WWF

REPORT

GUIANAS

2012

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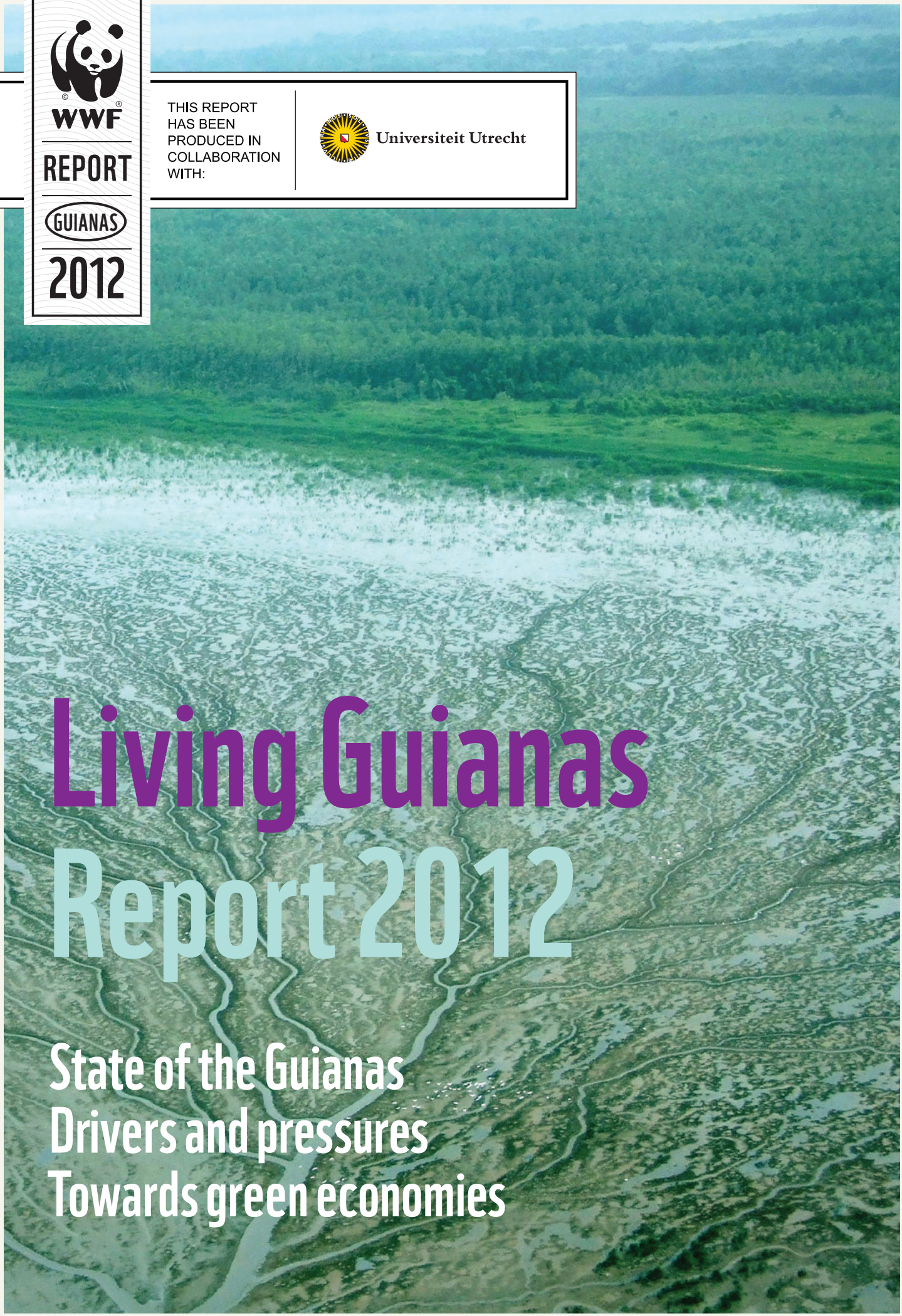

Living Guianas Report 2012

State of the Guianas
Drivers and pressures
Towards green economies

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WWF Guianas
WWF has been active in the Guianas since the nineteen sixties, starting with conservation work on Marine Turtles. The Guianas office opened since 1998.
WWF Guianas' mission is to conserve the distinct natural communities, ecological phenomena and maintain viable populations of species of the Guianas in order to sustain important ecological processes and services, while supporting the region's socio-economic development.

WWF
WWF is one of the world's largest, most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries.
WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

Copernicus Institute
The Copernicus Institute of Sustainable Development as part of the University of Utrecht in The Netherlands, investigates and develops processes and opportunities for innovative change towards sustainability. The institute, as part of the University of Utrecht, the Netherlands, seeks to contribute to the development of knowledge and techniques as well as to methods and instruments in the field of sustainable development, taking note of related social debates and policy processes. It is the ambition of the institute to make a difference – in science and education, and in society at large – in the exploration of a sustainable world.

Note on this report: Chapters 1 and 4 of this report have been produced by WWF Guianas. Chapters 2 and 3 have been produced by Copernicus Institute. Wherever possible, the report refers to scientific sources. However, in some cases data were inadequate or unavailable to the authors and assumptions had to be made based on best available knowledge.

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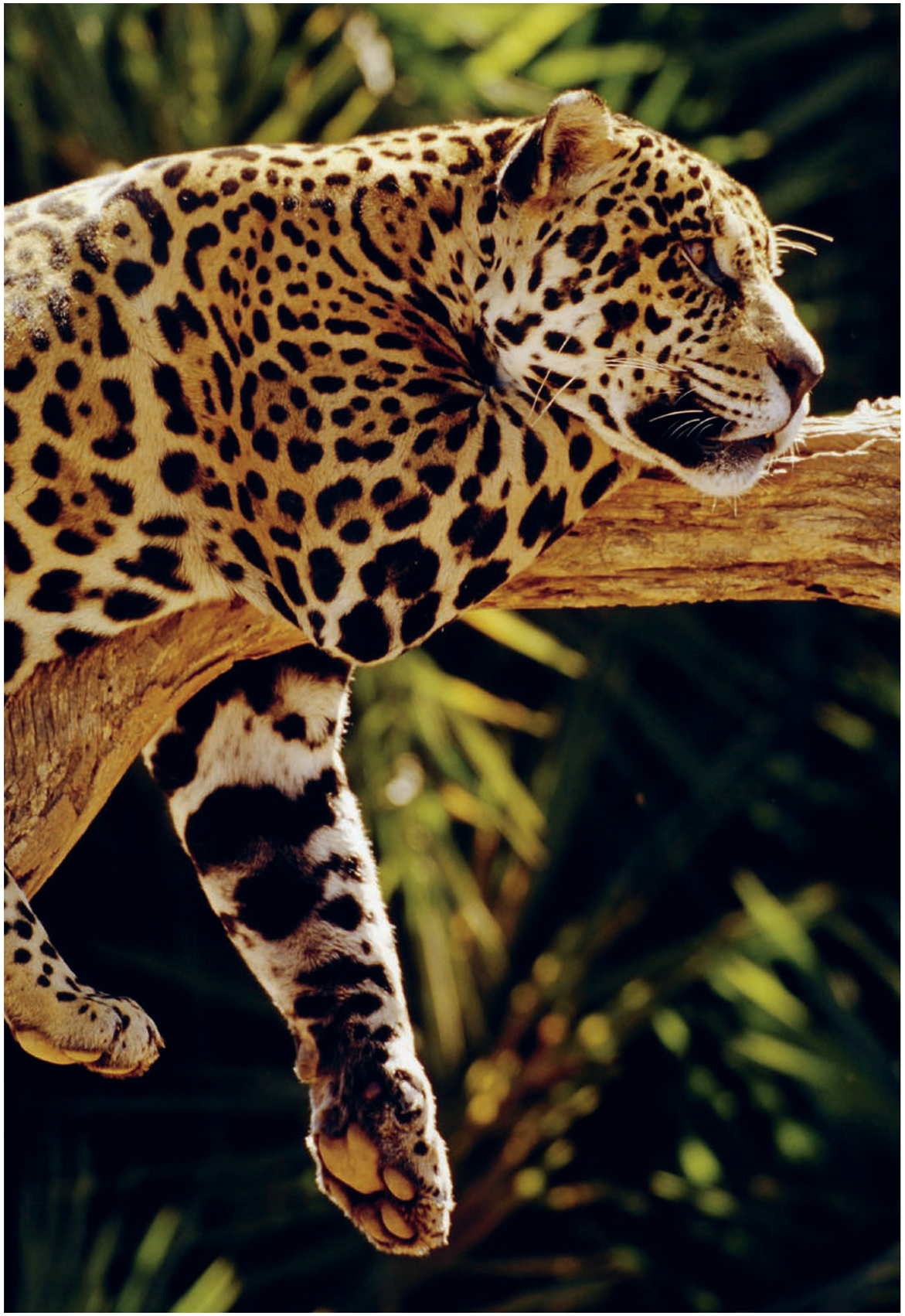
CONTENTS



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PREFACE

Thanks to the help of the Copernicus Institute in the Netherlands and various consultants from the Guianas and elsewhere, WWF Guianas has been able to produce the Living Guianas Report 2012. The report is based on the general outline of the Living Planet Report or LPR, produced by WWF International every two years. This Global LPR looks both at the state of the planet's biodiversity, and the footprint human beings place on the renewable resources of this very same planet. It then calculates how much this ecological footprint has exceeded the planet's biocapacity.

Furthermore, the LPR report presents plausible scenarios for the future, but – more importantly – comes up with some bold recommendations to reduce humanity's footprint (carbon, water, food, energy) and build more sustainable economies. The ultimate goal of the LPR is to promote better choices to come within the boundaries of one planet by balancing the ecological footprint with the planet's biocapacity, while maintaining healthy biodiversity and the ecosystem functions on which we all depend.

As the Guianas (and more broadly the Guiana Shield) is probably the region in the world with the highest biodiversity and a limited footprint, WWF Guianas investigated how to create a Living Planet Report for the Guianas. It soon became clear that insufficient data were available to measure the evolution of biodiversity (Living Planet Index) over a period of time in the Guianas, whilst data to measure the ecological footprint were also scarce.

In this sense, the Living Guianas Report presents some very first data to initiate the recurring production of a Living Planet Report for the Guianas in the future. Where other regions of the world are affected by problems of over-population, or very high footprint issues, the Guianas still host tremendous biodiversity and a variety of almost intact ecosystems. At the same time, population pressure is low. This holds enormous potential for preserving this important area in the future by developing sustainable or green economies, if intelligent investment is made with a view to the future.

The Living Guianas Report contains some general and some more specific recommendations on how to make better choices for the future. It highlights many positive actions that are already being taken by the different countries, but also raises some questions and presents some broad recommendations on how to improve the economic development of the Guianas without compromising the needs of future generations.

Dominiek Plouvier
Regional Representative
WWF Guianas

EXECUTIVE SUMMARY

The Guianas are the three countries Guyana, Suriname and French Guiana, in the north east corner of mainland South America. They are included in the larger Guiana Shield and the Amazon biome. As such they are part of the largest tract of continuous tropical forest in an almost pristine state in the world. Their coastal and marine habitats form a highly productive and biodiverse region. Their beaches are important nesting sites for several species of endangered marine turtles and vast tracts of mangrove and swamp forests are found along the coast of the Guianas. The region is shared with indigenous people, or Amerindians, and maroons, descendants from African slaves, which retained and cultivated many tribal traditions. Population pressures are relatively low, even in the populated coastal areas where few cities and villages are found besides the three capitals. Cultural diversity is significant throughout the Guianas.

With these given and unique features that are further outlined in chapter one, WWF Guianas took the initiative to develop a Living Planet Report for the Guianas, with the financial support of WWF-NL, WWF-France and together with Copernicus Institute of Sustainable Development in the Netherlands. WWF's biennial Living Planet Report includes only countries with more than one million inhabitants, thus omitting the Guianas. It looks at the state of the planet, with ambitious indicators such as the Living Planet Index; and the ecological footprint we humans pose on our planet in comparison to the biocapacity available to sustain our production and consumption. It contains important recommendations for better choices to come within the boundaries of our one planet. The message from the global Living Planet Report is very alarming. Species become less abundant or may even go extinct, ecosystems are further degraded while we strongly depend on healthy ecosystems and we consume 1.5 times that which the earth could sustain. On a regional scale, the Guianas, with their high forest cover and low population pressures, may be a spectacular exception to this pattern.

It soon became clear that many data are lacking or not available to complete a Living Planet Report for the Guianas. This Living Guianas Report 2012 presents some first data on the Guianas to develop a Living Planet Report for the Guianas in the coming years. This report should be seen as a basis for further national and international discussion on the development of green economies in the Guianas and as a contribution to the process of formulation of national recommendations.

In chapter two of this report the focus is on the state of the Guianas' species, ecosystems and ecosystem services, and the natural capital of the Guianas.

- The Guianas house a spectacular biodiversity, with high species richness and high levels of endemism. Also, the proportion of threatened species is low, but several endangered species are found in the Guianas, often in exceptionally high numbers.
- Forest cover in the Guianas is among the highest in the world, ranging between 77% to 93% in Guyana; 95% in Suriname and 98% in French Guiana, while forest cover loss is very low. Protected areas are found throughout the region, with French Guiana contributing a noteworthy 48% of its territory as protected areas. Opportunities for additional protected areas and increase in connectivity to create a network of protected areas are found throughout the region. Sustainable timber production, the harvest of non-timber forest products and eco-tourism are considered important services that the forests provide and which could be capitalized more from a green economies perspective.
- Freshwater quantities are vast, with huge water surpluses. While it is expected that water quality is generally very good throughout the region, some first indications of a decrease in quality can be observed in urban areas and certainly in rivers and streams affected by mining. Freshwater fishes are an important source of protein and income generator for people in the interior and the coastal region.
- The marine and coastal systems are often in a good state, providing important services in the form of coastal defense, fisheries and eco-tourism. The highly dynamic coast forms one of the most important nesting beaches in the world for the critically endangered Leatherback turtle, but also for other endangered marine turtles. The highly productive waters off the Guianas' coast sustain different types of fisheries. It has been discovered only recently that these waters also harbor a high diversity of marine mammals, including some spectacular and endangered whale species.

In chapter three of this report the focus is on drivers and pressures to the Guianas' natural capital.

- The most severe pressure identified is mining, mostly gold mining, but also bauxite, oil and gas.
  Expansion of gold mining is related to the increase of the gold price on the global market. Deforestation due to gold mining has seen a two-fold increase in eight years and the increase in impacted rivers follows a similar pattern. Major impacts are observed through chemical and physical pollution of rivers and streams due to the use of mercury in the process of gold extraction in small-scale mining. This results in serious health risks for miners, local populations and may even affect more remote populations. Medium to large-scale gold mining do not use mercury but rarely mitigate the environmental impacts in the form of restoration of the affected areas. The Guianas contain vast bauxite reserves. This industry is highly energy intensive. Expanding bauxite mining can thus be linked to increasing energy demands. Also, mining operations are expanding into vulnerable ecosystems with several endemic species. Oil and gas operations are increasing in the region, also offshore where the impacts of seismic exploration and the risk of oil spillage should be monitored with great care.
- Several new roads and hydroelectric dams are planned or considered, often in pristine and remote areas of the Guianas, or in close proximity to indigenous and maroon communities. Social as well as environmental impacts are expected, which need careful planning and mitigation where possible.
- Forestry operations are currently not considered as a significant threat, thanks to cautionary forestry regimes that are based on the principles of regeneration and sustainability. They could become a potential future threat and therefore continuing monitoring of their development is needed.
- In the marine realms, the impacts of fisheries are increasing, with several signs of overfishing in the region. Illegal and uncontrolled fishing occurs in the region, contributing to the need for regionally coordinated patrolling.

WWF Guianas thinks that the region has some important advantageous assets for the further development of green economies in the Guianas. This is the scope in the last chapter of this report. Solutions that are recommended here focus on greening high-impact sectors, managing natural capital in sustainable and equitable ways, rewarding those who provide ecosystem services and conserving biodiversity, greening financial flows, ensuring good governance and adapting the economy to stay within the planetary boundaries, whilst ensuring social equity and developing sustainable livelihoods. The report concludes with a closer look at each of the three Guianas and an appeal to the international community to support these unique countries with their vast natural capital in their efforts to develop greener economies.

10%

of Suriname's population is estimated to be directly dependent on the forest. Girl with Brown capuchin monkey *(Cebus apella)* in the interior of Suriname.

1. LIVING GUIANAS - WHY WE SHOULD CARE?

Within the vast immensity of the universe, a thin layer of life encircles a planet. Bounded by rock below and space above, millions of diverse species thrive. Together, they form the ecosystems and habitats we so readily recognize as planet Earth – and which, in turn, supply a multitude of ecosystem services upon which people, and all life, depend. The ever-growing human demand for resources, however, is putting tremendous pressures on biodiversity. This threatens the continued provision of ecosystem services, which not only further threatens biodiversity but also our own species' future security, health and well-being.

Introducing the Guianas

Rich in biodiversity, cultural diversity and natural resources, the Guianas form a unique region. Situated in the northeastern part of South America, the Guianas, which include Guyana, Suriname and French Guiana, harbor vast expanses of primary tropical forest and enormous volumes of freshwater. The region is home to many unique ecosystems and endemic species, as we will learn in chapter 2. Furthermore, the region is shared by indigenous and maroon communities, descendants of runaway slaves from Africa, who depend on the forest and rivers for their livelihoods. Their knowledge and skills are vital for proper conservation of the region, besides being a great asset to world culture.

Population densities in the Guianas are relatively low and are concentrated mainly in the coastal zone. Direct human pressures on the environment are therefore relatively low, which keeps the ecosystems and the services they render very much intact. However, as we will discover in chapter 3, growing international but also local demand for food, water, energy and natural resources such as gold, oil, bauxite and timber, are exerting increasing pressure on the region's natural systems and the wellbeing of its inhabitants.

Even though the three Guianas share natural richness, biodiversity and natural resources, protecting them and using them wisely will require different approaches, while at the same time offering opportunities for the countries to learn from each other. The three Guianas have different backgrounds in their political, economic and control systems. Guyana and Suriname are young, independent countries; French Guiana is an Overseas Department of France. However, they each share the ambition to focus on the promotion of further development. This provides a firm basis and offers the Guianas the opportunity to move towards sustainable and green economies, which forms the main subject of chapter 4 of this report.

Figure 1: The Guianas comprise 7 % of the Amazon biome and form a vital part of the Guiana Shield. *The Amazon Biome is defined as the area covered predominantly by moist tropical forest, with relatively small inclusions of several other types of vegetation, such as savannas, floodplain forests, grasslands, swamps, bamboos and palm forest. The Guiana Shield is an old Precambrian geological formation in the north of the Amazon Biome, spanning approximately 37% of the Amazon Biome.*

The Guianas and the Amazon Biome

Spanning 6.7 million km2 (twice the size of India, see figure 1), the Amazon Biome – also comprising the Guianas – is virtually unrivalled in scale, complexity and opportunity; it is truly a region of superlatives. Not only does the Amazon encompass the single largest remaining tropical rainforest in the world, it also houses at least 10% of the world's known biodiversity, including endemic and endangered flora and fauna, and its river accounts for 15-16% of the world's total river discharge into the oceans. The Amazon River flows for more than 6,600 km, and with its hundreds of tributaries and streams it contains the largest number of freshwater fish species in the world. Equally impressive are the uncountable numbers of mammals, birds, amphibians, and reptiles found across the biome.

During the last half century, the seemingly endless Amazon has lost at least 17% of its forest cover, its connectivity has been increasingly disrupted, and numerous endemic species have been subjected to waves of resource exploitation. The economic transformation of the Amazon based on the conversion and degradation of its natural habitat is gaining momentum. Yet, even as these threats grow in strength, we are also discovering that the Amazon plays a critical role in maintaining climate functions both regionally and globally, a contribution on which everyone depends, be they rich or poor.

WWF, through its Living Amazon Initiative, is directing its efforts to the establishment of 'an ecologically healthy Amazon Biome that maintains its environmental and cultural contribution to peoples, the countries of the region, and the world, within a framework of social equity, inclusive economic development and global responsibility'. The three Guianas together only comprise a mere 7% of the surface of the total Amazon Biome. However, while urgent threats to the Amazon elsewhere in the biome demand considerable attention, the Guianas are considered important to the mission of the Living Amazon Initiative because of the pristine state of many of its ecosystems and the low population pressures.

Further contributing to their relevance, the Guianas are almost completely encompassed by the Guiana Shield, which is considered by many as the largest tract of almost-pristine tropical rainforest, renowned for the vast quantity of ecosystem services it provides on a global scale (Guiana Shield Facility, 2012). The Guiana Shield is a geological formation that is 1.7 billion years old, located in the northern part of the Amazon Biome which, besides the Guianas, underlies parts of Brazil, Venezuela and Colombia. In its wider definition it spans approximately 2.5 million km2, around 37% of the Amazon Biome. The southern parts of the Guianas can be seen as part of the backbone of the Guiana Shield, where the long-term preservation of the Shield's integrity is determined.

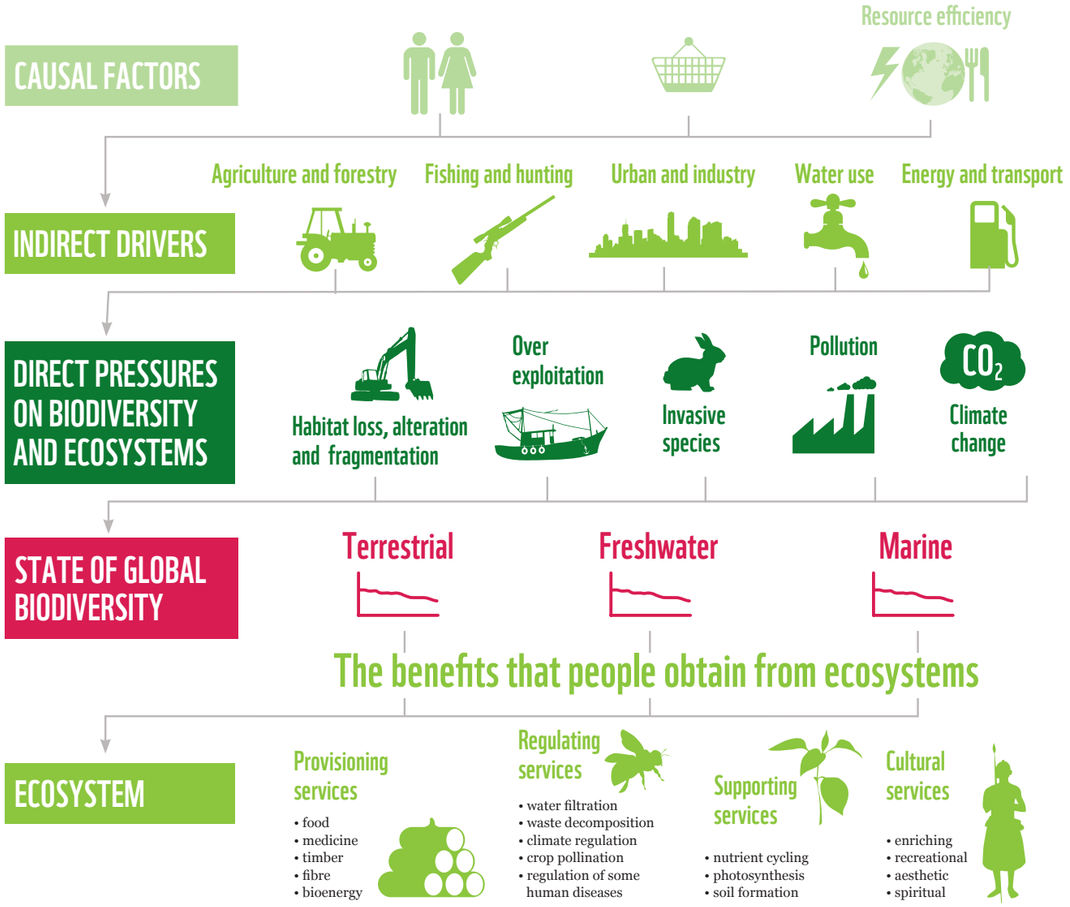

Figure 2: Interconnections between people, biodiversity, ecosystem health and provision of ecosystem services (above). The five greatest direct pressures to the state of global biodiversity (below).

The five greatest direct pressures to the state of global biodiversity are:

- **The loss, alteration, and fragmentation of habitats** – mainly through conversion of natural land for agricultural, aquacultural, industrial or urban use; damming and other changes to river systems for irrigation or flow regulation.
- **Overexploitation of wild species' populations** – harvesting of animals and plants for food, materials or medicine at a rate higher than they can reproduce.
- **Pollution** – mainly from excessive pesticide use in agriculture and aquaculture, urban and industrial effluents, mining waste and excessive fertilizer use.
- **Climate change** – due to rising levels of greenhouse gases in the atmosphere, caused mainly by the burning of fossil fuels, forest clearing and industrial processes.
- **Invasive species** – introduced deliberately or inadvertently to one part of the world from another, they then become competitors, predators or parasites of native species.

Linking biodiversity, ecosystem services and people

Biodiversity is vital for the health and well-being of mankind. Plants, animals and micro-organisms form complex, interconnected webs of ecosystems and habitats, which in turn supply a myriad of ecosystem services upon which all life depends (see figure 2). Although technology can replace some of these services and provide a buffer against their degradation, many are irreplaceable. Understanding the interactions between biodiversity, ecosystem services and humans is fundamental to reversing the trends outlined in chapter 3 of this report, 'Drivers and pressures on the Guianas' natural capital' and making better choices, such as those presented in chapter 4, so safeguarding the future security, health and well-being of human societies.

All human activities on earth make use of ecosystem services, but can also put pressure on the biodiversity that supports such services. In large part, threats stem from human demands for food, water, energy and materials, as well as the need for space for infrastructure. These demands are met by a few key sectors: mining, industry, water and energy. It is vital that these sectors come to understand the importance of sustainability as a fundamental pillar of their business, if we hope to set the world back on a trajectory that allows consumption to fall within the planetary boundaries.

Challenges and opportunities for green economies

Unsustainable models of economic activity in both developed and emerging economies are driving the loss of ecosystems, ecosystem services and biodiversity. In too many cases the over-exploitation of resources and damage or destruction of ecosystems involve great, short-term profits for a few stakeholders, while the long-term benefits of protecting, maintaining and investing in natural capital are inadequately valued or are even entirely neglected in any economic sense. Given the continuing global decline in biodiversity and increasing stress on ecosystem services available for economic activities, the urgency to move towards green economies is thus greater than ever (LPR, 2012).

In its somewhat simplified form, WWF refers to a green economy as 'a values-driven economy that enhances life – for people and nature to thrive'. UNEP, promoter of the Green Economy Initiative, defines it as an economy that results in 'improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities' (UNEP, 2012). The "green economies" strategic approach, proposed by WWF and others, aims to stimulate economic development that operates within the ecological boundaries of our planet, in both industrialized and emerging/developing economies. Economic activities of extraction and production are one of the biggest drivers of environmental loss, while there is potential for them to become important drivers of conservation. Solutions focus on greening high-impact sectors, managing natural capital in sustainable and equitable ways, rewarding those who provide ecosystem services and conserving biodiversity, greening financial flows, ensuring good governance and adapting the economy to stay within the planetary boundaries, whilst ensuring social equity and developing sustainable livelihoods. For this purpose a framework has been produced, based on a 'better choices from a one planet's perspective (see figure 22 on page 69 of this report), which involves governments, businesses and consumers and aims to create opportunities that are beneficial for nature and people.

A green economies approach could prove essential to ensure the long-term preservation of the natural capital of the Guianas. This is of international relevance, but most of all, it is also crucial to ensure truly sustainable development at the national level. This report provides a framework for making better choices for the Guianas with a brief look at the three Guianas individually. It seeks to form a basis for the development of national recommendations, which can only be formulated in a national process involving a satisfactory representation of relevant stakeholders.

8

different monkey species can be observed in the Guianas. Guianan red howler (*Alouatta macconnelli*) in Brownsberg, Suriname.

2. STATE OF THE GUIANAS: BIODIVERSITY AND ECOSYSTEM SERVICES

BIODIVERSITY

The Guianas are rich in biodiversity, with many endemic species and unique ecosystems. Biodiversity is a key value of ecosystem health and human wellbeing, and serves local people with food, medicines, income and other sources of livelihood. Moreover, biodiversity has intrinsic, as well as recreational value. Preserving biodiversity is thus of great importance to the Guianas and the whole world.

Eco-region

The Guianas encompass a wide variety of ecosystems, which cluster into different 'eco-regions': large areas of land and water that harbor a characteristic array of species, plant communities, dynamics and environmental conditions. The Guianan Eco-region Complex is made up of seven distinct terrestrial and four freshwater eco-regions. The Complex is internationally recognized as an area that it is important to conserve and it has been included in the WWF's Global 200 Eco-regions, a list of worldwide eco-regions prioritized for conservation. The Complex contains a combination of great species diversity, including both plants and animals, many of which are endemic to the region (meaning that they do not naturally occur outside of this restricted region). It is estimated that 40% of the flowering plant species are found only in the Guianas. Scientific explorations and biodiversity assessments still frequently discover species that are new to science.

Megadiversity

The megadiverse countries are a group of countries that harbor the majority of the Earth's species and are therefore considered extremely biodiverse. Conservation International identified 17 megadiverse countries, including the three neighboring countries of the Guianas (Mittermeier, 1988). The Guiana Shield, the larger region in which the Guianas is situated, could be considered megadiverse as a whole. To qualify as a megadiverse country, it must house at least 5000 of the world's plants as endemics (Mittermeier, 1988). Due to the small area of the territories involved, the Guianas do not classify as megadiverse; however, the biodiversity concentrations (tables 3 and 4) are expected to be similar to those of the neighboring megadiverse countries.

Threatened species

How threatened are the plants and animals of the Guianas? While this question may appear simple, it is difficult to answer, even though the region has a long tradition of exploring its species diversity, by both national and international taxonomists. Especially in remote regions, some portion of the species present are still unknown to science, while the conservation status of a large number of reported species has not been evaluated. For example, 33% of all plant species occurring worldwide are so poorly known that no conclusions can be drawn about their conservation status (Royal Botanical Gardens, 2010). Table 5 summarizes current knowledge of the fraction of threatened species reported in the Guianas according to the IUCN Red List (IUCN, 2012), compared to the global figures for different taxonomic groups. The percentages of threatened species reported for the Guianas are relatively low.

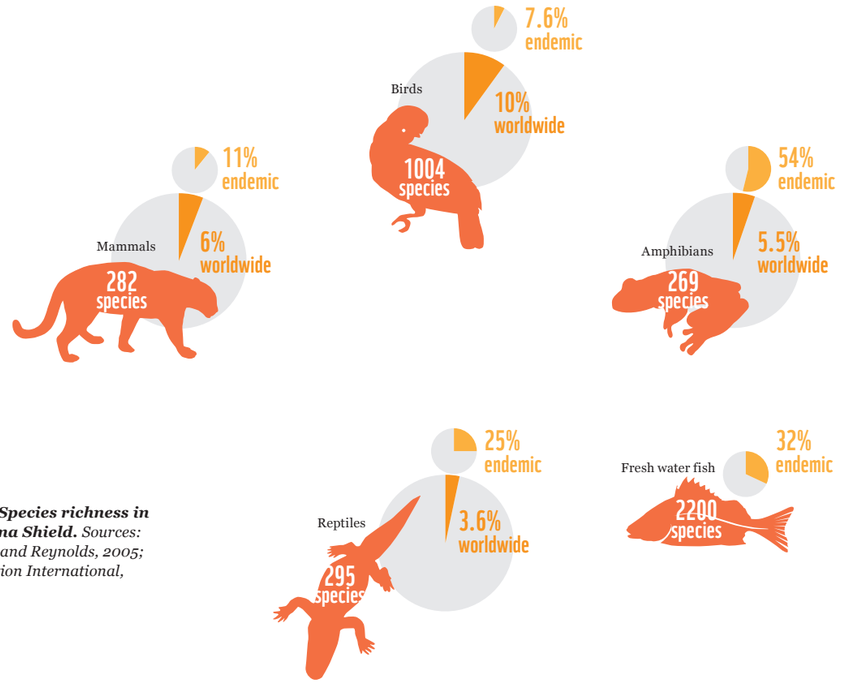

Table 4: Species richness in the Guiana Shield. *Sources: Hollowell and Reynolds, 2005; Conservation International, 2003.*

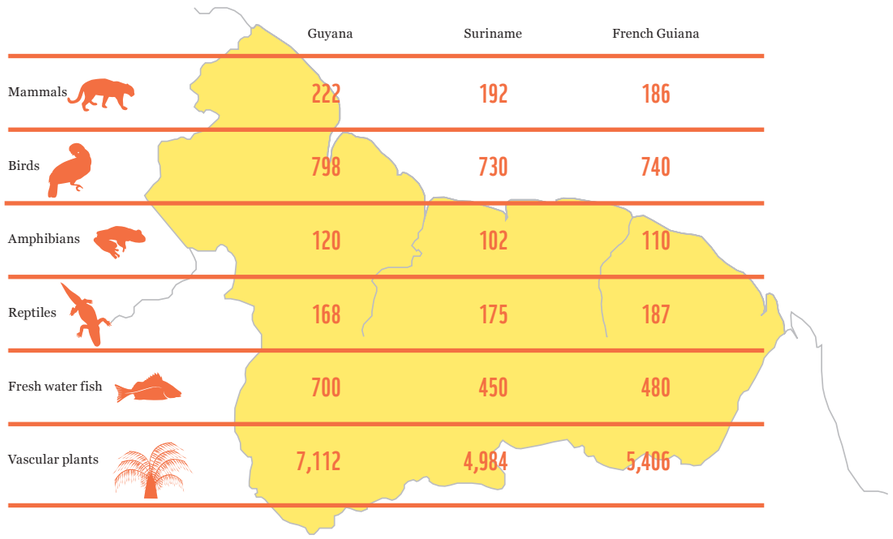

Table 3: Number of species per taxon in the Guianas. *Sources: Hollowell and Reynolds, 2005; DIREN, 2006; Conservation International, 2003; Funk et al., 2007.*

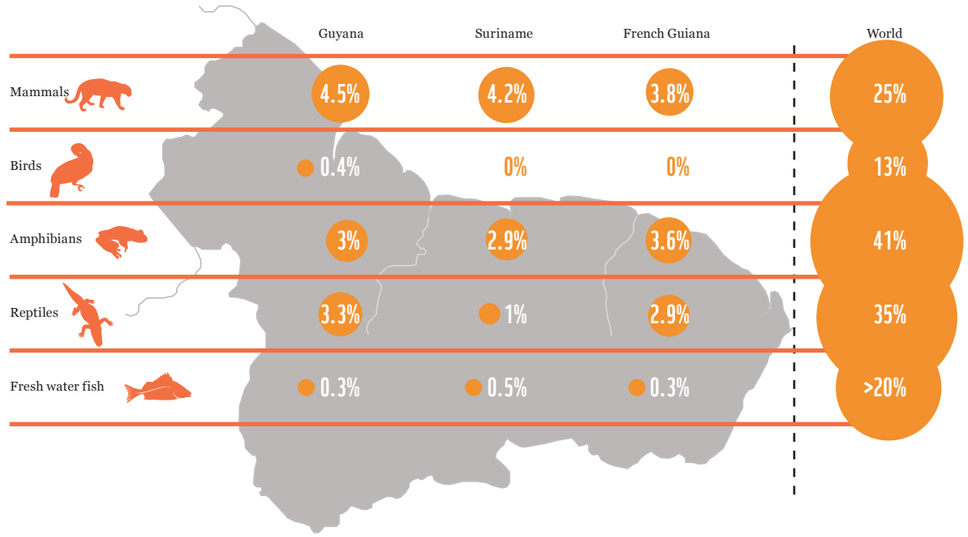

Table 5: Percentage of threatened species per taxon in the Guianas. *The IUCN Red List of Threatened Species™ provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria Threatened species. Species included in the table occur in the categories: vulnerable, endangered, critically endangered, extinct or extinct in the wild. Source: IUCN, 2012.*

Unique ecosystems
Besides the dense tropical forests, the Guianas encompass other unmatched terrestrial ecosystems, such as sandstone Table Mountains and vast tracts of white-sand savannahs, each with its own unique biodiversity.

Dramatic Tepuis

The Guianas host an archipelago of isolated sandstone plateaus and dramatic summits atop nearly vertical escarpments. These tabletop mountains extend from Venezuela into Guyana and Suriname. They are also called *tepuis*, after the Pemón Amerindian word for "house of gods". Some tepuis are graced by large waterfalls. Spectacular examples are Mount Roraima at the border of Guyana, and the Tafelberg in Suriname. Prolonged isolation and an abrupt topography have led to a unique habitat with many endemic plant and animal species.

Rupununi savannah and wetlands

The Rupununi Savannah in southern Guyana is a sparsely settled rolling plain, covering about 15,000 km². Huge ranches spread out from the wide Rupununi river, with sturdy buildings set on stilts in case of high water. *Vaqueros*, cowboys, are dedicated to cattle ranching in the vast dry grasslands. Amerindian communities include the Macushi, Wapishana, and Wai Wai. The Rupununi Savannah is intersected by the Kunuku Mountains, where wildlife abounds. Giant anteaters, harpy eagles, and jaguars all find a refuge here. The seasonally flooded North Rupununi wetlands are the spawning grounds for many fish species, and home to the large Arapaima fish.

White-sand savannahs

The white-sand savannah of the Guianas is a unique lowland landscape. It consists of infertile, coarse bleached and unbleached sands and sandy clays of continental origin. White-sand savannah areas of various sizes are scattered throughout the region. Most striking are the sediments which were exposed and have undergone intense bleaching, resulting in coarse white sand. They are covered with xerophytic scrub or woodland and partly with tropical rainforest. In Suriname, a savannah belt that lies on quartz rich sand sediments crosses the country from east to west, covering about 7% of the total land surface, and stretching well into Guyana and French Guiana.

2810 METERS RISES MOUNT RORAIMA IN ELEVATION, MAKING IT THE HIGHEST OF THE TEPUIS. IT IS LOCATED ACROSS THE BORDER AREAS OF SOUTHERN GUYANA, BRAZIL AND VENEZUELA AND IS ONE OF SEVERAL OPPORTUNITIES FOR TRANSBOUNDARY PROTECTED AREAS IN THE GUIANA SHIELD.

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Unique and characteristic species

The Guianas' lands and waters are endowed with a unique biodiversity of both flora and fauna, with an extremely high level of endemism. Few data are available on trends in the status of the biodiversity, but considering that large tracts of ecosystems that serve as habitat for many species are virtually intact with little disturbance by humans, it may be fairly confidently expected that most species continue to thrive and that populations are stable. The current status of these species provides a good baseline measurement for future monitoring. Unfortunately, there are also several exceptions where pressures from such activities as hunting for food and trade, poaching and pollution have led to observed or expected declines in populations.

Least concern

Guianan Cock-of-the-Rock

One of these unique species inhabiting the forest is the Guianan Cock-of-the-Rock (*Rupicola rupicola*). This bird has been identified as one of the key flagship species of the region (Guiana Shield Initiative, 2002). The male's striking orange coloring, complete with an attention-grabbing Mohawk, gives the bird its unique appearance, so it is no wonder that it graces the covers of so many tourist brochures. The Guianan Cock-of-the-Rock is found in the mountainous regions of the Guiana Shield and the population is healthy (Guiana Birding, 2012).

Vulnerable

Lowland tapir

The Lowland tapir (*Tapirus terrestris*) is a relative of the rhinoceros and inhabits the rain forests of South America. The Lowland tapir is the largest land mammal in South America, after the Baird's tapir. The lowland tapir lives near water and is a competent swimmer and diver. A long, flexible snout helps Tapirs grasp leaves, shoots, buds, fruit, and small branches to eat. The mammal is listed as vulnerable on the IUCN Red List. In French Guiana, Tapirs are regularly hunted and sold commercially for meat in markets and restaurants. Little information is available on the population in Guyana and Suriname, but Tapirs are not protected and are hunted both by subsistence hunters and by a developing bush-meat industry as roads are cut into the forest for logging (Naveda *et al.*, 2008).

West-Indian manatee

The West-Indian manatee (*Trichechus manatus*), is an aquatic mammal that occurs in coastal waters throughout the Caribbean region. The manatee is herbivorous and inhabits near-shore waters, lagoons, estuaries, grass swamps, mangroves and lowland forests (Lefebvre *et al.*, 1989). Interviews in French Guiana suggested that manatees may be less abundant than in the recent past, but they are still present and are regularly sighted along the coast of the Guianas and in estuaries up to 80 km inland. The main reasons for any recent decline are probably hunting for meat, pressures from development and, in some areas, marine pollution (De Thoisy *et al.*, 2003).

1 MONTH IS THE BREEDING PERIOD FOR THE GUIANAN COCK-OF-THE-ROCK (RUPICOLA RUPICOLA). THE STRIKING MALE ATTRACTS BIRD LOVERS FROM ALL OVER THE WORLD FOR ITS IMPOSING FEATURES AND COLOR. WANTED AND HUNTED FOR ITS FEATHERS, THE BIRDS ARE NOW PROTECTED BY THE GUIANAS' NATIONAL LAWS.

Endangered

Giant otter

The endangered Giant otter (*Pteronura brasiliensis*) has been recognized as another key flagship species (Guiana Shield Initiative, 2002), especially given the fact that the Guianas are now one of its last major strongholds and the species is now under threat from the toxic effects of mercury from the unregulated gold mining, which concentrates in river systems. The Giant otter is the largest of the world's thirteen otter species. It is a top predator in neo-tropical freshwater ecosystems, and is therefore an appropriate indicator species for changes in fish populations and anthropogenic disturbance. Otters require large home ranges and can rapidly disappear from even remote river systems due to their pronounced sensitivity to human disturbance and their vulnerability to mercury accumulation. Research on giant river otters in three rivers in Guyana and in Suriname showed that undisturbed locations have healthy otter populations, and that human activities such as hunting, logging, tourism and commercial fishing impact the population adversely (Duplaix, 2002). Finally, the charismatic and endangered Giant otter is respected in the region, and has not been hunted to near extinction as in other parts of South America. As such, it can be used as a catalyst to spearhead conservation awareness and to promote actions to protect key rivers. However, more river surveys need to be done and the rivers that have been surveyed so far must be revisited at regular intervals to obtain meaningful data on species population and habitat threats (Duplaix, 2002). The recent increasing pollution of rivers and creeks by small-scale gold mining is expected to exert a negative effect on populations, but the true impact is unknown at the time of writing.

Critically endangered

Leatherback

The IUCN has classified all sea turtle species as critically endangered or endangered and all locally occurring sea turtle species are protected by the national laws of the Guianas. Given the global decline in marine turtles over the last few decades, the Guianas' coast has become one of the more important nesting areas for the Atlantic Leatherback, which is among the most endangered species. The Leatherback *(Dermochelys coriacea)* is the largest of all sea turtles. It lacks a bony shell, as its carapace is covered by skin and oily flesh. It can grow to more than two meters in total length and up to 700 kilograms in weight. Direct nest counts in Suriname and French Guiana between 1967 and 2002 were used in a modeling study by Girondot *et al.* (2007), which stated that the entire population of Leatherbacks in French Guiana and Suriname is stable or slightly increasing. Fossette *et al.* (2008) added the most recent data for 2003-2005 to this database, analyzed the trend, and reported that a conservative interpretation is that the Leatherback population has been stable during this period. However, continued careful monitoring to accurately determine its overall status is required (Fossette *et al.*, 2008), especially in view of pressure on the population from by-catch in fishing operations, and egg poaching.

Unknown

Guiana dolphin

In French Guiana, a single study of the Guiana dolphin *(Sotalia guianensis)*, conducted in 2001 by Bouillet *et al.* (2002) showed that the dolphin can be sighted in estuaries along the entire coast, particularly in the dry season, and in rocky areas throughout the year. Threats impacting the species in French Guiana include incidental catches in large-mesh fishing nets, often towed by vessels registered in Brazil and Suriname, and chemical pollution, which affects both Guiana dolphins and other cetaceans.

10,000 NESTS

are made annually by the critically endangered Leatherback (*Dermochelys coriacea*) on the beaches of French Guiana and Suriname. The relatively undisturbed beaches of the Guianas are of immense importance to the survival of this gentle giant.

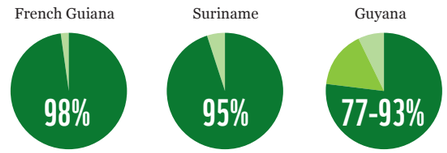
© Roger Leguen / WWF-Canon

FORESTS

Forests are essential to supporting life on Earth. The forests of the Guianas, together with similar forests in Brazil, Venezuela and Colombia within the Guiana Shield, form one of the largest continuous tracts of primary tropical rainforest left in the world. The forest delivers an array of ecosystem services; it sequesters large amounts of carbon, it provides timber and non-timber forest products, and it provides a home and livelihood for local people living in it.

Forest cover

Forest cover in the Guianas is among the highest in the world. Indeed, the Top 5 is led by French Guiana, which is a department of France, followed by Suriname, which has the highest reported forest cover of any country in the world (table 6).



	French Guiana	Suriname	Guyana
Forest cover x 1000 ha	8,082	14,758	15,205 to 18,395*
Net annual change rate in %	-0.06	-0.01	-0.00 to 0.06*
Annual primary forest loss in %	0.19	0.07	0.00 to 0.06*

Table 6: Reported forest cover, net annual change rate and annual primary forest loss. *Forest cover in the Guianas is among the highest in the world, with very low annual rates of change. Net annual rate of change is the difference between annual forest loss and forest gain. Average annual rates are calculated over 20 years for French Guiana and Suriname and 10 years for Guyana. Average annual primary forest loss follows the FAO definition, which has been interpreted differently for each of the Guianas. Sources: FRA, 2010; GFC and Pöyry, 2011. * These figures have been updated in the interim measures report of the Guyana REDD+ Monitoring Reporting and Verification System (GFC and Pöyry, 2011).*

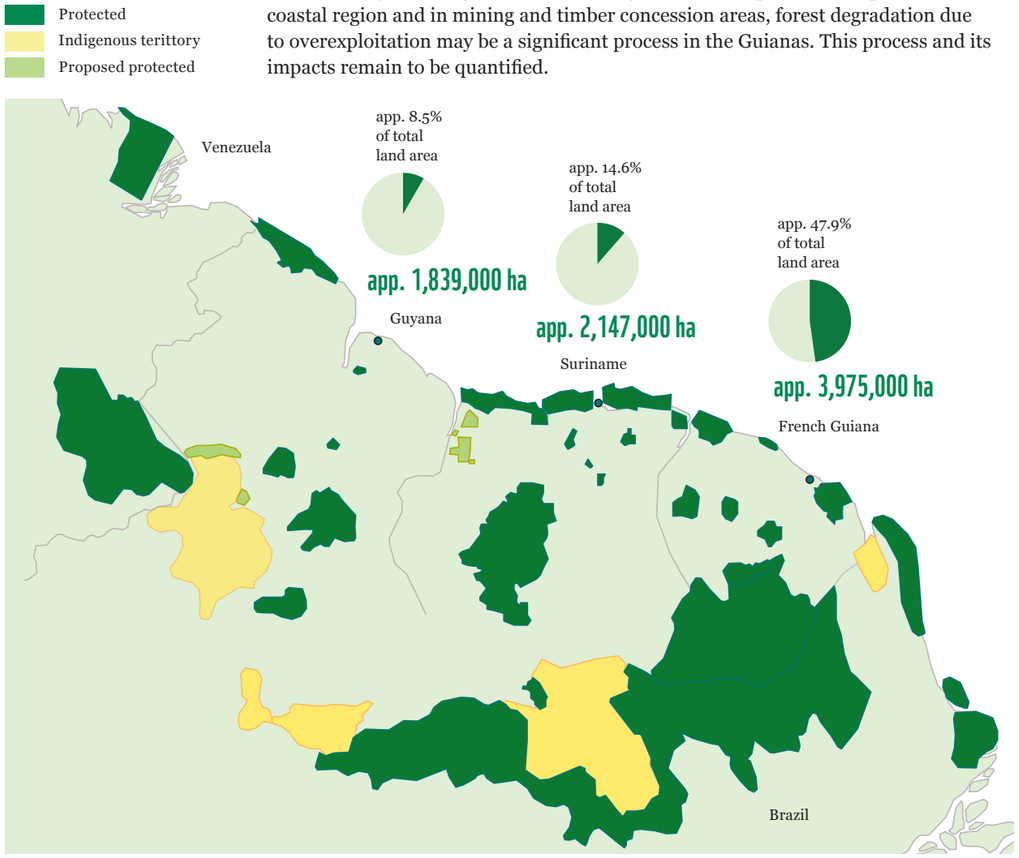
In the recent Forest Resources Assessment conducted by the FAO (FRA, 2010), about 95% of the forest of French Guiana and Suriname is classified as 'primary forest', which should not be interpreted as forest without human inhabitation or disturbance, but rather as largely intact forest. In Guyana, 45% of the forests are reported to fall in the category of primary forest. In Guyana, all (forestry and mining) concession areas are classified as non-primary forest, which explains why the category of primary forest remains stable according to these FRA (2010) figures. In French Guiana, from 1990 to 2005 a surface of 12,000 ha was exploited annually in concession areas. From 2005 to 2010, the rhythm of exploitation was 6,000 ha per year. This has resulted in a decrease of primary forest cover of 3.9% (1990-2010) or 0.19% per annum. In Suriname, a surface of 10,300 ha per year was exploited (2000-2010) or 0.07% of primary forest loss per annum.

An even more recent study commissioned by the Guyana Forestry Commission as part of the Monitoring, Reporting and Verification (MRV) under the REDD+ (a market-based incentive to reduce emissions from deforestation and forest degradation) process (GFC and Pöyry, 2011), revisited the forest cover and change rate figures for Guyana. Here, extensive Savannahs and other semi-forested lands have been included in the forest cover. Moreover, forest loss due to mining has been assessed and included, resulting in an annual change rate of 0.02% for the reporting period 1990-2009, increasing to 0.06% in 2009-2010.

The Guianas truly rank as High Forest cover, Low Deforestation countries, or HFLD. The term HFLD is applied to those countries that had forest cover greater than 50% in 2005 and average annual deforestation rates lower than the global average of 0.22% during the reference emission period of 1990–2000. Only 11 countries are considered to be HFLD countries, and they harbor 18% of tropical forest carbon (Fonseca *et al.*, 2007).

The figures presented here provide information on the quantity of forest cover in the Guianas. These figures do not reveal important changes in forest quality, however. Logging, mining, and the occurrence of fire may result in temporary or permanent decreases in tree density and other changes in vegetation structure. Irreversible impoverishment of the forest ecosystem due to human activities, or 'forest degradation', in turn affects ecosystem services such as biodiversity conservation, carbon storage, and regulation of hydrological cycles. In particular in parts of the coastal region and in mining and timber concession areas, forest degradation due to overexploitation may be a significant process in the Guianas. This process and its impacts remain to be quantified.

Figure 7: Map and land cover of the Protected Areas and Indigenous territories of the Guianas. *Extent and percentage of protected areas are an approximation, depending on the areas included (e.g. multiple-use zones, indigenous territories) and the total land cover used. Here an upper estimation of the proportion of the land cover of Protected Areas has been presented. Sources: Protected Planet and WDPA, 2012. Note that the areas for Guyana include Kanuku mountains (611,00 ha) and Shell Beach (169,200 ha), two recently added protected areas.*



Protected areas are cornerstones for conservation

The Guianas possess extensive protected areas systems, while coverage of total land surface varies widely per country (figure 7). Well-managed protected areas play a vital role in ensuring that ecosystems continue to function and provide ecosystem services, benefiting people within the boundaries of the protected area, in adjacent ecosystems and around the world. To fully safeguard the biodiversity that supports ecosystem services, an ecologically coherent network of protected and sustainable-use areas needs to be established around the globe. One of the main characteristics of an ecological network is that it aims to establish and maintain the environmental conditions necessary for the long-term conservation of biodiversity. Whereas only Guyana is currently below the global average of 13% of total land surface being designated as protected areas, both Guyana and Suriname have yet to reach the 2020 objective as formalized under the Convention on Biological Diversity (CBD) of assigning and effectively managing 17% of total land surface in protected areas. While Guyana has the least coverage of protected areas, they have strong regulatory mechanisms in place that are exemplary within and outside the region for forest conservation outside protected areas. Among these are the Codes of Practices for forest operators, the revised Forest Law (2009), a national forest policy, institutional restructuring, and REDD+ as a guiding framework for resource use in the forests. In the case of Suriname, similar actions are being taken to support forest conservation.

Protected areas network in French Guiana

Parc Amazonien in the south of French Guiana covers 3.3 million hectares of tropical forest, and is the largest protected area in the Guianas. This park borders in the south on the network of protected areas in northern Brazil, which includes the Tumucumaque Park and the Maicuri Reserve among others. The Brazilian and French network presents a magnificent area of 12 million hectares, which makes it the largest protected tropical forest in the world. The establishment of large protected areas connected through a network is important for the protection of rare habitat, the conservation of ecological processes, and the survival of species that require large territorial areas, such as the harpy eagle and the jaguar.

Conservation of World Heritage in Suriname

In 1998, the Surinamese government set aside 10% of land to create the Central Suriname Nature Reserve. Two years later, UNESCO named the reserve a World Heritage Site for its pristine tropical rainforest ecosystem, and 16,000 square kilometers of both montane and lowland primary tropical forest, including sections of the Guianas Highlands (Protected Planet, 2011).

Protected Areas Bill as legal framework in Guyana

The government of Guyana wanted to make a commitment to protect the country's natural heritage and to create a national system of protected areas. In July 2011, the passage of the Protected Areas Bill made this possible. The Bill provides for the establishment of a protected areas commission, the creation of a national protected areas system and the establishment of a protected areas trust fund. The Bill provides penalties for individuals who invade a protected area without permission from the Commissioner or the Minister. In October 2011, President Bharrat Jagdeo approved the declaration of the Kanuku Mountain area and Shell Beach as protected areas, amounting together to almost one million hectares. Shell Beach is one of the most important marine turtle nesting beaches in Guyana.

Conservation of Amerindian titled lands in Guyana

The 625,000 ha Konashen Community-Owned Conservation Area serves as an Anthropological Reserve and is Guyana's first Community-Owned Conservation Area (C.O.C.A.). It is the largest protected area in the country managed exclusively by an indigenous group, the Wai Wai, which brings a large stretch of rain forest under sustainable management while ensuring the continued development of the Wai Wai people and their traditional way of life. The Wai Wai of Konashen District in the south of Guyana received title to the land in 2004 and partnered with Conservation International and the government of Guyana to have the entire area established as a protected area.

Conservation and eco-tourism in Suriname

Peperpot Nature Park and Corridor in Suriname is a 700 hectare private protected area in Suriname set up in 2011. It houses many exotic bird and plant species. It is a regenerating swamp forest that was formerly a coffee and cocoa plantation. It is located only ten minutes away from Paramaribo and offers a unique experience of nature with a major focus on bird watching and (educational) nature walks. The Peperpot Plantation is an inheritance from the Dutch colonial period. Coffee and cacao were produced here, but the plantation was abandoned decades ago. The 700 ha Nature Corridor, with a surprisingly rich biodiversity, was established to ensure wildlife connectivity with the hinterlands.

Carbon storage and fluxes

There has been an explosive growth of interest in the world's forests, especially with an expanding awareness of their role in the global carbon cycle and the contribution forest loss makes to climate change. The forests of the Guianas sequester large amounts of carbon in biomass, both above ground and in the soil, and thus play an important role in global carbon exchange. The possibility of mitigating climate change by storing large amounts of carbon in biomass highlights their vital role in the functioning of the planet's natural systems. It is estimated that the Guianas holds in total 2.6% of the world's terrestrial carbon stock of 6.15 Mt C. Carbon density in the Guianas is relatively high at around 160 t/ha or more, compared to the world average, which is 71.6 t/ha (Saatchi *et al.*, 2011).

Forest degradation may result in longer-term reduction of carbon stocks present in forest ecosystems (see page 24). Impacts of forest degradation have not yet been quantified for the Guianas, but are relevant in view of the development policies and projects to reduce emissions due to land use change (in particular REDD+ policies).

Sustainable timber production

Timber production has significant potential as an ecosystem service that can generate a continuous stream of income, provided the forest is managed sustainably. Wood extraction in the Guianas is generally done at low intensities and by applying long rotation cycles (25 years or more). In Suriname, as well as the other Guianas, a long tradition of scientific research provided the basis for the development of the CELOS Management System for sustainable forest management (Werger, 2011). The principles developed in the CELOS Management System form an important foundation for modern forest management in Suriname. Similar sustainable forest management systems exist in French Guiana and Guyana, and current intensities of exploitation are low. Forest management is informed by scientific research. Exploitation of primary forest resources leads to temporary decrease in forest density, which is expected to recover within several decades. For further details on sustainable timber production see page 57 of this report.

65-90%
OF ALL PLANT SPECIES IN THE GUIANA SHIELD ARE CONSIDERED USEFUL BY LOCAL, INDIGENOUS AND MAROON PEOPLE

Non-timber forest products

Local people have used the biodiversity of the Guianas for thousands of years. Many indigenous and local communities in the region are dependent on natural resources for their survival (van Andel, 2000). Non-timber forest products (NTFPs) are defined here as all wild plant and animal products that can be harvested from forests or other types of natural ecosystems (Ros-Tonen *et al.*, 1995). This definition excludes the use of industrial timber, but includes the small-scale use of wood for canoes, crafts, house construction and fuel. Commercialization of NTFP's represents a 'hidden economy' in the Guianas. For many products, data on the quantities harvested, domestic trade, export volumes and revenues are either unreliable or simply do not exist (van Andel, 2003). Recent reseacht has revealed an overwhelming diversity and lively trade of NTFPs in the Guianas (van Andel, 2000; Grenand *et al.*, 2004; van Andel *et al.*, 2007; van Andel and Ruysschaert, 2011).

Podosiri

Podosiri is the Surinamese name for açai, the fruit juice of *Euterpe* palms. *Euterpe* fruits and the processed podosiri drink are commercialized throughout Suriname (Van Andel, *et al.*, 2003). Palm products are important NTFPs in the Guianas. Palms are abundant in coastal swamps, often forming almost pure stands, while in the interior the species are merely restricted to swampy places in the forest.

Ecotourism

Ecotourism promotes a fair regional economy, which does not comprise the region's ecosystem services, biodiversity and cultural integrity, but actually rewards the inhabitants for maintaining the forest. Ecotourism is perceived as an effective way to combine conservation efforts with economic development, and it offers great potential for the Guianas (Olsder, 2004). Economic benefits are often a reason for local communities to turn to tourism development. Even though the sector is growing, it is still small-scale, with over a hundred tour operators throughout the Guianas at the time of writing. Hardly any statistics are available on the ecotourism market, and some operators give their own interpretation of what ecotourism means in practice. Efforts to certify ecotourism are in their infancy (Olsder, 2004). However, it is estimated that sustainable, nature-related tourism contributes 1% to GDP in Suriname (Tropenbos, 2009). Community-based ecotourism, with close involvement and a certain degree of ownership by local communities, is found at several locations within the Guianas, as in Surama village in Guyana. Some of the prime ecotourism sites in the Guianas include Kaieteur National Park (Guyana), Tresor Reserve (French Guiana) and Brownsberg Nature Park (Suriname). However, these locations are threatened with degradation, particularly from gold mining.

226 METER

The height that the single-drop Kaieteur Falls in Guyana plunges down from the Potaro River. This is twice the height of the Victoria Falls, located on the border of Zambia and Zimbabwe in Africa. Together with its volume of 663 m^3 water per second, this waterfall has an uncommon combination of height and water volume, making it one of the most powerful waterfalls in the world.

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RIVERS AND OTHER FRESHWATER SYSTEMS

The region's name Guianas originates from an Amerindian term for 'land of many waters', reflecting the vast amounts of freshwater available. The Guianas contain an extensive complex of wetlands, streams and rivers that drain the savannas, rainforests and uplands into the Atlantic. The freshwater system of the Guianas supplies drinking water and provides fish, which forms a major source of protein for the local people.

Freshwater surplus

All people depend on water. The Guiana Shield region contains approximately 10-15% of the world's freshwater volume, and given the worldwide water problems predicted for 2025 (IWMI, 2000), the conservation of this region's hydrological services can be considered of global importance. South America could be considered the world's most water-rich region, with the Guianas leading the top five water surplus countries, which have in excess more than 100,000 cubic meters per capita per year. The top five surplus countries are Greenland, French Guiana, Iceland, Guyana, and Suriname (FAO- AQUASTAT, 2010).

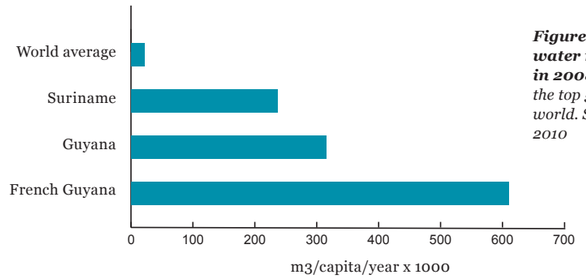

Figure 8: Total renewable water resources per capita in 2008. *The Guianas belong to the top 5 surplus countries in the world. Source: FAO-AQUASTAT, 2010*

Exporting fresh water

In January 2012, the President of Suriname announced a decision to prioritize a feasibility study to become a major exporter of fresh water to the region. This could potentially solve problems with drinking water availability in Caribbean countries that are currently dealing with increasing water shortage, high prices and energy costs for sea water desalination. However, several challenges will need to be overcome before such an operation can prove economically and environmentally viable. None the less, potential future business opportunities could contribute to present-day good stewardship of the quality of the surplus water in the Guianas.

Freshwater quality

The availability of large surpluses of freshwater is a very important asset to local communities living in the interior and the population in the coastal region. High water quality probably predominates throughout the Guianas. Freshwater resources are presumed still to be of high quality in many places. However, in several locations in both urban and rural areas, the surface water quality is under severe stress due to poor sanitary practices, and industrial and mining activities (Water Resources Assessment, 2001). The presence of nutrients, chemicals and heavy metals in surface water reduces freshwater quality.

Freshwater quality in French Guyana

In French Guiana, oxygen assessments at 35 stations showed good quality at 63% of the stations. Of the 39 stations tested for mercury, 13% showed high levels. Other heavy metals tested at healthy levels (Office de l'Eau, 2009).

Freshwater quality in Guyana

In Guyana, sediments and suspended particulate matter in water along a 60 km stretch of the Potaro River basin were analyzed to better understand the sources of increased mercury in the carnivorous fish species. The increased levels of mercury in the sediments appear to have their origin in the placer gold mining activities, which require large amounts of soil and sediments to be excavated and processed. The source of mercury in soil may include atmospheric deposition (Paktunc *et al.*, 2004). In Georgetown and in populated areas of the coastal lowlands, surface water contamination occurs from inadequate waste disposal and chemicals used in the production of rice and sugarcane. Contamination of surface water could develop into a major health hazard. Chemical contamination of surface water occurs primarily near manufacturing areas, especially along major rivers within mining districts. The Essequibo, the Mazaruni, the Cuyuni, the Barima, and the Barama Rivers and associated tributaries are probably polluted by chemicals used in the mining industry, such as mercury (Water Resources Assessment, 1998).

Freshwater quality in Suriname

In Suriname, mercury levels in sediment and predatory fish were measured at 53 localities by Ouboter *et al.* (2012). The average mercury levels in bottom sediment exceeded the Canadian standard for sediment in most localities, except the coastal plains. Of the predatory fish, 41 percent had mercury levels above the European Union standard for human consumption (0.5 µg g-1). The mercury levels were highest in fish from the Brokopondo Reservoir, adjacent to several major gold mining areas, and the Upper Coppename River, a pristine area where mercury is expected to be deposited atmospherically.

2,200 FRESH WATER FISH SPECIES ARE KNOWN IN THE GUIANAS, 32% OF WHICH ARE ENDEMIC. MORE TREASURES ARE LIKELY TO BE FOUND, AS THE DISCOVERY OF 10 SPECIES NEW TO SCIENCE DEMONSTRATES, FOUND IN A RAPID BIODIVERSITY ASSESSMENT IN THE COPPENAME RIVER IN SURINAME.

Freshwater fish as protein source and income generation

Fish is the most important source of protein for the Amerindians and Maroons in the Guianas (Van Andel *et al.*, 2003), and members of the very common armored catfish family are the most important commercial freshwater species (Ouboter, 2001). Whereas it is not fully exploited, commercially viable opportunities for sustainable trade in ornamental fresh water fishes have been identified for the region (Grosman, 2002). Reaching up to three meters in length, the ancient, air-breathing Arapaima (*Arapaima gigas*) is the largest scaly freshwater fish in the world. It is distributed throughout the Amazon and is considered a delicacy in the region. In the Guianas it only occurs in Guyana. The Arapaima is in great demand in Brazil, which has resulted in the collapse of its population in Guyana (Castello, 2001).

Community-based management of Arapaima in Guyana

Out of concern for the arapaima fish population and the livelihood of the people of the North Rupununi in southern Guyana, a community-based monitoring and management project devoted to this fish was set up by the North Rupununi District Development Board (NRDDB) and the people of the North Rupununi. This work was funded and supported by WWF Guianas and IUCN NL. People of the North Rupununi can now sustainably harvest and trade arapaima while ensuring that the fish population will recover. Sixteen communities with a population of 5000 residents stand to benefit from this project.

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MARINE AND COASTAL SYSTEMS

The Guianas' coasts are exceptionally diverse, with mangrove forest fringing the coast, and a great variety of flora and fauna. Marine and coastal ecosystems are precious to humans, providing a number of services essential to our survival. The mangrove forest is still largely intact along most of the Guianas' coast and acts as a coastal barrier to saline water intrusion from the Atlantic onto the low-lying coastal areas, which are inhabited by over 80% of the region's population. Mangroves play an important role in the global carbon cycle. The marine waters provide animal protein, and the beaches serve as nesting grounds for leatherbacks and green turtles. They harbor a very diverse marine life, including large predatory fish, dolphins and whales, which we are only beginning to understand. As part of the marine zone under the influence of the Amazonian affluence, the Guiana's marine waters may even rank among the ten most productive marine systems in the world.

80% OF THE GUIANAS' POPULATION INHABIT THE LOW-LYING COASTAL AREAS, VULNERABLE TO CLIMATE CHANGE. COSTS FOR CLIMATE ADAPTION ARE ALREADY INCREASING IN THE REGION.

Coastal diversity

The Guianas' coastal zone is characterized by extensive intertidal mudflats, intersected by narrow sand and shell beaches, and major mangrove swamps that are bordered inland by shallow saline and brackish lagoons and swamps. The extensive mangroves and mudflats along this coast are among the most important, least degraded in the world, although they are increasingly coming under threat. The biodiversity of the Guianas' coastal zone is very rich, with unique species of both flora and fauna. The eco-region is renowned for the millions of migratory birds from North America that winter along the coasts, and for its beaches, which serve as nesting ground to four species of endangered marine turtles: the Leatherback, Olive Ridley, Green turtle and Hawksbill turtle.

Fish depends on healthy mangrove

Fish and shrimp products constitute a significant proportion of exports from Suriname (ASP, 2004). Studies in Suriname have indicated that 60-80% of all fish sold at coastal fish markets originate from mangrove areas (Finlayson & Moser, 1991) and that up to 90% of all fish and shrimp species in Suriname (incl. those caught offshore) are found in mangrove areas during one or more stages of their life cycle (University of Leuven *et al.*, 2006).

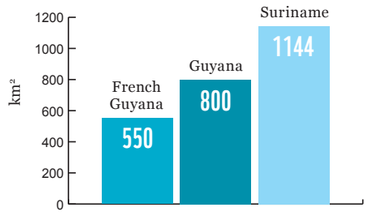


Figure 9: Mangrove cover.
Source: FAO estimates, 2005

Mangrove forests
The coast of the Guianas is covered with mangrove forest that extends several kilometers inland (figure 9). Mangroves are found in fringe communities as a band along the coast, interspersed by sandy beaches in a few places, as well as in small patches along river mouths and rivers in proximity to the sea. There are many protected areas along the Guianas' coastline, which has contributed to the conservation of large, intact blocks of mangrove forest and other natural ecosystems. Some fragmentation has occurred in recent decades as the habitat has been changed due to agriculture. Most fragmentation in Suriname and French Guiana has been due to natural forces, such as the coastal currents. In more recent years, particularly in Guyana, the loss of mangrove forest has been more severe, mainly due to agricultural expansion, fishing, urban development and replacement of the forest by dikes as a defense against the sea.

"Bio shield"
Mangroves are natural coastal defenses. They act as natural barriers, reducing erosion, trapping sediments, stabilizing shorelines, and damping wave action. On average, about 85% of the Guianas' population resides within 100 kilometer of the coast (Earthtrends, 2003) (Suriname: 87%; French Guiana: 93%, Guyana: 77%), so it is important that the region places great emphasis on the Atlantic Ocean and mangroves as natural sea defense structures.

Protein source
The Guianas' coastal waters foster some of the greatest productivity of fish and shellfish. Mangroves contribute substantially to the diversity, productivity and stability of fish communities in these tropical coastal waters. Mangrove habitat plays a variety of roles in the lives of fish and shrimp, including feeding areas, daytime refuges, spawning areas and/or nursery grounds. This typically includes many species that are of economic importance to fisheries.

Dynamic coast
The muddy coastline of the Guianas is fed by the silt washed from the mouth of the Amazon River and to a lesser extent from other major rivers, such as the Marowijne, Corentyene and Essequibo. Due to the westward-oriented Guiana current and the north-easterly trade winds, the Guianas' coastline is highly dynamic, being subject to successive phases of beach erosion and accretion. Due to westward-moving currents, both the sandy beaches and the mudflats move in westwards, thanks to erosion on the east and accretion on the west (Goverse, 2003). Sandy beaches and mudflats drift westward at a rate of 1.5 kilometers a year. The length of the beach erosion and accretion cycle is estimated to be approximately 35 years. In the Guianas, the presence of sandy beaches, which sea turtles rely on for nesting, is influenced by these coastal forces. Nesting beaches appear and disappear with the rhythm of sedimentation, coastal erosion and mud flat displacement. When sandy beaches disappear, or shift westward, so does the sea turtles' nesting habitat.

70-90%
OF THE ENERGY OF WIND-GENERATED WAVES IS ABSORBED BY MANGROVES DEPENDING ON THEIR HEALTH AND MATURITY

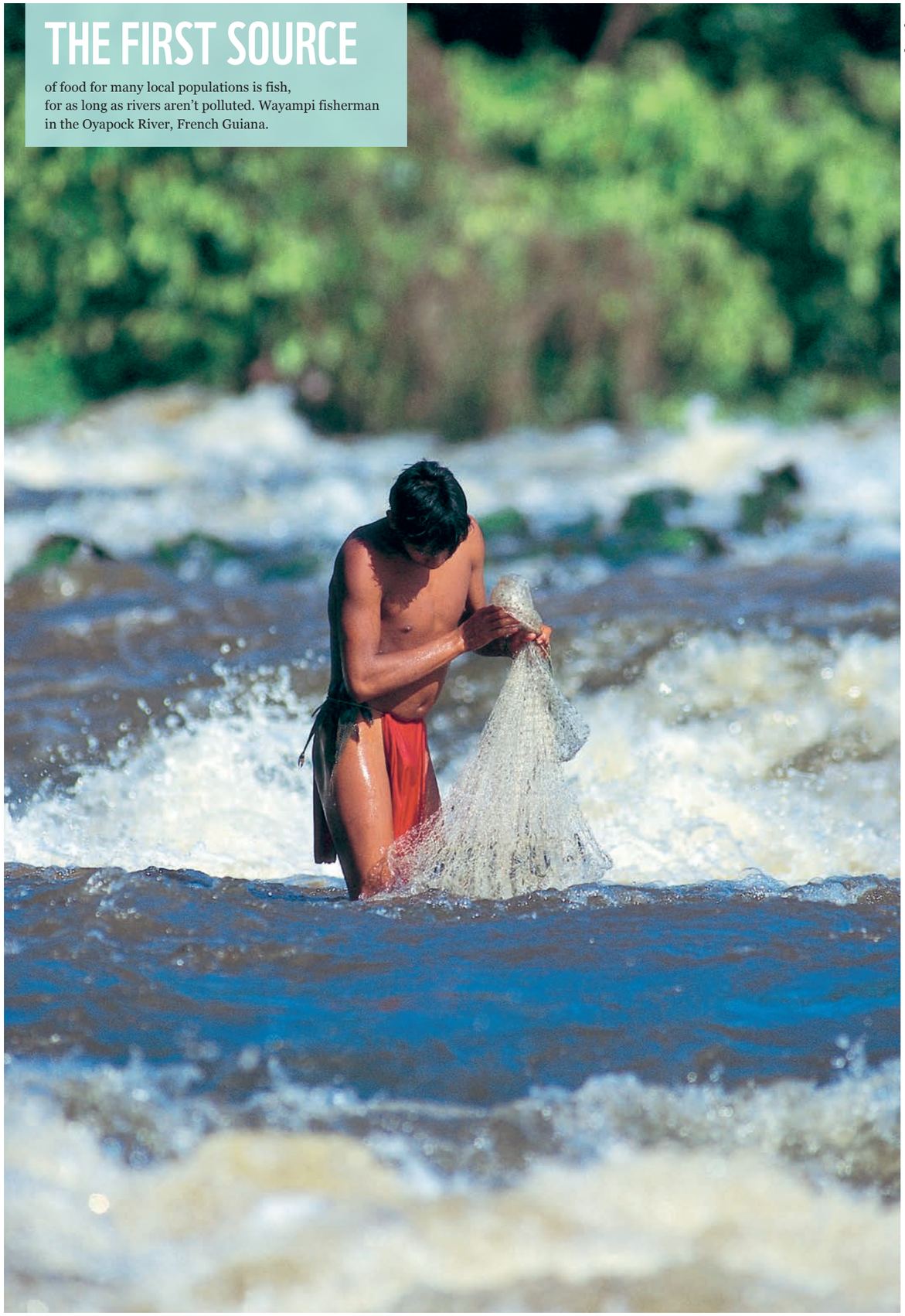
Marine turtle nesting habitat
The IUCN has classified all species of marine turtles either as critically endangered or endangered and all locally occurring sea turtle species are protected by the national laws of Guianas countries (IUCN, 2012). Given the global decline in marine turtles over the last few decades, the Guianas' coast, especially the area around the mouth of the Marowijne River, has become one of the most important nesting areas for Atlantic leatherback. To contribute further to its relevance, it appears that the Guianas population of leatherbacks is healthy and rather stable, compared to other populations in the world, which are often in steep decline. The most common nesting species are the Leatherback, *Dermochelys coriacea*, and Green turtle, *Chelonia mydas*.

Marine habitats
The marine diversity of the coast and the deep sea areas of the Guianas is not as well-known as its terrestrial wildlife. The marine habitats of the Guianas are highly productive. This high productivity is related to a high diversity and abundance of marine species. We are only beginning to understand what the status of the marine resources is, and how important these waters are for fisheries.

Many river plumes enrich the marine habitats with nutrients, including that of the Amazon river towards the east, and contribute to the productivity of the marine environment along the coast of the Guianas, which rank among the most productive in the world (Brichet *et al.*, 2011). From the mouth of the Amazon River to the Orinoco Delta of Venezuela, the sediments from the Amazon river dominate the coastal dynamics of the entire region. Three types of marine environment can be recognized: the continental plateau with high alluvium content and high turbidity, the steep continental slope, and beyond this slope oceanic habitats with deep-sea plains up to 4500 m deep (Van Canneyt, 2009; Brichet *et al.*, 2011).

A high density of cetaceans is observed. In particular, bottlenose dolphins are present in high densities and are found in large groups in the continental slope zone, as appeared from an aerial survey in French Guiana (Van Canneyt, 2009). The Guiana dolphin *(Sotalia guianensis)* is endemic to northeastern Latin America; its distribution follows the Amazonian river plume. The Guiana dolphin was recently recognized as a new species, distinct from the Tucuxi dolphin *(Sotalia fluviatilis)* (Brichet *et al.*, 2011). Its limited distribution makes the species vulnerable to human disturbance, in common with other dolphins associated to river plumes elsewhere in the world.

By combining marine mammal species lists from the literature, Brichet *et al.* (2011) arrive at a spectacular list of 30 different cetacean species reported for the region of northeastern Latin America, and one sirenian species, the West-Indian manatee *(Trichechus manatus)*. The Sei whale *(Balaenoptera borealis)*, the Blue whale *(Balaenoptera musculus)* and the Fin whale *(Balaenoptera physalus)* are endangered according to the IUCN Red List, while the Sperm whale *(Physeter macrocephalus)* and the West-Indian manatee are listed as vulnerable. Observations on the diversity and abundance of marine mammals have recently been confirmed (but not published yet) by marine mammal specialist observers aboard vessels involved with seismic exploration for oil drilling off the coast of the Guianas.



THE FIRST SOURCE

of food for many local populations is fish, for as long as rivers aren't polluted. Wayampi fisherman in the Oyapock River, French Guiana.

© Roger Leguen / WWF-Canon

3. DRIVERS AND PRESSURES ON THE GUIANAS' NATURAL CAPITAL

So far, ecosystem services, biodiversity and cultural diversity in the Guianas have been little affected by economic activities as compared to many other parts of the Amazon Basin. The loss of forest cover and forest degradation are of increasing concern in the Guianas, in particular in relation to mining activities and the development of new infrastructure. The effect of pollution of rivers and streams by mercury used in small-scale gold mining is increasing and poses proportionately increasing risks to local health and freshwater biodiversity.

The human dimension

In terms of its populations, the Guianas nowadays house an intriguing mixture of cultures, mostly revolving around the three capitals and several inhabited coastal areas. There is great ethnic diversity thanks to historical and more recent inflows of immigrants. Several indigenous tribes continue to thrive following their traditional habits or have adapted to a more modern lifestyle, both in the interior of the Guianas and in the coastal zones. Maroon people, who are descendants of runaway slaves of African origin, form other tribal groups, which can be found along several rivers, mainly in Suriname and French Guiana. The indigenous and maroon communities in the interior are diverse in culture and a great asset to world culture. While the majority of the population consists of Creole people, descendants of Africans mixed with Europeans, and people originating from India, it cannot be said that these groups dominate either the culture or lifestyles, given the vast diversity.

Expressed in numbers, several factors are in favor of relatively low population pressures on the Guianas' natural capital. Population numbers range between approximately 224,469 in French Guiana (INSEE, 2010), 534,000 in Suriname (EarthTrends, 2003) and 784,894 in Guyana (Bureau of Statistics, 2007). The three Guianas rank among the bottom 20 of 242 countries/territories listed for their low population densities of 2.6, 3.3 and 3.7 individuals per km² respectively (Wikipedia, 2012). Together with the Central African Republic and Gabon, which have approximately double the densities, the Guianas are the only tropical forested territories with such low population densities. Of the total population, half of French Guiana's people live in the urban area of the capital Cayenne (INSEE, 2010), 74% of Suriname's people live in its capital Paramaribo, other urban and coastal areas (EarthTrends, 2003), and 41% of Guyana's people live in and around its capital Georgetown (Bureau of Statistics, 2007). Vast expanses of tropical rainforest within the Guianas have virtually no inhabitants or house only small populations living within the limits of their natural environment and having only a moderate impact on it.

The indigenous and maroon peoples of the Guianas
The indigenous people of the Guianas are known as Amerindians. They are the descendants of the first people that inhabited the various geographical zones in the northern part of South America. Some communities were coastal dwellers while others lived mainly in the rainforest, savannahs and mountains of the interior. A considerable number of maroons also live along the waterways in the interior of Suriname and to a lesser extent in French Guiana. Maroons are descendants of African slaves who escaped from the plantations and retain an identity based on their West African origins. French Guiana harbors some 10,000 Amerindians and 22,000 Maroons (Kambel and MacKay, 1999). Guyana's interior is populated by around 60,000 Amerindian people (Kambel and MacKay, 1999). In Suriname, there are about 45,000 Maroons who have mainly settled along the main rivers in the east and central part of the country. The indigenous population, about 10,000-22,000 people, is mostly found in the southern part of Suriname, but some tribes live near the coastal savanna belt (Kambel and MacKay, 1999).

While still relatively low, population numbers in the Guianas are expected to grow in the near future, in particular due to immigration. Changing consumption patterns are also expected to contribute to increasing population pressures. More specifically, increasing wealth could lead to a larger ecological footprint and a greater impact on the environment, as has been observed in other parts of the world (LPR, 2012).

Ecological footprint and biocapacity
Throughout the world, the Ecological Footprint is used to track humanity's demands on the biosphere by calculating the area required to produce the resources people consume, the area occupied by infrastructure, and the area of forest required to sequestering CO_2 to compensate for consumption-related emissions (Wackernagel *et al.*, 2002). This measure of humanity's consumption is compared to the Earth's supply in terms of regenerative capacity, or biocapacity. Since the 1970s, the world has been in a situation of overshoot, where the Ecological Footprint exceeds the Earth's biocapacity. However, there are great differences between regions and countries. Countries such as the USA and the Netherlands, in common with many other developed countries, consume more than three times the globally available biocapacity per capita (LPR, 2012). These countries thus depend heavily not only on the supply of goods and products from abroad but also on the regenerative capacity elsewhere.

Unfortunately, footprint figures are unavailable for the Guianas, as only countries with over 1 million inhabitants are included in the biennial footprint and biocapacity accounting. In general, countries with low population pressures and high forest densities – such as the Guianas – are among the countries with both a relatively low Ecological Footprint and a high biocapacity. In the 2012 edition of the Living Planet Report, Gabon is presented as the country with the highest per capita biocapacity (LPR, 2012). With Suriname having twice as much forest per capita as Gabon, and Gabon's forests comprising 73% of its total biocapacity, it is expected that Suriname's per capita biocapacity would rank among the highest in the world..

TRADITIONAL PRACTICES WITH SUSTAINABLE AND LOW-FOOTPRINT PRODUCTION ARE FOUND AMONG INDIGENOUS AND MAROON PEOPLE THROUGHOUT THE GUIANAS

© Laurens Gomes / WWF Guianas

EARLY 1990s

Brazilian gold miners, or garimpeiros, started to cross the borders into the other Amazonian countries, after stronger mining regulation in Brazil. They brought along more destructive mining methods to the Guianas.

MINING

The Guianas are rich in minerals, with gold, bauxite, diamonds, and iron representing the most significant mineral resources in the region. This has driven mining activities for centuries. Whereas other known and lesser known minerals are present, the mineral industry of the Guianas has recently focused on gold, bauxite and petroleum exploration. Whereas the revenues from mining are a major factor contributing to economic development, the direct and indirect impact on forests, rivers, species and human health are very significant. Few mechanisms are in place to mitigate these impacts, and opportunities for improvements leading to more responsible mining are vast.

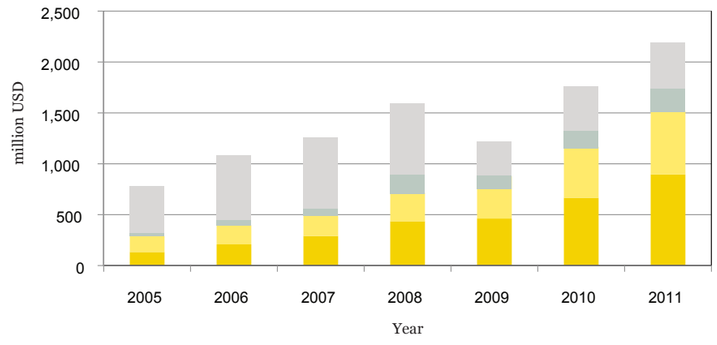


Figure 10: Approximate trends in the development of mining exports between 2005 and 2011 in Suriname. *Sources: Based on published and unpublished data from the Central Bank of Suriname, 2012; Deviezen Commissie Suriname; Various newspapers.*

Key

- Alumina
- Oil
- Large-scale gold mining
- Small-scale gold mining

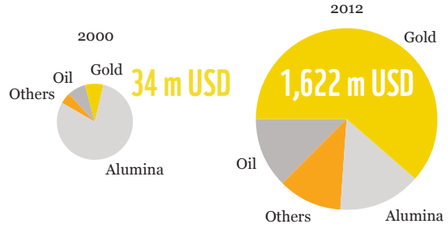


Figure 11: Approximate differences in value and composition of mining exports between 2000 and 2012. *Gold mining shows an expansion from an estimated 34 million USD to 1,622 million USD in 12 years. Source: Unpublished data from the Central Bank of Suriname, 2012.*

Gold mining

Today's gold mining sector has outpaced all earlier mining activities; the number of people involved, production levels and technological advancement is unprecedented. This is due in part to the high price of gold on the world market, low investment cost and relative ease of access to mining areas. Extractions from small-scale gold mining account for a significant part of total mining products in Suriname and Guyana, and to a lesser extent in French Guiana, where industrial, medium-to-large-scale gold mining predominates. A considerable portion of gold from small-scale mining operations in French Guiana is traded further in Suriname, where the gold from these illegal sources enters the formal markets. Artisanal and small-scale gold mining is a complex, extremely controversial issue in the Guianas, which has gained media attention both as a source of subsistence for the poor and for its association with social and environmental impacts. Gold mining is a major contributor to the economy of the Guianas (see e.g. figure 10 and 11), but poses the greatest threat to biodiversity and people's health and social life. The current high gold prices will probably trigger further developments in the sector. At the current gold price, a considered proportion of the Greenstone belt, the geographically defined area where large reserves of gold are found, and even several areas outside the loosely defined belt, can already be mined profitably. However, with every further increase in the gold price, additional forested areas and water systems come under pressure from gold mining, while the challenges associated with regulating the sector grow even further.

Large and medium-scale gold mining

Large-scale gold mining is found in the Guianas as highly organized, technologically sophisticated operation, with investments totaling several hundred million US dollars (Healy and Heemskerk, 2005). With annual production of over 10,000 tons of gold and well over 5,000,000 tons of run-of-the-mill ore outputs – as compared to medium-scale mining, which is defined as between 50,000-1,000,000 tons a year (Noetstaller, 1987) – the largest gold mining enterprises in the Guianas can be considered truly large and they contribute significantly to total gold production. Most large-scale gold mining operations are found in Suriname, to a lesser extent in Guyana, while they are absent from French Guiana, where most legal gold mining operations rank as medium-scale. Whereas the Guianas benefits from large- and medium-scale gold mining in terms of employment, income through (partial) ownership of companies, royalties and taxes, most benefits exit the region. Royalties and taxes are relatively low, many companies are foreign and additional benefits are gained at later stages of the value chain, after export from the region.

Cyanide is used in certain stages of the chemical process of gold extraction, while large quantities of mercury are used in the small-scale sector. Whereas cyanide can be at least as detrimental to the environment and human health as mercury (its toxicity is considered higher per volume), it is generally better contained within the industrial processes of large- and medium-scale gold mining, leading to less spillage into the environment. A major exception was the 1986 environmental disaster in Guyana caused by a dam breach that led to a major spillage of more than 400 million gallons of cyanide-laced material into the Omai river, subsequently flowing into the Essequibo, Guyana's largest river (Ramraj, 2001). Although a matter of dispute, the effects of this spillage on rivers, drinking water, fish stocks, Amerindian and urban populations were considerable and long-lasting. After this environmental disaster, Guyana embarked on a period when no large-scale gold mining was permitted, in view of the poor reputation of the companies behind the operations. The restoration of degraded lands is a common practice only in French Guiana, where it is required by law.

Small-scale gold mining

Needing only a pick-axe, shovel, a small sluice box and a gold pan – an investment of less than 100 US dollar (Healy and Heemskerk, 2005) – small-scale gold mining is accessible to many. Although several forms of small-scale mining could be classified as artisanal (craft-based), as in the example above, many other forms can be found throughout the Guianas that are not. The techniques, equipment used, levels of organization, etc., vary greatly and often follow a pattern of succession. At the other end of the spectrum, highly-mechanized, small-scale mining can be found, which requires diesel generators, excavators, water jets and pumps and sometimes even conveyor belts. These types of small-scale mining are highly organized, with formal and/or informal rules of the game; they require considerable investments, which are only available to a few individuals in the sector.

Despite its classification, which may suggest otherwise, the social and environmental impacts of small-scale gold mining are high, as is its contribution to the economy. In Suriname alone, small-scale gold mining in 2011 provided over 20,000 direct jobs, with many of the miners originating from Brazil; perhaps as many or more jobs were found in the subsidiary service sectors (WWF, unpublished data). Here, gold purchased from small-scale miners by licensed buyers is valued USD 950 million, well over half of the total value produced. Mercury is the preferred chemical used in the recovery of gold, but mercury-free techniques exist and are promoted throughout the region, as are retorts that recycle most of the chemical. Unfortunately, their application is not widespread. The use of and trade in mercury for gold mining is entirely prohibited by law only in French Guiana. Unfortunately, illegal mining is still prevalent in French Guiana and the use of mercury is still widespread. This is mainly the case in the border regions with Brazil and Suriname, but it is not confined to these regions.

Goldrush

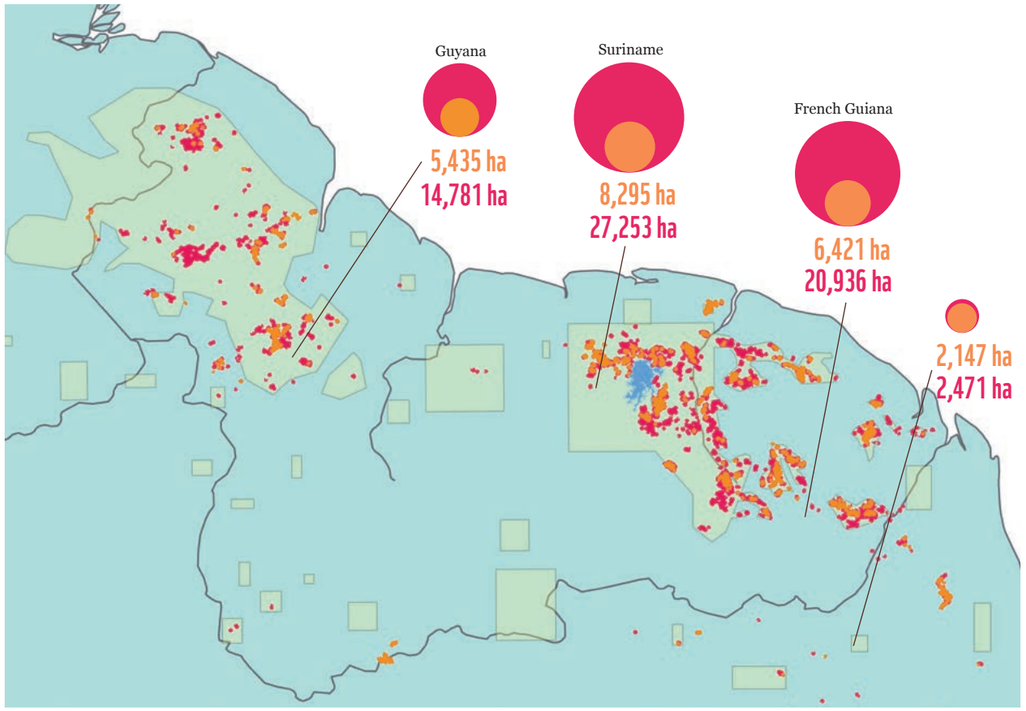
Primitive gold mining in the Guianas began in the 16th century, but the challenging tropical environment, a weak infrastructure and unsettled political and business conditions kept the region isolated from development until relatively recently. In the early 1990s, the Brazilian government began to regulate small-scale mining, and Brazilian miners, also called garimpeiros, started to cross the borders into the Guianas and other regions, attracted by the relative freedom from bureaucracy and lack of control, and by exaggerated rumors of the area's richness. Garimpeiros have modernized the small-scale mining industry in the Guianas by replacing the concept of subsistence mining with mining for profit (Veiga, 1997). In association with economic depression and political instability, the small-scale mining industry has grown and made the Guianas a true Eldorado (Heemskerk, 2000).

Impact on forests

Although deforestation from gold mining appears modest in comparison with other documented tropical forest land uses, it represents the fastest growing cause of forest loss. In 2007, a total of 62,970 hectares of forest was cleared in the Guianas for gold mining activities, compared to a total of 20,151 hectares in 1999 (ONF, 2010 and figure 12). Although this direct loss of forest, which was observed by satellite monitoring, forms only a small proportion of the total standing forest, the 200% increase in mining impacts on deforestation between 1999 and 2007 is certainly alarming. In Guyana, it has recently been identified as the single largest driver of deforestation with up to 0.06% of annual forest loss (GFC and Pöyry, 2011).

Several protected areas throughout the Guianas are located within the Greenstone belt, containing large reserves of gold. Here, illegal gold mining can conflict strongly with the park's conservation objectives. Examples are Parc Amazonien in French Guiana, Brownsberg Nature Park in Suriname, and Kaieteur National Park in Guyana. In many other areas in the Guianas, where drivers and pressures to the environment are low, the conservation of large tracts of forests could entail a form of passive management, focusing on measures such as the prevention of major development, a rejection to grant concessions in the area and its buffer zones, and regular monitoring to prevent extractions and alter the habitat. This is not the case in the protected areas mentioned, where – given current gold prices – active and frequent interventions are needed alongside effective preventive measures. The success of these interventions will affect not only the viability of the protected areas, but also that of the entire protected area system in the Guianas, wherever it overlaps with (known) gold reserves. This is a pattern that is encountered throughout the Amazon and also in other regions of the world.

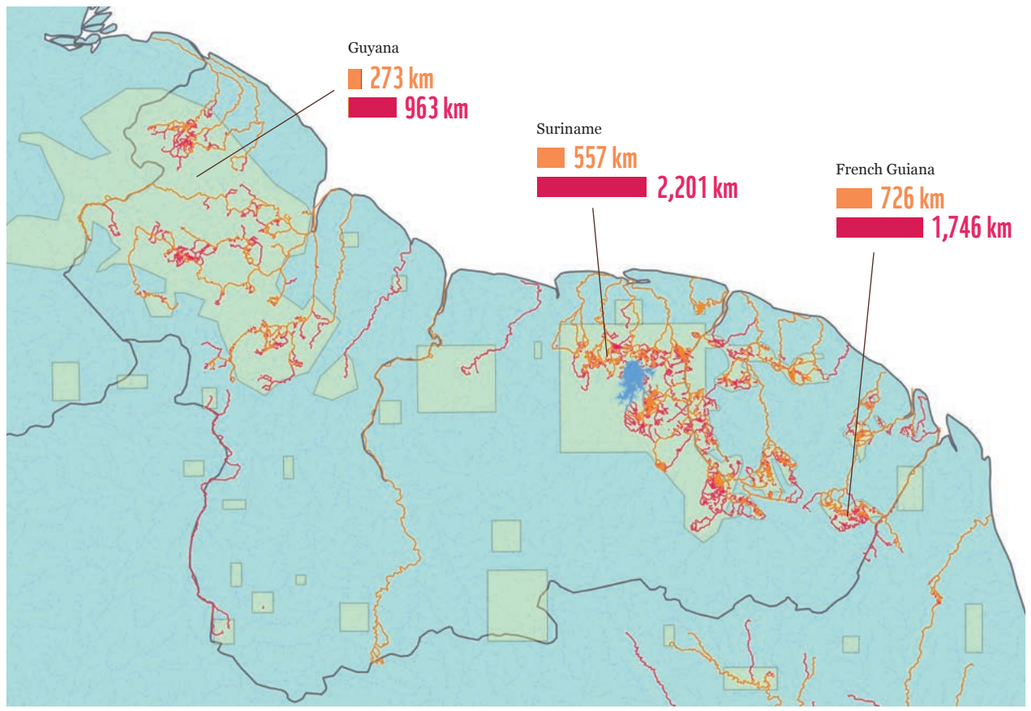
Figure 12: Deforestation due to gold mining observed by satellite monitoring. *Source: ONF, 2010.*



Impacts on fresh water

Gold mining exerts vast impacts on fresh water, river and creek ecosystems. The main impacts are related to, but not restricted to, small-scale gold mining, especially as related to the quantities of mercury used in the chemical process of gold extraction. Mercury is a heavy metal that is highly toxic to virtually all biodiversity. It enters the Guianas' aquatic ecosystems in dissolved form in the water column, but can also form toxic products such as methylmercury (monomethylmercury), which are highly stable and can remain in the ecosystem for long periods (possibly up to thousands of years). Mercury contaminates the river sediment and works its way up the food chain in a process called bioaccumulation, reaching high concentrations in predatory species such as some (consumable) fish species. Another major disturbance to the aquatic environment is the increased turbulence and turbidity, which in themselves impact the ecosystem and can increase the adverse effects of mercury pollution. Most small-scale gold mining activities are located in close proximity to creeks and streams, so a direct impact on these systems in the form of disruption to the ecosystem is observed. Restoration of the degraded aquatic ecosystems can be very difficult and very costly, natural regeneration is thought to be a very slow process, taking up to hundreds of years.

Figure 13: Impacted and potentially impacted waterways due to gold mining. *Source: ONF, 2010.*



No comprehensive survey exists of the direct and indirect impacts on fresh water systems of gold mining in the Guianas. As a first, quantitative regional study, satellite monitoring has been conducted to map the expansion of the impact of gold mining on rivers in the Guianas (ONF 2010 and figure 13). For this study, gold mining as observed by interpreted satellite images was traced back to the nearest downstream rivers and streams and a network of potentially impacted rivers and streams from the first point of impact to the sea was depicted and measured. The total length of these potentially impacted rivers in the three Guianas was 11,784km in 2000 and 26,169km in 2008. This reflects an increase of gold mining impacts on river systems that is comparable to that observed on forests.

Recently, evidence has been gathered indicating that the impacts of mercury use in gold mining have been underestimated when only downstream impacts are considered. It appears that atmospheric transportation of mercury by (northeastern trade) winds followed by wet deposition may account for significant quantities of mercury entering both gold mining impacted and even pristine aquatic ecosystems (Ouboter *et al.* 2012). In several locations throughout Suriname, even in areas without gold mining and historical accounts of gold mining, mercury levels in fishes and sediment are found to be very high, often higher than international standards used for human consumption It has been suggested that pristine areas may be more sensitive to mercury than areas affected by gold mining, because mercury is freely available for bio-accumulation and uptake by the ecosystem. Negative impacts are expected on aquatic life as well as reptiles, birds and mammals.

INDIGENOUS AND MAROON PEOPLE EXPRESS INCREASING CONCERNS ON THEIR EXPOSURE TO THE NEGATIVE EFFECTS OF MERCURY ON THEIR HEALTH THROUGH UPTAKE FROM DRINK WATER AND FOOD CONSUMPTION. HIGH MERCURY CONCENTRATIONS IN THE AIR HAVE BEEN FOUND EVEN IN THE CITIES IN CLOSE PROXIMITY TO THE SHOPS WHERE GOLD IS COLLECTED AND PROCESSED.

Human health and social impacts

Along with the threat to ecosystem health, the use of mercury in gold mining also poses serious threats to human health. In some Amerindian and Maroon villages along the Marowijne River up to 79% of the children had abnormal high hair mercury levels of more than 10 µg mercury per gram (the maximum safe level set by the WHO) due to their consumption of freshwater fish (Cordier *et al.*, 1998). Analysis of the hair of fish-eating populations close to gold mining areas have revealed increased mercury levels (Peplow and Augustine, 2007). Hair samples from 16 of the 22 participants in Kwakoegron, Suriname, had mercury levels of 2.2–20.2 µg/g total mercury, exceeding normal levels for hair (2 µg/g total mercury) (Peplow and Augustine, 2007). Elsewhere in Suriname and French Guiana similar mercury concentrations have been found in hair samples of Amerindian and Maroon populations (Fréry *et al.*, 2001; Ouboter *et al.*, 2007). As mercury accumulates in the body, it causes irreversible, sometimes fatal nerve damage, with pregnant women and infants most at risk, since it can also be a source of serious birth defects and childhood deformity (De Kom *et al.*, 1998).

Besides impacts related to mercury use, other negative impacts to human health can be observed. Whereas malaria is steadily decreasing in most of the interior of the Guianas, several gold mining sites are a major exception, with malaria occurring frequently, probably related to the laxity of preventive measures being taken on-site. Severe social impacts related to gold mining are found in the form of increased sexually transmitted diseases, prostitution, conflicts and land rights, etc. (Heemskerk and Olivieira, 2004).

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Maroon adults and children willingly contributed hair samples to find out about their exposure to mercury. Lissete Koormans taking hair samples of Maroon women in Brownsweg resort, Suriname.

Bauxite mining
The bauxite deposits in Guyana and Suriname are among the richest in the world, and the production and export of bauxite and alumina are of major importance to their economies. Since its discovery at the start of the 20th century and subsequent mining activities, bauxite mining and processing have made a significant contribution to employment; it has only recently been surpassed by gold mining in terms of export values. Several mines are now at the end of their production and efforts are being made to access other reserves to maintain or increase production. It is estimated that Guyana and Suriname together contain approximately 1,430,000 tons of bauxite, or roughly 5% of the world's reserve (US Geological Survey, 2012).

In a search for access to these reserves, bauxite mining is expanding into vulnerable ecosystems with a high presence of endemic species, such as the Nassau Mountains in Suriname and the Bartica area in Guyana. This also holds for several of the tabletop mountains and hills that can be found in the Guianas (see page 16 of this report), which are rich in bauxite.

Not only does bauxite mining have significant direct impacts on the environment, the impact of the high energy requirements by the sector is also significant. Several of the plans that exist to increase energy production, mostly through the planned construction of hydroelectric dams, relate to the increasing and projected energy demands from the mining sector, which mostly means the bauxite mining sector.

Impacts of terrestrial oil exploration and exploitation
While terrestrial oil and gas production has been steadily increasing for years, marine oil and gas exploration and exploitation date from more recent times. The Guiana basin has been identified as the world's second-best basin for off-shore oil extraction as it is still largely under-exploited (U.S. Geological Survey World Petroleum Assessment, 2000). Offshore oil activities have developed at an accelerating pace in recent years in the territorial waters of all three Guianas. Operations are expanding and thus coming to occupy an increasingly large area.

A new oil refinery in Suriname
In Suriname, the construction of an oil refinery was recently announced. One of the purposes of this refinery is to increase the self-sustainability in oil supply for the national market, instead of remaining dependent on the import of refined oil products while simultaneously exporting unrefined oil. To become truly profitable, the national production of oil and gas needs to increase. This explains in part the sudden boom in oil exploration activities, both on and off shore.

5 MILLION BARRELS
OF OIL WERE SPILLED INTO THE OCEAN DURING THE OIL SPILL DISASTER OF THE GULF OF MEXICO IN 2010


© Bob Zuur / WWF-Canon

Impacts of marine oil exploration and exploitation on marine mammals and other marine life
The impacts of marine oil and gas exploration and exploitation are difficult to assess, certainly in the case of the Guiana basin off the coast of the Guianas, where little is known about the biodiversity and composition of marine ecosystems. One impact that needs to be considered is related to seismic activities, undertaken during the exploration phase to profile the subsoil beneath the ocean floor in the search for oil. There is very little documented evidence on the impacts of seismic activities on cetaceans, but scientists agree that firing airguns – releasing up to 230 dB of acoustic noise – as part of seismic surveys has significant biological, physical and psychological effects on cetaceans, such as disturbances to their social behavior, changing their migration routes, and auditory and bio-sonar disorders (Brichet, *et al.*, 2011). Similar to terrestrial activities, safeguards are needed to avoid oil spillage and risky operations that may lead to environmental disaster. Given the great biodiversity and the abundance of many unique, rare and threatened species on the one hand, and the environmental risks associated with deep sea oil drilling on the other, several environmental organizations have requested a halt to marine oil exploration and exploitation.

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3 NEW ROADS

that will connect the Guianas to each other and to Brazil are considered for development in the next decade. Today the three Guianas are still separated from each other and neighboring countries by rivers and mountains.

INFRASTRUCTURE

Efficient infrastructure, transport, tele-communications, and energy is essential to national and regional development. However, when poorly planned, the negative impacts can outweigh the benefits. The plans for a north-south road infrastructure system leading to the Brazilian border in both Suriname and Guyana, and proposed hydroelectric dams, could affect the primary tropical forest in the Guianas.

Roads

An interconnected road system, penetrating underdeveloped regions, makes land more easily accessible, thus making it cheaper, as well as linking remote production sites to markets. This enhances competitiveness in international markets for timber and other natural resources, and provides local communities with an opportunity to expand their sales of goods and services.

Future plans

The most important supranational infrastructure plan for the Guianas is captured in the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), which aims to promote the development of regional transportation, energy and telecommunications infrastructure, by improving the physical connections between the 12 South American countries. IIRSA investments are expected to integrate highway networks, waterways, hydroelectric dams and telecommunications links throughout the continent, particularly in remote, isolated regions, to allow greater trade and create a South American community of nations. In the context of IIRSA, a number of interconnecting roads between Guyana, Suriname, French Guyana, Brazil and Venezuela have been proposed (figure 14). Key elements of the proposed infrastructure system for the Guianas are the south-north linkages between the heart of Amazonia, Manaus, and the ports and cities on the Caribbean Sea, including Caracas and Georgetown; and the northwest-southeast linkages parallel to the coastline.

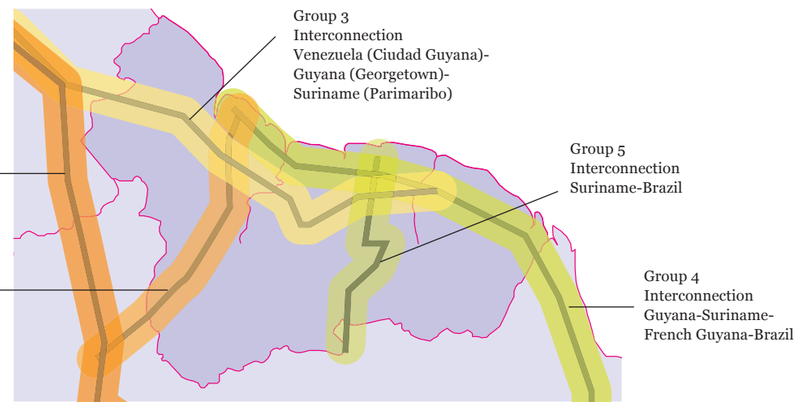

Figure 14: The Guiana Shield Hub. *Planned and considered roads within IIRSA. Source: CEDLA, 2012.*

Dams

Population growth will increase the demand for energy in the future. The mining sector also contributes to very high and increasing energy demands. Given the abundance of freshwater resources, it is no surprise that hydropower is an important source of renewable energy in the Guianas, in particular in French Guiana and Suriname. Expansion of the hydropower capacity is expected to take place in the near future (table 15). Hydropower dams are often associated to large flooded areas, resulting in large volumes of methane emissions a greenhouse gas even more potent than CO_2.

Hydropower in French Guinana

75% of French Guiana's electricity is generated from a single dam at Petit Saut, located on the Sinnamary River, adjacent to the estuary. The electricity sector is under French government control.

Hydropower in Guinana

Compared with the rest of South America, Guyana has the lowest or nearly lowest electric power per capita, and the least reliable, most expensive power tariffs. Almost all power is generated from diesel or bunker fuel thermoelectric sources. No hydroelectric dams have yet been built (Encyclopedia of the Nations, 2011).

Hydropower in Suriname

Suriname is largely self-sufficient in energy production. A small share of the power consumed is supplied by the state-owned power plants at Paramaribo and Nickerie. The government buys a large share of electricity from the Suriname Aluminum Company's (Suralco) station on the Brokopondo hydro-electric reservoir which produces the majority of the energy for the country.

Reservoir	Capacity (MW)	Area flooded (km2)	Emission/yr (million ton CO2 equivalent)	Emission/km2/yr million ton CO2 equivalent)
Balbina, Brazil	250	1770	30.2[1] 3.0[2]	17062[1] 6203[2]
Tucurui, Brazil	8400	2430	51.5[1] 2.6[3]	21193[1] 3916[3]
Samuel, Brazil	216	550	0.5[3]	3563[3]
Petit Saut, French Guiana	26.5	365	0.12[4]	1203[4]
Brokopondo Reservoir, Suriname	100	370		
Planned reservoir				
Saint-Georges, French Guiana	8[5]			
Mancaba Soula, French Guiana	9[5]			
Amaila Falls Hydropower project, Guyana	165[6]			
Tapa-Jai, Suriname	305[7]	256[7]		
Kabalebo, Suriname	450-650[8]	2460[8]		
Gran Kriki small-hydro project, Suriname	15-20[7]			

Table 15: Overview of actual, planned and considered hydropower projects in the Guianas, compared to three Brazilian dams, with estimated emissions. *Sources: 1. Verweij et al., 2009; 2. Kemenes et al., 2011; 3. Dos Santos et al., 2006; 4. Abril et al., 2005; 5. WWF Guianas and ONF, 2006; 6. Amaila Hydropower, 2011; 7. Boksteen, 2009; 8. Goodland, 2006.*

Tapa-Jai hydropower project and road development in Suriname

There are many opportunities to expand the hydroelectric power capacity in Suriname. One of the larger projects to be considered is the Tapa-Jai hydropower project in the southeastern part of Suriname. If this plan will be developed, it involves diverting the flow of the Tapanahony river towards the Jai creek and further to the Marowijne creek, finally allowing the water to flow into the already existing Brokopondo Reservoir. Extra power will be generated at the installed Afobaka hydro-electric power plant and new plants will be built. An additional road to Stoelmanseiland will also be developed. To construct the upstream dams, extension of the road network by 160 kilometers south of Pokigron will be required, connecting many maroon and indigenous villages with the city. Roads and power transmission lines in this project will require deforestation of approximately 1,700 hectares, and inundation will impact 25,660 hectares (Jolly and Kuyper, 2012).

Building a new road will have significant impact on the territory and its inhabitants, who have been living sustainably from the forests for centuries, practicing agriculture, hunting, fishing and gathering (ACT, 2012). The Trio and Wayana communities living in Tepu, Apetina and Palumeu are located far away from the administrative and political center on the coastal strip. Because they live in remote areas with little outside contact, the villagers can be considered as fairly traditional. Both young and old villagers are concerned about how a new road may negatively influence the area of land available. The communities are also greatly concerned for river and soil pollution; they see roads as a threat to their environment. The concerns are different among villages, but include the fear of outsiders threatening their food security, competing for their jobs, introducing diseases, challenging the peace of their villages, plundering, harassment, and using their land for mining (ACT, 2012).

0 ROADS EXIST IN THE DEEP INTERIOR OF SURINAME SO FAR. COMMUNITIES IN THE SOUTH OF SURINAME HAVE A GOOD UNDERSTANDING OF THE VALUE OF THEIR TERRITORY AND ARE HIGHLY APPREHENSIVE OF NEW INFRA-STRUCTURE THAT MIGHT COMPLETELY DISTURB THEIR WAY OF LIFE

Impacts of infrastructure developments on forests

Deforestation
Asner *et al.* (2006) showed that there is a significant connection between the presence of roads, selective logging practices and deforestation in the Brazilian Amazon. Within a radius of 25 kilometers from main roads, the probability that a logged forest will become completely deforested is up to four times higher than that for unlogged forests. Plans for the development of roads and dams will contribute to substantial land use conversion in the region, with further loss of forest cover in the future.

Forest degradation in Guyana
The most degraded forest areas in Guyana are found in the North-West region of the country, which is known to have the highest concentration of mining concessions. This area coincides with timber concessions, meaning that forestry will have provided infrastructure for mining, free of charge (Cedergren, 2009). An investigation by the Guyana Forestry Commission (GFC, 2010) using remote sensing techniques estimated a total of 54,210 hectares of degraded forest area (0.36% of total forest area) and 2,626 km of forest roads in 2007-2008.

Loss of biodiversity
Little is known about the impacts of infrastructure on tropical forest biodiversity. Benítez-López *et al.* (2010) studied the effects of infrastructure proximity on mammal and bird populations worldwide. Mammal and bird population densities declined with their proximity to infrastructure. The effect of infrastructure on bird populations extended over distances up to about one kilometer. For ground-dwelling mammals, the effect extended to up to five kilometers. Another impact of infrastructure on mammals and birds was that the animals tended to avoid infrastructure in open areas over longer distances than in forested areas, which could be related to the reduced visibility of the infrastructure in forested areas.

Carbon emissions
Flooding of large tracts of forests by damming rivers and streams for the production of hydropower also results in the emission of large volumes of greenhouse gases. Methane emission is particularly important since it is caused by the decomposition of plant material. Table 15 lists actual and planned hydropower projects in the Guianas, compares them with three Brazilian dams, and gives estimated greenhouse gas emissions. Those dams with large flooded areas are especially associated with larger estimated volumes of greenhouse gas emissions.

Impacts of infrastructure developments on rivers

River fragmentation
Dam construction requires the creation of large reservoirs which cause flooding, sometimes of areas of natural, cultural and economic significance, and sometimes requiring the displacement of original inhabitants. Fragmentation of rivers alters the natural flow patterns of water, sediments and nutrients. A dam also acts as a barrier between the upstream and downstream movement of aquatic species, interfering with their spawning areas and range, with possible impacts on fish as a source of food and income.

Impacts of damming on fish communities
Long-term changes in the fish fauna of the Brokopondo reservoir have been studied to investigate the effects of damming on fish community structure (Mol *et al.*, 2007). Before closure of the dam in 1964, the fish fauna in the Suriname River comprised 172 species, high diversity and very even distribution. Fourteen years after the dam's closure, a stable equilibrium of reservoir fish fauna had been reached. The reservoir fauna comprised only 41 species, low diversity and relatively uneven distribution. Most species with strict habitat requirements in the Suriname River and its tributaries did not survive in the Brokopondo reservoir.

Socio-economic impacts of new roads
Building new roads or improving existing roads will create corridors between populated areas in the coastal zone and the remote, forested interior, which can subsequently facilitate uncontrolled migration to otherwise inaccessible areas, resulting in increased land use changes, deforestation, and expansion of unsustainable extractive activities. Among the major risks of new accesses to core areas of the forest are increased poaching and wildlife trading, forest fragmentation, and forest degradation promoted by unsustainable mining and timber logging practices. Moreover, road infrastructure can hamper the preservation of indigenous culture.

Socio-economic impacts of damming
Creating a dam in a river, with the subsequent inundation of land, may also involve displacement of communities that have established their livelihood in the forest for many years. Damming the Suriname River to create the Brokopondo reservoir led to the relocation of some 5000 Maroons to new villages along the Suriname River above and below the reservoir (Leentvaar, 1973). Prior to the area's inundation, the tribal people had made their living from subsistence fishery, hunting and slash-and-burn agriculture. Other than small-scale agriculture, the only industries around the lake are logging and (illegal) gold mining (since 1990). No substantial fishery has developed on the reservoir during its 40-year existence. The continuing expansion of small-scale gold mining, the difficulties in regulating this sector and the encroachment of the Brownsberg Nature Park by illegal gold miners, are closely related to the history of the Brownsweg resort, which is a displacement area of maroons that used to live along the part of the Suriname river that is now part of the hydroelectric reservoir.

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10 PER HECTARE

is the maximum number of trees that can be felled in Guyana, thanks to its strict Code of Practice.

FORESTRY OPERATIONS

Tree species in the Guianas have good timber properties, but inaccessibility of the hinterland, high investment costs and high species diversity combined with low volumes of target species as well as good regulatory frameworks have preserved forest logging on a large scale. However, with possible new roads in the future, logging could become more of a serious threat to biodiversity and ecosystem services. Fortunately, management practices are of relatively high standards in the Guianas and, in combination with the continuation of the low volumes currently extracted, forestry can also be seen as an opportunity for sustainable income generation.

Selective logging

The change in forest cover in the Guianas due to logging is still minimal, as is round wood extraction (table 16), especially in comparison to neighboring Brazil. Approximately half of French Guiana's allocated resource areas are dedicated to non-destructive forestry activities. The State provides all infrastructure for logging activities, and standing trees are currently auctioned at the rate of two trees/hectare. Logging represents a minimal threat to biodiversity in French Guiana, which exports little timber. In Guyana and Suriname, logging concessions are awarded on short-, medium-, and long-term leases. The logging in these two countries is mainly selective. Selective logging in Guyana is well within the parameters of sustainability, thanks to a stringent Code of Practice, including cutting cycles of 25, 40 or 60 years, and a felling intensity of around ten trees per hectare (GFC, 2002). In Suriname, the CELOS Management System is an important foundation for sustainable management practices (Werger, 2011). In 2010, wood production in Suriname amounted to 247,377 m3, while the national target for an optimal sustainable production volume within the existing concessions is 500,000 m^3 (SBB, 2011).

Country	Industrial roundwood extraction total volume (1000 m^3 over bark)		
	1990	*2000*	*2005*
French Guiana	91	60	62
Guyana	n.a.	363	395
Suriname	116	177	181
Brazil	111,254	92,102	117,048

Table 16: Trends in removals of wood products between 1990 and 2005 in the Guianas. *Source: FAO, 2005. "Over bark" is a term meaning volumes including bark.*

500,000 M³
IS THE TARGET FOR ANNUAL SUSTAINABLE YIELD OF ROUNDWOOD IN SURINAME

Logging in Suriname and the HKVs

In Suriname logging is mainly confined to the forestry belt in the North. There are several systems for timber licensing, including concessions, communal logging permits (*Houtkapvergunningen* – HKVs) and incidental cutting licenses. Concessions vary in length between one and 20 years. About 546,000 hectares of HKVs are granted to indigenous communities on state-owned lands since 1992. These forests should be managed for subsistence, rather than for commercial purposes. HKVs are usually registered in name of the chief of the community. Therefore it happens that HKVs are being negotiated between the community chief and logging companies and bring little benefit to the community as a whole (Tropenbos, 2004). Volumes of wood annually harvested from HKVs are rising (figure 17).

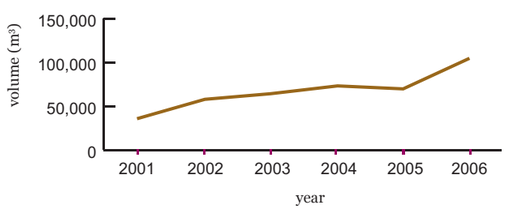

Figure 17: Annual harvest from communal logging concessions or Houtkapvergunningen (HKVs). *Source: SBB, 2011.*

Potential future threats

The current forestry operations represent only mild threats to ecosystem services thanks to their low yields and moderate impacts. There are significant opportunities for income generation from sustainable management of the Guianas' forests, including conservation. Sustainable forest management can thus contribute to the development of green economies.

With the implementation of new infrastructure, legal and illegal logging operations are expected to increase. If not properly controlled, deforestation will be enhanced by various types of land use change, such as the establishment of new mining sites, expansion of agriculture and cattle ranching, and establishment of palm oil plantations, all at least partly driven by foreign investments. Also, a lack of sound land use planning, with subsequent ill-planned issuance of new concessions, and the risk of an excessive increase in wood production according to sustainability standards, pose potential future threats to the forests of the Guianas.

Misty tropical forest at higher altitude in French Guiana.

MORE THAN 1,200

Marine Turtles were estimated to be caught in fishnets in 2010 in Suriname. The installation of Turtle Excluder Devices (TEDs) in the nets of several fisheries, such as the seabob fishery, is common practice or even obligatory. This leads to a strong reduction in by-catch. Other fisheries are lagging behind with the development of similar devices suitable for their fishing type.

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MARINE AND COASTAL FISHERIES

Fishery resources are vast in the exclusive economic zones (EEZ) of the Guianas as well as in the coastal areas. Since the 1950s there has been a steep increase in fish catch, especially in Guyana and Suriname, but the catch has fallen over the last decade. Excessive by-catch and over-exploitative fishing practices are matters of concern throughout the Guianas' marine and coastal waters. For marine turtles that share these waters, such as the critically endangered Leatherback, mortality and damage from accidental by-catch has been identified as one of the main threats.

Importance of fisheries for the Guianas' economy

Marine fisheries constitute an important economic sector in the Guianas, providing export earnings, employment, incomes, and animal protein. A significant portion of the region's population depends on fishing for its survival and cannot substitute fish with other sources of animal protein. The shrimp resources in the Guianas support one of the most important export-oriented shrimp fisheries in the world. There has been a steep increase in fish catch since the 1950s, but the catch has declined in all three Guianas over the last decade (table 18).

Country	Contribution of fisheries and aquaculture to workforce)	Fisheries contribution to GDP	Fisheries contribution to export (USD)	Fish consumption per capita (kg)
French Guiana	1.1 % (1980)[1]	not available	not available	not available
Guyana	3.0 % (2010)[3]	26.7 % (2004)[2]	7.1 % (2004)[2]	45.7 (2003)[4]
Suriname	2.2 % (2000)[1]	4 % (2004)[2]	3.3 % (2006)[2]	16.3 (2003)[4]

Table 18: Indicators of the contribution of fisheries to the Guianas' economy. *Sources: 1. WRI, 2003; 2. FAO fishery country profile; 3. Bureau of Statistics Guyana, 2010; 4. NFSO: National Fisheries Sector Overview, 2003.*

Impacts of fisheries on marine and coastal diversity

Overfishing

Fish production in the three Guianas is decreasing, and the fish catch with it. Several reasons are mentioned for this, including high exploitation costs due to high fuel prices, inadequate management of fish resources, and fish stock decline throughout the region (figure 19 and FAO fishery country profile, 2012). Some of the common fish species are being overfished (Suriname Business Forum, 2012). There is a lack of management and control on the Guianese marine waters, and there is increasing illegal fishing, especially of Guyanese fishers on Surinamese waters and of Brazilian and Surinamese fishers on French Guiana's waters.

Guyana's marine shrimp fisheries are accepted as being overexploited, especially the prawn fisheries, and there is concern that the seabob (a smaller shrimp) and sharks are also showing signs of overexploitation (figure 20 and National Development Strategy of Guyana, 2012).

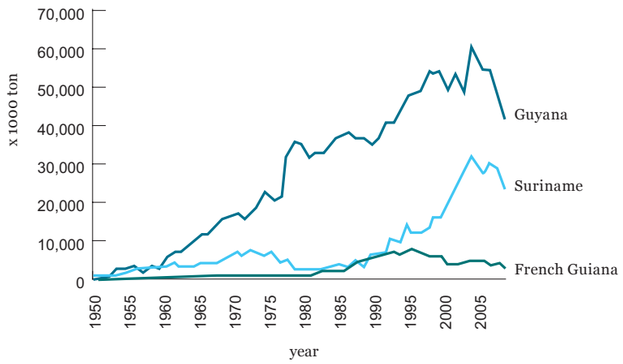


Figure 19: Fish catch volumes in the Guianas' waters. *The reported volumes include aquatic species caught for all commercial, industrial, recreational and subsistence purposes. Aquaculture is also included. Source: FAO - Fisheries and Aquaculture Information and Statistics Service, 2011.*

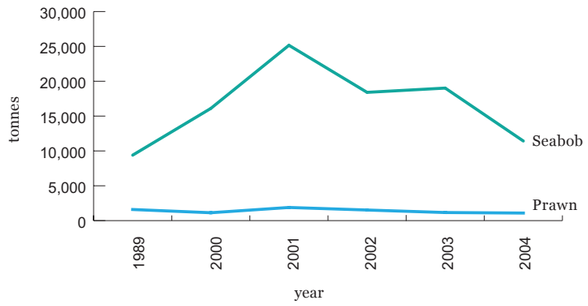


Figure 20: Prawn and seabob production in Guyana. *Source: FAO, 2011.*

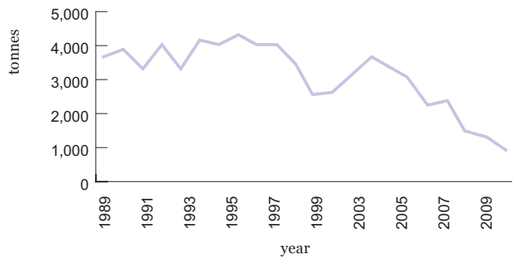
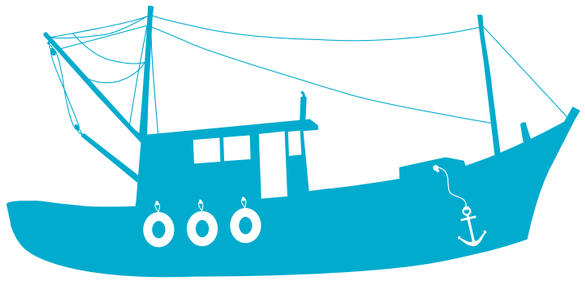


Figure 21: Shrimp production in French Guiana. *Source: FAO, 2011.*



There is evidence that some of the fisheries in the Guianas may be fully exploited or overexploited, particularly some of the groundfish. In cases where assessments have been undertaken, there are clear signs of overexploitation of the southern red snapper, with declining catch rates and a decrease in the size of this species. Similarly, Lane snappers (*L. synagris*), Bangamary (*Macrodon ancylodon*) and sharks are also showing signs of overexploitation. In general, all the shrimp species in the region are subject to increasing trends in fishing mortality and the fishery is generally overcapitalized. Stocks of brown and pink spotted shrimp may be close to full exploitation (Phillips, 2007). Shrimp production in French Guiana has been showing a downward trend over the last two decades (Figure 21).

Market value

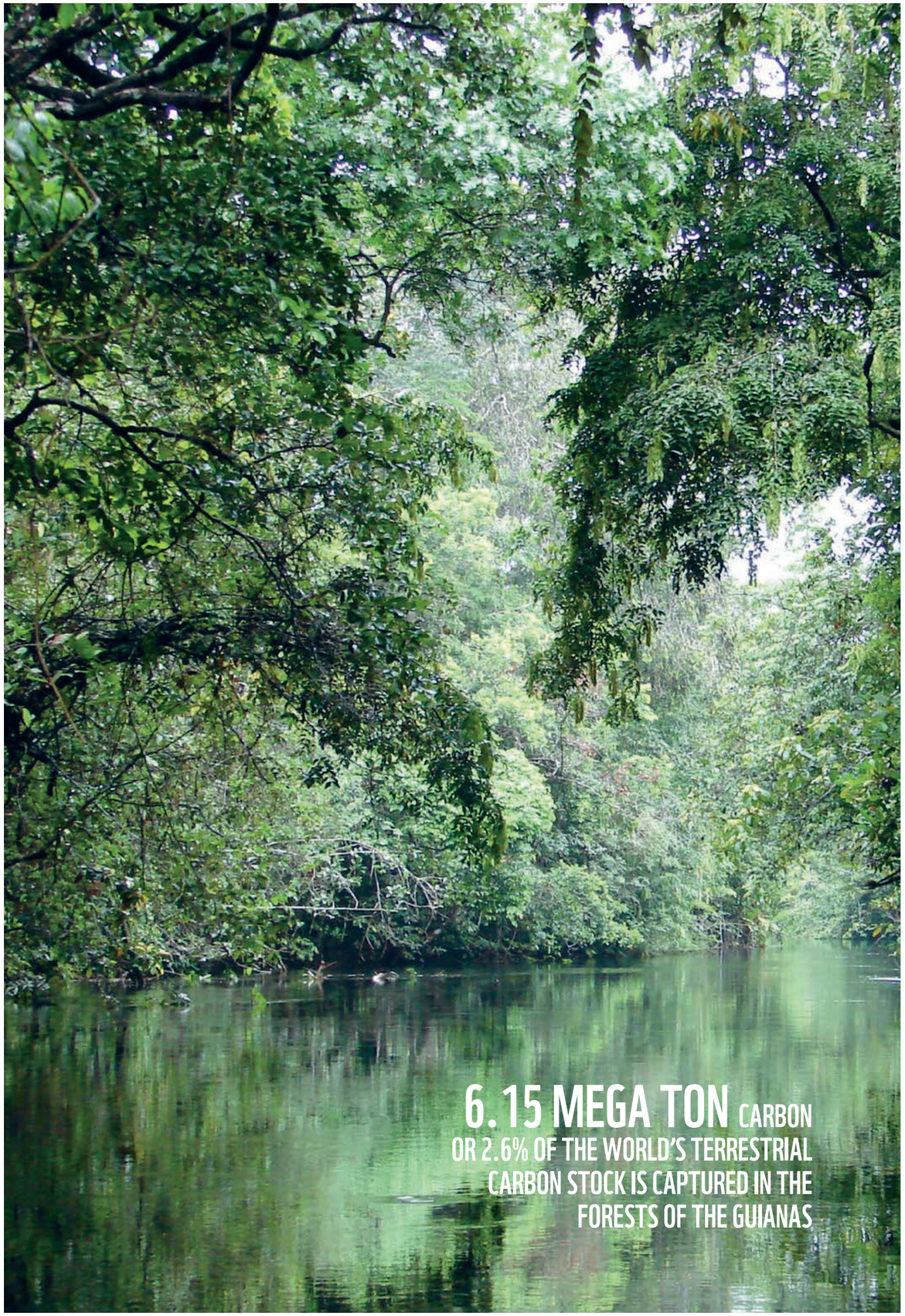
From the mid-1990s, the world's shrimp market has been characterized by the rapid development of aquaculture, which resulted in a drop in the international market prices for shrimp. According to FAO international trade data, the unit price for shrimp have decreased since 1995. In 2003, the current price (6.5 US$ / kg) was thus lower than the price reported in 1986 (7 US$ / kg). In addition to this decrease in the potential value of shrimp landings, the rise of fuel costs observed in the past few years severely impacted the already depressed economic status of the shrimp fishery (Chabaud and Thébaud, 2009).

By-catch

The shrimp by-catch situation is a well-known issue in the region. Analysis of the species and sizes composition of shrimp by-catch has indicated that many commercial species are included, with only a small part being utilized, and that undersized individuals generally predominate. Species composition has also changed over the years and several species have practically disappeared from the by-catch (Charlier, 2001).

Fisheries improvements and sustainable fisheries

While over-fishing and by-catch continue to pose considerable threats to marine biodiversity and the sustainability of commercially harvested stocks, several positive changes to fisheries management and fishing practices have been observed recently or are currently in the process of implementation. Turtle Excluder Devices (TEDs) and Trash and Turtle Excluder Devices (TTEDs) have been deployed in several fisheries, including the seabob shrimp fishery. These devices lead to a considerable reduction in the by-catch of marine turtles as well as other species, with additional benefits to fishermen thanks to the improved quality of the target catch and reduced sorting time. In 2011, the seabob fishery in Suriname was awarded the MSC certificate, and preliminary interest has been expressed in Guyana in following this example. Marine zoning policies to exclude activities in no-fishing zones and active policies to reduce IUU fisheries (Illegal, Unreported and Unregulated) have been implemented or are in the process of implementation. The first attempts to address piracy and illegal fishing are being made by the placement of a coastguard, while the need for further communication among the Guianas on this important topic is expressly acknowledged.



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4. TOWARDS SUSTAINABLE AND GREEN ECONOMIES FOR THE GUIANAS

Most people essentially desire the same thing: A life where needs are met; to be safe and healthy; to be able to explore interests and realize potential; and to improve well-being. In many places in the world, economic development is exceeding the boundaries of what this earth can replenish and absorb. It seems that the Guianas are a major exception to this, with their vast natural capital and limited population pressure, added to a great potential for green economies. Yet, at the same time, pressures on the environment are increasing, mainly related to international demands for resources, which in turn contribute to the urgency to further prioritize the development of green economies for the Guianas.

CAPTURING OPPORTUNITIES FOR SUSTAINABLE DEVELOPMENT

In chapter 1 of this report we learned about the close links between biodiversity, ecosystems and people and the urgent need to further prioritize the development of green economies. Here we review the potential for and threats to sustainable development and green economies of the three Guianas, as part of the wider Amazon, on the basis of the findings presented in chapters 2 and 3. Application of the concept of green economies in emerging and developing countries is still at an early stage, with a variety of interpretations of the concept. Here we apply WWF's broader definition of a green economy as 'a values-driven economy that enhances life – for people and nature to thrive'. We refer to Guyana's Low Carbon Development Strategy as a laboratory for green economies of global significance.

The three Guianas comprise one of the few regions in the world where significant economic activities of extraction and production – one of the biggest drivers of environmental loss – have only recently started to develop. Moreover, the Guianas qualify as HFLD (High Forest Low Deforestation) countries and many of the natural forests are still intact. Direct pressures on nature, biodiversity and natural capital are limited as population density in the Guianas is low and population increase is only moderate. These are favorable conditions for greening the economies of the Guianas, but the true potential for green economies lies in how governments, businesses and other actors of the Guianas will manage economic development and protection of natural capital in the future. This is especially relevant because the Guianas are facing increasing pressures on its' natural capital.

Characteristics of the Guianas

1. Compared to many other places in the world, natural forests in the Guianas cover more than 80% of the three countries, while deforestation and forest degradation are very low (far lower than the world average deforestation of 0.22% per year). Even in the coastal zone, where most of the populations live, extensive unspoiled mangrove forests, swamp forests and other ecosystems continue to be found in an intact condition.
2. The population density in the Guianas is very low (see figures in other chapters) and population increase is only moderate, mostly arising from the influx of migrants. Most people live in the three capitals and surrounding villages, with few people living in the hinterland (mostly Amerindians and Maroons).
3. There is no major culture of deforestation within the local population of the Guianas, which can be observed in other parts of the tropical world: no culture of cattle ranching, palm oil or pulp and paper plantations, while shifting cultivation areas are relatively small in size compared to Asian countries like Indonesia and Malaysia. Some interesting models of the sustainable use of natural resources continue to exist in many of the local communities.

Small-to-medium-scale gold mining, industrial mining, oil drilling, infrastructure development, forestry and marine and coastal fisheries are exerting increased pressure on biodiversity, ecosystems and people. Even though these pressures might not be as severe as in other regions in the world, the current rapid and steady development of the Guianas economies might soon become a serious threat to the natural capital. The challenge for the Guianas is to manage the natural resources in such a way that biodiversity and ecosystems are protected, that the present generation benefits from the renewable resources in a sustainable way, so that future generations can also benefit from the vast natural capital of the Guianas.

The most important drivers and pressures on the Guianas' natural capital

1. *Small- to medium-scale gold mining*. The ever-increasing gold price over the last ten to fifteen years has led more and more people to seek their living, and sometimes their fortune, in the gold business; destroying landscapes, polluting creeks and rivers. This gold rush has been accelerated with the advent of Brazilian *garimpeiros* who have introduced new, more destructive techniques to the Guianas. In the absence of prospecting and land use planning, damage is worse than that associated with industrial mining. Both the uncontrolled use of mercury and the siltation of waterways are highly detrimental to aquatic life, fish consumption and the availability of drinking water.
2. *Industrial mining and oil drilling*. Again, with the very high gold price, large companies are requesting more new concessions and the Governments of the Guianas are expected to grant more new concessions to these companies. Bauxite mining is also expanding and might soon reach the Nassau mountains in Suriname, where endemic fish species have been found. It is already known that there are vast oil reserves offshore of the Guianas, so an increase in oil drilling is expected with its high associated risks and potentially negative environmental impacts, not only on marine mammals such as dolphins, turtles and whales, but also on the entire marine fishing industry.
3. *Infrastructure*. Large mining projects need lots of energy and good transportation routes. There is hence a clear demand for more roads and the building of hydroelectric dams in pristine areas of virgin forests, especially in the southern part of Suriname and Guyana.
4. *Unsustainable marine and coastal fisheries*. In common with many other parts of the world, overfishing is a serious problem in the Guianas, as there are too many licenses and governmental control is far from sufficient. Related to this overfishing are the problems of uncontrolled artisanal fishing, illegal fishing and the threat of piracy.

Greening the economic activities of the Guianas entails the greening of high impact sectors such as small- to large-scale gold mining operations, oil drilling and infrastructure development. There are many opportunities to reduce the impacts of these activities on biodiversity, forests, fresh water and human health. These depend, however, on the willingness of all actors involved to move towards an economic model in which protecting natural capital and respecting the ecological boundaries are part of the core business. Greening the Guianas' economy also offers opportunities for low carbon development (see box below).

In all, it is about making smart and better choices when protecting natural capital, greening production, directing financial flows, resource governance and sustainable consumption. These are presented in the next section.

Guyana's laboratory for green economies

Guyana, under the leadership of the former President Bharrat Jagdeo, set the scene in 2009 with the development of a national-scale Low Carbon Development Strategy (LCDS). This is a 'laboratory' for green economies, as WWF International's Conservation Director Lasse Gustavsson pointed out in March 2011 during his visit to the country. Many lessons have been learnt in the meantime, to the benefit of the country's own development; lessons that could help Suriname and French Guiana as well as other countries worldwide in their search for models to support green economies.

RECOMMENDATIONS FOR MAKING BETTER CHOICES FOR THE GUIANAS

In this section WWF Guianas refers to the general WWF recommendations in the biennial edition of *The Living Planet Report*, more specifically the 2010 and 2012 editions, WWF's recommendations for Rio+20, as well as some regional studies undertaken by WWF Guianas. At the center of WWF's global recommendations is the 'better choices from a one planet perspective' framework (figure 22).

WWF's One Planet Perspective proposes to manage, govern and share natural capital within the Earth's ecological boundaries, as opposed to the current situation of global overshoot of the earth's capacity and global decline in biodiversity and ecosystem services (LPR, 2012). In addition to safeguarding and restoring this natural capital, WWF seeks better choices along the entire system of production and consumption, supported by redirected financial flows and more equitable resource governance. All of this, and more, is required to decouple human development from unsustainable consumption (moving away from material and energy-intensive commodities), to avoid greenhouse gas emissions, to maintain ecosystem integrity, and to promote pro-poor growth and development.

The One Planet Perspective shows that choices at all levels are very interdependent. Preserving natural capital, for example, will affect decisions and possible outcomes relating to the way we produce and consume. Financial flows and governance structures will similarly determine to a great extent whether production and consumption choices will actually contribute to biodiversity conservation, ecosystem integrity and, ultimately, food, water and energy security.

Within this framework, WWF proposes to manage, govern and share natural capital within the earth's ecological boundaries, as opposed to the current situation of global overshoot of the earth's capacity and global decline in biodiversity and ecosystem services (LPR, 2012). While some recommendations might be global in scope, some choices should be applied throughout the region or might be country-specific. The regional recommendations formulated on the next pages of this report seek to provide a basis for the development of national recommendations through a process involving the satisfactory representation of relevant national stakeholders.

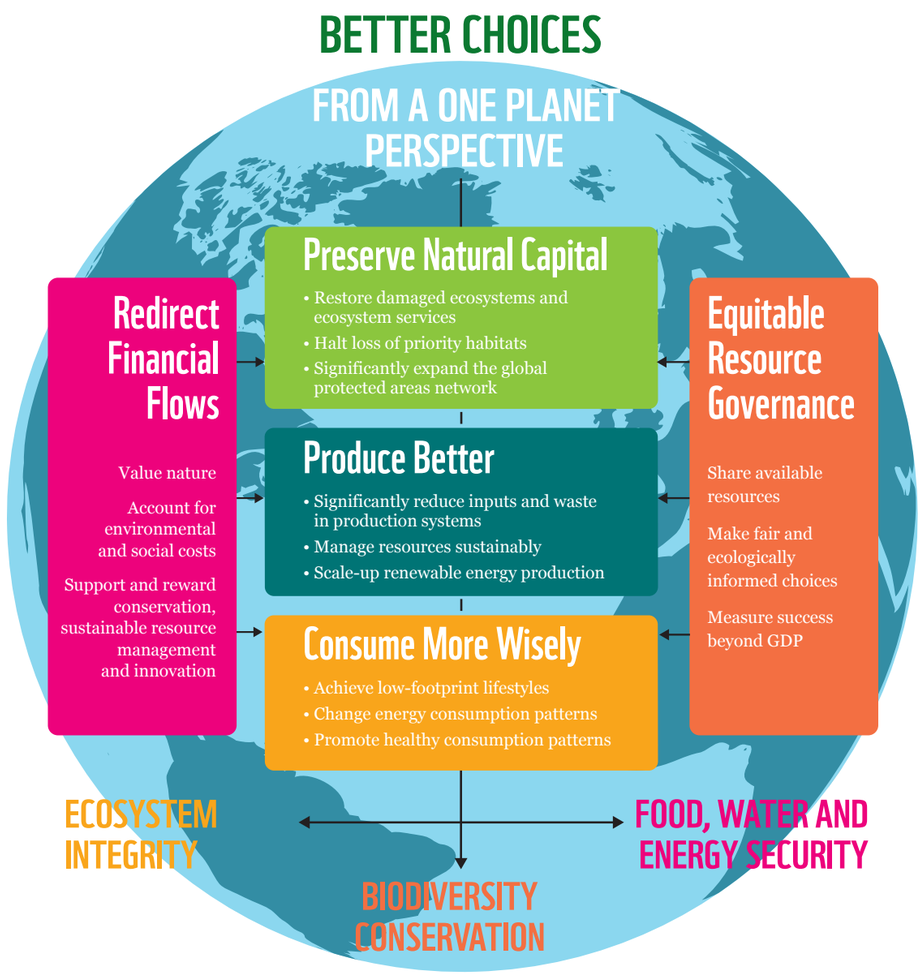

Figure 22: WWF's One Planet Perspective *proposes to manage, govern, and share natural capital within the earth's ecological parameters.*

BETTER CHOICES FROM A ONE PLANET PERSPECTIVE

Preserve natural capital (forests, freshwater, biodiversity, carbon)

Increase the number and connectivity of Protected Areas. While French Guiana has certainly made important recent progress with the creation of Parc Amazonien and several other nature reserves, thus arriving at the protection of more than 40% of its total surface area, Guyana and to a lesser extent Suriname are lagging behind. However, in the region, Suriname was the first country to set the stage of a country-wide protected areas network, creating more than 10 Protected areas from the 1960s onwards. In 1998 Suriname set aside over 10% of its territory by creating the Central Suriname Nature Reserve (CSNR), but since then there has been weak government interest in creating more protected areas. Guyana finally launched its Protected Area Bill in 2011 and set aside two new protected areas (Kanukus and Shell Beach). However, a more regional outlook with involvement of Brazil is needed to create more protected areas in the South of Guyana and South of Suriname to form a large network of protected areas with Brazil (Tumucumaque, Grao-Para reserve, Maicuru and others) and Parc Amazonien in French Guiana (see also figure 7 in chapter 2). This will be a significant step towards safeguarding the long-term conservation of this important part of the Amazon Biome, known for the vast quantity of ecosystem services provided to the entire world.

Furthermore, with the expected future oil drilling off the Guianas coast, and a clear indication of overfishing in some parts of the region, there is a need in all Guianas to engage in the process of marine zonation and set aside *Marine Protected Areas* with clear management prescriptions. One of the first areas that should be considered is the area North of the mouth of the Marowijne river estuary (*Transboundary Marine PA between French Guiana and Suriname*), with clear recommendations and control of fishing, seismic activities and oil exploration to protect the globally important nesting beaches of marine turtles on both sides of this river. Where marine fishing grounds are overfished, there is an imperative need for restoration and the installation of no-fishing zones. This will only work if an adequate monitoring, control and penalty mechanism is put in place by the Governments.

Mitigating the impacts of new infrastructure. It is clear that new infrastructure in the form of new roads and possibly hydroelectric dams will consume large areas of forests in the interior and open up previously intact ecosystems. Two steps in mitigating these impacts are of particular importance: first of all, well elaborated ESIAs (Environmental and Social Impact Assessments) need to be worked out and Environmental and Social Management Plans need to be implemented. Secondly, compensation should be incorporated in voluntary and regulated impact mitigation schemes (biodiversity off-sets). This would take the form of preservation of adjacent areas with similar biodiversity and ecosystem values, setting them aside as protected areas.

Restoration of degraded lands and waters. It is particularly important that lands and freshwater ecosystems degraded by small- to large-scale mining should be restored. The Governments of the Guianas have an important role to play in regulation, as this has often not been done in the past.

Species monitoring, hunting and poaching prevention. Even though hunting pressures are mostly low and many species that are in decline elsewhere in the world continue to thrive in the Guianas, many iconic and other, less well-known species are becoming increasingly rare due to hunting and poaching. Of particular concern is the poaching of marine turtle eggs, especially in Suriname, where despite decades of education and awareness programs, the situation is still far from sustainable. Moreover, few programs exist to monitor the distribution, status and threats to these animals.

Produce better and smarter

Good Governance is the keyword for a *better, more environmentally friendly, responsible and sustainable production of minerals, oil, timber or any other products* in the Guianas. As the private sector is by definition 'for profit' and interested in the first instance in short-term financial gain, it is up to the Governments of the three Guianas to offer proper guidance and control; this needs to be done in the form of proper legislation and regulations, and strong institutions with a presence in the field, which are not open to bribery and corruption. Moreover, incentives should be given to private companies that lead the way, like MSC-certified fisheries or FSC-certified timber companies, by offering tax breaks or other incentives. Unfortunately, this is not always the case, and private companies that do not respect the environmental and social guidelines are not always excluded to gain access to the resources.

In the gold mining sector much more needs to be invested in the *better planning and control of the operators*, in order to prevent useless destruction of forest and freshwater ecosystems and halt further pollution. While Guyana as well as Suriname have pledged to develop policies to transit to mercury-free operations, only French Guiana has a total ban on the use of mercury, which has been 'illegal' since 2006. This was in part thanks to strong support from the local mining sector itself. Much more needs to be invested in alternative, mercury-free techniques, which need to be demonstrated on-site, as well as better control of such operations. Demonstrations of tailings management and restoration of degraded lands coupled with clear enforcement and legislation are urgently needed. In all three Guianas, strong institutions with the proper mandate are in place to give this the needed priority.

In the marine realm the Government equally needs to pursue *better resource planning*, especially in fishing. There is a great deal of overfishing, while few (or no) data are available to assess the fish quota per species in relation to the capacity of the stocks to be replenished. Bottom trawling can be devastating to all fishing grounds. Initiatives set up by WWF and the private sector, like the *Marine Stewardship Council (MSC)*, can help boost the government's presence and increase control of the sector. The recent initiative of the MSC certificate, which was received by the international company Heiploeg Group and the Surinamese seafood processor Namoona/SAIL for the Atlantic seabob shrimp in Suriname, is a notable example. This privately-led initiative resulted in the institution of a seabob working group in Suriname, to regulate fishing and avoid overexploitation of seabob shrimp. Along the same lines, the Regional Fisheries Committee in French Guiana paved the way for proper fisheries management through the voluntary adoption of such selective devices as the TTEDs (Turtle and Trash Excluder Devices) and the definition of 'shared and managed fishing grounds'.

In the timber sector the Guianas are fortunate not to have (too many) large companies with little or no respect for the environment and social wellbeing. Furthermore, both the ONF (Office National des Forêts) in French Guiana, the GFC (Guyana Forestry Commission) in Guyana and the SBB (Stichting Bosbeheer en Bostoezicht) in Suriname, are well-functioning State Forest Services that are able to exert relatively good control over logging operations. While annual log production is relatively low in the Guianas (especially in French Guiana), new companies are arriving and will arrive in the near future, and *the issue of 'overharvesting per hectare' coupled with a sufficiently long rotation period, will have to be looked at closely*, especially in light of an ever-growing demand from China and S-E Asia, where many more species are harvested and use. Here again, private-public-NGO initiatives like the *Forest Stewardship Council (FSC)* certification can help. Other positive developments can be expected from FLEGT and Legality Verification Schemes.

Towards the wise consumption of available resources and the reduction of waste and pollution

The Guianas have an enormous benefit from their small populations, while still having vast reserves of resources. While resource production can be greatly improved (see above), *consumption patterns can be improved* too. Each year, by the end of March, WWF holds a global event called 'Earth Hour'. At the same hour all over the world, the lights go off for one hour, reminding us of the unwise way we live and often consume scarce resources. The message goes far beyond saving electricity but it is a message that we as individuals, as well as companies, businesses and governments, have to consume wisely, be economical; and that we all live on only 'one' planet, where resources are finite.

In the Guianas, the local population from towns and cities could make greater efforts to recycle and re-use waste instead of throwing it away in creeks, rivers and hidden forests. Wise consumption is a message that is directed not only to businesses, and middle and higher income classes, but also to the poorer classes of the population to whom most of these basic principles also apply.

Equitable resource governance

The steadily growing economies of the Guianas imply a real risk of increasing economic inequalities between the poor, who have limited access to economic and social benefits, and the middle and upper class. This could potentially obstruct further economic growth over the longer term. Commodity market sectors such as mining, logging and fishing are currently exerting pressures on the Guianas natural capital. For artisanal and small-scale workers in these sectors, there may be few alternatives within reach to improve their working and living conditions. In the Guianas, their status is often illegal or informal. Recognition of their situation is a first step for livelihood improvements. Further support to local development will greatly contribute to *more equitable resource governance*, when combined with the mitigation of environmental impacts. This could also build important trust with Governments. When alternatives to illegal or informal practices are within reach, enforcement measures are likely to be more effective. Respecting resource needs of local populations, in terms of access to healthy fresh water and food resources (e.g. fish stocks, agricultural plots) is essential to the well-being of these populations and needs to be included in the management of concessions and when planning the issue of new concessions.

Redirect financial flows and broaden the scope of development

A fundamental question arises, which is whether development is too excessively focused on an increase in material wealth. While this kind of reflection is especially crucial for the rich nations and the BRICS countries (Brazil, Russia, India, China and South Africa), to counteract the 'Business as usual' scenario, it is also relevant in the context of the Guianas. For the last 80 years, GDP has been used as the main indicator of progress, yet that does not give the full story. Ultimately we should be striving for personal and societal wellbeing, which is far more than an increase in consumption. Above a certain income level, more consumption does not increase social benefits, health and human wellbeing. GDP needs to be complemented by other indicators such as the Human Development Index (HDI), the Living Planet Index (LPI), ecosystem services indices, and the Ecological Footprint.

For the Guianas in particular, the economic, financial and fiscal benefits of the exhaustible natural resources such as oil, gold, bauxite and others, should be *redirected and invested broadly in human and social development*, as well as in sustainable economic sectors, to give an equitable benefit to all people, including the future generations. We should beware of polluting freshwater and destroying the natural capital for the financial benefit of a couple of decades of mining and oil business, while leaving a ruined ecosystem to our children. Redirecting financial flows from the extractive industries to support for the development of green economies will have the benefits of diversifying the economy, making it less dependent on price fluctuations on the commodity markets, as well as providing alternatives when the finite extractive resources start to deplete significantly.

REDD+ as a payment for ecosystem services offer new opportunities to cope with the environmental challenges of the Guianas. Former President Jagdeo of Guyana launched the idea of compensation for carbon in standing forests at the UNFCCC COP 13 in Bali in 2007. Since then, Guyana has signed an important agreement with Norway to pay for the conservation of Guyana's forests and further development of the LCDS. Both Guyana and Suriname are redirecting investments to prepare for REDD readiness, but it remains unclear, speaking globally, whether the rich nations and the private sector will be willing to pay for standing forest carbon, or indeed other services such as biodiversity and water retention that result from forest conservation. In this context, international cooperation should contribute to reward and support keeping the Guianas with their vast natural capital truly alive, which is of global importance as shown in this Living Guianas Report.

Land-use planning and land allocation

An important overarching asset in a One Planet Perspective is sound land-use planning and land allocation, which was an essential element of the recommendations on green economies in the 2010 editions of the Living Planet Report (LPR, 2010). The development of an inclusive process for land-use planning is of critical importance (but not a guarantee) to safeguard the natural capital of the Guianas for the future, given the emerging developments. This section of the report is dedicated to this important topic.

It is difficult to compare French Guiana, a region and department of France in Europe, with two young developing nations like Guyana and Suriname. One area in which French Guiana excels, in common with many surrounding Latin countries (most of them independent for two centuries at least), is the important issue of land-use planning. While for a long time the whole terrestrial area has been planned in French Guiana (protected areas, logging concessions, agricultural areas, etc.), a more refined approach to land use planning such as the SDOM and the SDAGE have been engaged in recently. In the SDOM, which is the nationwide planning of future mining concessions, a multi-stakeholder approach was used to arrive at the allocation of future mining zones and no-go zones (even if there are resources to be mined). SDAGE was a watershed management planning tool and is about to be revised at the time of writing.

Both Guyana and Suriname, as young independent nations, have more steps to take and a lot to gain by conducting land-use planning, especially in the south of both countries. Over the decades, both countries have witnessed a proliferation of timber and mining concessions from the north to the south. It is expected that oil exploration concessions will soon be granted. Guyana, however, has gone a long way with the demarcation of Amerindian Lands, but has only recently taken action with the long-overdue institution of some new Protected Areas. The allocation of lands to indigenous and maroon peoples in Suriname and French Guiana has not been given similar treatment to that in Guyana, for a variety of reasons. Nevertheless, Guyana still has a long way to go with biodiversity inventories in order to set up a representative National Protected Area System.

In Suriname there is an urgent need for land-use planning in central and south Suriname, in order to set aside areas for the Amerindian and Maroon communities, and define the areas to be set aside for biodiversity and landscape protection. With upcoming projects like the planned Tapajai hydroelectric dam project, and the planned road and rail links to Brazil, the need for proper multi-stakeholder land use planning cannot be sufficiently emphasized. A dialogue with Suriname's tribal groups has recently been restarted at the initiative of the Government, providing some hope that this issue can be advanced soon. Government recognition of land rights for indigenous and maroon communities and an ability to communicate with each of the groups is a prerequisite for success in the development and planning initiatives in the south of the country. Otherwise we might end up with even more infrastructure, mining and other concessions in areas where traditional people have their lands, villages and cultural and spiritual areas, potentially leading to further tensions between the north and the south of the country.

4%

of Suriname's population joined the first Earth Hour in the country in 2010. Earth hour is a WWF initiative that started in Sydney in 2007 and now embraces hundreds of millions of people in 152 countries that switch off their lights for an hour on the same night to signal their care for our planet.

A CLOSER LOOK AT EACH OF THE THREE GUIANAS

Guyana

Since 2009 Guyana has been set on the path to a green economy by launching the LCDS, or Low Carbon Development Strategy. This LCDS was long in preparation by former President Bharrat Jagdeo and his team of experts, who conducted extensive national studies on the 'opportunity-cost of no-deforestation' with the help of well-known consultancy firms like McKinsey and others. WWF Guianas also supported the Guyana Forestry Commission in 2009 with the first studies leading to the setting up of a national Forest Carbon Stock Assessment, as well as an MRV-system (Monitoring, Reporting and Verification) for REDD+. All this work led to the signature of a 250 million USD grant from Norway to support implementation of the LCDS.

Another very positive development in Guyana was the approval of the Protected Areas Bill in 2011 and the creation of two more protected areas. This process will continue in the future and seems very promising. While it is not intended to stop mining or logging under the LCDS, such operations will need to be well planned and controlled, and produce less deforestation. But it is clearly the government's intention to produce less carbon dioxide emissions on the national scale. Several projects are underway to realize this objective, one of them being the building of a hydroelectric dam on the Amaila falls in the west-central portion of the country. Guyana is clearly an example to the world and a 'laboratory' for green economies, and the whole world can take lessons from this wise approach.

Suriname

Positive developments have been noted in recent years with respect to better environmental management and more green development. One of the positive developments has been the creation of a special Unit (OGS) for controlling and reorganizing the small scale gold mining sector under the Office of the President. While results have been mostly focused on short-term enforcement, it is clear that the task is huge and daunting. Further, it is not only the poor who are involved in the small- to medium-scale gold mining sector, but also some influential people, making the task all the more complicated. A special coordinating unit for the environment and spatial planning has been set up within the department of National Security in the office of the President. Another positive element is the creation of the CCDA, or Climate Compatible Development Agency, which also falls directly under the Office of the President and is now catalyzing REDD+ readiness in Suriname.

However, it is of the highest urgency that, besides imposing tax conditions on the investing multinationals, there will be sufficient pressure from the Government to enforce the application of sound environmental and social guidelines. Plans by the government to support institutional strengthening of NIMOS (the National Institute on Environment and Development), currently tasked with guiding impact assessment processes, are regarded as very positive. However, they should be combined with accelerated implementation of environmental laws and regulation. Other key areas, such as the demarcation of indigenous and maroon lands, the creation of new protected areas, and general land use planning for central and south Suriname, deserve the needed attention.

French Guiana

French Guiana is an Overseas Department of France and as such the main decisions regarding 'green economies' have to emerge jointly from the French State and the main local councils. The importance of French Guiana or 'La Guyane' used to lie primarily in the aeronautical and space base Ariane in Kourou. But over the years, a growing recognition of the importance of local biodiversity has emerged. As a consequence, the French Government, in agreement with local councils, has taken some positive, key decisions regarding the protection of the forests as more than 40% of the terrestrial area is protected in one form or another. Environmental regulation of companies is also very strict and since 2006 mercury has been entirely banned in the country for use in gold mining. However, there is still an enormous problem with 'illegal gold mining', not least in the very important Parc Amazonien, and this is therefore the greatest threat by far to the environment in French Guiana.

Apart from the Central Government in Paris, some decisions on development and conservation fall under the responsibility of the regional powers or 'La Région'. La Région has an increasingly positive attitude to conservation and green development, and now even plays an important role in funding and managing the first 'regional' protected area (Kaw mountains). However, some clear threats are also emerging in French Guiana: the development of more new roads to the interior, the threat of new multinational mining companies, as well as the upcoming oil exploration in French Guiana's marine waters.

CONCLUSION

The enormous reserves of forest and freshwater resources, coupled with low population pressure and a relatively low exploitation level of natural resources over the past decennia, provide the Guianas with favorable conditions to develop green economies pathways. There is probably no single region in the tropical world where these highly favorable conditions are equaled. The challenge for governments, businesses and communities of the Guianas is to curb current pressures on biodiversity and ecosystem services from increasing economic activities in such a way that natural capital is preserved, and current and future populations can benefit from the sustainable management of the rich resources of the Guianas. While Guyana takes the lead with its Low Carbon Development Economy, the other countries in the region are carefully viewing this development and will take their own decisions. To WWF it is clear, however, that Guyana and Suriname need to be supported by the international community in their quest for sustainability and the establishment of green economies, in a similar way as French Guiana benefits from European support. Protection of the rainforest needs to be rewarded by the international community and businesses, as it provides tremendous ecological services, not least in the form of 'standing carbon', which helps in the reduction of CO_2 emissions. Sustainable timber harvesting and sustainable fisheries also need to be rewarded with premium prices. WWF Guianas with the help of the WWF network and all its donors will certainly continue to help the governments, businesses and communities in the Guianas that want to build a better future for the benefit of the environment and all people living in the Guianas.

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LIST OF ABBREVIATIONS

ACT	Amazon Conservation Team
BRICS	Brazil, Russia, India, China, South Africa
C.O.C.A.	Community-Owned Conservation Area
CBD	Convention on Biological Diversity
CCDA	Climate Compatible Development Agency
CEDLA	Centre for Latin American Research and Documentation
CELOS	Center for Agricultural Research in Suriname
CI	Conservation International
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization (of the United Nations)
FLEGT	Forest Law Enforecement, Governance and Trade (EU)
FRA	Forest Resource Assessment (FAO)
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GFC	Guyana Forestry Commission
GSF	Guiana Shield Facility
GSI	Guiana Shield Initiative
HDI	Human Development Index
HFLD	High Forest cover, Low Deforestation
HKV	communal logging permits (Houtkapvergunningen in Dutch)
IIRSA	Initiative for the Integration of Regional Infrastructure in South America
INSEE	National Institute of Statistics and Economic Studies - France
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
LAI	Living Amazon Initiative
LCDS	Low Carbon Development Strategy
LGR	Living Guianas Report
LPI	Living Planet Index
LPR	Living Planet Report
MRV	Measurement, Reporting and Verification (for REDD)
MSC	Marine Stewardship Council
NIMOS	National Institute on Environment and Development - Suriname
NTFP	Non-Timber Forest Products
OGS	Commission Structuring Gold Sector
ONF	National Forestry Service - France (Office National des Forêts)
REDD+	Reducing Emissions from Deforestation and Degradation "plus" conservation and sustainable management of forests
SBB	Suriname's Forestry Service (Stichting Bosbeheer en Bostoezicht in Dutch)
T(T)ED	Turtle (and Trash) Excluder Device
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WDPA	World Database on Protected Areas
WHO	World Health Organization
WRI	World Resources Institute
WWF	World Wildlife Fund (also known as World Wide Fund for Nature)

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