REPORT

SOCIO-ECONOMIC STUDY OF THE FISHERIES SECTOR IN SURINAME

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LIST OF ABBREVIATIONS

ABS	Algemeen Bureau voor de Statistiek
BV	Inland navigation (Binnenvaart)
CEP	Caribbean environment program
CEVIHAS	Centrale Visaanvoer Haven Suriname
EBS	NV Energie Bedrijven Suriname
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization of the United Nations
FR	Forest Reserve
GPD	Gross Domestic Product
IDB	Inter-American Development Bank
LBB	National Forest Service (s' Lands Bos Beheer)
LVV	Agriculture, Animal Husbandry, and Fisheries (Ministry of) (Landbouw, Veeteelt, en Visserij)
MAS	Maritime Authority Suriname
MUMA	Multiple Use Management Area
NB	Nature Conservation division (Natuurbeheer)
NIMOS	National Institute for Environment and Development in Suriname (Nationaal Instituut voor Milieu en Ontwikkeling in Suriname)
NR	Nature Reserve
RGD	Regionale Gezondheids Dienst
SK	Suriname Coast (fishing license)
SKB	Suriname Coast Bangamary (fishing license)
SSA	Suriname Seafood Association
SWM	Surinaamse Waterleiding Maatschappij
TED	Turtle Excluder Device
VISCO	Vissers Organisatie Coronie
VKI	Stichting Viskeurings Instituut
VMS	Vessel Monitoring System

1. INTRODUCTION

Fisheries have long been a traditional source of income worldwide and thus also contribute to many livelihoods in Suriname. Suriname is rich in natural resources and rich in a variety of fish species. The country's coastal waters contain fish species with a high market value that are in high demand in the Caribbean, United States, Europe and Japan. Rivers and more inland creeks and swamps also provide for a variety of fish. Fisheries include a whole chain of different segments in which people find employ from fishermen to fish processing companies to sellers and exporters, and lastly the consumers.
The fisheries in Suriname can be divided in two main sectors, namely the artisanal sector and industrial sector. The artisanal sector can also be commercial in nature, may it be on a relatively smaller scale than the industrial fishing. The commercial fisheries contain shrimp and fish trawling, fishing on species like red snapper, mackerel and longline fishing on larger pelagic fish species. The artisanal fisheries or 'small-scale' fisheries use more traditional fishing techniques like driftnet fishing in the coastal waters and further down in sea; Fyke net fishing, seine net fishing, line fishing and chase pin or 'Jagi-Jagi' fishing in the rivers and river mouths.

The importance of the fishery sector is reflected in its contribution to Suriname's economic sector. In 2015, the total catch from vessels operating in Surinamese waters was 31.852 tons fish and 6.821 tons shrimp. Over the last decade, the fisheries sector has become increasingly important and currently represents 2.3% of GDP. Though total fish and shrimp capture has been fluctuating, higher international market prices have resulted in higher values of production and exports for the sector[1] (Derlagen et.al, 2013). This study describes the socio-economic characteristics of fisheries in Suriname with representation of local fishing communities within the coastal districts, demographic and socio-cultural characteristics.

Objective

The goal of this study is to get insight in the socio-economic importance of the Suriname marine fisheries sector, more specifically the relationship between economic and social activities. Specific focus is set on the coastal districts of Nickerie, Coronie, Saramacca, Wanica, Paramaribo, Commewijne and Marowijne, particularly focusing on fishing populations.

Methodology

The desk-top study was conducted by two social science consultants, Gwendolyn Smith and Dunja Burkhard. Data was collected in two ways: 1) interviews with the Ministry of Fisheries, and 2) secondary data collection. Data collection took place from 15 May until 20 June 2017. Data that was based on assumptions and could not be verified was excluded from this report: **only factual data is included**.

Secondary data were collected from the General Bureau of Statistics in Suriname (ABS), internet sources, reports from international organizations and existing consultancy reports. Of relevance were Environmental and Social Assessment studies in the oil and gas sector, and the Fisheries Management Plan for Suriname 2014-2018 was used to obtain information about local development initiatives in the area.

[1] Derlagen, C., Barreiro-Hurlé, J. and Shik, O. (2013). Agricultural Sector Support in Suriname, IDB/FAO, Rome, Italy available at http://www.gov.sr/media/968294/agricultural_sector_support_in_suriname.pdf

2. ADMINISTRATIVE AND LEGAL STRUCTURE

Suriname is geo-politically divided into ten districts (Figure 1). The coastal area is the most populous area and contains the districts of Nickerie, Coronie, Saramacca, Wanica, Paramaribo, Para, Commewijne, and Marowijne. Together, these districts account for 91.5% of the total population of Suriname (479,590 people). This is the region where most fishers live. The remaining 8.5% of the population (44,552 people) live inland in the savannah and forest region districts of Sipaliwini and Brokopondo.

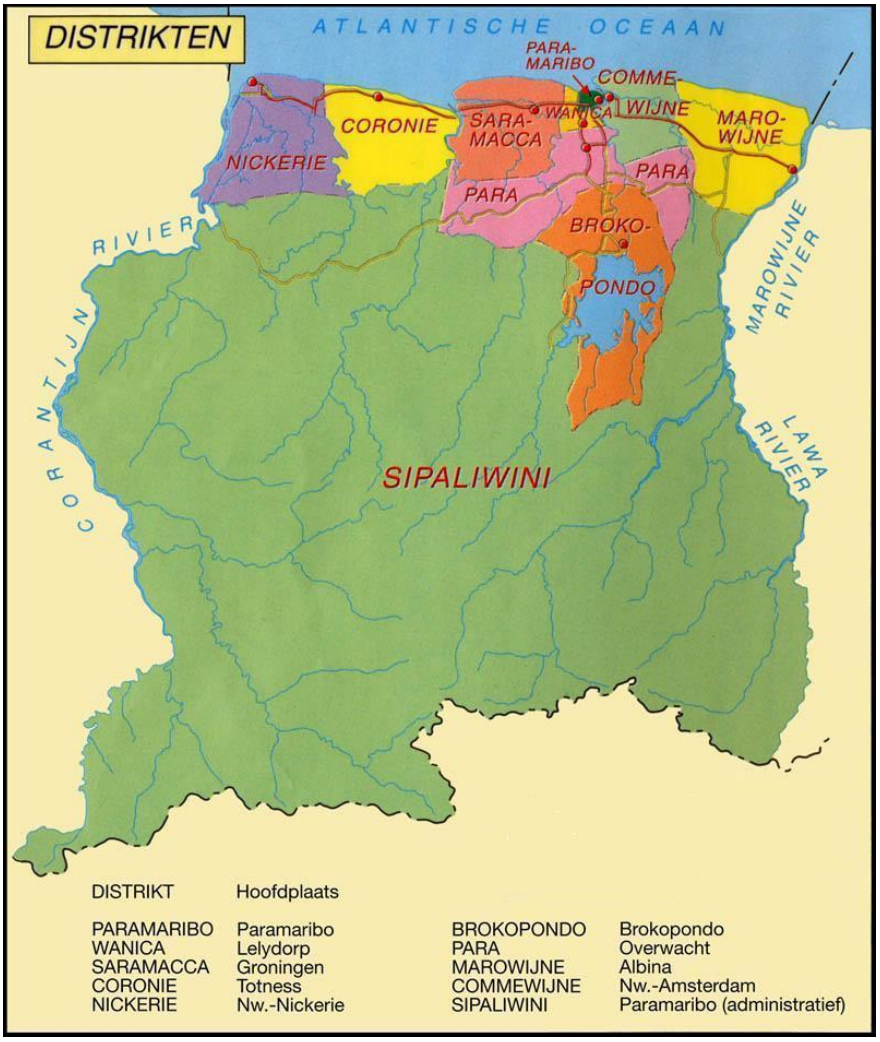


Figure 1: The Districts of Suriname

2.1 Government

The districts are further subdivided into several regions called resorts. District commissioners are supported by an advisory council of elected officials at both district and resort level. Each resort elects several representatives into a representative body called resort council. According to Article 161 of the 1987 Constitution, these resort councils are the highest political-administrative body in the district. However, until now, the resort councils have not functioned effectively due to small populations and restricted jurisdiction (on economic drivers). Although resorts are the lowest administrative organs of government, in general, they have limited executive power in decision-making processes. Their main task is to channel information and signal the higher level of government, such as the district commissioner, members of parliament and high-level staff of Ministries.

The overarching governmental department that is responsible for execution of the governmental fisheries policy and for control on compliance with legal regulations concerning fishing is the Fisheries Department of the Ministry of Agriculture, Animal Husbandry and Fisheries (LVV). The organogram of the sector institutions of the Fisheries Department below shows the variety of governance matters that theoretically fall under jurisdiction of this department (Figure 2). Among the main tasks of this department are the issuing of licenses to fishermen and the registration and control of the number of harvests of fishing boats at each official boat landing.

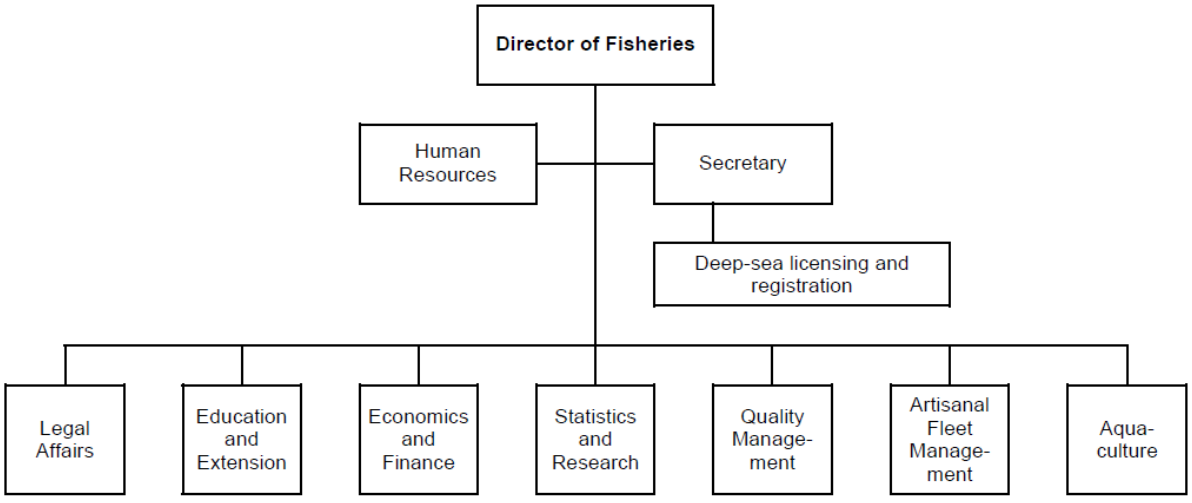


Figure 2: Fishery sector institutions Organogram of the Fisheries Department. Source: FAO Country Fishery Profile (2008)

The Fisheries Department is supported by the following governmental/ semi-governmental institutions to execute their tasks:

Maritime Authority Suriname

The Maritime Authority Suriname (MAS) is a corporation established in 2002 to privatize government services, and is legalized under the Maritime Authority Act. This institution is responsible for the registration of all fishing vessels operating under the Surinamese flag. The MAS is also responsible for supervising the compliance of

ships with legal rules and the authority must guarantee a safe and efficient passage of sea-going vessels from and to Suriname, based on internationally accepted standards, rules and treaties ratified by Suriname. The MAS sends out notices to shipping traffic and all other water users about e.g. shipwrecks and other possible obstacles in the water, water levels and tidal currents.

Suriname Forest Service (LBB) and the Nature Conservation Division (NB)

The Suriname Forest Service (LBB) is responsible for the establishment and supervision of management of protected areas, including the turtle nesting beaches. The Nature Conservation Division (NB) of LBB is responsible for the daily management of protected areas. There is potential interference from oil exploration activity (planned seismic survey areas) to several protected areas, namely (from West to East): Mac Clemen Forest Reserve (FR), Hertenrits Nature Reserve (NR), Bigi Pan Multiple Use Management Area (MUMA), Peruvia NR, Coppename Monding NR, North Saramacca MUMA, and Commewijne-Marowijne MUMA. NB does not execute any activities in the Atlantic Ocean.

The Suriname Coast Guard

As of 2017, the Suriname Coast Guard is the official supporting institution by law in charge of fisheries inspections of fishing activities in Surinamese waters. The Coast Guard falls under jurisdiction of the Ministry of Internal Affairs, and works in close collaboration with the Fisheries Department to execute their tasks.

Fish Inspection Institute (VKI)

The Fish Inspection Institute (VKI) was established by the Ministry of LVV in 2007. The VKI is the competent authority established to inspect the quality of fish products and see if caught fish follows food health regulations under the Fish Inspection Act of 2000. The main tasks of this institute include: 1) determining of quality standards for all fishery products; 2) inspections and control on the hygiene on board fishing vessels, all plants, landing sites and commercial aquaculture farms; 3) execution of control over the entire production chain of fisheries products from packing, labeling, storage and transportation of fisheries products to the final consumer; 4) registration of landing sites and commercial aquaculture farms[2] (Ministry of LVV, n.d).

2.1.1 Legal framework

Suriname is governed by the 1987 Constitution of the Republic of Suriname. Suriname's legislation at the national level is exercised through Laws or Acts generated by the Parliament (Wet, also called Verordening and Landsverordening prior to 1975), Decrees (Decreet), Government Decree (Staatsbesluit), Presidential Decree (Resolutie), Presidential Orders (Presidentieel Besluit) or Ministerial Orders (Ministeriële Beschikking) targeting various sectors (Schalkwyk & Sanchez, 2016). Suriname does not have an approved national law on environmental management, but there are several regulations, national acts and signed international conventions that are relevant to the fisheries in Suriname. It is noteworthy to mention that fisheries legislation in Suriname is currently being redrafted under a FAO TCP project : "Updating Suriname's capture fisheries legal

[2] Available at: http://www.gov.sr/media/62827/note_regarding_plant__animal_andfisheries_health_in_suriname_van_debie.pdf

framework".The outcome of this process will be a new fisheries act, replacing both the current fishing degree and fish protection act.

National law	Content
The fishing decree, 1980 (S.B. 1980 No. 144, as amended by Act S.B. 2001 No. 120)	Authorizes the government to make regulations for the protection of marine fish stocks, and defines the fishery zone as the territorial waters of Suriname including the exclusive economic zone (EEZ). By law of April 14th, 1978, it is prohibited for neither Surinamese nations nor foreigners to fish in the fishery zone without a valid fishing license. This includes the licensing and registration of all fishing vessels operating in the waters of the fishery zone.
Law on the Territorial Sea and the Continuous Economic Zone 1978 (S.B. 1978 No. 26)	Defines the territorial sea of Suriname at 12 nautical miles from the nearest point on the line of low-water mark along the shore and establishes a zone, and the "Economic Zone," at 200 nautical miles from the coast. Claims Suriname's sovereign rights concerning the exploration, exploitation, conservation and management of living and nonliving resources within these zones.
Fish Protection Act, 1961 (G.B. 1961 No. 44 as amended by Act S.B. 1981 No. 66)	Prohibits the taking or disturbance of fish within Suriname's territorial waters (except during established fishing seasons)

Convention	Content
United Nations Convention on the Law of the Seas (UNCLOS); 1982	Establishes controls on routine discharges from maritime vessels and addresses national jurisdiction over territorial waters
United Nations Convention on Biological Diversity (UNCBD) and the Cartagena Protocol on Biosafety, 2000	Relates to biodiversity, oil spills, specially protected areas and wildlife and land-based sources of marine pollution. Provides the legal framework for the Caribbean Environment Program (CEP).
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	Ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild
Ramsar Convention, 1971	The convention on Wetlands of International Importance, especially as Waterfowl Habitat
United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, 1995 United Nations Fish Stocks Agreement, 2001	Conservation and management of highly migratory and straddling fish stocks in international waters regulated by e.g. the Northwest Atlantic Fisheries Organization

	and the International Commission for the Conservation of Atlantic Tunas
Rio Declaration on Environment and Development (Agenda 21)	E.g. conservation of biological diversity (biodiversity), control of pollution

Convention	Content
International Convention for the Prevention of Pollution from Ships 1973 as modified by Protocol of 1978 relating thereto (MARPOL73/78)	Establishes controls on routine discharges from maritime vessels
Caribbean Environment Program (CEP)	Established by the UN Environment as one of the Regional Seas Programs in recognition of the importance and value of the Wider Caribbean Region's fragile and vulnerable coastal and marine ecosystems including endemic plants and animals.
FAO Code of Conduct for Responsible Fisheries, 1995	Strengthening and building fisheries management systems
The Reykjavik declaration on responsible Fisheries in the Marine Ecosystem, 2001	Implementation and consideration of marine ecosystems into responsible fisheries management

Table 3: Overview of Fisheries Laws and Regulations

2.1.2 Fishers' organizations

Currently there are six fishers' organizations registered in Suriname, which represent artisanal fishers in their respective area (Nickerie, Coronie, Boskamp, Commewijne, Galibi and Paramaribo)[3]. Fishers active in the district of Coronie are represented by the fisher's organization of Coronie (VISCO). Fishers active in the district of Commewijne are represented by the organization called 'Visserij Collectief Commewijne (VCC)' and fishers active in the district of Marowijne are represented by the fisher's organization of Galibi (Vissersorganisatie Galibi).

2.2 Fishing Grounds

Marine water resources (Exclusive Economic Zone – EEZ) extend approximately 370 kilometers offshore from the coast of Suriname. The EEZ zone can be divided into three ecological sections, which are characterized by the differing water color (blue, green and brown waters) depending on the season as can be seen in figure 4a. In terms of fisheries, the EEZ can be divided in two major areas (Figure 4b):

[3] Available at: http://www.gov.sr/ministerie-van-lvv/actueel/capaciteitsversterking-binnen-de-visserijsector.aspx

1. The Deep-Sea

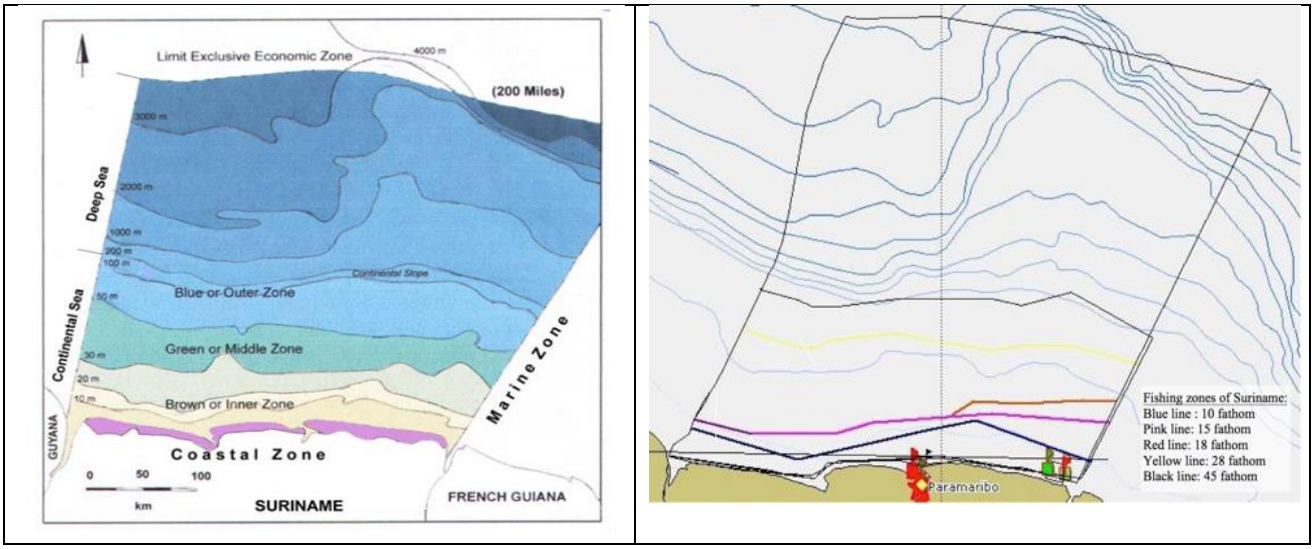
Zone (beyond 10 fathoms)– this is the area of industrial fisheries. Industrial fishing tends to occur at depths greater than 18 meters (10 fathoms). This zone contains mostly of blue waters, but also green and even brown at the inner border depending on the season.

2. The Shallow Zone (0 – 10 fathoms) – this area is dominated by artisanal fishers (typically holding a BV or SK license). This zone is characterized by green and brown waters.

The marine water resources contain several unique species, such as dolphins, sea turtles, whale sharks and manta rays of which many are sensitive to changing circumstances. Communities living along the coast take tourists to watch Guiana dolphins, sea turtles and other interesting species.

In the deep-sea zone of the marine water resources, fishers target deep-sea shrimp species and fish such as red snapper, mackerel and other larger pelagic types such as sharks, tuna and related fish. Closer to the coast lies the shallow zone, where fishermen target *Sciaenidae* and *Ariidea* species in conjunction with the shallow water Seabob shrimp *(Xiphophenaeus kroyeri*). The shallow zone is characterized by its shallow contour and brown to green. By law, these zones are also related to the types of fishing that are allowed (Figure 4b). Trawling, for instance, is not allowed in the shallow sea zone.

Seabob shrimp fishing is allowed between 10 fathoms (18.3m) water depth to 15 fathoms (27.4m) water depth to the limit of Suriname waters[4]. Commercial fishers (other than Seabob shrimp fishers) can fish from 15 fathoms (27.4m) water depth to the limit of Suriname waters. Deep-sea shrimp trawlers can fish from 45 fathoms (82.3m) to the limit of Suriname waters. Fishing on tuna and tuna-like species is allowed from 28 fathoms to the limit of Suriname waters. Artisanal fishermen can fish from the coast until 9 fathoms (16.5m) water depth.



[4] An exception to this is the border depth line for sea bob shrimp fishing east of Matapica which partly crosses the 15 fathoms depth line

Figure 4a: The Marine Environment. Source: NIMOS	Figure 4b: Fishing zones of Suriname. Source: Department of Fisheries

2.3 Fishing Licenses

By Law on the Territorial Sea and the Continuous Economic Zone 1978, neither Suriname citizens nor foreigners can fish commercially, without a valid fishing license in the "Fishing Zone", which consists of the territorial waters and bordering 350 sea mile exclusive economic zone (EEZ) of the Republic. It is important to mention that fishing licenses are issued based on the type of fishing vessel, which in turn is only seaworthy in certain fishery zones. There are two types of fishing licenses issued to only Surinamese vessels[5] (artisanal fishing licenses):

- **BV license:** Fishermen with an inland navigation (Binnen Vaart) fishing license are permitted to fish in creeks and rivers, including the estuary. Depending on the fishing technique, fishermen may remain in the river or work outside the river mouth in the shallow waters near the coast.
- **SK license**: Vessels with a Suriname Coast (Surinaamse Kust) license are allowed to fish in the offshore zone in water depths between 0 and 16,5 meters (9 fathoms depth). The SK license permits fishermen to fish along the breadth of the coast of Suriname[6].

Fishermen active in commercial fisheries at sea between 12 and 350 sea miles (22-648 km) have deep-sea licenses. There are three types of deep-sea licenses:

- **SA licenses** are 100% owned by Surinamese
- **SB licenses** are 50% owned by Surinamese and 50% owned by foreigners
- **SC licenses** are 100% owned by foreigners

2.3.1 Artisanal Fishing Licenses

The Fisheries Department requests a license to fish for commercial purpose, also in the case of artisanal fishing. However, in practice, it is difficult to distinguish between commercial and non-commercial operations. Suriname Coast (SK) and Inland Navigation (BV) licenses are only issued to Surinamese fishing vessels. Even though the fishing license is non-transferable by law, licenses are 'sold' or 'leased' to Guyanese fishing boat owners. In 2006 there were approximately 977 vessels (SK and BV licenses) operating in rivers, estuaries and brackish water lagoons along the coast of Suriname. It is worth noting that according to the Fisheries Department, there is until recently, a lack of capacity to identify and monitor the exact number of active fishing vessels operating in the waters (BV and SK vessels). This means that the number of issued BV and SK fishing licenses do not necessarily coincide with the exact number of active fishing vessels in the waters.

Fishers with an **inland navigation (BV) fishing license** are allowed to fish in creeks and rivers, including to the river mouth. Because „river mouth" has not been defined by law, these fishers also enter the shallow parts of

[5] The fishing decree (S.B. 1980 no 144) defines a Suriname vessel as a vessel that is at least for 50% owned by a Suriname national or owned for 25% to a Suriname national and for 50% to a Suriname resident; and moors regularly in Suriname; and the ship owner resides in Suriname and is as such registered at the Chamber of Commerce (Duijves & Heemskerk, 2011).

[6] With the exception of Galibi in the district of Marowijne which has a (seasonal) no-fishing zone for protection of sea turtles.

the coastal zone. For certain fishing techniques, such as Jagi-Jagi the fishers stay in the river mouth because they depend on the tide. Yet when working with the long-line or drifting gillnet, the fishers enter the fertile mudflats or go even deeper at sea; up to a depth of 4 to 6 fathoms (7 meter to 11-meter depth).
BV licensed fishers use two types of boats:

- Flat bottom boats and
- Round bottom boats

Because these boats are not seaworthy, BV fishers can only fish at sea when the water is not too turbulent. When the water is relaxed, BV fishers may travel for up to four hours along the coast and go at sea. BV licensed fishers typically work with less than three people onboard, but occasionally they go out alone. Data for 2011 (preliminary) show that most BV licenses have been allocated for the Suriname River and Suriname River mouth (incl. Braamspunt) fishing areas, followed by the Corantijn River and Nickerie River mouth. These data for 2011 are not complete (explaining the large difference between 2011-2010) but they do give a general impression of the busiest fishing areas. Also, it is worth mentioning that until recently there is no limit to the issuing of BV licenses by the Fisheries Department.

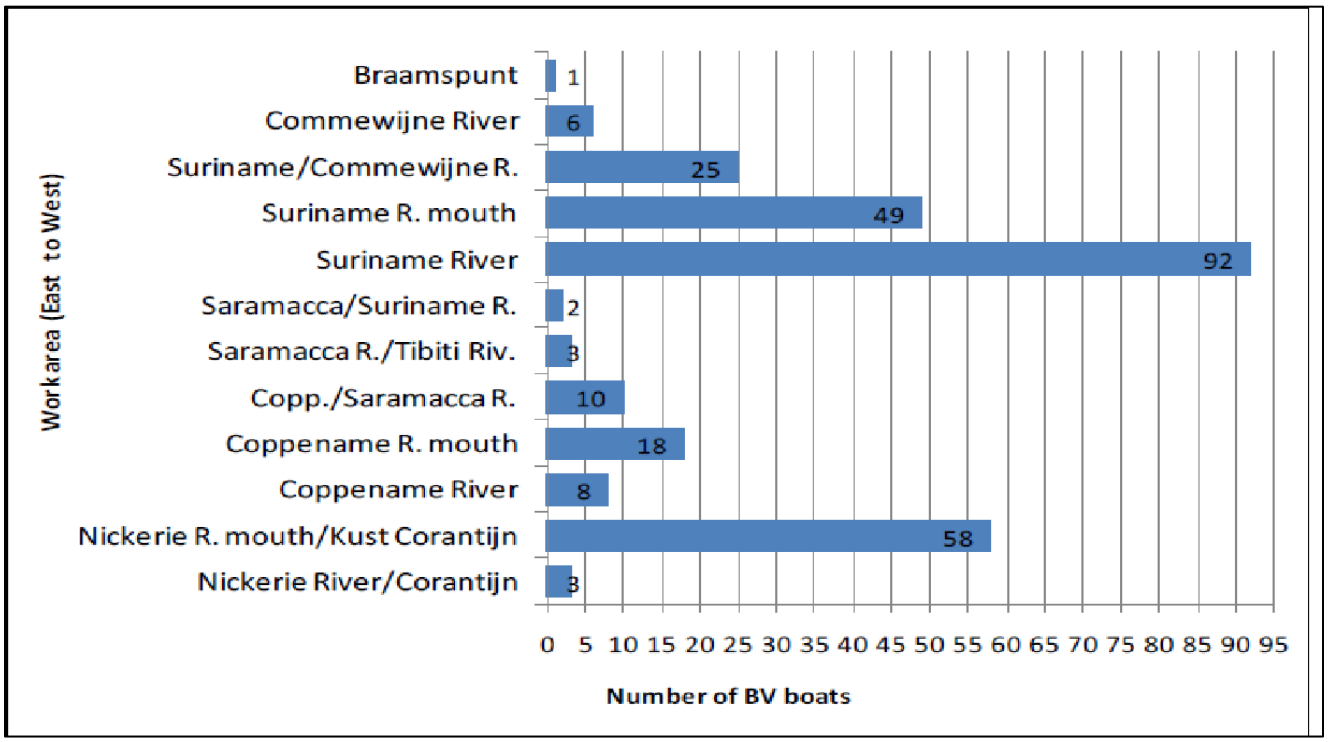


Figure 5: Number of BV licenses allocated for the different fishing areas in 2011. Source: Duijves & Heemskerk (2011)

Vessels with a **Suriname Coast (SK) license** are allowed to fish in the offshore zone between 0 and 9 fathoms depth (16.641 m), but the exact fishing grounds of fishermen holding an SK license depend on four factors:
(1) The season
(2) The water level and moon
(3) Catch results by other fishers
(4) Perceived risk of piracy

SK fishers from Paramaribo reported that they travel for up to about 14 hours before putting out their nets. SK fishers use two types of boats:

- Decked wooden vessels named „closed type Guyanese" vessels or „inboard". This type of boat typically stays at sea for two to three weeks, or up to a month in exceptional cases and typically 15 meters in length.
- Open wooden vessels named „open type Guyanese" vessels or „cabin cruiser" can stay for about two weeks at sea and are between 12 to 14 meters long.

	
Closed type Guyanese vessel	Open type Guyanese vessel

Unlike the BV licenses, fishers with SK licenses have a limitation to their numbers issued by the Fisheries Department. Table 2 below reflects the number of actual issued fishing licenses per fishing type category between the years 2003 and 2012. It must be stated however that when these numbers are compared to the determined number of licenses that can be issued by the Department of Fisheries (Table 1), there are inconsistencies. The number of issued SK fishing licenses for example is higher than the maximum predetermined number in some years. This has led to disputes between fishers and discontent with the Fisheries Department. Apart from these conflicts, these inconsistencies have negative impacts on fish stocks and may even further amplify conflicts over licensing.

Table 1: The number of permitted licenses for commercial and artisanal fisheries 2003-2012. Source: Fishery Management Plan 2014-2018 (Fisheries Department)

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Shrimp trawlers	100	100	100	70	65	65	31	31	31	34
Seabob trawlers	30	30	30	29	30	30	25	20	20	22
Fish trawlers	15	15	15	15	15	15	15	15	25	23
Fish trawlers small pelagic	0	0	10	10	10	10	10	10	0	0
Large pelagic line fishing	0	15	15	18	10	10	10	30	30	60
Snapper and mackerel	100	150	150	150	150	150	100	100	100	100
Total commercial fleet:	**245**	**310**	**320**	**292**	**280**	**280**	**191**	**206**	**206**	**239**
SK gillnet and njawarie	325	350	350	340	345	345	304	300	300	300
SK Bangamary		40	40	35	40	40	40	30	20	20
Total artisanal fleet:	**325**	**390**	**390**	**375**	**385**	**385**	**344**	**330**	**320**	**320**

Table 2: The number of issued fishing licenses per category 2003-2012. Source: Fishery Management Plan 2014-2018 (Fisheries Department)

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Shrimptrawlers	79	78	68	37	47	18	27	25	26	25
Seabobtrawlers	27	27	30	25	28	24	25	20	19	22
Fishtrawlers	14	14	24	10	9	13	11	20	21	23
Large pelagic line fishing	4	5	6	10	10	10	9	9	8	16
Snapper and mackarel	55	58	56	66	64	26	60	65	40	49
Total commercial fleet:	**179**	**182**	**184**	**148**	**158**	**91**	**132**	**139**	**114**	**135**
Closed Guyana boats (inboa	42	58	62	55	65	63	56	52	52	63
Open Guyana boats (bb-mo	262	290	305	327	298	303	258	242	223	279
SK Bangamary	15	39	40	40	43	37	40	37	43	41
Total Coastal fleet:	**319**	**387**	**407**	**422**	**406**	**403**	**354**	**331**	**318**	**383**
Fuiknet BV Chinese seine	349	289	315	247	252	248	246	252	340	260
Lijnen BV longline	30	21	21	40	14	21	11	13	15	4
Drijfnet BV (drifting gillnet)	90	80	100	140	153	97	124	119	65	72
Sport BV	50	73	63	73	80	99	118	186	362	230
Spannet BV (gillnet)	11	8	5	7	7	10	8	9	14	10
Sleepnet BV (dragnet)	3	1	2	1	1	2	2	0	0	0
Zeegnet BV (River seine)	9	4	8	8	4	8	13	12	20	15
Kieuwnet (Lagoon gillnet)	74	42	36	65	36	30	35	72	86	69
Aquarium	0	0	0	0	0	0	0	0	0	0
Guyana (BV)	30	21	9	8	0	0	0	0	0	0
Guyana (SK)	22	22	0	0	0	0	0	0	0	0
Total river(mouth) fleet	**668**	**561**	**559**	**589**	**547**	**515**	**557**	**663**	**902**	**660**
Total artisanal fleet	**987**	**948**	**966**	**1011**	**953**	**918**	**911**	**994**	**1220**	**1043**

2.3.2 Industrial Fishing Licenses

In the marine environment, major threats to sea turtles are injury and mortality as a result of bycatch during fishing operations, especially during trawling. To minimize these threats, turtle excluder devices or TED's are used. A "Turtle Excluder Device" is a grid of bars with an opening either at the top or the bottom of the trawl net. The grid is fitted into the neck of a shrimp trawl (Figure 6). Small animals such as shrimp pass through the bars and are caught in the bag end of the trawl. When larger animals, such as sea turtles and sharks, are captured in the trawl, they strike the grid bars and are ejected through the opening[7]. Fishers working with shrimp and seabob trawlers are obligated to fish with the TED's during their operations. The TEDs are part of the requirements to receive and renew fishing licenses and to be able to export their shrimp to the USA.

[7] National Oceanic and Atmospheric Administration: http://www.noaa.gov/

The World Wildlife Fund monitors turtles by placing a GIS transmitter on their back[8]. The real-life data gives information about their movement to the feeding grounds after nesting. Information about the migration during nesting season in April-July is not yet available but WWF suspects female turtles to stay close to the coast, approximately 150 meters from the shore. Sand and shell beaches are located more to the East, between the Marowijne and Suriname River. These beaches are a nesting place for internationally important sea turtles such as the leatherback turtle (*Dermochelys coriacea*), olive ridley (*Lepidochelys olivacea*) and green turtle (*Chelonia mydas*). The turtle eggs are traditionally used as food by indigenous peoples living in the coastal zone, and recently also a food source for stray dogs. Turtles are also a source of income generation for local communities practicing ecotourism (Duijves & Heemskerk, 2011).

Figure 6: The turtle excluder device (TED). Source: Fishery Management Plan 2014-2018 (Fisheries Department)

Industrial fishermen use two types of fishing techniques: trawling (shrimp and fish trawling) and longline fishing (fish). These two fishing techniques shall be discussed in more detail in section 5.1.2. When discussing industrial fishing licenses, aspects such as the type of vessel, the fishing techniques used and the depth at which certain species are allowed to be targeted should also be taken into account. Fishers can obtain up to 4 types of licenses based on:

1) The depth in the water column where trawling will occur. Seabob trawling occurs between 20 and 40 meters, whereas fish trawling occurs between 30 and 80 meters. Shrimp trawling occurs between in water depths of between 30 and 200 meters

2) The location of the net in the water column, i.e. either dragged along the sea floor (bottom trawling) or towed higher in the water column (pelagic or midwater trawling).

3) Another distinction is made between benthic trawling, which involves towing a net at the bottom of the ocean and demersal trawling, which involves towing a net just above the benthic zone. Table 3 below provides an overview of the different requirements for shrimp and finfish trawl fishing and longline fishing, and the maximum number of vessels allowed to operate in the waters.

[8] http://conserveturtles.org/wwf/

Table 3: License requirements for commercial fisheries. Source: (Beltrán T, 2017)

Fishing method	Target Fishery	Permitted Depth (m)	Maximum number of licenses
Shrimp bottom trawl fishery	Large shrimp: hopper, pink, brown, white, (minimum 10 cm with head)	27	31
	Orange shrimp, Scarlet shrimp, Royal red shrimp	>81 meter	4
Shrimp bottom trawl fishery	Seabob (*Xiphophenaeus kroyeri*) with by catch	18-27	20
Demersal bottom trawl fishery	Demersal fish (sea bottom)	27	15
Small pelagic trawl fishery	Minimum 60% pelagic fish	27	10
Large pelagic line fishery	Large pelagic fish: Yellowfin, Albacore Tuna Blackfin tuna Dolphinfish a.k.a Mahi Mahi, Wahoo sharks	51	30
Red Snapper line fishery	Main catch: Lane snapper, Dog snapper, Vermillion snapper. By-catch: other types of snappers.	27	100
Mackerel line fishery	Main catch: King mackerel By-catch: Serra Spanish, Wahoo, Sailfish, Dolphin fish, Blue Marlin.	18	

2.4 Fishing Fleet

All fishers must register their vessels according to the Fishing Decree. This registry is handled by the Maritime Authority Suriname (MAS). Registered vessels must attach their registration number plates on both sides of the bow. All vessels must always contain the official licensing and registration documentation on board. Vessels with an SK fishing license will be registered with an SK number, and vessels that operate inland holding BV licenses will be registered with BV numbers. The commercial fleet operates in water depths beyond the 18-meter contour and comprises many different vessel types:

- Shrimp and Seabob trawlers;
- Fish trawlers;
- Small and large fish trawlers targeting pelagic fish; and
- Long liners

The industrial fishing fleet operates with a variety of gear and was estimated to have an approximate size of 169 vessels in 2006. Overfishing by the industry, which caused depletion in shrimp stocks, had made shrimp trawling less profitable and caused a decrease in industrial fishing licenses. This resulted in limitations on the number of allowable licenses imposed by the Suriname Government in the 1990's. There are currently limited

shrimp licenses issued due to concerns about the stock levels of shrimp in Surinamese waters and as part of the national commitment to reduce fishing fleets by 30%. Evidence from fishermen supported this assessment by noting that shrimp populations fail to recover between fishing seasons (August to December). The number of vessels in the registered fishing fleet 2000-2010 supports this statement (Table 4), as the overall fleet has decreased in size since 2000. However, the fishing fleet has been slowly increasing since 2009.
According to the Fisheries Department, the Seabob fishery is also responsible for the decline of fish stock for reasons as lots of bycatch (approximately estimated 40%[9]). Based on this, the government decided to reduce the Seabob fishery licenses to 22 (10 Surinamers, 12 foreigners).

Table 4: Surinamese Commercial Fishing Fleet Size from 2000 to 2010. Source: Fishery Management Plan 2014-2018 (Fisheries Department)

Trawler	**Year**										
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Shrimp trawler	99	87	85	79	77	68	37	47	18	27	35
Seabob trawler	24	24	24	27	27	30	25	28	24	25	20
Fish trawler	13	12	14	14	14	15	10	9	12	11	9
Large fish trawler						9			1		11
Small fish trawler-		2		4	5	6	10	10	10	9	9
Long liners	101	63	25	55	58	56	66	64	26	60	65
Total	237	187	148	179	182	184	148	158	91	132	139

In Coronie, no rivers run through the district so the only fishing grounds are at sea. Therefore, all BV registered vessels operate offshore in Coronie and are usually larger than an average size BV vessel. This means that vessels which are as large as SK vessel are registered under a BV number. Some inconsistencies have been identified that occur regarding licenses. Namely, the illegal copying, selling and renting of licenses to others.

[9] Available at: https://www.researchgate.net/publication/305215384_An_ecosystem_approach_to_fisheries_management_The_Atlantic_seabob_shrimp_Xiphopenaeus_kroyeri_in_Suriname

2.4.1 Vessel Monitoring System

All commercial and artisanal licensed and registered fishermen are obligated to install a tracking device called the Vessel Monitoring System (VMS) on their vessel. This system works via the Argos satellite navigation network and must continuously, permanently and automatically provide the following information:

- The identity of the vessel
- The geographical position of the vessel
- The date and time of the positioning of the vessel
- The speed and direction of the vessel

The VMS data is retrieved and documented twice daily. Illegal fishing activities can be detected and can be prosecuted.

2.5 Catch registration

All fishermen operating industrial and artisanal fishing vessels are obligated to deliver their catch to designated landings in Suriname. These landings are designated by the Fisheries Department where data regarding the catches is collected and documented in special logbook forms and must be sent electronically to the Fisheries Department after each landing. This is the case for industrial fishing, but in the case of artisanal fishing not all landings are recorded due to a sample-based system that used by the Fisheries Department. As mentioned before, the recording system works well for the registration of industrial fishing since each catch of each vessel is traceable. However, for the SK fleet, sometimes flaws are detected within the system: catches of different vessels being registered together.

3. Demographics and population

Suriname has a total land area of 163,820 square kilometers and a total of 524,143 inhabitants. In 2010 several 6,324 people were employed in the fishing sector, comprising about approximately between 7% and 8% of the total workforce. The population density in Suriname is approximately 3.1 inhabitants per square kilometers. This makes Suriname a low populated country. The average density, however, does not reflect the spatial distribution of the population in Suriname, for the population distribution over the different coastal districts is unequal (Table 5). The district of Wanica is growing faster compared to any other district with 36.7% growth between 2004-2012 compared to a growth rate varying between -6.5 to 27.3% on average (ABS, 2012)

Table 5: Population Numbers and Density for the Coastal Districts of Suriname. Source: ABS, 2004

District	Population	Area (km^2)	Density (Inhabitants per km^2)
Paramaribo	242,946	182	1327.6
Wanica	85,986	443	194.1
Nickerie	36,639	5,353	6.8
Coronie	2,887	3,902	0.7
Saramacca	15,980	3,636	4.4
Commewijne	24,649	2,353	10.5
Marowijne	16,642	4,627	3.6

In recent years, the annual growth of the Surinamese population has been around 1.37 %. The population of Suriname consists of several ethnic groups, such as Hindustani 27.4%, Creoles 17.7%, Maroons 14.7%; Javanese 14.6%; Mixed 12.5%; Miscellaneous others (Chinese, Indigenous peoples, Lebanese, European, etc.) 6.5%; Not reported, 6.6% (Smith et.al, 2014). Local fishermen working along the Suriname coast (full-time or part- time) are represented by almost all ethnic groups living in the country. The following section will describe these different ethnic groups living in the coast districts of Suriname.

3.1 Coastal ethnic groups

There are several coastal fishery groups, which are discussed below.

Hindustani

Hindustani people (37% of the Surinamese population) are the descendants of indentured laborers from former East India, who came to Suriname between 1873 and 1918 to work on the plantations. They dominate the rice farming industry in western Suriname, in the districts of Nickerie and Coronie. The main urban center of the rice districts is Nieuw Nickerie, on the border with Guyana, with 11,100 inhabitants (Smith et.al, 2014).

Creoles

Approximately 31% of the Suriname population are the descended from African slaves and people of mixed African heritage. Creoles in the coastal area frequently live on the old plantations and rural lands obtained by their families after the abolition of slavery, mostly in the coastal districts of Para, Wanica, and Coronie (found

to the south and west of Paramaribo). In the past decades, a significant proportion of lands in the district of Coronie has become brackish and unsuitable for agriculture due to the deteriorating sea defense system. This event has forced many small-farmers in this district out of business, and many have migrated towards Paramaribo (Smith et.al, 2014). Today, Creoles primarily work as public servants and laborers in extractive industries (e.g. bauxite, lumber etc.) and other resource-based industries, such as fisheries, coconut and banana plantations, and bee farming.

Javanese

Javanese (15% of the Surinamese population) are the descendants of indentured laborers from the Indonesian island of Java who came to Suriname between 1890 and 1939 to work on the plantations after the abolition of slavery. They continue to inhabit the rural areas surrounding Paramaribo, in the districts of Saramacca, Wanica, and Commewijne. Their main economic activity is small-scale agriculture of fruits and vegetables, which are sold at the Paramaribo markets (Smith et.al, 2014).

Maroons

In the 18th century, groups composed of primarily Ndyuka Maroons settled in the Suriname coastal zone where they worked in the lumber and balata wood product industries. Today, the Maroons form approximately 11% of Suriname's population and mostly live on the savannahs and plains to the east of Paramaribo, in the district of Marowijne (Smith et.al, 2014). Many continue to work in the extractive industries (e.g. bauxite, lumber etc.), in addition to subsistence agriculture, hunting, fishing, and minor trade. Some informally sell fruits, vegetables, and bush meat along the main road to the east; others bring their produce to the Central Market in Paramaribo. The main village of Albina (capital of the Marowijne district), on the border with French Guiana, is an important transport hub for travelers between Suriname and French Guiana, and for Maroons traveling from the villages along the Marowijne, Lawa, and Tapanahonie Rivers in the interior to the coast.

Indigenous peoples

The original inhabitants of the coastal region districts are the Kalina (Caribs population 2,500) and Lokono (Arawaks, population 3,500) Amerindians, who continue to inhabit this area. They live primarily along the main roads and rivers. Many villages of this ethnic group have their own headman, called kapitein, but there is no overarching political structure governing both the Carib and Arawak ethnic groups. The indigenous groups living in the coastal regions engage in fisheries for livelihood (Smith et.al, 2014). However, the distinction between traditional and commercial is difficult to make and this also elicits conflicts between the Fisheries Department and the indigenous peoples (POF, 2017). Also, because indigenous peoples customarily travel large distances in what they consider their territory. An overview of the indigenous peoples' territory is given in Figure 7.

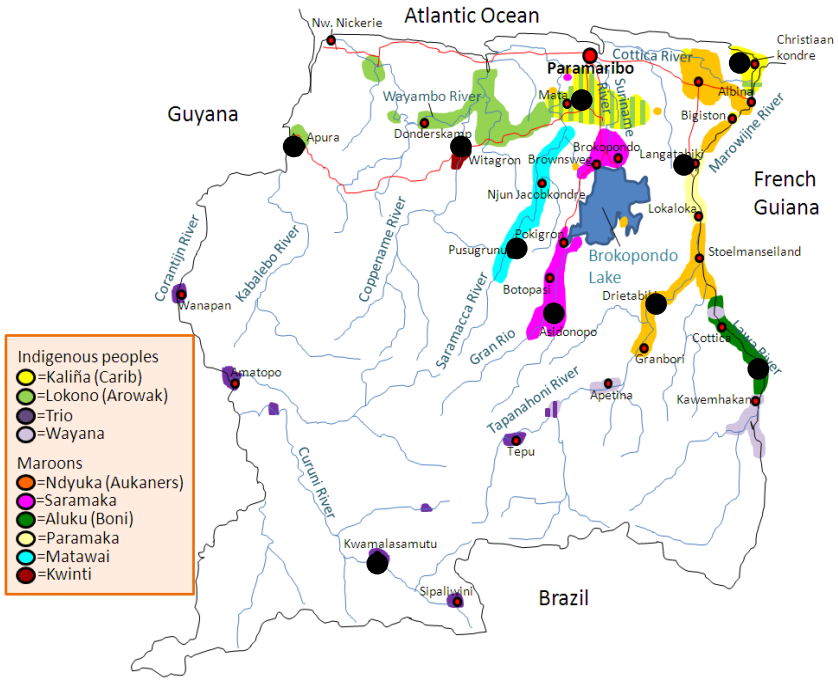


Figure 7: An overview of the territory of indigenous groups in Suriname

3.2 Fishing Communities and Demographics in Suriname

Most active local fishermen live in Paramaribo or in small settlements alongside rivers in the different coastal districts. When fishing, artisanal fishers operate either from temporary camps or directly from their homes. An overview of the population living in certain fishing communities in the coastal region districts and active in fisheries is given in Table 6 below. These numbers however only reflect the full-time employment statistics.

In recent years the fishing companies shifted to hire more part time employment. Also, from 2010, the general trend seen is that less people are working on each boat. In addition, the shrimp companies have been going through a process of laying off people over a period of several years since 2009/2010 due to decline in production.

Table 6: Population Inhabiting the Coastal Area and Active in Fisheries. Source:Duijves & Heemskerk (2011)

Community	Est. # persons	Population composition
COMMEWIJNE DISTRICT		
Nieuw Amsterdam	1200	Mostly Javanese and Hindustani
Zoelen	500	Most are Guyanese. Suriname inhabitants are mostly Javanese with some Hindustani.
Pomona	100	Three Suriname (Javanese) families and ± 30 houses with Guyanese families and temporary labor migrants.
Bigi-santi	100	Mostly temporarily residents. The population is dominated by Guyanese fishermen (± 80%). There are some women but no children of school-age. Suriname fishers are mostly of Hindustani and Javanese descent.
Braamspunt[2]	100	See Bigi-Santi.
Johanna Margaretha	400	Javanese (2/3 of the inhabitants) on one side of the village, Hindustani on the other side.
Rust en Werk	300	Javanese
Frederiksdorp	10	Javanese/Dutch
SARAMACCA DISTRICT		
Boskamp	400	80% Guyanese, with some Javanese and Hindustani inhabitants
Kalebaskreek	150	Indigenous
Batavia		Pilgrimage site
CORONIE DISTRICT		
Totness	1800	80% Creole, 10% Javanese, 10% others.
NICKERIE DISTRICT		
Nw. Nickerie	12.842	Mostly Hindustani (60-70%) and to a lesser extent Creole and Javanese

Some important conclusions can be drawn about the fishing communities in Suriname. In the fishing communities of Pomona, Bigi Santi, Braamspunt, Zoelen and Boskamp, where the population is dominated by Guyanese, population numbers fluctuate with the fishing seasons. Shrimp fishing, for example, occurs during

two seasons. Large Seabob shrimp are caught during Suriname‟s long rainy season (May-August), which mostly occurs in the Suriname River. In December-January, fishers catch the small „wit-bere‟ shrimp, which mostly occur in the Commewijne River. In the shrimp off-season, some families in communities that focus on shrimp fishing (i.e. Zoelen, Pomona) will catch fish (e.g. Kandra).
Also, some members of more settled fishing families may look for employment elsewhere (i.e. Paramaribo), mostly in construction. Others (particularly single men) may move back to Guyana. Particularly in December and January, many Guyanese fishers leave Suriname to spend the holidays in Guyana. In Pomona, Guyanese labor migrants come specifically for shrimp fishing at the start of the season (April) and often leave Pomona again in October at the closure of the shrimp season (Duijves & Heemskerk, 2011).

During the high seasons for Seabob shrimp some fishers from Zoelen work from nearby fishing locations such as Braamspunt, and only return home every couple of days. During the off-season for Seabob shrimp, the inhabitants stay in Zoelen to catch small shrimp and small fishes (e.g. anchovies) to make *terie*. While the Guyanese fishers tend to stay at Bigi Santi/Braamspunt for months, the Suriname fishers tend to come for a couple of days at a time

Interesting is the high number of Guyanese fishers living in a number of these communities and working in Suriname waters. As compared to people from Paramaribo and other urban areas, the inhabitants of most fishing and plantation communities have relatively poor access to health care facilities, government institutions, information and educational facilities. They rely on -often irregular- boat and/or bus transport. The households largely use on rainwater for their daily water needs and the more isolated communities have no access to electricity. In those isolated fishing communities (i.e. Braamspunt, Bigi Santi, Pomona), living conditions can be characterized as very poor (Duijves & Heemskerk, 2011).

3.2.1 Fishing communities in the Paramaribo District

In Paramaribo, fishers can deposit their fish at a number of boat landings are located on the western shores of the Suriname River. The most important of these may be the Waldring landing and Clevia. The fishers working from these locations do not form a physically fixed community, but they are part of the socio-economic community of artisanal fishers. They live mostly dispersed in Paramaribo and Commewijne (Figure 8).
On the south side of the city, industrial trawlers moor on a couple of locations, including Bethesda. The boat owners are Dutch, Surinamese, Chinese, Korean, and Venezuelan. Foreign crews typically live on the boats. These fishers do not form a community in the traditional sense, but they do form a socioeconomic community with shared lifestyles and knowledge systems. The Surinam harbor is located in Paramaribo as well.
Fishers who are landing their boats along the West (Paramaribo) banks of the Suriname River typically live dispersed in the capital city of Paramaribo. Fishing is not the main economic activity in the Paramaribo district. More jobs can be found in the commercial sector, public sector and business sector (Heemskerk & Duijves, 2011).

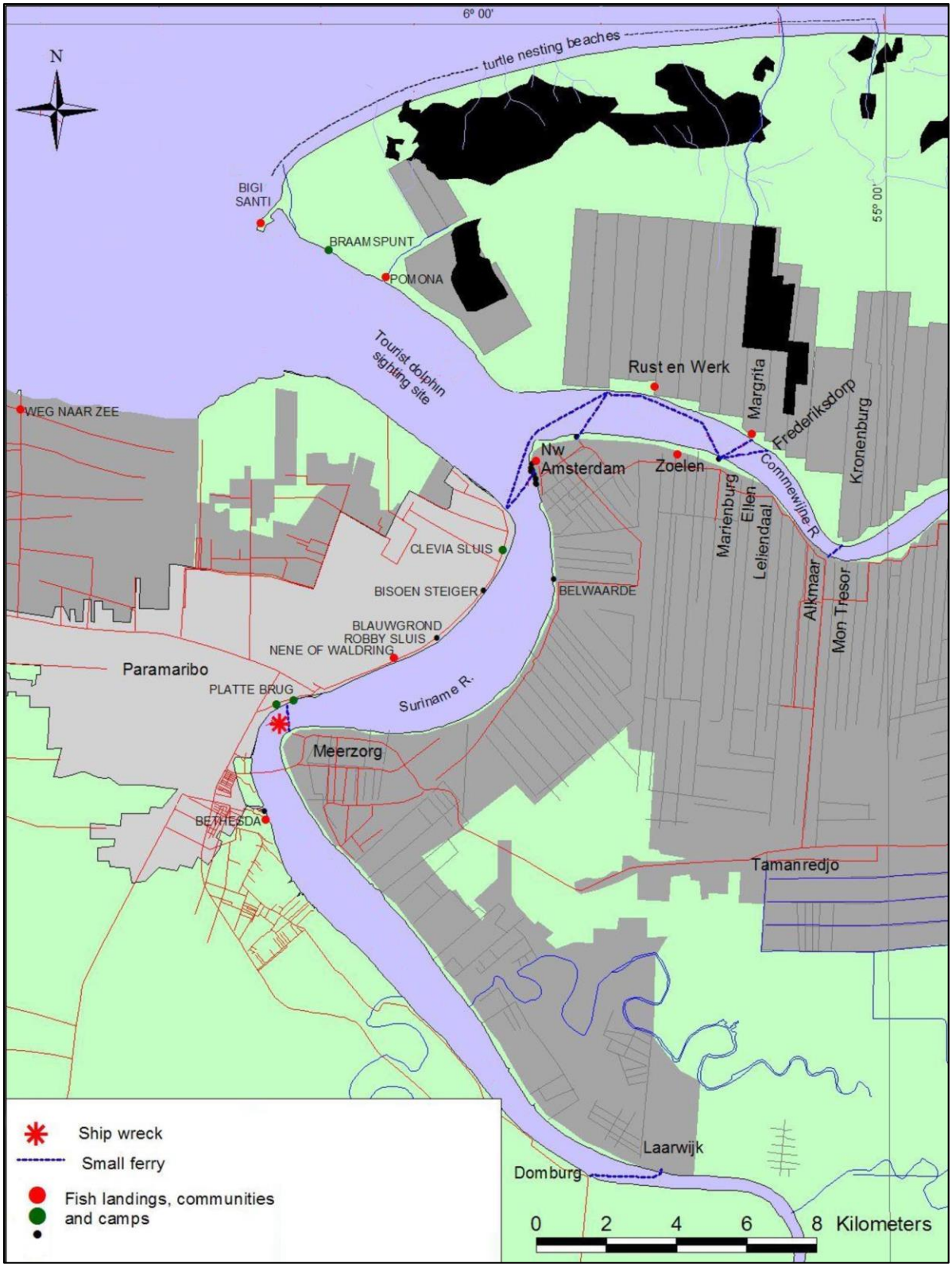


Figure 8: Fishing communities in Paramaribo and Commewijne

3.2.2 Fishing Communities in the Commewijne District

The district of Commewijne contains several fishing communities that also serve as well-known fish landings (Figure 8):

- **Nieuw Amsterdam** is the district capital of Commewijne.
- **Zoelen** is a small shrimp fishers' settlement located on the former plantation Zoelen near the village of Nieuw Amsterdam.
- **Pomona**, a shrimp fishers' village is located on the Eastern banks of the Suriname River at the mouth of the Jonkermans Creek.
- **Bigi Santi** and **Braamspunt** are two fishing communities located on a peninsula on the north-western shore of the district, together popularly known as "Braamspunt".
- **Johanna Margaretha**, is a former plantation village on the Northern banks of the Commewijne River. Some river fishermen are located here.
- **Rust en Werk**, is a former plantation village on the northern banks of the Commewijne River. Some river fishermen are located here.
- **Frederiksdorp** is a former plantation made into a tourist resort on the northern banks of the Commewijne River.
- Other plantations, settlements and villages in Commewijne include: Mariënburg, Alkmaar. Ellen, Leliëndaal. All of these are located on former plantations.

Fishing is an important economic activity in the village of Nieuw Amsterdam. The village of Nieuw Amsterdam contains 17 registered boat owners that operate a total of 22 vessels holding an SK or BV license. By estimation the whole district of Commewijne includes a total of approximately 50 to 100 boats. Depending on the boat type, 2 to 6 people may be working per boat. Fishing directly employs 300 to 500 people (including vessel owners and fish processors), and indirectly sustains many more. Other important economic activities in Nieuw Amsterdam include government service, agriculture, and tourism. Tourism activities generally involve dolphin watching, and visiting old plantations in the district (Duijves & Heemskerk, 2011).

All fishermen working from Zoelen hold Inland Navigation (Binnenvaart - BV) licenses. Approximately 15 fishing boats moor at the Zoelen landing on a regular basis. The fishermen use seine nets (known locally as fuik or foiki, to catch small shrimp (witi-bere) and fishes which are used to make dried salted fish (known locally as terie). Both the shrimps and fish species are caught in the Commewijne River near the village (Duijves & Heemskerk, 2011).

Commercial fishermen may fish in the local river or go further offshore to target Kandra (*Cynoscion virescens)*, prawns, and large shrimp. Shrimp and small fishes are typically dried at home and sold either to intermediaries or straight to end clients. In the shrimp and terie industry, fishermen's wives and other family members hold important roles in processing the catch. Male tasks include making the drying rack and carry the load with a shovel. Female tasks include sorting, salting and turning the fish on the drying rack daily, packaging and sales/marketing. Young boys who not visit school usually go along with their fathers. Small children may help the mother.

The Bigi Santi and Braamspunt fishermen utilise seine nets to target shrimp and small fish found in

coastal/intertidal waters, the catch is dried to produce, sara-sara and terie respectively. This fishing technique depends on tidal movements; the nets are placed in the water at high tide and as the water recedes the shrimp and fish are pulled in the net and scooped out. Due to the reduced tidal flow during neap tide (i.e. when the moon is in the 1st or final quarter) known locally as lesi watra, fishermen do not go out. May and June are the peak months for the shrimp fishermen, while mid-October to November are low-season months. During the low season, fishermen look for temporary work on nearby plantations and in Paramaribo.

Information on other groups of fishermen were unavailable during the time of this study.

3.2.3 Fishing Communities in the Saramacca District

The fishing communities in the district of Saramacca are named:

- **Boskamp** is a small fishers' community on the banks of the Coppename River in the Saramacca district (Figure 9).
- People living along the **Saramacca River** and the **Larecoweg** and in **Calcutta** are mostly (subsistence) farming families who use the Saramacca River for fishing and transportation.
- The inhabitants of the indigenous communities of **Kalebaskreek** and of the village of **Batavia** use the Coppename River to fish for subsistence use and to travel to the coastal area. The Coppename River is also the main access route to the indigenous villages of **Corneliskondre** and **Donderskamp** along the Wayambo River.

The fishing community of Boskamp which is situated west of Paramaribo near the mouth of the Coppename River is the home of Suriname and Guyanese fishers and their families. According to the Visserijdienst (Fisheries Department), the community has between 10 and 15 BV licensed boats. Most BV fishermen from the community utilise a fishing technique known locally as jagi jagi, in the river mouth. As a result of this fishing method (see also Table 6.9 and Section 6.6.1) there are a number of poles standing in the water along the coast which cannot easily be removed. The majority of fixed gear stands are placed in the fish-rich estuarine area between the Saramacca and Coppename River.
Boskamp is known in Suriname for its dried and smoked fish, which is prepared by the local population. At least one resident from Boskamp takes tourists to the mouth of the Coppename River and along the shore for bird watching on the mud flats and fishing.

Information on other groups of fishermen were unavailable during the time of this study.

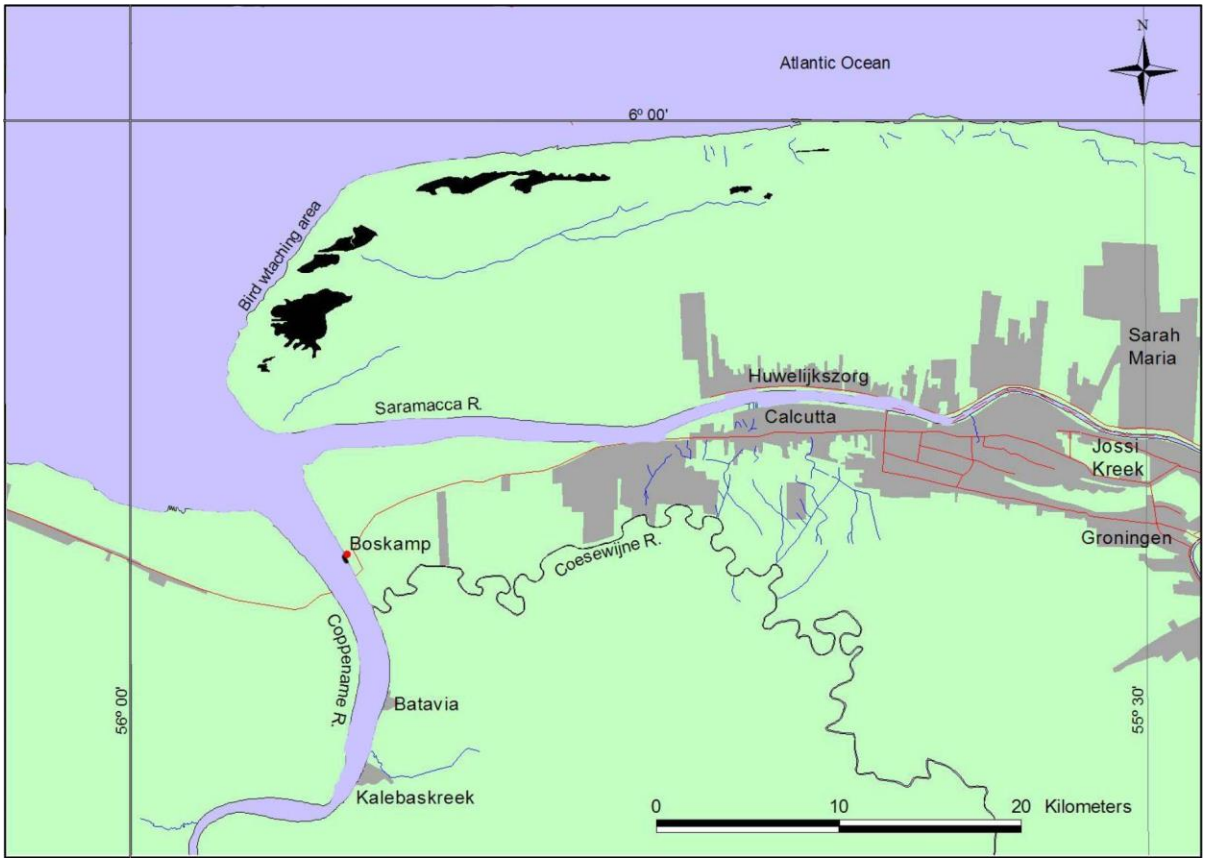


Figure 9: Location of the fishing community of Boskamp in Saramacca

3.2.4 Fishing Communities in the Coronie District

Totness is the district capital of District Coronie (Figure 10). While not a classic fisher community, it is the main point of departure for fishers from this district. In 2011, the Fisheries Service in the Coronie district, registered 9 BV boats and 3 SK (Suriname coast license) boats. The only fishing technique used in Coronie is drift nets, no static gear such as jagi-jagi or shrimp fishing with fyke nets takes place in this district. Other economic activities in the district are agriculture, horticulture (cultivation of coconuts and beekeeping) and livestock rearing. Approximately 15% of the district inhabitants are working in public services.

Figure 10: The location of Totness in Coronie

3.2.5 Fishing Communities in the Nickerie District

Nickerie (Figure 11) is a predominantly agricultural district with rice and banana as the main cash crops and important export products. The main fishing activities in Nickerie are drift net and purse seine fisheries (known locally as hari-tité) for Koebi (*Plagioscion surinamensis*) along the mouth of the Corantijn River, and fyke net and drift net fishing in the coastal area. Popular fishing locations are found between Turtlebank and Corantijnpolder.

In addition to the local fishermen, there are many Guyanese fishermen working in Suriname waters, they are concentrated in the Springland area. Other economic activities on Suriname territory include wood transport by Chinese companies and Guyanese vessels using the Zaagmolenlanding to enter the river.

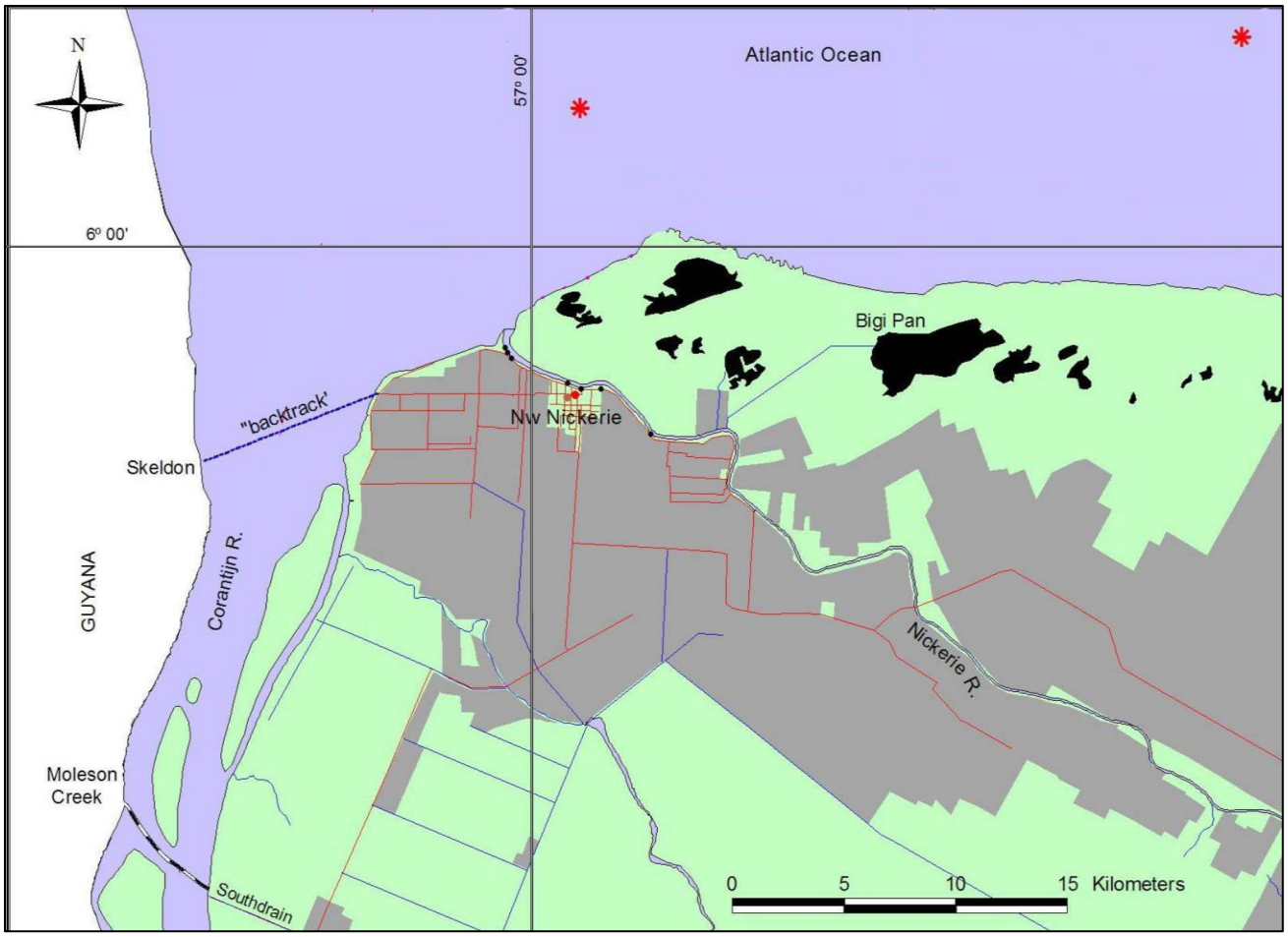


Figure 11: The city of Nieuw Nickerie

3.2.6 Fishing Communities in the Marowijne District

There is a lack of data on fishing activities specifically in the Marowijne district of Suriname. According to the Fisheries Department, this is due to the fact that fisher's active in this district are not formally registered by the Department, moreover the registration is not maintained. The little information available on fisheries in Marowijne states that the fishing community of Galibi had a number of 35 fishermen active in this sector in 2012 (Figure 12). More information on the number of active fishers and the socio-economic importance of fisheries in Galibi could be obtained through the fishing organization of Galibi.

Figure 12: The location of Galibi in the district Marowijne

4. Health

The citizens of Suriname have an average life expectancy of 70.8 years. The life expectancy for 2010-2015 is 74 for women and 68 for men. People active in all chains within the fishery sector are expected not to deviate from these numbers. The most significant diseases that can cause death are stroke, coronary heart disease, diabetes mellitus and HIV/AIDS.

Suriname has a total of five hospitals, of which four are located in Paramaribo and one is located in Nieuw Nickerie. Only two out of these hospitals are equipped with an emergency room, one hospital in Paramaribo and one in Nieuw Nickerie. The remaining services in the coastal region districts are provided by smaller Government clinics called RGD clinics (Figure 13). Fishermen can use all of these services for a small fee or free by obtaining a social security card.

Compared to other districts, the district of Nickerie has a relatively high number of suicides. An epidemiological study in the Nickerie catchment area revealed high rates of suicide (48 per 100,000) and attempted suicide (207 per 100,000) on average in the years 2000–2004. Particularly remarkable is the high number of attempted suicides among males (49%), and the use of pesticides in both fatal (55%) and nonfatal suicidal behavior (44%). The high incidence of suicidal behavior may reflect the very poor economic situation of the district, poverty of most of the population, high levels of alcohol misuse, domestic violence, the rigidity of Hindustani culture regarding family traditions, the accessibility of pesticides, and the lack of future perspectives. There is no statistical data on health incidents specifically regarding active fishermen.

Figure 13: The RGD clinics in Suriname. Source: RGD online (2017)

5. Education

Children go to pre-primary school at age four for a period of two years until they can be enrolled in primary schools. Primary education lasts for 6 years and children are typically enrolled from age 6 until they are 12 years old (compulsory education runs from age 7 to 12). On average, children stay in school for 7.2 years. From the age of 4, 91% are enrolled in primary education. When reaching the age of 12, children are eligible for secondary education, however only approximately half of this age group will continue school (Duijves & Heemskerk, 2011).

The literacy rate of Suriname adults (15 years and older) is 95% (which is approximately equal among men and women – 95/94%). For youth between 15 and 24 years, the literacy rate is 98% (approximately equal among men and women – 98/99%). Several primary and secondary educational facilities can be found in all coastal districts, however continued secondary and higher educational facilities are located only in Paramaribo.

In Suriname, there is no specialized education in fishing, but fishers mostly obtain skills by on the job experience. However, there are several initiatives of the Ministry of Agriculture and Fisheries to provide training and workshops for people active in fisheries. Trainings are usually linked to projects funded by outside funders such as technical and conflict resolution trainings in the project: Sustainable Management of Bycatch in Latin America and the Caribbean Trawl Fisheries (REBYC-II-LAC) funded by the FAO. Statistical data on educational levels of fishermen is yet unavailable.

A considerable number of Guyanese fishers have been living in Suriname for a long time, and their children attend schools in Suriname. In Commewijne most of the children on the right bank of the Commewijne River go to school on the other side of the river and School children living on the former plantations in the Commewijne district rely heavily on school boats and ferry boats to travel to school to bring them to schools in Ellen, Leliëndaal, Nieuw Amsterdam and Paramaribo. Nieuw Amsterdam itself has two primary schools, one public school and one EBGS (Moravian Church). Children from Zoelen are visiting this school as well; the school bus takes the children to these schools. Continued education possibilities are centered in the resorts Alkmaar (Ellen and Leliëndaal) and Meerzorg. In Boskamp children visit the primary school in Calcutta, secondary education can be found in Freiburg. School children from Kalebaskreek and Batavia travel to Boskamp by boat as well. Totness and Nickerie have several educational facilities, primary as well as secondary (Duijves & Heemskerk, 2011).

5.1 Skills

As mentioned in the previous section, fishermen obtain their skills by experience. These skills are learned on the job or are passed on from family members, and contain knowledge on e.g. fishing seasons, fish stocks and fishing techniques. Each fishing technique is characterized by specific gear, period of being active, duration of fishing trips, and fishing location. The different fishing techniques are described in more detail below.

5.1.1 Artisanal Fishing Techniques

Artisanal fishermen can be divided into two main categories based on their location and the fishing techniques used:

Coastal fishing

- The drifting gillnets stand as a vertical curtain in the water column with floating devices attached to the top and weights at the bottom. This is the most common method of fishing in the coastal zone. The gillnets are set out between 2 and 5 kilometers offshore from the coast with mesh sizes ranging from 2.5 to 8 inches. Fishermen using this technique mainly catch Bang-bang, Kandratiki and Koepila and Bangamary (dagutifi).
- The bottom long-line consists of a main line of between 600 and 1000 meters in length with baited hooks attached at intervals. Long lines are set by an anchor or left to drift (Figure 14).

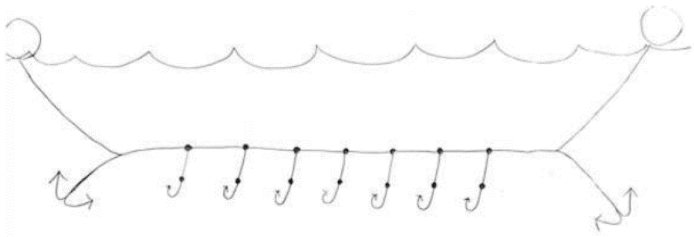


Figure 14: Long line with baited hooks. Source: Fishery Management Plan 2014-2018 (Fisheries Department)

River, Estuarine and Brackish Water Fishing

These fishermen use a variety of techniques for catching fish.

- Chase pin (known locally as Jagi-Jagi) is a fishing technique whereby a seine net is placed on two sticks after the flood tide has reached the furthest point in the river (Figure 15). In front of the fixed net, there are a series of smaller poles in a "V" shape. As the water recedes during the ebb tide, the poles lean together and act as a barrier to direct the fish into the seine net at the end of the V shape. The fishermen stay for an average of 4-6 hours on the water using this technique. Different Jagi-Jagi stands may be placed in the river along a wide stretch of water. The poles of the chase pins remain in the water and are only replaced when they are worn. In some instances, such as in the mouth of the Coppename River near Boskamp, the Jagi-Jagi stands close off a large section of the river mouth, and other vessels have to go around them.

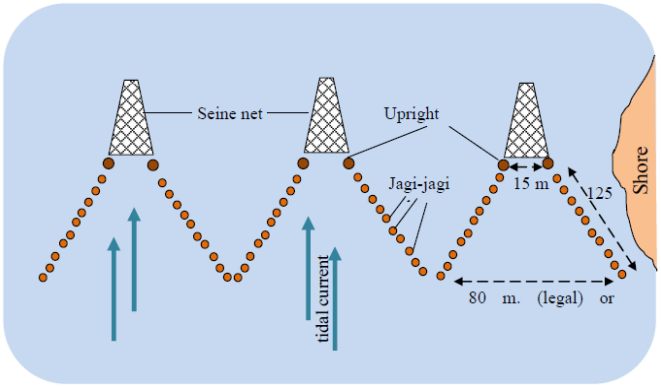


Figure 15: Diagram of the Jagi-Jagi Fishing Technique. Source: Smith et.al, 2014

- Fishermen also use fyke nets to catch fish in estuaries. Fyke nets are bag-shaped nets which are held open by hoops. These nets are also known as "hoop nets" or "funnel nets" (known locally as foiki). This

technique depends on the tidal currents in the river mouth. Fyke nets are placed between poles, but do not use the rambling sticks to chase fish into the net. Fyke net stands are found in the estuaries of the Suriname, Commewijne and Corantijn Rivers.

- Fishermen use njawarie fishing (a pin seine net) or 'schutbank' on the mud banks to form a "U" shape that traps fish as the tide recedes (Figure 16). At the high tide, a long net is placed on the riverbank and as the tide gets low, the fish are captured in the net. Fishermen using this technique mainly catch fish such as Bang-bang, Koepila, Pani, Snoek, Dagoe tifi and Botro fisie (Duijves & Heemskerk, 2011).

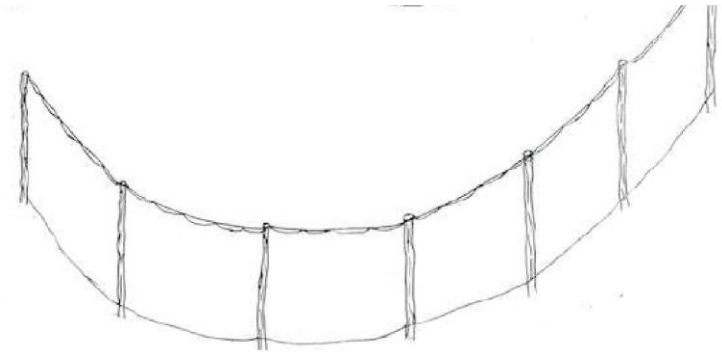


Figure 16: The net setup for the Njawarie fishing. Source: Fishery Management Plan 2014-2018 (Fisheries Department)

Table 7 below provides a complete overview of the characteristics of the artisanal fisheries in Suriname.

Fishing technique/Gear[7]	Catch	License	Times and duration	Location
Shrimp fishing with fyke net or Chinese seine	Small shrimp (*wit-bere*) and small fishes of the Sciaenidae species. Both are dried to be sold as resp. *sara-sara* and *terie*	BV	Fishers go out when the tide is past its highest point, and stay for 4-5 hours as it becomes low tide. Fishers work for 6-10 days every fortnight. They do not work when the moon is at the 1st and last quarter (no current).	River mouth, near the river shore. E.g. Suriname River, along Zeedijk Nickerie
Jagi jagi or chase-pin (Guy).	Dagoe-tifi, Witwiti, Kandra	BV	Fishers go out when the tide is past its going down, and stay for 2-3 hours as it becomes low tide. They do not work when the moon is at the 1st and last quarter (no current).	River mouth, near shore and further to the middle: Suriname river, Coppename river
Inland drift net fishers	Bangbang, Koepila, Snoek, Koemakoema, Trapoen, etc.	BV	River fishers typically stay out for a couple of hours. Fishers who move into the coastal waters generally spend up to 8 hrs/day at sea but may spend the night on the water when the catch is disappointing.	River and River mouth, coastal zone near the river mouth. A.o. Coppename River
River fishing using a fixed gillnet or *spannet* (almost disappeared), sometimes combined with line	Sciaenidae species, non-scaled fish (i.e. granmorgoe)	BV	Fishers typically go out for a couple of hours.	Rivers
Purse seine fishery (*cirkelnet* or hari-tité)	Koebi	BV	3-4 days, until the box is filled.	Rivers, e.g. Commewijne and Suriname Rivers, and Corantijn River
Long-line sea fishing.	Tuna but also Kandra, Bang-Bank, and small	SK	Undetermined; may stay at sea for several days to 2 weeks (often Venezuelan boats)	Sea

Fishing technique/Gear[7]	Catch	License	Times and duration	Location
	sharks			
Bank fishing using pin seine (*Njawarie*)	Botervis, Snoek	SK; *schutbank*	With high tide, fishers closes off the mud bank with a gillnet, which is set out in a U-form. When the tide returns, fish are drawn in the net.	On mud banks in front of the shore, e.g. Vissersbank, WiaWia bank, Matapica bank
Ocean drift net fishing. Fishers use drifting gillnets. Typical mesh size: 2.5" to 8" Min. mesh size: 2" (5 cm) Length: 2 - 5 km	Kandra, Bang-Bang	SK	SK fisher generally stay away for 1-2 weeks, but may remain at sea up to three weeks in a row	Ocean, at varying depths.
Bangamary fishing uses Drifting gillnet (*Drijfnet*), Maximum length: 2 km. Min. mesh size 8.75 cm	Bangamary, locally named Dagoetifi. They also may fish for Butterfish	SK	With ice, fishers may stay away 3-4 days; without ice, fishers only go for a day or day-share (tide fishers)	Sea
Line fishing and small trawl net (*sleepnet*)	Kwikwi, Anjoemara, Toekoenari	Sports-license	Couple of hours, usually daytime and weekends	Rivers further land inward, e.g. Suriname and Corantijn Rivers

Table 7: Characteristics of different artisanal fishers. Source: Duijves & Heemskerk (2011)

5.1.2 Commercial Fisheries

The commercial fishermen use two types of fishing techniques in Suriname: trawl fishing and line fishing.

- **Trawl fishing** includes pulling a large fishing net through the water behind one or more boats (Figure 17a) and is regulated by the Ministry of LVV through licensing. Trawl fishing is predominantly used for catching shrimp and large pelagic fish (finfish) (Duijves & Heemskerk, 2011). Some of the shrimp trawl vessels have been modified to catch finfish including Lutjanids *(L. synagris) and Sciaenids (C. virescens).*
- **Line fishing** (Figure 17b) includes suspending fishing lines with baited hooks from one or more boats. Line fishing is predominantly used for red snapper and mackerel (Duijves & Heemskerk, 2011).

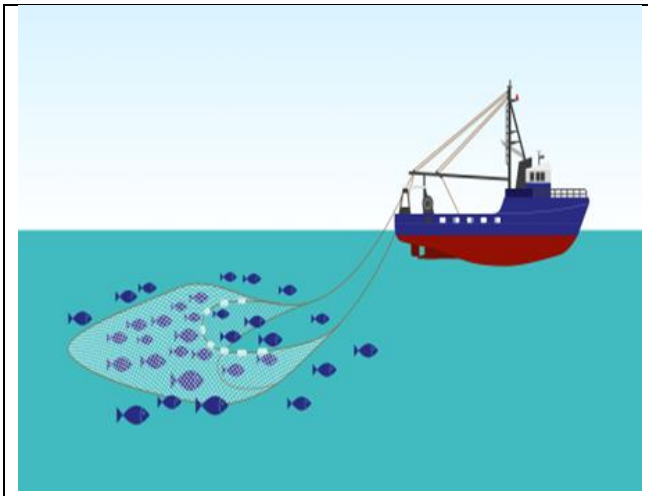


Figure 17a: Trawl fishing technique

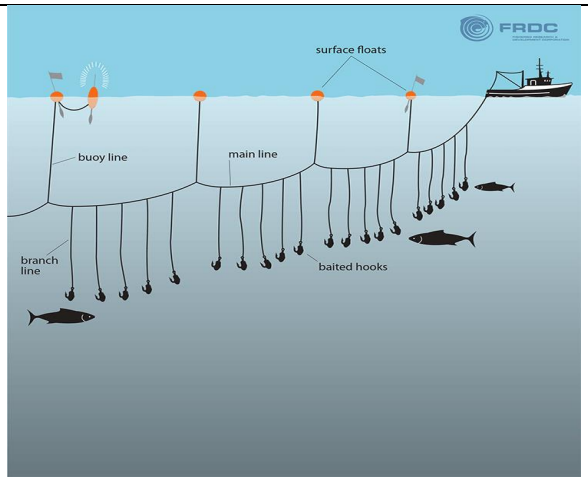


Figure 17b: Line fishing technique

There are no specific communities attached to commercial fishing offshore Suriname. Fishing boats are operated by both Surinamese nationals and foreigners (e.g. Venezuelans, Guyanese etc.). About 80% of all offshore licensed fisherman are foreigners. Currently all industrial (deep sea) vessels mainly targeting tuna, operate under the Panamanian flag, and no such boats operate with a Surinamese flag. Surinamers have cultural barriers to fishing on sea because they do not like to stay away from home for long periods of time. The last year's foreigners have changed from predominantly Chinese to fishers coming from the Philippines. Commercial fisheries are mainly used for export purposes and generally operate from Paramaribo or the district of Para.

6. Employment and GDP

The Gross Domestic Product (GDP) of Suriname in 2012 was USD 4.3 billion (World Bank, 2013) with the contribution of the agriculture sector (including fisheries) of approximately 10.4% (CIA Factbook, 2013). Within the agricultural sector, the export value of fisheries provides an annual contribution to the GDP of approximately 4% (WTO, 2007).

The fishing industry provided employment for approximately 6,324 people in 2010 (Table 8) throughout the industry chain from the supply (the offshore fishermen), processing and the commercial aspect of the industry. It must be noted however that there is insufficient official data on more recent employment numbers.

Table 8: Employment Statistics in the Fishery Sector 2005-2010 (Ministry of LVV).

Employment Category	2005	2006	2007	2008	2009	2010
Commercial fisheries						
Shrimp boats	469	259	357	126	217	175
Seabob boats	210	175	210	168	175	140
Fish trawlers	112	80	112	96	104	72
Fish trawlers (large pelagic)	72	0	0	8	0	88
Fish trawlers (small pelagic)	48	80	80	80	80	72
Snapper & Mackerel boats	399	462	420	0	0	0
Subtotal	**1,310**	**1,056**	**1,179**	**478**	**576**	**547**
Artisanal fisheries						
SK (O.G. + G.G.)	1835	1910	1815	1345	1570	1395
SK Bangamary	200	200	215	180	200	185
Fykenet[1]	1260	980	1008	992	1524	928
Line	42	78	20	16	22	14
Driftnet	500	695	770	485	620	595
Spannet	10	14	20	20	16	14
Sleepnet	4	2	2	4	4	4

Zeegnet	40	40	20	40	65	55
Gillnet	108	195	108	90	105	213
Guyana (SK + BV)[2]	45	40	0	0	0	0
Sport fishing	0	0	0	0	0	0
Subtotal	**4,044**	**4,154**	**3,978**	**3,172**	**4,126**	**3,403**
Fish sales						
Central market[3]	489	372	339	339	285	261
Fish stores[4]	498	412	258	387	104	175
Fish sellers[5]	74	74	74	60	60	96
Factory	70	65	0	51	51	51
Fish company	480	0	0	273	135	375
Subtotal	**1,611**	**923**	**671**	**1,110**	**635**	**958**
Processing companies	**1,414**	**1,388**	**1,236**	**1,218**	**940**	**1,235**
Total employment in sector	**8,379**	**7,521**	**6,393**	**6,924**	**6,458**	**6,324**

[1] Fykenet fisheries involve family units

[2] Licenses issued by Suriname Government

[3] Sellers of the Central Market are also fish processors (in both Paramaribo and Nickerie)

[4] Registered licenses at the Chamber of Commerce

[5] Sellers registered by the Chamber of Commerce

6.1 Socio-economic Importance

The fishing industry is an important economic sector in Suriname. In 2004, the gross value of fisheries' output was estimated at 36.6 million USD. In 2006, fish production worth 45.7 million USD was exported (Stichting Planbureau Suriname, 2008). Most of this money was earned in industrial fishing.

Historically, the commercial fishing industry started in Suriname during the mid-1970s with the first recorded export in 1976. The industry has been a relatively stable sector that contributes to the GDP mainly via the export of shrimp and other fish types. Suriname fish export data shows a steady quantity of export products in the last decade.

Table 9: Export Quantity and Value of Fish Products 2004-2009. Source: Smith et.al, 2014

Year	2004	2005	2006	2007			2008	2009
Amount exported (tonnes)	27,377	24,850	25,888	29,633			28,370	33,800
Value exported (USD$)	55,204	50,281	51,760	55,492			58,450	78,570

There has been a slow decline in the sea shrimp production (Table 10). These catches were 982 tons in 2006, approximately 780 tons in 2007 and there was a large fall in 2008 with a catch of 247 tons. The decline in production of the fishery sector is thought to be due to high fuel prices, reducing numbers of shrimp trawlers, and overfishing. Conversely the seabob shrimp sector recorded an increase in production from 6,023 to 9,000 tonnes of seabob between 2008 and 2009.

Table 10: Fish Catches by Type of Fishery 2004-2009. Source: Smith et.al, 2014

Production (metric ton)/Year	2004	2005	2006	2007	2008	2009
Seabob shrimp	10,567	8,927	10,340	8,233	6,023	9,000
Sea shrimp	1,530	1,335	982	780	247	240
Aquaculture	288	242	180	19	29	35
Fish	1,8647	17,395	19,062	20,000	17,179	16,000

The stability of the fisheries industry provides a stable income for many fishermen. Most of the work on the various fishing boats is done by men and women sometimes assist in the cleaning and selling of shrimps. In 2010, there were 547 fishermen who were directly active in the commercial fishing subsector. The spin-off of this sector, including suppliers of fishing gear, engine maintenance, fuel, and the labour force at processing plants accounts for more jobs. However, restrictions on the number of fishing licenses issued by the Suriname government over concerns regarding potential overfishing is prohibiting an increase in employment opportunities for potential fishermen or related jobs.

7. Infrastructure and Services

7.1 Boat landings

Both artisanal and commercial fishermen are mandatory to moor their vessels at certain designated boat landings in Suriname (Table 11). There is no auction system for catch at the boat landing locations, but rather the catch is sold to intermediary buyers or sold directly to fish processing companies. All fishing vessels are obligated to deliver their catch to designated landings in Suriname. Compulsory condition of licensing for artisanal fishing is that their catch is processed in Suriname. Thus, if the vessel has less landings than the minimum required landings of 12 landings per year their license will not be renewed. However, in reality a significantly large number of SK licensed vessels are not landing in Suriname, but in Guyana which means less revenue for fish processing companies in Suriname. The process of illegal renting of licenses to vessel owners living in Guyana contributes to this problem. The landing obligation would be able to prevent this problem, after all when vessels do not land or have less registered landings in Suriname than the minimum required amount their license will not be renewed. However in reality there is no strict policy control over the requirements of the landing obligation. Another problem is: only a limited amount of the total catch is landed in Suriname, while the larger amount of more valuable catch is landed and processed in Guyana. Another fact are the false invoices from fish processing companies in Suriname.

Surinamese vessels with an SA license are mandatory to harbor in Suriname on regular basis. Because fishers and other water users from Paramaribo to Nickerie live dispersed over the districts, boat landings are important contact points for fishers and others in the fishing industry. The boat landings also are a place to get in touch with boat owners who organize tourist trips, for example dolphin or bird watching trips. In addition, the boat landings are important for industrial (freight) traffic.

Artisanal boat landings

Important designated boat landings for artisanal fishing vessels are located in the Suriname River, the Nickerie River, the Coppename River (Boskamp) in the district of Saramacca and the Marowijne River (Galibi) in the district of Marowijne. Artisanal fishing communities bring their catch to different landings in Paramaribo North (Iijn 4, the Waldring boat landing or Clevia) or the Central Market. A large concentration of artisanal fishermen are located in Boskamp in the district of Saramacca, these fishermen bring their catch to the “small bridge” area of Boskamp. Individual fishermen in Totness (Coronie district) and bring their catch to the Totness canal. At Nieuw Nickerie fishermen bring their catch to the Zeedijk or turtleback area as both places are used as landing sites for artisanal fishers (Duijves & Heemskerk, 2011).

Commercial landings

The commercial fishing vessels are predominantly (percentage/numbers) owned by fish processing companies that land their harvest for own processing at the central fish landing harbor called Centrale Visaanvoer Haven Suriname (CEVIHAS) or at their private landing stage. These are all located in the Suriname River or near Paramaribo. Landings used for trawling operations in Paramaribo are Bethesda and CEVIHAS; whilst in the district of Para the boat landings are Domburg and Paranam.

Table 11: Artisanal and commercial boat landings in Suriname. Source: Duijves & Heemskerk (2011)

Formal or given name of landing	Region or district
Artisanal fishers	
Boskamp 'small bridge'	District Saramacca
Totness canal	District Coronie
Zeedijk/Turtleback area/Corantijnpolder	District Nickerie
Springland	Guyana
'Lijn 4' (Chini sluices/Xavics fish store)	Paramaribo North
Waldring boat landing/ Boomskreek	
Clevia Sluices	
Platte Brug (Sale of fish behind the Central Market)	Central Paramaribo
Visserij Centrum Commewijne (VCC)	Commewijne East bank
Fish processing plant of Mr. Breinburg	
Ice factory Shaw	
Kaersenhout	
Harold Habibula	
Glenn Habibula	
Willem	
Industrial fishers (trawlers)	
Bethesda	Paramaribo South
CEVIHAS (several landings)	
Smalkalden (Integra Marine)	Para
Domburg	
Paranam	

7.2 Public Services

Water and Sanitation

Suriname has enormous water reserves. Depending on the area, fresh water and groundwater resources are exceptionally rich. Suriname's water is clean and safe to drink from the tap.

Most households in Nieuw Amsterdam are being supplied with tap water by the Suriname Water Company (Surinaamse Waterleiding Maatschappij, SWM). However, the water pressure is too low to make use of the system. The households largely rely on rainwater for their daily needs, especially for households on the plantation lands(e.g. Bakkie and Rust en Werk). In dry periods people need to buy water.

In Zoelen drinking water from SWM is accessible in the entire village. Households in Boskamp (Saramacca district) are supplied with SWM tap water but the water is not purified and thus can barely be used. In Pomona drinking water is obtained from rainwater.

At Bigi Santi/Braamspunt, for drinking water, the fishers and their families rely on rainwater. In the dry season the fishers buy SWM water in Nieuw Amsterdam.

Electricity

The state-owned company N.V. Energiebedrijven Suriname (EBS) is the main energy provider in Suriname. Most coastal towns and villages receive electricity from the EBS. The Energy Companies Suriname (Energie Bedrijven Suriname, EBS) provides electricity in Commewijne, from Bakkie to Rust en Werk. In zoelen most of the villagers have access to the public electricity net, though one part of the village is not connected. In Pomona electricity is derived from the village generator, with some household owning private generators.

In Boskamp all the houses have access to electricity. Nieuw Nickerie and Totness are the regional centers of their districts with most necessary facilities and utilities. In Bigi Santi and Braamspunt there is no public electricity (only few individuals own a generator).

8. Other activities

Other than the activities pertaining to fishing, there are a number of activities taking place in the waters of Suriname such as tourism, oil and gas and port and handling activities. The vessels operating in these sectors moor and sail out from various harbors and piers in Suriname, these are named in table 12.

8.1 Tourism

Tourists can enjoy a number of activities in the coastal/ marine environment of Suriname. A number of tour operators operating in Paramaribo, Commewijne, Marowijne and Nickerie organise a variety of trips within Suriname for bird watching tours, dolphin spotting tours and sea turtle watching tours. The coastline of Suriname consists predominantly of sandy beaches, mudflats, clay banks and other geomorphological features. There are several sandy beaches along the Saramacca, Coronie and Nickerie districts, with only a few beaches suitable for swimming and other forms of recreation.

In addition, the mudflats along the Suriname coast are feeding grounds for large numbers of migratory and resident waterfowl (Smith et.al, 2014). The high bird diversity and occurrence of rare and endemic species, including the scarlet ibis (in the Bigi Pan area of Nickerie), attracts bird watchers and other tourists. Eco-tourism caused by sea turtle nesting grounds provides an important source of income for the indigenous villages near Galibi (Marowijne district).

8.2 Oil and Gas sector

The petroleum industry started in Suriname in the 1980‘s and has continued to develop through exploitation of its offshore reserves. Suriname’s state-owned oil company, Staatsolie has become a steady producer of the hydrocarbon reserves from its onshore fields. In 2011, 5.99 million barrels of crude oil were produced from onshore wells at the Tambaredjo field.

According to Staatsolie reports, it is believed that the offshore Suriname Basin contains at least another 21

billion barrels of undiscovered oil (Smith et.al. 2014). In 2011, crude oil production amounted to 5.99 million barrels, an increase of 3% compared to 2010. Exploration activities in Commewijne, Weg naar Zee and Nickerie commenced and the results so far indicate the Weg naar Zee Block as the most mature area, with prospects to declare reserves at the end of 2012.
Since the discovery of the Zaedyus well in French Guyana (2010), there has been a noticeable increased interest in offshore Suriname. Twenty-five wells have been drilled in the Suriname portion of the Guyana-Suriname Basin, to provide information on source rocks, hydrocarbon content and potential reservoirs

8.3 Port Handling and Services

The main port in Suriname is the "Nieuwe Haven" port located in Paramaribo. This is a complex of 123.500 m^2 consisting of a 600m long quay for cargo ships and a separate quay for bulk oil delivery. This port has the greatest movement of shipping activity. There are a number of inland ports located on major rivers to the east and south of Paramaribo (Moengo and Paranam, respectively). To the west of Paramaribo the largest port is Nieuw Nickerie, with a smaller inland port (Wageningen) located upstream of the coast on the Nickerie River. The most important navigation routes depart from Paramaribo northwest to Trinidad and Tobago, and northeast to Rotterdam in the Netherlands. In 2004, traffic in these two routes ranged between 800 and 1,000 vessels a year. There is a lesser coastal shipping route to the northeast linking Paramaribo to Belém (Brazil).

Suriname's port handles import goods coming from Europe, USA, China, Japan, Latin America and the Caribbean. Approximately 100.000 twenty-foot containers and 300,000-ton freight are handled at the port annually. This means that container trucks constantly enter and leave the Nieuwe haven for loading/unloading, especially during business hours. Several shipping, freight and transport companies are located at the Nieuwe Haven to support port operations.

Table 12: Harbours and other important tourist piers in Suriname

Tour Operators	
Leonsberg	Paramaribo North
Landings at the various plantations on the north banks of the Commewijne River: Rust en Werk, Johanna Margaretha, Frederiksdorp, etc.	District Commewijne
Nieuw Amsterdam main landing	
Industry	
Paramaribo harbor	Paramaribo South
Oliesteiger / SOL landing	
Oliesteiger Tout Lui Faut refinery	Wanica
Paranam landing	Para
Smalkalden (Integra Marine)	
Catharina Sophia/Josikreek	District Saramacca
Sarah Maria	
Nw. Nickerie harbor	District Nickerie
Ferry services, incl. school boats	
Landings at plantations on the north and south banks of the Commewijne River: Rust en Werk, Margrita, Frederiksdorp, Leliëndaal, Bakkie, etc.	Commewijne
Nw. Amsterdam main landing	
Leonsberg	Paramaribo North
Boskamp main landing	District Saramacca
Southdrain	District Nickerie
Moleson Creek & Springland	Guyana

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