can provide Suriname with substantial and sustainable economic benefits. Eco-tourism could contribute to the employment and the recognition of the importance of the Maroons and the Indigenous peoples.

Socio-cultural conditions and human health

Suriname has a significant cultural heritage, which results from the various colonial, ethnic and native interactions in its history. As the native community of Suriname, Indigenous groups have introduced agriculture products such as cassava, pottery making, and the manufacturing of canoes from hollowed tree-trunks that are used to navigate the rivers and creeks. Furthermore, evidence of a significant cultural heritage are the buildings in the inner city of Paramaribo. Some key sites are listed below.

The Central Suriname Nature Reserve (CSNR)
Suriname's heritage and environmental pride undoubtedly is the Central Suriname Nature Reserve (CSNR) established by the Government of Suriname in 1999, which covers an estimated 16000 sq. km. Hailed as a unique spot in the Amazon area in terms of topography and soil, this vast area harbours an enormous variety of ecosystems. The reserve forms a corridor linking the three most important pre-existing protected areas in Central Suriname: the Raleighvallen Nature Reserve (78 sq. km.) in the north, and the Tafelberg (140 sq. km) and Eilerts de Haan Gebergte (220 sq. km.) Since November 2000, the World Heritage Centre has put the CSNR on the List of World Heritage Sites, making it the largest single monument in the world.

Like the many scattered rock drawings (petroglyphs) over the country, in May 2000, northeast of the village of Kwamalasamutu in Southern Suriname, the Trio community found important petroglyphs. This finding is not only of important cultural value to the inhabitants of the area, but also of historic importance for Suriname as it could shed light on Suriname's history of 1500 and 1600 A.D. of which so little is known. A team of local and expatriate historians, archaeologists and anthropologists is expected to map the area. The St. Peter and Paul's Cathedral of Paramaribo, built in 1890 and judged to be one of the largest wooden buildings of high architectural value in the Caribbean and South America, is undergoing a restoration after more than ten years of closure. The building has been recognized as an architectural heritage of Suriname and as such, it is one of the buildings earmarked as historical monument. The restoration is funded by the European Union.

Along the Suriname River, approximately 55 km southeast of Paramaribo are the historic ruins of Joden Savanna, which means Jewish Savannah. Built during the 17th century by Jewish migrants, it was once a prosperous settlement for owners of sugar cane plantations. It was abandoned in 1832 when a fire destroyed wooden houses of the village. Nonetheless, the synagogue Beracha Ve Shalom continued to be used until about 1860. Near the ruins of the synagogue graveyards both of the Jewish migrants and former slaves can be found. Presently, the Stichting Joden Savanna (Foundation Joden Savanna) is making efforts to transfer this historic site into a tourist attraction.

The health sector was severely affected by fiscal problems in the late 1990s as the government fell seriously behind on payments to major hospitals and healthcare institutions. There has been a heavy loss of trained personnel through emigration: estimate published in 2001 suggested that 82% of nurses trained between 1970 and 1998 were working overseas. Despite the lack of public investment, Suriname’s healthcare indicators are generally comparable with those of its Caribbean neighbours. Life expectancy at birth in 2000 was 71.4 years; infant mortality is at 25 per 1,000 live births; clean drinking water is available for 95% of the population; and access to sanitation facilities exists for 83% of the population.

During the period of 1997 - 1999 the 10 leading causes of death in Suriname were heart & vascular diseases, cerebral vascular diseases, accidents & crimes, malignant neoplasms, gastro-intestinal diseases, prenatal death, diabetes mellitus, acute respiratory

infections, diseases of the urinary tract and HIV/aids. During the nineteen twenties, the crude death rate of Suriname was about 20 deaths per 1,000 of the population. Since the seventies and up to the late nineties, however, this rate has decreased considerably to around 6 and 7. Between the sexes, there is a difference in mortality rates. Females died at an average later age than males: they lived about 4.4 years longer. On the other hand, the number of births per 1,000 of the population in the period of 1972-1998 has also decreased from 28 to 24.

4 Environmental policy, legislation and planning framework

4.1 Policy and legislation

The Government Declaration of the period 2000-2005 emphasizes that responsible management of environmental problems requires an efficient and effective approach. The overall goal of the national environmental policy was defined as: protection, conservation, improvement and rehabilitation of environmental quality.

Studies on environmental management in Suriname have indicated that current laws in the forms in which they exist were created to regulate the various sectors, but are not sufficient to accommodate environmental management. The current legislation is fragmented and dispersed over various sectors. It also lacks subsidiary legislation and regulation, is out of date, fails to use implementation and enforcement powers and establishes a low regime of fines and penalties. An overview of the key existing environmental legislation is presented in the annex.

NIMOS has developed a draft Framework law for Sustainable Environmental management which will provide a broad and flexible framework for addressing environmental issues and for responding to changes in socio-economic and ecological parameters. This framework law will provide a basis and reference point for the coordination of sectoral activities and the rationalization and harmonization of sectoral regimes. The following elements have been included in the Framework Act:

- Institutional arrangements for environmental management
- Principles of a long-term environmental policy and planning
- Principles of public participation
- Liability system
- Duties and competences of the coordinating body and its relation to the other bodies and institutions
- Environmental impact assessments and inspections
- Financial conditions
- Control mechanisms e.g. sanctions, penalties
- Dispute settlement procedures

The draft act has been submitted to the Ministry of Labour, Technology and Environment in 2003 and will be presented for approval to the Council of Ministries and the State

Council, after which it will go to the National Assembly. Expected passing date is July 2004.

Currently there is no law requiring an Environmental Impact Assessment (EIA) or a Strategic Environment Assessment (SEA). Together with the draft law on Environmental management also draft regulations for Environmental Impact Assessments (EIA) have been made. These are at the moment also awaiting approval by Parliament. With the formal approval by the National Assembly on these two pieces of legislation an important step towards the achievement of sustainable development will be set.

While the EIA has been drafted, what is still missing is the set of standards for pollution regulation. The values are still blank in the draft law. A study will need to be conducted to design standard values for Suriname.

In the drafted law action points have been included which should improve enforcement of the environmental laws. Time will tell whether these are sufficient.

To create awareness for the upcoming new environmental legislation, NIMOS has developed an Environmental Legislation Awareness Plan. However, this programme still needs to be implemented.

The government has not set up a sustainable development plan so far. Agenda 21 was never implemented and the commission that was installed to follow up on it, has not been active since 1999. Through some of the international conventions that Suriname has signed and ratified, studies were conducted to assess the environment, but so far it has not resulted in concrete environmental action plans that have been adopted by the Government.

The following main conventions were signed and ratified by Suriname:

- Suriname ratified the UN Convention on Biological Diversity (CBD) on 12th January 1996. Major threats to biodiversity include lack of awareness on the impact of unsustainable methods in economic activities such as logging, mining and the wildlife trade. The sustainable use of natural resources as traditionally practiced by the indigenous people and tribal communities is threatened by the lack of recognition of their land rights, increasing poverty and underdevelopment which have resulted in the pursuit of economic alternatives, e.g. small scale gold mining, which continue to result in negative environmental and social impacts.
- The Framework Convention on Climate Change (Rio de Janeiro, June 1992) was signed on 23 September 1997 and ratified on 14 October 1997. Suriname is not yet party to the Kyoto Protocol. Climate change is probably the most complex and challenging environmental problem to face. The priority issues in climate change, biodiversity and land degradation has considerable cross-convention similarities and offer significant opportunities for integrated and synergistic approaches.
- The United Nations Convention to Combat Desertification was signed in May 2000. To reduce unwanted adverse effects such as land degradation due to climatic variations (drought) and human activities (overexploitation of dry lands).

For Suriname the main concern regarding combating land degradation presently is the sectors gold mining and agriculture. Preventive steps already taken to adequately anticipate and monitor this land degradation are the development of action plans and integrate the concerns into multi-sectoral national plans an assuring the interface of these actions plans with plans of other critical sectors such as rural development, water resources and forestry.

4.2 Institutional framework

Environmental issues generally tend to cut across ministries and their conventional responsibilities. Against this background, a specific national institutional framework for environmental managements was designed. After extensive consultation in national seminars and based on experience gained in the creation of environmental organization of institution in other countries, the framework was accepted and established by the Government. This framework was formulated in a project, ATN-SF5941-SU Environmental Management Program, which was co-funded by the Government of Suriname, the Inter-American Development Bank and the European Union.

The institutional framework for the management of Suriname's environment is based on several operational entities utilizing cross-sectoral coordinating mechanisms, as follows:

1. NMR was established by Presidential Order in June 1997. Its mandate is to support the Government of the Republic of Suriname by means of advises concerning the preparation of environmental policy at the national level and exercise of control in the implementation thereof. The Council, according to the Presidential Order, executes its activities by means of NIMOS, while the President can charge the ministries most suitable to that end and/or NIMOS with the actual control and sanctions to be taken if there are any and which arise from the same. The regulations for NMR membership provide for a wide representation of both government and non-government parties, including representatives of Maroon and Indigenous communities, trade and industry, consumer organizations, and trade unions.

2. NIMOS was established on March 15, 1998 by the President of the Republic of Suriname, as the Executing Agency of the National Council for the Environment. Specific tasks for NIMOS are defined in Presidential Decree 7483/98 of November 16, 1998 and a few days later, on November 26, 1998, NIMOS was registered as a foundation in the Public Registry of foundations of Suriname under number 2407.
   The objectives of NIMOS are:
   a. realize national environmental legislation in the widest sense,
   b. prepare and realize regulations with regard to protection of the environment,
   c. coordinate and supervise the observance of those regulations.

3. The Ministry of Labour, Technological Development and Environment, responsible for the integration of environmental policy into the national development policy

4. The Inter Ministerial Advisory Committee comprised of representatives of the sector ministries and NIMOS to discuss environmental problems in the different sectors and to come with proposals for solutions. This committee is currently not active.

5. The Ministries have their own state responsibilities for widely different aspects of national environmental management according to the Government Decree on the Tasks of Ministries 1991.

Since the installation of this new structure, no assessment has been made of the capacity and financial resources of authorities responsible for environmental management except for the NIMOS institute.

4.4 EC and other international development assistance

4.4.1 EC

This covers experience relating to interventions with specific environmental objectives, and the integration of environment into programmes with other primary objectives, including the application of environmental assessment procedures.

1. **Rehabilitation, upgrading, expansion and institutional strengthening of the Nieuwe Haven Terminal Paramaribo - 7.ACP.SUR.045 (€ 0,495 Mio)**
   The preparatory study that was concluded on the rehabilitation, upgrading, expansion and institutional strengthening of the port of Paramaribo had an environmental impact assessment as an integral part of the study.

   The finalisation of the joint appraisal of the project between the NAO, port stakeholders (state and non-state actors) and the EC was in accordance to the planning for 2003, resulting in the introduction of the FP in June 2003 and approval at the EDF-committee in September 2003 for € 29.8 mio. Signing of the Financing Agreement is foreseen in January 2004.

2. **Construction Road to the Ferry Terminal - 7.ACP.SUR.048/8.ACP.SUR.012 (€ 13.2 Mio)**
   For the construction of the Road to the Ferry Terminal, a comprehensive Environmental Impact Assessment study has been conducted. The results of this study will be incorporated in the tender for works to minimize the environmental hazards during construction and use of the road.

3. **National Environmental Programme (NIMOS) - 7 ACP SUR 047 (€ 0,59 Mio)**

   On June 4th 1998, a Technical Cooperation Agreement (TCA) was signed between the Inter-American development bank (IDB) and the Government of Suriname to support

the development of a national legal and institutional framework for environmental policy and management.
The total cost of the project was 1.3 mio EUR, of which EUR 590,000 contributed under the above mentioned project.
In 2003 an evaluation was carried out, which showed that most of the expected results of the project have been achieved, but the timeliness of implementation of the project components was poor, as a result of a number of factors. The main factors were delays as a result of late signing of the MoU between IDB and the EC, as well as political changes in the country. Lack of a full-time General Director and Financial Officer at the NIMOS Office contributed to further delays as a result of late payments. Most of the project components have been completed over the past 18 months, with the pressure of having to bring the project to an end.

Results:

- Publication of "Overview of Environmental Related laws and Regulations in Suriname" by NIMOS, which sets out the environmental related tasks of the various Government bodies and the legal basis for these tasks;
- Designation of NIMOS as the coordinator of the project on National Country Plan for the Ozone Depleting Substances funded by the United nations Environmental Programme (UNEP);
- Development of a NIMOS website: www.nimos.org
- Start of a long-term Public Awareness Strategy
- NIMOS served as the operational focal point for the Inter-American Forum on Environmental law (FIDA, an Inter-American Network of Experts and Officials in Environmental law, Enforcement and Compliance).
- In November 2003, a draft National Policy on Environment was finalised by NIMOS, which will be presented to the Environmental Council in March 2004.
- The draft national Environmental Legislation has been submitted to the Ministry of Labour, Technology and Environment in 2003 and will be presented for approval to the Council of Ministries and the State Council, after which the National Assembly. (Expected date: July 2004)

Degree on integration on crosscutting themes:
Environment and capacity building: The National Environmental Council, existing of representatives of the Government, Private Sector, Trade Unions, NGO's and Maroons and Indigenous People, allow for dialogue between government and other stakeholders towards the decision making process for ownership of land, environmental policy and sustainable development.

4. Caribbean Regional Environmental Programme (CREP)

CREP was designed to demonstrate a model for sustainable use of natural resources. It is a four-year programme whose purpose is to strengthen regional cooperation and capacity in conservation management and sustainable development in order to assure greater attention to environmental issues in the CARIFORUM region. The Caribbean

Conservation Association (CCA) is implementing CREP. The programme, which has a budget of EUR 9,1 Mio is funded under the 7th EDF.
In Suriname the following project has been proposed: Marketing of a Community Heritage (Maroon) and Ecology based tourism at Brownsberg National Park. World Wildlife Fund is implementing infrastructure upgrade and expansion of the park facilities.
The proposed demonstration activities are:

- Feasibility of Craft & Furniture Production
- Cost Assessment of Improved Water & Sanitation supply to Brownsberg
- Feasibility, design & construction of Craft, Training & Visitor Centre
- Sustainable Harvesting of Forest Products
- Training of Natural Resources Management
- Design of Marketing Strategy of Site to increase visitors
- Developing Skills of Community Youth's in use of natural materials

The principal national implementing agencies are expected to be STINASU and the TJUFANGA.

5. **Micro Projects Programme (8 ACP SUR 3)**
   The Micro Projects Programme (8 ACP SUR 3) is, among others, one of the key actors in community-level efforts in biodiversity, climate change and/or international waters at the level of bilateral organizations with a contribution in the policy dialogue, technical assistance and community development.
   For example, on 14 and 15 November 2003 an international workshop was held (financed under the above EC project) on Land Rights for Indigenous and Maroons to which Indigenous people and Maroons, lawyers, politicians, members of the National assembly, and others shared information on the current state of affairs regarding the rights of the indigenous people and tribal people in Suriname (about 15% of the population) and the UN, OAS and local legal obligations in this respect.

4.4.2 Other funding agencies

The list of the other funding agencies and their projects still needs to be completed

5 Recommended priority actions

The following list of priority actions is yet incomplete and should be viewed as a starting point for a discussion on what the priority actions should be.

We recommend the following priority actions

- While environment is not a focal sector of the EC delegation in Suriname it is a cross-cutting principle. Therefore we recommend that this draft Country Environmental Profile will be reviewed and finalised by a consultant. The CEP should asses the environmental situation more in to depth, review the institutional

and legal framework, evaluate NIMOS and the NMR, make an extensive overview of the other donor activities in environment. This should result in an environmental action plan for the EC delegation in Suriname.

- While NIMOS has drafted an Arrangement of Regulations against Pollution, no standards have been set to define the acceptable levels of contamination. An assessment will have to be made of international and regional standards to construct the appropriate values for Suriname.
- When the new environmental act has been approved by the National Assembly (expected July 2004), the next step will be to strengthen the part of environmental monitoring and enforcement.

ANNEX I

Map of Suriname

ANNEX II

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ANNEX III

Consul tees

ANNEX IV

Overview of the current laws related to environment