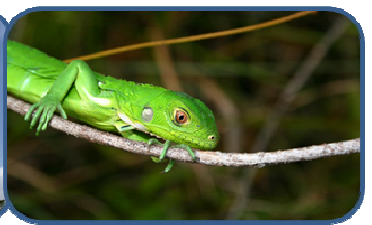
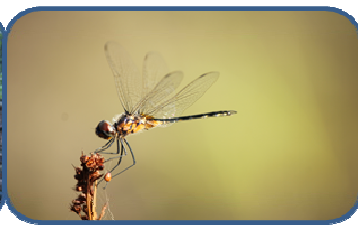




2012 ANNUAL REPORT





VISION

(Strategic Plan 2010-2014)

To lead Trinidad and Tobago in attaining and managing environmentally healthy and sustainable communities and ecosystems



MISSION

The Environmental Management Authority is committed to protecting, restoring and conserving the environment to improve the quality of life by promoting:

- Environmentally responsible development
 - A culture of care for the environment
- Development and enforcement of environmental legislation
 - Use of economic, financial and other incentives

This is to be achieved in an atmosphere of mutual respect, professionalism, accountability, transparency, collaboration and social responsibility.

MESSAGE FROM THE CHAIRMAN



Dr. Allan Bachan
Chairman

During the 2012 reporting period, the Board of Directors of the Environmental Management Authority (EMA) operated under the Chairmanship of the late Mr. Kelvin Ramnath, followed by Mr. Shyam Dyal, Deputy Chairman. On behalf of the current Board of Directors I am pleased to present this 2012 Annual Report, as part of the EMA's ongoing commitment in meeting its mandate and working towards sound environmental management in Trinidad and Tobago.

This Annual report is grounded in the results of the National Biodiversity Assessment of Trinidad and Tobago (NBATT). With regards to the annual report, all facets of environmental management within the EMA's purview for the 2012 period will be shared, along with highlights of our major achievements and future targets.

The NBATT presented in this report takes stock of the breadth and depth of information on biodiversity in Trinidad and Tobago so that a baseline for improving research and management approaches related to our country's biological resources can be established. This information will build on the findings of reports which have been compiled on biodiversity in Trinidad and Tobago over the years, and also identify important gaps in biodiversity management processes, information and policies in Trinidad and Tobago.

In addition to the NBATT report, the EMA took on the challenge of addressing noise pollution complaints through its first noise campaign, titled 'Music is our Culture, Noise is Not' and also introduced a pilot noise hotline and noise FAQ booklet. The EMA also held its first Sea Turtle Symposium in May 2012 and hosted several public education awareness initiatives to boost environmental sensitisation in Trinidad and Tobago. The EMA also launched its first National Photography Competition, 'Aripo Savannas Revealed' which sought to improve public's awareness of the EMA's Environmentally Sensitive Areas.

The ongoing work of the EMA continued as a second Ambient Air Quality Monitoring (AAQM) Station was installed on the port of Pt. Lisas. The EMA also met with Nature Seekers (NS) in January 2012 and collaborated with this community-based organisation (CBO) on a project that aimed at reducing the number of sea turtles caught and killed in gill nets through providing and encouraging the use of alternative fishing methods. For 2012, the EMA also adopted a sector specific approach for permitting beginning with the water and wastewater sector. Based on

information contained in the Source Registration database, permits were issued to 50 facilities in 2012.

The EMA remains committed to using the most reliable data to inform its reports. Our dedication and thorough processes involved in developing and executing environmental legislation and policies, monitoring developmental activities, executing public education and awareness programs, and establishing and coordinating stakeholder partnerships, are entrenched in the EMA's implicit mission to ensure that sustainability is at the core of its operations.

At the EMA, the strategic focus is to lead Trinidad and Tobago in attaining and managing environmentally healthy and sustainable communities, and ecosystems. We are proud of our leadership role in sustainability and continue to set milestones of achievement for ourselves and for the benefit of this nation.

The EMA has been working diligently to meet its mandate and will continue to strive towards maintaining the delicate balance of our country, while ensuring that responsible environmental management prevails.

Dr. Allan Bachan
Chairman
March 2014

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List of Abbreviations

BAC	Biodiversity Advisory Council
BRMC	The Buccoo Reef Management Committee
CARDI	The Caribbean Agricultural Research and Development Institute
CBC	California Biodiversity Council
CBD	Convention on Biological Diversity
CCC	Coral Cay Conservation
CDIAC	Carbon Dioxide Information Analysis Centre
CEDPT	The Comprehensive Economic Development Plan for Tobago
CNG	Compressed Natural Gas
COP	Conference of the Parties
COP10	Tenth Conference of the Parties
CRU	Cocoa Research Unit
CSO	Central Statistical Office
EMA	Environmental Management Authority
ESA	Environmentally Sensitive Area
ESS	Environmentally Sensitive Species
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO-5	Fifth Global Environment Outlook report
GISD	Global Invasive Species Database
GoRTT	The Government of the Republic of Trinidad and Tobago
GSPC	Global Strategy for Plant Conservation
ha	Hectares
HDI	Human Development Index
IPCC	Intergovernmental Panel on Climate Change
IT-PGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
IWCAM	The Integrated Watershed and Coastal Area Management Project
LAC	Latin America and the Caribbean
LRC	Land Reclamation Committee of Trinidad and Tobago
m	Meters
MEWR	Ministry of the Environment and Water Resources
MFP	Ministry of Food Production
MFPLMA	Ministry of Food Production, Land and Marine Affairs
MT	Metric Tonnes
MTPF	Medium Term Policy Framework
N/A	Not Available
NAPCLDTT	National Action Programme to Combat Land Degradation in Trinidad and Tobago
NBATT	The National Biodiversity Assessment for Trinidad and Tobago

NBSAP	The National Biodiversity Strategy and Action Plan
NCCP	National Climate Change Policy
NEP	National Environmental Policy
NFP	The National Forest Policy
NGO	Non-Governmental Organization
NIWRMP	The National Integrated Water Resources Management Policy
NPAP	National Protected Areas Policy
NSDP	National Spatial Development Plan
NTFPs	Non-Timber Forest Products
NWC	The National Wetlands Committee
NWP	National Wetland Policy
NWRMS	The National Water Resources Management Strategy
ODPM	Office of Disaster Preparedness and Management
PA	Protected Area
PES	Payment for Ecosystem Services
PGRFA	Plant Genetic Resources for Food and Agriculture
ProEcoServ	Project for Ecosystem Services
PSIP	Public Sector Investment Project
SIDS	Small Island Developing State
SPAW	Specially Protected Areas and Wildlife
SST	Sea Surface Temperature
STRAP	Sea Turtle Recovery and Action Plan
T&T	Trinidad and Tobago
TEEB	The Economics of Ecosystems and Biodiversity
THA	Tobago House of Assembly
UKNEA	United Kingdom National Ecosystem Assessment
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency
UWI	The University of the West Indies
WASA	Water and Sewerage Authority
WRI	World Resources Institute
WSDTT	Working for Sustainable Development in Trinidad and Tobago

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**PART A: ASSESSMENT OF THE STATE OF THE ENVIRONMENT
REPORT**

EXECUTIVE SUMMARY

Biodiversity plays a critical and beneficial role to the economic, social and environmental aspects of human development. Trinidad and Tobago (T&T) boasts of rich biodiverse environments relative to its size. Unfortunately, according to the National Biodiversity Assessment of T&T (NBATT) report, there is a decline in the size of these major natural ecosystems.

Between 1990 and 2010, T&T's forests suffered an average loss of 0.31% of forest cover per year due to land use pressures. Currently, the primary forest cover is estimated at 32% of the land area for Trinidad and 54% for Tobago. Natural forests provide the majority of the sawn logs to the timber industry, which contributed TT\$28 million in 2011 to the economy. This ecosystem provides water purification, flood regulation, soil retention and carbon sequestration/storage services. These forests also provide for hunting of game species, the most popular being the Agouti. According to the report, within recent years wildlife populations have been decreasing, while the number of registered hunters has been increasing.

Of significance within this report are the two savanna ecosystems found in Trinidad. The Aripo Savannas, one of the two savanna ecosystems, has not been seriously degraded due to its distance from urban areas. However, rarer species of plants found there have been impacted by the increased frequency of fires. With respect to the second savanna ecosystem, the Erin Savannas, one third of its natural vegetation has been damaged by the planting of Caribbean Pine. Furthermore, the invasive species *Acacia mangium*, has been outcompeting the natural flora in the Erin Savannas where it is colonising the undisturbed areas of the savanna as well as areas disturbed by pine.

Wetland ecosystems are also decreasing in size in T&T. Between 1976 and 2007, wetlands decreased by 2,896 hectares (ha) mainly due to industrialization and increasing population growth, coupled with its demand for urbanisation. Mangrove forests currently occupy a total area of 9,146.4 ha in Trinidad and 229.9 ha in Tobago. Wetland ecosystems, including coral reefs and mangrove forests, provide services which include reduction of coastal erosion, habitat provision and as a tourist attraction.

Seagrass communities are located on several coasts in both Trinidad and Tobago. Its extent is not thoroughly researched but it has been found to be declining. Coral reefs play an important part in maintaining the biodiversity of marine life as they create several habitats and feeding grounds for them. Unfortunately, live hard coral cover in Tobago has declined by 50% within 2005 and 2010 due to two major bleaching events.

Commercial fish stocks have been in decline as several species are considered to be overexploited. Marine ecosystems provide T&T with a major food source of fish and seafood products with a consumption per capita of 14 kilograms per year. When values of several ecosystem services are summed, they are worth within an estimated TT\$1,827,000 – 2,107,000 per year.

The main factors contributing to biodiversity loss includes deforestation and the alteration of land use for agriculture and housing. Industrial development also plays a negative role as it has converted several areas and ecosystems along the west coast of Trinidad into industrial estates. In order to accommodate these developments, an increase in road networks has also led to habitat fragmentation. In Tobago, the landscape change was determined by its growing tourist destination status, which demanded more accommodations. Other factors contributing to changes in land cover are quarrying, logging and fires.

Biodiversity in T&T is currently facing the negative impacts of climate change. In 2009, carbon dioxide emissions in T&T were estimated at 42,540.9 kilotonnes. The low-lying coastal ecosystems are at the highest risk due to sea level rise of 1mm per year.

T&T is also facing the issue of food insecurity. The production levels of the local agricultural sector and its contribution to GDP have dropped consistently over the past few years. Consumption consistently outweighs local production leaving food availability largely dependent on foreign markets. T&T currently faces a food import bill of TT\$4 billion. However, there are current in situ and ex situ conservation practices in place to aid local agrobiodiversity. Cocoa, hot pepper and breadfruit are considered strategic crops that have a natural advantage in T&T and possess great economic opportunities.

In order to conserve and improve the current state of the environment in T&T, several policies have been put in place by the Government of the Republic of Trinidad and Tobago. These include the National Environmental Policy, the National Climate Change Policy, the National Biodiversity Strategy and Action Plan, the Working for Sustainable Development in Trinidad and Tobago Policy, the Medium Term Policy Framework, the Comprehensive Economic Development Plan for Tobago, the National Forest Policy, the National Integrated Water Resources Management Policy, the National Water Resources Management Strategy, the National Wetland Policy, the National Protected Areas Policy and the National Action Programme to Combat Land Degradation in Trinidad and Tobago.

Chapter 1 Introduction

Overview

Biological diversity (biodiversity) is defined by the Convention on Biological Diversity (CBD) as “the variability among living organisms from all sources including, among others, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”¹. In recent years, there has been a growing appreciation for and understanding of the critical importance that biodiversity plays in underpinning human well-being. Biodiversity’s roles in sustaining ecosystem functioning and providing vital benefits or ecosystem services (such as food, freshwater, pollination and natural disaster mitigation) are crucial in supporting the economic, social and environmental aspects of human development.

Global Perspective

In almost every part of the world, biodiversity is declining at accelerating rates². The recently concluded Fifth Global Environment Outlook report (GEO-5) has highlighted the following²:

- The pressure on biodiversity continues to increase. Habitat loss and degradation from agriculture and infrastructure development, overexploitation, pollution and invasive alien species remain the predominant threats. Climate change is increasing in importance and will have profound impacts, particularly in combination with other threats.
- The state of global biodiversity is continuing to decline, with substantial and ongoing losses of populations, species and habitats.
- The benefits humans obtain from biodiversity are at risk, which includes continuing ecological degradation, unsustainable levels of consumption and inequities in sharing of the benefits from biodiversity. These threaten the improvements in human well-being and health that have been achieved in recent decades.
- There has been an increase in responses to the loss and degradation of biodiversity, although these have failed to reduce its decline and more effort is needed.

¹ Convention on Biological Diversity (CBD), (n.d.). Article 2- Use of Terms. Retrieved from <http://www.cbd.int/convention/articles/default.shtml?a=cbd-02>

² United Nations Environment Programme (UNEP), (2012). GEO₅ Global Environment Outlook- Summary for Policy Makers. Retrieved from http://www.unep.org/geo/pdfs/GEO5_SPM_English.pdf

Box 1.1. CBD Strategic Plan 2011-2020.

Mission Statement

"Take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication. To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented, and decision-making is based on sound science and the precautionary approach."

Source: CBD, n.d.³

At a global level, findings indicate that biodiversity is steadily declining and the window of opportunity for addressing this problem is closing. This has caused key players in biodiversity to take more concerted action to bring greater focus and attention to biodiversity issues. The CBD's Tenth Conference of the Parties (COP10) held in Nagoya in 2010 made several decisions, and recommended several actions in this regard, including the establishment of the (20) Aichi Targets under the CBD's Strategic Plan 2011-2020 (*Table 1.1*). These targets provide a comprehensive framework for countries to work both individually and collectively towards achieving the CBD's mission (*Box 1.1*), and meeting the overall goal of greater sustainability at all scales.

Table 1.1. Aichi Biodiversity Targets.

Strategic Goal	Target Number	Target
A		<i>Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society</i>
	1	By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
	2	By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.
	3	By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent

³ Convention on Biological Diversity (CBD), (n.d.). Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets. Retrieved from <https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf>

Strategic Goal	Target Number	Target
		and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.
	4	By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.
B	<i>Reduce the direct pressures on biodiversity and promote sustainable use</i>	
	5	By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.
	6	By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.
	7	By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.
	8	By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.
	9	By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.
	10	By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.
C	<i>To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity</i>	
	11	By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.
	12	By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.
	13	By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.
D	<i>Enhance the benefits to all from biodiversity and ecosystem services</i>	

Strategic Goal	Target Number	Target
	14	By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.
	15	By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 percent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.
	16	By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.
E	<i>Enhance implementation through participatory planning, knowledge management and capacity building</i>	
	17	By 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.
	18	By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.
	19	By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.
	20	By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

Source: CBD, n.d.⁴

⁴ Convention on Biological Diversity (CBD), (n.d.). Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets. Retrieved from <https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf>

The Trinidad and Tobago Context

Trinidad and Tobago (T&T) boasts a very rich biodiversity relative to its size. This biodiversity plays a very important role in supporting development activities on both islands. A national-level assessment of T&T's biodiversity, undertaken in 2010 as a part of the country's Fourth National Report to the CBD, highlighted that there have been disturbing signs of loss and degradation to many aspects of the country's natural living resource base with undeniable consequences for human well-being⁵. As such, in 2010, T&T reported to the CBD that similar to all other countries, it was unable to meet the Biodiversity 2010 Target. This Target was "*to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth*"⁶. Measures in place in T&T (over fifty laws, policies, plans, strategies and programmes) to curb the loss of biodiversity have not been sufficient to address the growing problem, and a different approach is urgently required.

One important step to bring greater coherence and direction to the management of biodiversity in T&T which is currently being initiated by the Government of the Republic of Trinidad and Tobago (GoRTT) is the revision of the National Biodiversity Strategy and Action Plan (NBSAP). The existing NBSAP was passed in Cabinet in 2001 but was never fully implemented. It is currently out of date and needs to take into consideration new frameworks, tools and approaches that are available for biodiversity planning and management. It also needs to take into account changes in biodiversity which have occurred over the last decade so that these can be factored into priority setting and programming.

Revising the NBSAP is by no means an easy or straightforward process. There are several steps which are involved in the NBSAP update, and a critical early step is establishing a baseline understanding of the current state of biodiversity and its management. It is in this context that the current report, referred to as the National Biodiversity Assessment for Trinidad and Tobago (NBATT), is designed and presented.

Purpose and General Scope

The purpose of this report is to provide a status update of the environment with a focus on the biodiversity resources in T&T. It builds on the findings of the Fourth National Report of T&T to the CBD (2010) and several other reports which have been compiled on biodiversity in T&T

⁵ The Government of the Republic of Trinidad and Tobago, (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

⁶ Convention on Biological Diversity (CBD), (n.d.). Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets. Retrieved from <https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf>

over the years. With this focus in mind, and based on the Aichi Targets, this report is centered on the following questions:

1. What is the current state of, and trends in, T&T's biological resources? And which resources are most at risk? *Chapter 2*
2. What are the major factors that are driving negative changes in the country's biodiversity? *Chapter 2*
3. What is the value of T&T's biodiversity to human well-being? *Chapter 3*
4. What role does biodiversity play in agriculture? *Chapter 4*
5. What is the legal policy framework for the management of Trinidad and Tobago's biodiversity? *Chapter 5*

1.1.1 Selection of Biodiversity Components for Assessment

In an assessment such as this, attempting to cover every aspect of biodiversity in T&T (every ecosystem, ecosystem service, species or gene) is very difficult, and may not be useful from a national planning perspective. For the purpose of informing policy and action, it is most useful to prioritize those components which are considered most critical to human well-being, and/or which play important roles in maintaining the integrity of key natural systems. In this regard, this report focuses on the following sub-categories of biodiversity under each of the four major components:

1. Ecosystems

- Forests (*F*)
- Wetlands (*W*)
- Savannas (*S*)

2. Ecosystem services

- Provisioning: Timber (*F*), Wildlife (*F*), Fisheries (*W*)
- Regulating and Supporting: Runoff regulation (*F*), Coastal protection (*W*), Water purification (*F*), Carbon sequestration (*F*)
- Cultural: Tourism (*F, W*), Non-timber forest products-craft (*F*)

3. Species

- Flora
 - Terrestrial flora
 - Seagrasses and mangroves

- Fauna
 - Mammals
 - Birds
 - Fishes (marine and freshwater)
 - Amphibians
 - Reptiles
 - Marine invertebrates
 - Terrestrial invertebrates (butterflies, spiders and scorpions)
 - Corals

4. Genetic resources

a. Agrobiodiversity

The extent to which each of the aforementioned aspects is assessed is highly dependent on available data and information, and the reader should therefore not expect an equal treatment of every aspect.

Box 1.2. Useful Terminology.

Ecosystems are defined as dynamic complexes of plant, animal and micro-organism communities and the non-living environment interacting as a functional unit.

Ecosystem diversity refers to the variety of habitats that occur within a region, or the mosaic of patches found within a landscape.

Ecosystem services are the benefits that people derive from ecosystems (including provisioning, regulating, cultural and supporting services).

Species diversity is the variety and abundance of different types of organisms which inhabit an area.

Genetic diversity is the combination of different genes found within a population of a single species, and the pattern of variation found within different populations of the same species.

Source: CBD, n.d.⁷, CBC, 2008⁸, USEPA, 2003⁹

⁷ Convention on Biological Diversity (CBD), (n.d.). Article 2- Use of Terms. Retrieved from <http://www.cbd.int/convention/articles/default.shtml?a=cbd-02>

⁸ California Biodiversity Council (CBC), (2008). Scientific Definitions of Biodiversity. Retrieved from http://biodiversity.ca.gov/Biodiversity/biodiv_def2.html

⁹ United States Environmental Protection Agency (USEPA), (2003). Ecosystems and their Services. Retrieved from [http://yosemite.epa.gov/SAB/sabcvpess.nsf/e1853c0b6014d36585256dbf005c5b71/8f5869f2c957655d85256f1200524ffc/\\$FILE/MA_CF_chap2_p4c_final.pdf](http://yosemite.epa.gov/SAB/sabcvpess.nsf/e1853c0b6014d36585256dbf005c5b71/8f5869f2c957655d85256f1200524ffc/$FILE/MA_CF_chap2_p4c_final.pdf)

Chapter 2 Biodiversity Status, Trends and Driving Forces

Introduction

Trinidad and Tobago's biodiversity supports a number of natural ecosystems including forest ecosystems; inland freshwater systems (rivers and streams); coastal and marine ecosystems (such as coral reefs, mangrove swamps, seagrass beds and open ocean); savannas; karst landforms (including caves); and man-made/induced systems (such as secondary forests, agricultural lands and freshwater dams). For the purpose of this report, three main ecosystems are considered in the assessment of status, trends and driving forces. These include (1) Forests, (2) Wetlands, and (3) Savannas. The services provided by these systems support human well-being in direct and tangible ways such as through the provision of freshwater, forest products and fisheries. These services are also important at a national scale in indirect and sometimes less tangible ways, such as through regulating, supporting and cultural services (*Box 2.1*).

Despite the importance of biodiversity to national gross domestic product (GDP), local livelihoods and other aspects of well-being at the national and sub-national levels, previous reports have highlighted that unsustainable development and ineffective management practices have been leading to a decline in biodiversity and consequently a degradation of ecosystems and its services.

This section provides an assessment of the conditions and trends in key ecosystems and the services they provide, species and genetic resources, and identifies the drivers of change – direct and indirect – acting on these ecosystems. The implications of drivers on human well-being are not assessed in great detail as these are done in *Chapter 3* and *Chapter 4* of the report.

Box 2.1. Ecosystem Services Definitions.

Ecosystem services are the goods and benefits that people obtain from ecosystem processes and functioning. These services are categorized as provisioning, cultural, or regulating and supporting.

Provisioning ecosystem services include all material and energetic outputs from ecosystems, for example, food, water, timber, fuel and fiber.

Cultural services include all non-material ecosystem outputs that have symbolic, cultural or intellectual significance, for example, recreation, education and research, and religious symbolism.

Regulating and supporting services include non-consumable ecosystem outputs such as regulation and remediation of wastes (carbon dioxide sequestration), flow regulation (hydrologic cycle), geophysical cycling (nutrient cycles), and regulation of the biotic environment (habitat and disease regulation).

Source: Haines-Young & Potschin, 2009¹⁰

¹⁰ Haines-Young, R., & Potschin, M. (2009). Methodologies for Defining and Assessing Ecosystem Services. Retrieved from http://www.nottingham.ac.uk/cem/pdf/JNCC_Review_Final_051109.pdf

Assessment of Status and Trends in Biodiversity in Trinidad and Tobago

2.1.1 Key Ecosystems

There are a number of indicators for assessing the conditions and trends in terrestrial ecosystems where a useful indicator for this is the extent or coverage of the ecosystem. The reduction in the size of ecosystems is often the result of land use change. Conversion of habitats for human use can have major impacts on species within the ecosystem, and can also affect functional relationships resulting in the reduction of an ecosystem's ability to deliver goods and services. Therefore, information about trends in the extent of biomes, ecosystems and habitat-types, is a crucial part of understanding the state and trends of biodiversity as a whole.

Box 2.2. Key Definitions.

Biome: The largest unit of ecological classification below the level of the globe. Terrestrial biomes are typically based on dominant vegetation structure. Marine biomes are typically based on biogeochemical properties. Ecosystems within a biome function in a broadly similar way, although they may have different species composition.

Ecosystem: A dynamic complex of plant, animal, and microorganism communities and their non-living environment interacting as a functional unit.

Habitat: an ecological area that is inhabited by a particular species of animal, plant or other type of organism.

Source: UKNEA, 2011¹¹

2.1.1.1 Forest Ecosystems

There are two recent sources of data on the extent of forest cover in T&T which provide significantly different values for forest cover. The most recent estimates from the Food and Agriculture Organization (FAO) indicate that in 2010, total forest cover was approximately 226,413 hectares (ha) which represents 44% of the area of T&T (combined), of which 28% is listed as primary forest (*Figures 2.1 and 2.2*)¹². Forest cover is defined worldwide as land spanning more than 0.5 ha, with trees higher than 5 metres (m) and a canopy cover of more than 10%, or trees able to reach these thresholds in situ¹². Note that this definition differs from T&T's definition of forest cover which is defined as land spanning more than 0.4 ha, with trees higher than 3 m and a canopy cover of more than 10%¹². The following forest types are found in T&T: evergreen seasonal forest, semi-evergreen seasonal forest, deciduous seasonal forest, dry

¹¹ United Kingdom National Ecosystem Assessment (UKNEA), (2011). Technical Report- Glossary. Retrieved from <http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=X%2b%2bO2dpIXW0%3d&tabid=82>

¹² Food and Agriculture Organization (FAO), (2010). Global Forest Resources Assessment 2010, Country Report- Trinidad and Tobago. Retrieved from <http://www.fao.org/docrep/013/al647E/al647e.pdf>

evergreen forest, seasonal montane forest, montane forest, swamp forest, secondary forest, teak and pine plantations, other plantations and bamboo.

This differs from data from Helmer et al. (2012) who found that up to 2010, forest cover in T&T was 72% of its area¹³. Of this, T&T was estimated to have a total forest cover of 73% and 84%, respectively. Forest cover is defined by Helmer et al. (2012) as comprising dry evergreen forest-littoral woodland, deciduous to semi-evergreen seasonal forest, semi-evergreen seasonal forest, evergreen seasonal forest, montane rainforest, rainforest, forested wetlands, young secondary forest, and tree plantations¹³. It is questionable whether young secondary forest including abandoned agricultural estates, tree plantations and bamboo should be counted as actual forest. If plantation forests (3.3%) and young secondary forests (36.3%) are extracted from Helmer et al.'s proposed total forest cover for Trinidad, then the remaining primary forests amount to approximately 32.4%¹³. In the case of Tobago, after removing the young secondary forest (bamboo and cocoa) and forested wetlands, the percentage of primary forest cover amounts to 53.6%¹³.

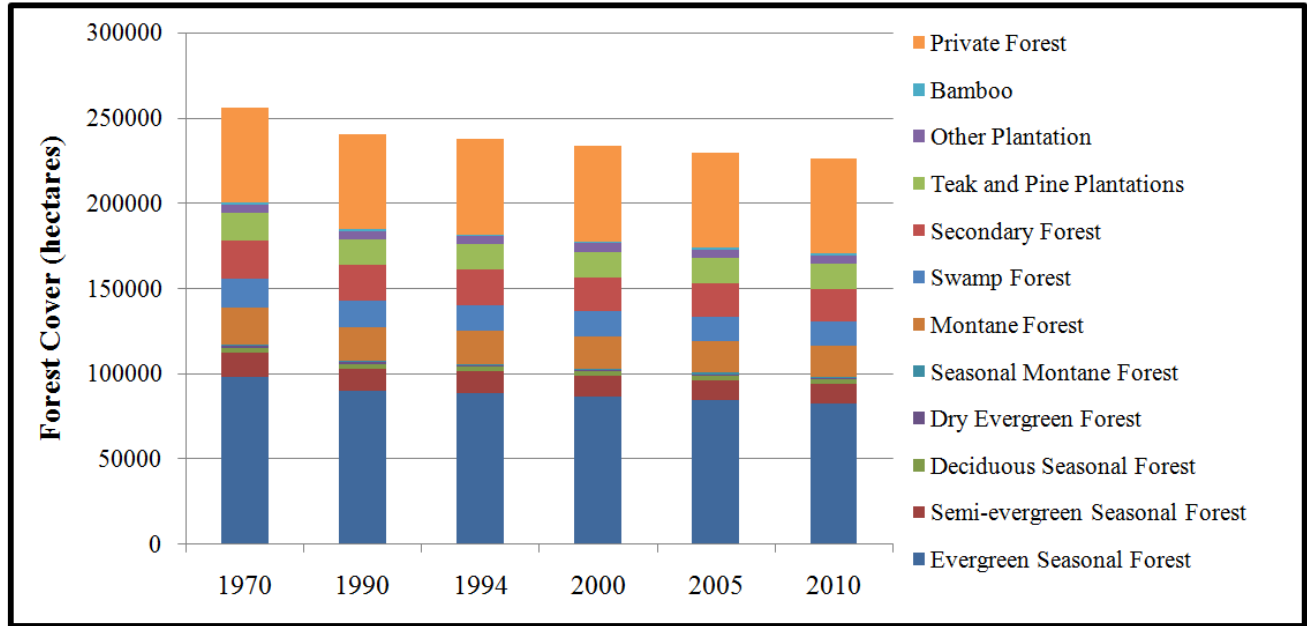
Further examination of the methods used for data collection revealed differences between FAO's and Helmer et al.'s methods. The FAO forest cover data is based on remote sensing using Landsat satellite images from 1975, 1990, 2000 and 2005, whereas in the Helmer et al. (2012) study, forest cover was derived using remote sensing from the compilation of Landsat satellite images ranging from 1985 to 2007¹³.

It is likely that the figures provided by Helmer et al. (2012) may overestimate forest cover due to the use of old data in calculating current estimates. It is also likely that Helmer et al. (2012) did not successfully distinguish between evergreen seasonal forest, lower montane forest and young secondary forest, possibly due to the difficulty in making this differentiation from remote sensing methods including air-photos¹⁴. What the discrepancy highlights is the need for standardized and ground-truth methods of data collection.

¹³ Helmer, E. H., Ruzycki, T. S., Benner, J., Voggesser, S. M., Scobie, B. P., Park, C.,..., Ramnarine, S. (2012). Detailed maps of tropical forest types are within reach: Forest tree communities for Trinidad and Tobago mapped with multiseason Landsat and multiseason fine-resolution imagery. *Forest Ecology and Management*, 279, 147-166.

¹⁴ Oatham, M. P., Armstrong, R. & Ramlal, B. (personal communication, August, 2004). Changing Land Use on the Erin Savannas. Nature of the Islands Conference in honour of Peter R. Bacon. University of the West Indies, Trinidad.

Figure 2.1. Forest Cover (ha) by type in Trinidad and Tobago between 1970 and 2010.



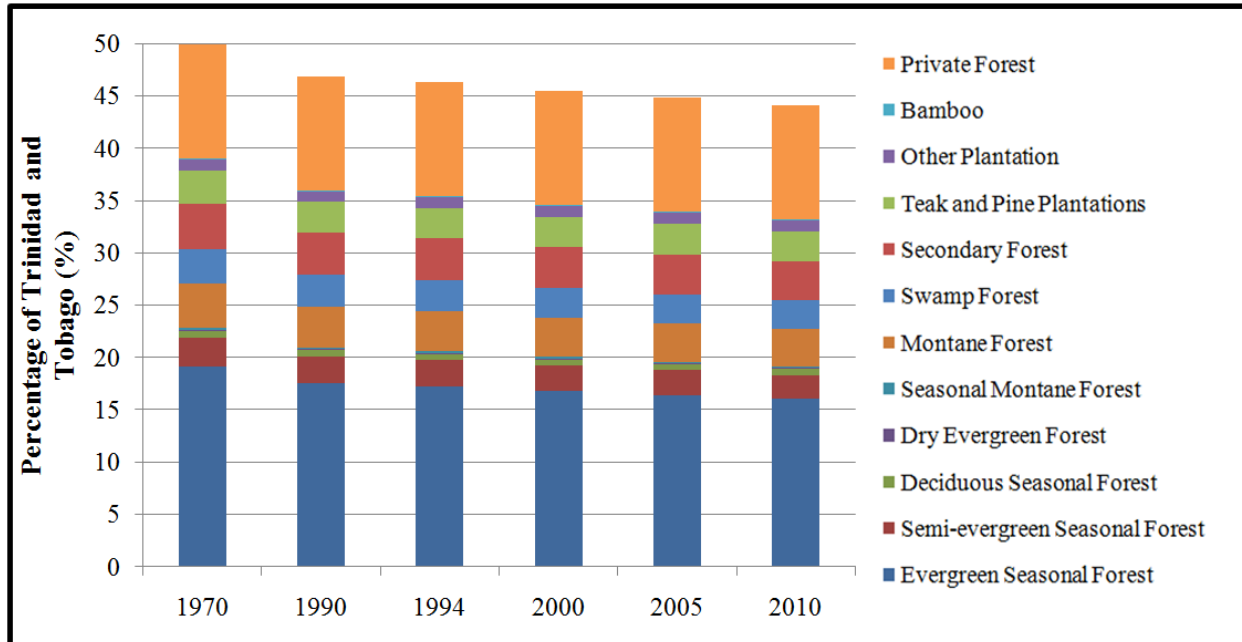
Source: FAO, 2010¹⁵

Based on the discrepancies between sources, caution needs to be exercised in quoting figures from various sources, given the differences in calculation methods and definitions of forest. From this assessment, it is suggested that the safest and most conservative numbers to quote for ‘percent forest cover’ (or primary forest cover) would be about 32% of the land area for Trinidad and 54% for Tobago¹⁵.

Based on FAO’s Global Forest Assessment (2010), the forested areas are mainly concentrated in the eastern Northern Range, Central Range and Southern Range of Trinidad, and the Main Ridge in the centre of the island of Tobago. It is important to note that the dominant forest type in T&T is evergreen seasonal forest, and decrease in total extent of forest in T&T are due largely to decreases in this forest type (*Figure 2.2*).

¹⁵ Food and Agriculture Organization (FAO), (2010). Global Forest Resources Assessment 2010, Country Report- Trinidad and Tobago. Retrieved from <http://www.fao.org/docrep/013/al647E/al647e.pdf>

Figure 2.2. Forest Extent as a Percentage of Trinidad and Tobago between 1970 and 2010.



Source: FAO, 2010¹⁶

Deforestation throughout Trinidad has been occurring for decades. Information obtained from Beard (1946) indicated that low figures for forest cover in the western Northern Range occur more as a result of extensive cutting for residential and commercial development than natural conditions¹⁷. Opadeyi (2010) noted that deforestation was also prevalent in the valleys of the Eastern Northern Range largely due to land development and quarrying pressures¹⁸. The implications of the increasing extent of deforested land include key tradeoffs in important forest ecosystem services such as water provisioning and flood regulation (*Section 2.3.5*).

2.1.1.2 Wetland Ecosystems

Wetlands are defined in the Ramsar Convention as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water where the depth at low tide does not exceed 6 m¹⁹. Wetland ecosystems can be classified as either emergent (existing above sea level) or submerged (inundated by the sea). In T&T, emergent wetland ecosystems comprise mangrove communities, marshes, freshwater swamp forest, and manmade wetlands; submerged wetlands include coral reefs and seagrass beds. Data on the extent of emergent wetlands available from

¹⁶ Food and Agriculture Organization (FAO), (2010). Global Forest Resources Assessment 2010, Country Report- Trinidad and Tobago. Retrieved from <http://www.fao.org/docrep/013/al647E/al647e.pdf>

¹⁷ Beard, J. S. (1946). *The Natural Vegetation of Trinidad*. Oxford: Clarendon Press.

¹⁸ Opadeyi, J. (personal communication, April 8, 2010). *Managing Our Land, Managing Our Future*. The University of the West Indies, St. Augustine, Trinidad.

¹⁹ Ramsar Convention, (1971). *Convention on Wetlands of International Importance Especially as Waterfowl Habitat*. Retrieved from http://www.ramsar.org/cda/en/ramsar-documents-texts-convention-on/main/ramsar/1-31-38%5E20671_4000_0__

Juman (2010) and Opadeyi (2010) indicates a decreasing trend in the extent of these wetlands (Table 2.1)^{20,21}. Table 2.2 identifies key emergent wetlands in T&T of ecological and economic importance.

Table 2.1. Wetland Coverage in Trinidad and Tobago.

Country	Location	Extent (ha)	Year	Source
Trinidad and Tobago Wetlands	-	16,836	1976	Opadeyi (2010) ²¹ - Data source does not distinguish between emergent and submerged wetlands.
	-	14,009	1994	
	-	13,940	2007	
Trinidad	North Coast	41.4	2010	Juman (2010) ²⁰ - Emergent wetlands.
	East Coast	1,132.83		
	West Coast	7,719.1		
	South Coast	1,137.7		
Tobago	-	220.77		
	Total	10,251.8		

Table 2.2. Important Wetland Ecosystems in Trinidad and Tobago.

Site	Extent (ha)	Floral Diversity	Faunal Diversity	Management
Caroni Swamp	8,340.1	-Mangrove Forest (5,263 ha) -Red mangrove (<i>Rhizophora mangle</i>) -White mangrove (<i>Laguncularia racemosa</i>) -Black mangrove (<i>Avicennia germinans</i>) Brackish marsh Freshwater marsh	-Aquatic estuarine invertebrates -Oysters (<i>Crassostrea rhizophorae</i>) -Mussels (<i>Mytella guyanensis</i> , <i>M. falcata</i>) -Clams (<i>Phacoides pectinatus</i>) -Black conch (<i>Melongena melongena</i>) -Shrimp (<i>Penaeus</i> spp.) Birds (190 species) -Waterbirds -Migratory species -Forest and pasture birds	1936- 2,833 ha declared Caroni Swamp Forest Reserve 1953- 136 ha declared Wildlife Sanctuary 1987- Declared Prohibited Areas under the Forests Act chap. 66:01

²⁰ Juman, R. A. (2010). *Wetlands of Trinidad and Tobago*. Trinidad and Tobago: Institute of Marine Affairs.

²¹ Opadeyi, J. (personal communication, April 8, 2010). *Managing Our Land, Managing Our Future*. The University of the West Indies, St. Augustine, Trinidad.

Site	Extent (ha)	Floral Diversity	Faunal Diversity	Management
Godineau Swamp	3,171	-Tidal marsh (1,746 ha) -Mangrove swamp -Swamp forest -Terrestrial forest	Feeding ground for bird species	-
Guayaguayare Swamp	105.4	-Mangrove forest -Red mangrove -White mangrove -Black mangrove -Mangrove fern - <i>Acrostichum aureum</i> - <i>A. danaeifolium</i> -Marsh grasses	Fiddler crabs (<i>Uca</i> spp.) Hairy crabs (<i>Ucides cordatus</i>) Mangrove crabs (<i>Cardisoma guanhumi</i>)	-
Maracas Swamp	21.3	Freshwater marsh (elephant's ear; sedges; grasses; bamboo; ferns; palms) Swampwood forest (bloodwood, mangrove fern, seaside mahoe, coconuts, white mangrove)	Fish (5 species) Reptiles (2 species) Birds (6 species)	-
Nariva Swamp	11,343	-319 macro-plant species -Freshwater marsh -Palm forest -Swamp forest -Upland forest -Mangrove forest -Littoral woodland	-Mammals (45 species) -Reptiles (39 species) -Fish (33 species) -Birds (204 species) -Frogs (19 species) -Insects (213 species) -Molluscs (15 species) -Arachnids -Protozoa -Crustaceans	1993- declared a Ramsar Site 2006- declared an Environmentally Sensitive Area
Pointe-à-Pierre Wild Fowl Trust	25	-	Birds - 117 species observed	Man-made pond managed as a research and education centre
Southwest	90.8	-Mangrove forest	-Habitat for resident	-

Site	Extent (ha)	Floral Diversity	Faunal Diversity	Management
Tobago – Bon Accord/ Buccoo Bay		-Red mangrove -White mangrove -Black mangrove -Buttonwood mangrove (<i>Conocarpus erectus</i>)	and migratory fowl -Black-bellied whistling ducks (<i>Dendrocygna autumnalis</i>)	
Southwest Tobago – Kilgwyn and Friendship	32.3	Red and white mangroves	-	1980- declared a scientific reserve. However much of the mangrove was cleared in the 1990s for extension of the runway at Crown Point International.
Southwest Tobago – Petit Trou	N/A	-Mangrove forest -Red mangrove	-Cascabel snakes -Mangrove crabs -Birds	-

Source: Modified from Juman, 2010²²

Mangrove Forests

Mangroves in T&T have undergone significant alterations since the early 1970s due mainly to population growth, increasing urbanization, industrialization, and tourism in coastal areas. *Table 2.3* indicates the extent of mangroves in T&T compiled from data over the period 1970-2012. A comprehensive assessment of mangroves in T&T by the Institute of Marine Affairs (IMA) in 2009 notes the following²³:

- Mangrove forests occupy a total area of 9,146.4 ha in Trinidad and 229.9 ha in Tobago.
- Within several wetland areas such as the Nariva and Caroni Swamps, mangrove extent has decreased due to development pressures.
- Mangroves are moving inland and encroaching on some freshwater wetland communities because of inland salt water intrusion.

²² Juman, R. A. (2010). *Wetlands of Trinidad and Tobago*. Trinidad and Tobago: Institute of Marine Affairs.

²³ Juman, R. A. & Ramsewak, D. (2009). Research Report- The Status of Mangrove Forests in Trinidad and Tobago. Institute of Marine Affairs, Trinidad and Tobago.

Table 2.3. Mangrove Extent in Trinidad and Tobago, 2010 and 2012.

Country	Location	Extent (ha)	Year	Source
Trinidad- 9146.03 ha	North Coast	0.3	Up to 2010*	IMA (2010) ²⁴ (Note: Data source does not distinguish between emergent and submerged wetlands)
	East Coast	1132.83		
	West Coast	8012.9		
Tobago- 229.9 ha	Leeward Coast	132.3	Up to 2012*	
	Windward Coast	97.6		

* Data was compiled by groups of researchers over several periods from 1970-2010. For the purpose of this table, areas were grouped together for the purpose of total extent coverage therefore specific years of research could not have been included.

Seagrass Communities

Seagrass communities in T&T are located at several points along the coast (*Table 2.4*). The extent of seagrass communities in T&T is generally underreported, however the IMA (2010) notes that seagrass beds are declining everywhere around the country due to a number of driving forces which are discussed in *Section 2.5.1*²⁴.

Table 2.4. Dominant Seagrass Communities around Trinidad and Tobago.

Location		Seagrass Communities		
	Extent (ha)	Turtle grass (<i>Thalassia testudinum</i>)	Shoal grass (<i>Halodule wrightii</i>)	<i>Halophila decipiens</i>
Trinidad				
Carenage Bay	>1	√		
Islands off the Northwest Peninsula	>1		√	√
Salybia Bay, Toco	>1	√		
Williams Bay	>1		√	√
Guayaguayare Bay	>1		√ (largest and densest in T&T)	
Tobago				
Bon Accord	50 (2010)	√ (80% of seagrass community)	√	√
La Guira Bay	>1	√ (dominant)		
King's Bay	>1	√ (dominant)	√	√

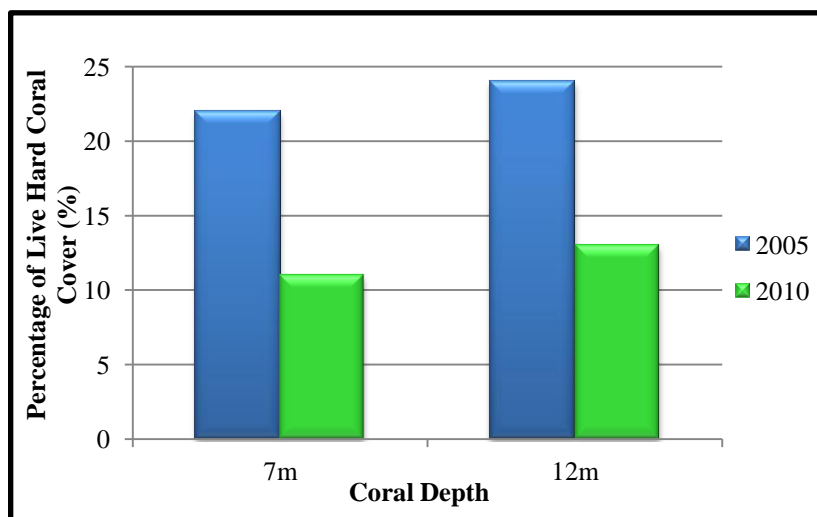
Source: Modified from Juman, 2010²⁴

²⁴ Juman, R. A. (2010). *Wetlands of Trinidad and Tobago*. Trinidad and Tobago: Institute of Marine Affairs.

Coral Reefs

The extent of live hard coral cover is considered to be a good indicator of reef health, and is therefore used to provide an overall impression of the current status of reef sites. An island-wide coastal ecosystem mapping project in Tobago surveyed the extent of live hard coral cover after two major bleaching events in 2005 and 2010, and determined that live hard coral cover declined by approximately 50% between 2005 and 2010 (*Figure 2.3*)²⁵. On the north-western side of Tobago, mean coral cover at 7 m and 12 m depths dropped from 21% in 2005 to 15% in 2008, most likely due to disease outbreaks following the 2005 bleaching event²⁶.

Figure 2.3. Percent Live Hard Coral Cover across Eight Sites in Tobago in 2005 and 2010.



Source: CCC, 2012²⁵

2.1.1.3 Savanna Ecosystems

Natural savannas are distinct from human derived savannas as a result of continued disturbance from either mowing or fires. The two groups of savannas in Trinidad are the Aripo Savannas found in the Northern Basin or Caroni Plain, and the Erin Savannas found on the southern peneplain south of Point Fortin²⁷.

The Aripo Savannas are the eastern-most group of Northern Basin Savannas that previously existed in patches extending from Piarco, eastward to Valencia. Due to their location, they were

²⁵ Coral Cay Conservation (CCC), (2012). Tobago Coastal Ecosystems Mapping Project: Final Report- Results of Community and Scientific Work. Retrieved from <http://www.coralcay.org/science-research/scientific-reports/>

²⁶ Bouchon, C., Portillo, P., Bouchon-Navaro, Y., Louis, M., Hoetjes, P., De Meyer, K.,..., Isaac, C. (2008). Status of Coral Reefs of the Lesser Antilles: The French West Indies, The Netherlands Antilles, Anguilla, Antigua, Grenada, Trinidad and Tobago. In *Status of Coral Reefs in the World* (pp. 265-280). Townsville, Australia: Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre.

²⁷ Comeau, P. L. (1989). Savannas in Trinidad. *Living World Journal of Trinidad and Tobago Field Naturalists' Club*, 1989/90, 5-8.

the furthest from urban areas and as such under the least pressure in the past and escaped being destroyed for transport, housing or industrial development. Aside from the Aripo Savannas, which represent approximately a third of the Northern Basin Savannas, only fragments of the original natural savanna remain at Piarco, O'Meara and Wallerfield²⁸.

The Erin Savannas are found on the ridge-tops north of Palo Seco and east of Buenos Aires Village²⁸. It is possible that historical reports of savannas at Princes Town may be savannas of a similar type.

There have been two significant disturbances to the Aripo Savannas – destruction of the northern-most savannas by construction of a Water and Sewerage Authority (WASA) pipeline in 1977 and disturbance of parts of the savanna by attempts at flax cultivation. Fortunately, the Aripo Savannas have not been reduced in extent nor seriously degraded, although there is evidence that some rarer species of plants have been impacted by the increased frequency of fires. The surrounding marsh forests however are being degraded from fires and residential squatting, to the extent that of the 3,000 ha of natural ecosystems in the reserve at its establishment, only 1,788 ha remain intact. Despite increased rates of fire, the vegetation of the Aripo Savannas appear to be very stable (although there are concerns about uncommon species such as the orchid (*Cyrtopodium parvifolium*) being lost if frequency of fires increases). Hunting pressure in the savannas and adjacent forest is intense so it is likely that populations of game animals such as agouti, lappe and deer are greatly depressed.

Up to a third of the Erin Savannas have probably been irreversibly damaged by planting of Caribbean Pine – even in areas in which the pine has been removed, the recovering vegetation is not savanna vegetation. The invasive species *Acacia mangium*, is also present in the savannas and appears to be colonizing the edges of the undisturbed savanna and the areas that have been disturbed by pine.

A total of 457 plant species have been recorded in the Aripo Savannas, of which 39 are restricted to these savannas nationally, 16 to 20 are rare or threatened and 2 are endemic: *Rhynchospora aripoensis* and *Xyris grisebachii*²⁹. Bird species such as the Red-Bellied Macaw and the Moriche Oriole are nationally restricted to the Aripo Savannas³⁰. Two plant species endemic to Trinidad occur in the Erin Savanna; a vine *Aristolochia boosii* and a sedge *Rhynchospora ierensis*³¹. Altogether, there are six species of plants found in the Erin Savanna and nowhere else in

²⁸ Comeau, P.L. (1989). Savannas in Trinidad. *Living World Journal of Trinidad and Tobago Field Naturalists' Club*, 1989/90, 5-8.

²⁹ Van den Eynden, V., Oatham, M. P., & Johnson, W. (2008). How free access internet resources benefit biodiversity and conservation research: Trinidad and Tobago's endemic plants and their conservation status. *Oryx*, 42 (3), 400-407.

³⁰ Caribbean Natural Resources Institute, (2008). *Aripo Savannas Environmentally Sensitive Area Resource Management Plan: A framework for Participatory Management*. Port of Spain, Trinidad: Environmental Management Authority.

³¹ Armstrong, R., Oatham, M. P. & Ramlal, B. (2004). Plant Community Changes on the Erin Savanna. *Living World 2004 Supplement Journal of the Trinidad and Tobago Field Naturalists' Club*, 4, 25.

Trinidad. The fauna of the Erin Savanna has not received much attention and it is not known if there are any rare or endemic species.

2.1.2 Key Ecosystem Services

Ecosystem integrity is determined by how intact the complexity of plants, animals, and micro-organisms are, and the robustness of their interactions. Measuring the integrity of an ecosystem is a formidable undertaking because of the inherent complexities of ecosystems. Therefore, focus is placed on the quality of services that are provided by ecosystems as a proxy for ecosystem integrity. Important in this regard is an understanding of critical thresholds in ecosystem services as a marker for consequential changes in ecosystems.

An overall assessment of the status and trends in ecosystem services provided by key biomes in T&T indicates that most services are in fair condition but are in decline (*Table 2.5*). This assessment is based on analysis of available, empirical data as well as expert judgments, and in many cases, datasets which were found to be inadequate for informing a complete assessment of ecosystem integrity.

Table 2.5. Status and Trends in Key Ecosystem Services in Trinidad and Tobago.

Ecosystem Service	Service Type (Provisioning/ Regulating/ Supporting/ Cultural/ Research)	Condition	Trend	Certainty/ Confidence Level	Data Source(s)
<i>Forested Ecosystems</i>					
Timber	Provisioning	Fair	Decreasing	High	Forestry Division, 2012 ³²
Non-timber forest products (including wildlife hunting)	Provisioning	Fair	Decreasing	Medium	Forestry Division, 2012 ³²
Runoff regulation and retention (flooding and landslides)	Regulating	Fair	Decreasing (rapidly)	Medium to High	ODPM, 2012 ³³
Climate and microclimate regulation	Regulating	Fair	Decreasing	Low	N/A

³² Forestry Division, (2012). Data Request from Forestry Division on June 30, 2012. (Unpublished information). Status and Trends in Key Ecosystem Services (Timber and Non-timber forest products).

³³ Office of Disaster Preparedness and Management (ODPM), (2012). Data Request from ODPM. (Unpublished information). Status and Trends in Key Ecosystem Services (Runoff regulation and retention).

Ecosystem Service	Service Type (Provisioning/Regulating/Supporting/Cultural/Research)	Condition	Trend	Certainty/Confidence Level	Data Source(s)
Soil conservation	Regulating	Fair	Decreasing	Medium	ODPM, 2012 ³⁴
Biodiversity services – wildlife habitat	Regulating and Supporting	Fair	Decreasing	Medium	Forestry Division, 2012 ³⁵
Water cycling and replenishment (for the provision of freshwater)	Supporting	Fair	Decreasing	Medium	FAO Aquastat, 2012 ³⁶
Amenity value (recreation and ecotourism)	Cultural	Good	Decreasing	Medium	Forestry Division, 2012 ³⁵
<i>Inland Freshwater Ecosystems</i>					
Freshwater provision	Provisioning	Fair	Decreasing	High	GoRTT, 2012 ³⁷ ; FAO Aquastat, 2012 ³⁶
Fisheries	Provisioning	Fair	Decreasing	Low	N/A
Flood regulation, water storage	Regulating	Fair	Decreasing (rapid)	Low	N/A
Biodiversity support	Regulating and Supporting	Fair	Decreasing	Low	N/A
Amenity value	Cultural	Fair	Decreasing	Medium	Forestry Division, 2012 ³⁵
<i>Coastal and Marine Ecosystems</i>					
Fisheries (both marine and coastal)	Provisioning	Fair	Decreasing (rapidly)	Low to Medium	Fisheries Division Records, 2012 ³⁸
Flood regulation/ water storage	Regulating	Fair	Decreasing (rapidly)	Low	N/A
Shoreline protection (from erosion and	Regulating	Fair	Decreasing	High	Burke et al., 2008 ³⁹

³⁴ Office of Disaster Preparedness and Management (ODPM), (2012). Data Request from ODPM. (Unpublished information). Status and Trends in Key Ecosystem Services (Soil Conservation).

³⁵ Forestry Division, (2012). Data Request from the Forestry Division, June 30, 2012. (Unpublished information). Status and Trends in Key Ecosystem Services (Biodiversity and Amenity values of Forest and Inland Freshwater Ecosystems).

³⁶ Food and Agriculture Organization (FAO) Aquastat, (2012). Use of the Aquastat Database. Retrieved from <http://www.fao.org/nr/water/aquastat/main/index.stm>

³⁷ The Government of the Republic of Trinidad and Tobago (GoRTT), (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

³⁸ Fisheries Division Records, (2012). Data request from the Fisheries Division, Ministry of Food Production, Land and Marine Affairs on April 30, 2012. (Unpublished information). Status and Trends in Key Ecosystem Services (Fisheries).

³⁹ Burke, L., Greenhalgh, S., Prager, D., & Cooper, E. (2008). *Coastal Capital-Economic Valuation of Coral Reefs in Tobago and St. Lucia*. Washington D.C., US: World Resources Institute (WRI).

Ecosystem Service	Service Type (Provisioning/Regulating/Supporting/Cultural/Research)	Condition	Trend	Certainty/Confidence Level	Data Source(s)
storms)					
Biodiversity services – coral reef diversity, mangrove and seagrass fish nurseries, etc.	Regulating and Supporting	Fair	Decreasing	Medium	Burke et al., 2008 ³⁹ ; Juman et al., 2009 ⁴⁰ ; Juman, 2010 ⁴¹
Amenity value	Cultural	Good	Decreasing	Medium	Burke et al., 2008 ³⁹
<i>Savanna Ecosystems</i>					
Flood regulation and ground water storage	Regulating	Fair	Decreasing	High	Oatham, 2012 ⁴²
Amenity value (recreation, tourism, research)	Cultural and Research	Fair	Decreasing	High	Oatham, 2012 ⁴²
Biodiversity services – habitat for endemics	Regulating and Supporting	Fair	Decreasing	High	Oatham, 2012 ⁴²
Wildlife hunting	Provisioning	Fair	Decreasing	High	Oatham, 2012 ⁴²

2.1.2.1 Forest Ecosystems

Key Regulating Services

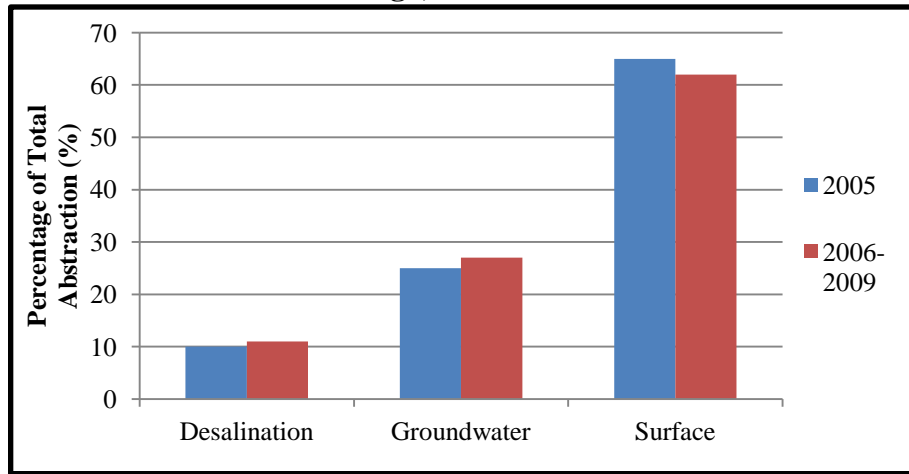
One of the most important bundles of ecosystem services provided by forests in T&T, particularly those on slopes, is runoff regulation, erosion control and water provision. Freshwater in T&T is mainly derived from the natural watersheds across the country, especially the Northern Range in Trinidad and the Main Ridge in Tobago, through either surface or groundwater sources. A relatively small percentage of freshwater is also produced by desalination on Trinidad's west and south coasts (*Figure 2.4*).

⁴⁰ Juman, R. A., & Ramsewak, D. (2009). Research Report- The Status of Mangrove Forests in Trinidad and Tobago. Institute of Marine Affairs, Trinidad and Tobago.

⁴¹ Juman, R. A. (2010). *Wetlands of Trinidad and Tobago*. Trinidad and Tobago: Institute of Marine Affairs.

⁴² Oatham, M. (personal communication, December, 2012). Status, Trends and Driving Forces of Savannas in Trinidad and Tobago. The University of the West Indies, St. Augustine, Trinidad.

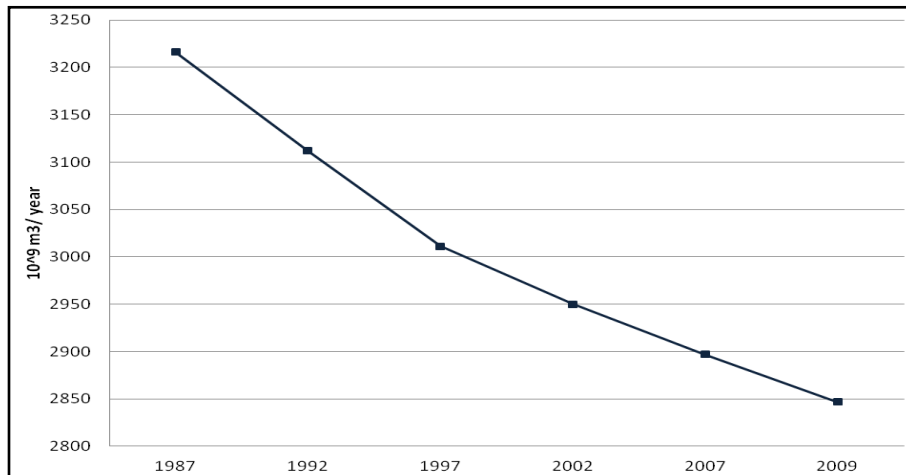
Figure 2.4. Freshwater Abstraction as a Percentage of Total Abstraction in Trinidad and Tobago, 2005-2009.



Source: WASA, 2010⁴³, FAO Aquastat, 2012⁴⁴

Data from the FAO Aquastat (2012) indicates that renewable internal freshwater resources per capita have been decreasing since 1987 (Figure 2.5)⁴⁴. Correlating data presented in Figure 2.5 with population levels and rainfall over the period 1987 to 2009 in T&T indicates that neither population levels nor rainfall levels have changed significantly over the period. This causes a decrease in renewable resources per capita mainly due to reductions in overall freshwater provision.

Figure 2.5. Renewable Internal Freshwater Resources per Capita in Trinidad and Tobago, 1987-2009.



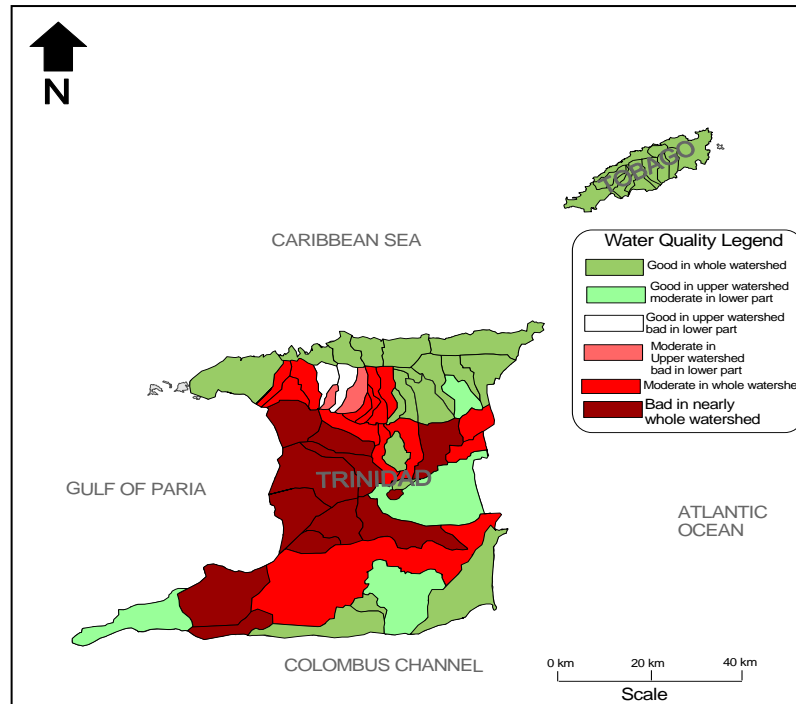
Source: FAO Aquastat, 2012⁴⁴

⁴³ Water and Sewerage Authority (WASA), (2010). (Unpublished information). Freshwater Abstraction as a Percentage of Total Abstraction in Trinidad and Tobago, 2006-2009.

⁴⁴ Food and Agricultural Organization (FAO) Aquastat, (2012). Use of the Aquastat Database. Retrieved from <http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en>

Up-to-date information on the quality of freshwater resources provided by ecosystems in T&T is generally lacking. However, what can be gleaned from the most recent water quality dataset in 1998 is that surface water from forested watersheds is generally of a higher quality than non-forested watersheds (*Figure 2.6*).

Figure 2.6. Surface Water Quality in Trinidad and Tobago, 1999.



Source: GoRTT, 1999⁴⁵

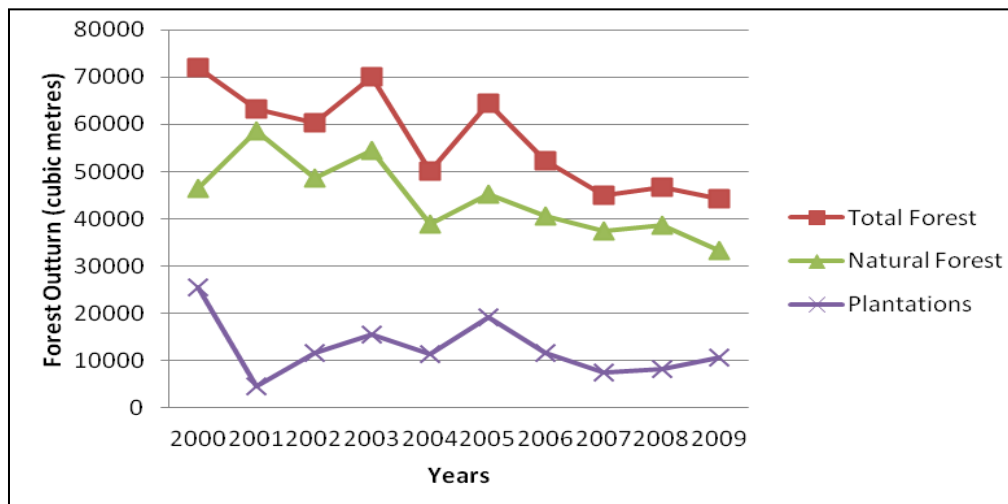
In the absence of concrete indicators, the role of forests in runoff regulation is perhaps best demonstrated with a comparison of watersheds in the eastern Northern Range with those in the western Northern Range. Flooding is minimal in downstream areas of the eastern Northern Range after a storm event, whereas flooding after storms is more frequent in downstream areas of the western Northern Range. While direct correlations between forest cover and flooding frequency and severity are not available from the literature, the flood regulating roles that forests play in intercepting rainfall, reducing overland flow, and regulating the flow of water through catchments has long been established and cannot be overstated. Coupled with a decrease in infiltration services because of increasing infrastructural development, flood events are increasing in magnitude and frequency, especially in western Trinidad.

⁴⁵ The Government of the Republic of Trinidad and Tobago (GoRTT), (1999). Water Resources Management Strategy for Trinidad and Tobago, Final Report. DHV Consultants/Delft Hydraulics/Lee Young and Partners.

Timber and Non-Timber Forest Products

Timber harvesting is an economically important service provided by forests in T&T. Since 2000, natural forests have provided the majority of sawn logs for the timber industry. However, there has been an overall decline in natural forest outturn evident between 2000 and 2009 (Figure 2.7). Very little timber harvesting still occurs in natural forests (in Forest Reserves) as they are all considered to be too depleted of timber to be harvested. The only natural forest being harvested is from the Periodic Block System in the Victoria-Mayaro Forest Reserve. This Forest Reserve, in addition to being mostly well managed for timber production, is also one of the main hunting areas for wild meat in the country. This is probably no coincidence and indicates an intact, naturally functioning ecosystem that provides the full range of ecosystem services.

Figure 2.7. Forests Outturn from Sawn Logs in Trinidad and Tobago, 2000-2009.

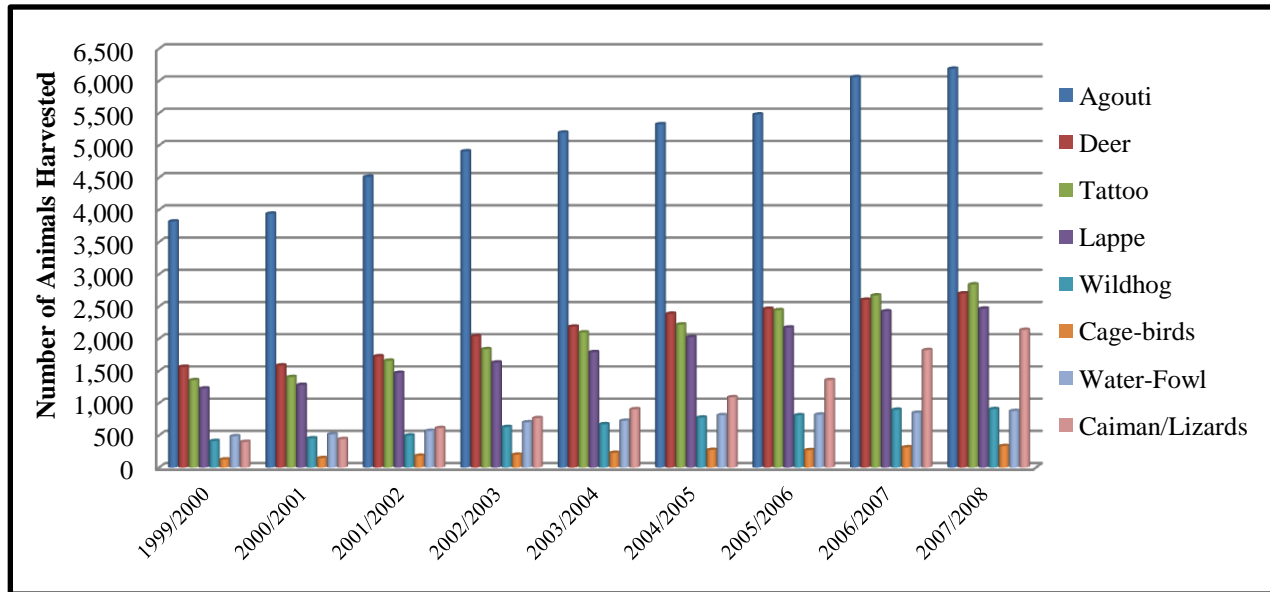


Source: CSO, 2012⁴⁶

The role of forests in providing habitats for wildlife is important not only from a strictly conservation standpoint, but also from an economic standpoint. The most popular game species are the Agouti (*Dasyprocta agouti*) - which accounts for one third of all animals hunted - the Brocket Deer (*Mazama americana trinitatis*), the tatoo (*Dasypus novemcinctus*), the lappe (*Agouti paca*), the wild hog or quenk (*Tayassu tajacu*) and lizards (including the Caiman – *Caiman crocodylus*) (Figure 2.8).

⁴⁶ Central Statistical Office (CSO) of Trinidad and Tobago, (2012). Data request from Central Statistical Office on April 30, 2012. (Unpublished information). Forests Outturn from Sawn Logs in Trinidad and Tobago between 2000 and 2009.

Figure 2.8. Individual Numbers of Wildlife Species Harvested Annually, 1999-2008.



Source: Forestry Division, 2009⁴⁷

2.1.2.2 Coastal and Marine Ecosystems

The integrity of coral reef and mangrove ecosystems (and complexes of coral reefs, mangroves and seagrass beds) heavily influences their ability to support marine and coastal fisheries. Because fish landed in T&T are affected by fisheries habitats in neighbouring islands, it is worth considering trends in fisheries within the Caribbean. Meta-analysis of time series data for the period 1955-2007, in a study by Paddock et al. (2009) of reef fish density in the Caribbean, shows that the overall density has been declining significantly for more than a decade at rates that are consistent across all sub-regions of the Caribbean Basin (2.7-6.0% loss per year)⁴⁸. The authors conclude that the significant decline in overall fish abundance and its consistency across several trophic groups and among both fished and non-fished species indicate that Caribbean fishes have begun to respond negatively to habitat degradation including coral reef flattening and destruction⁴⁸.

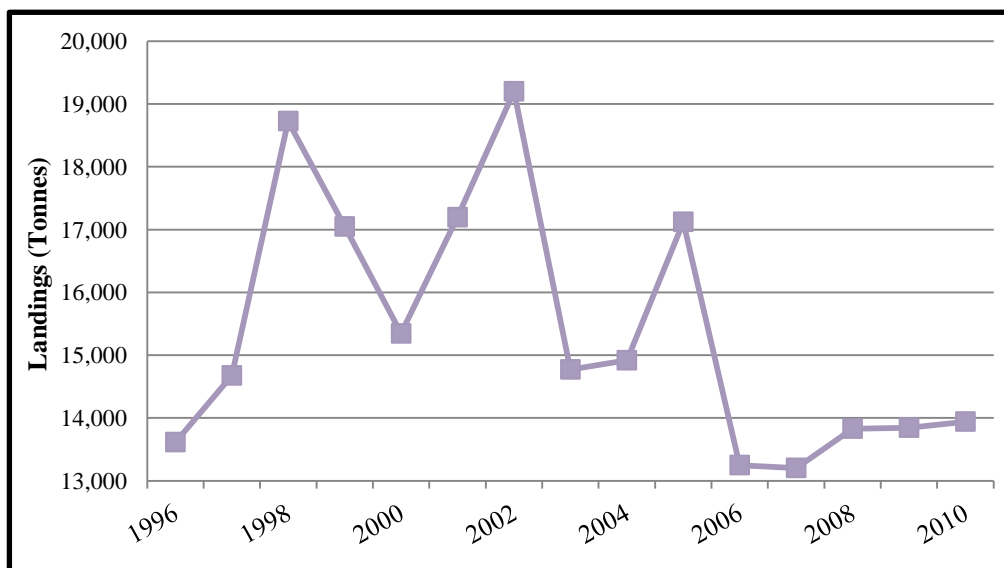
Data on fish landings per site is currently collected from 26 of the 67 fish landing sites in Trinidad by the Fisheries Division, and rough estimates are used for Tobago based on records from the Tobago House of Assembly (THA). Collectively, this data indicates that fish landings fluctuate between 13,249 and 19,200 tonnes per annum (*Figure 2.9*). However, information provided by the Fisheries Division indicates that many fish stocks have already declined or are

⁴⁷ Forestry Division, (2009). Individual Numbers of Wildlife Species Harvested Annually, 1999-2008. In The Government of the Republic of Trinidad and Tobago (GoRTT), (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

⁴⁸ Paddock, M., Reynolds, J. D., Aguilar, C., Appeldoorn, R. S., Beets, J., Burkett, E. W.,..., Côté, I. M. (2009). Recent Region-wide Declines in Caribbean Reef Fish Abundance. *Current Biology*, 19 (7), 590-595.

declining (Table 2.6). The following datasets are necessary for assessing fishery resources and their ability to meet national needs: size of the fish stock, regeneration rate of the fish stock, maximum sustainable yields, and the size of the fish landed.

Figure 2.9. Estimated Annual Landings (Tonnes) for the Marine Capture Fisheries of Trinidad and Tobago, 1996-2010.



Source: Fisheries Division Records, 2010⁴⁹

Table 2.6. Status of Fish Stocks in Trinidad and Tobago.

Species	Data Used in Study	Status of Stock
Artisanal Fleet (Gillnet, Surface handlines, Seines)		
Carite or Spanish Mackerel (<i>Scomberomorus brasiliensis</i>)	1972-2002 (Trinidad); 1977-2002 (Southern Caribbean & nearby Atlantic)	Fully exploited to overexploited
	1991-1992 (Trinidad: artisanal gillnet & line)	Fully exploited
Kingfish or King Mackerel (<i>Scomberomorus cavalla</i>)	2006-2007 (Trinidad: a la vive, troll, switchering & banking)	There has not been a significant change in fishing mortality in the last 10 years
	1996-1998, 2004 (Trinidad: artisanal a-la-vive, banking, switchering, troll)	Overexploited

⁴⁹ Fisheries Division Records, (2010). Estimated Annual Landings (tonnes) by Fleet for the Marine Capture Fisheries of Trinidad & Tobago (1996-2009). In: The University of the West Indies, (n.d.). *Fisheries and Aquaculture Statistics*. Retrieved from http://scsee.uwi.tt/developingcaribbean/devcatt/Fisheries_and_Aquaculture_Statistics.pdf

Species	Data Used in Study	Status of Stock
	1995-2003 (Trinidad: artisanal troll & a-la-vive); 1950-2003 (Gulf of Mexico to Guianas)	Fully exploited to overexploited
	1987 (Trinidad: artisanal gillnet & line)	Fully exploited
Cavalli (Caranx hippos)	1995 to 2007 (Trinidad artisanal multi-gear fleet)	The catch per unit of effort has remained stable between 1995 and 2007 suggesting similar stability in population size
Shark (Carcharinus porosus)	1992 (Trinidad)	Underexploited
Four-winged flyingfish (<i>Hirundichthys affinis</i>)	1989/90 – 1990/91 (Tobago)	Heavily exploited
	1988-2008 (Eastern Caribbean)	Regionally the stock is not overfished and overfishing is not occurring. Catch rates have remained stable since 1988. However, this does not imply that local depletion may not be occurring.
Herrings, anchovies, sardines	N/A	N/A
Trawl Fleet (Artisanal, Semi-industrial and Industrial trawlers)		
All shrimp species: Brown (<i>Farfantepenaeus subtilis</i>); White (<i>Litopenaeus schmiti</i>); Pink (<i>F. notialis</i>); Honey or Seabob (<i>Xiphopenaeus kroyeri</i>); Red-spotted (<i>F. brasiliensis</i>).	1975, 1988-2009 (Trinidad & Venezuela: trawl); ParFish (Participatory Fisheries Stock Assessment) interviews (43 conducted with fisherfolk in the Trinidad artisanal, semi-industrial and industrial trawl fleets, April-October 2008)	Overall stock biomass likely to be stable or increasing. However, local depletion in Trinidad waters could still be taking place. It should be noted that there are severe and increasing limitations on the available data.
All shrimp species: Brown (<i>Farfantepenaeus subtilis</i>); White (<i>Litopenaeus schmiti</i>); Pink (<i>F. notialis</i>); Honey or Seabob (<i>Xiphopenaeus kroyeri</i>); Red-spotted (<i>F. brasiliensis</i>).	1975, 1988-2004 (Trinidad & Venezuela: trawl)	Overexploited. Stock biomass is declining.

Species	Data Used in Study	Status of Stock
Pink shrimp (<i>F. notialis</i>); Honey or seabob (<i>X. kroyeri</i>)	1992-2002 (Trinidad: trawl)	Fully exploited to overexploited
Brown shrimp (<i>F. subtilis</i>)	1988-2001 (Trinidad: trawl); 1973-2001 (Venezuela: trawl)	Severely overfished, with overfishing taking place since the 1970s.
	1988-1996 (Trinidad: trawl); 1973-1996 (Venezuela: trawl)	Overfished
Shrimp Fishery	1995-1996 (Trinidad: trawl); 1995-1998 (Venezuela: trawl)	Fully exploited to overfished, over-capitalized
Cro-cro or Croaker (<i>Micropogonias furnieri</i>)	1987, 1989-1997 (Trinidad: artisanal trawl, gillnet & line; Venezuela: trawl)	Fully exploited to overfished
	1995-2006 (Trinidad: artisanal gillnets & lines; artisanal, semi-industrial & industrial trawl)	
Salmon or Weakfish (<i>Cynoscion jamaicensis</i>)	1989-1997 (Trinidad: artisanal trawl, gillnet & line)	Fully exploited to overfished
Lane Snapper (<i>Lutjanus synagris</i>)	1963, 1975, 1995 - 2004 (Trinidad: artisanal gillnet, line, fishpot & all trawl fleets)	Overall stock biomass does not appear to be affected by the high local fishing mortality. It is theorized that this may be due to relatively constant recruitment to the fishery in Trinidad from an external source of the stock in the region.
Groundfish Fishery	1989-1997 (Trinidad artisanal trawl & gillnet)	Fully exploited to overfished
Artisanal Fleet/Semi-Industrial Multi-Gear Fleet/Recreational Fleet (Fishpot, Demersal line)		
Snapper Plumhead (<i>Rhomboplites aurorubens</i>)	1992 (Trinidad: artisanal fishpot on North & East coasts)	Fully exploited
Lane snapper (<i>Lutjanus synagris</i>)	1980-1981 (Trinidad: artisanal fishpot on North & East coasts)	Underutilized but the species may be currently fully exploited to overexploited
Redfish (<i>L. purpureus</i>)	1992 (Trinidad: artisanal fishpot on North & East coasts)	Fully exploited
Yellowedge Grouper (<i>Epinephelus flavolimbatus</i>)	1992 (Trinidad: artisanal fishpot on North & East coasts)	Fully exploited or overexploited

Species	Data Used in Study	Status of Stock
Sweetlip (<i>Mycteroperca interstitialis</i>)		
Semi- Industrial Pelagic Longline Fleet/Semi-Industrial Multi-Gear Fleet/Recreational Fleet		
Wahoo (<i>Acanthocybium solandri</i>)	1995-2003 (Eastern Caribbean)	Stable stock suggested
Yellowfin tuna (<i>Thunnus albacares</i>)	ICCAT database – annual submissions from countries and entities exploiting the resources and findings of scientific research papers	Fully exploited to overexploited
Bigeye tuna (<i>Thunnus obesus</i>)		Fully exploited to overexploited
Skipjack tuna (<i>Katsuwonus pelamis</i>)		Indeterminate, however there may be overexploitation within the FAD fisheries
Albacore (North Atlantic stock) (<i>Thunnus alalunga</i>)		Fully exploited to overexploited
Albacore (South Atlantic stock) (<i>Thunnus alalunga</i>)		Overexploited
Marlin - Atlantic blue marlin (<i>Makaira nigricans</i>) & Atlantic white marlin (<i>Tetrapturus albidus</i>)		Atlantic blue marlin overfished for about 3 decades
		Atlantic white marlin overfished for more than 2 decades
Swordfish (North Atlantic stock) (<i>Xiphias gladius</i>)		Fully exploited
Swordfish (South Atlantic stock) (<i>Xiphias gladius</i>)		Indeterminate, however there is apparent stability in at least one target fishery.
Atlantic sailfish (West Atlantic stock) (<i>Istiophorus albicans</i>)		Over the past 2 decades abundance indices have remained relatively stable. As a result, current catch level is considered to be sustainable.

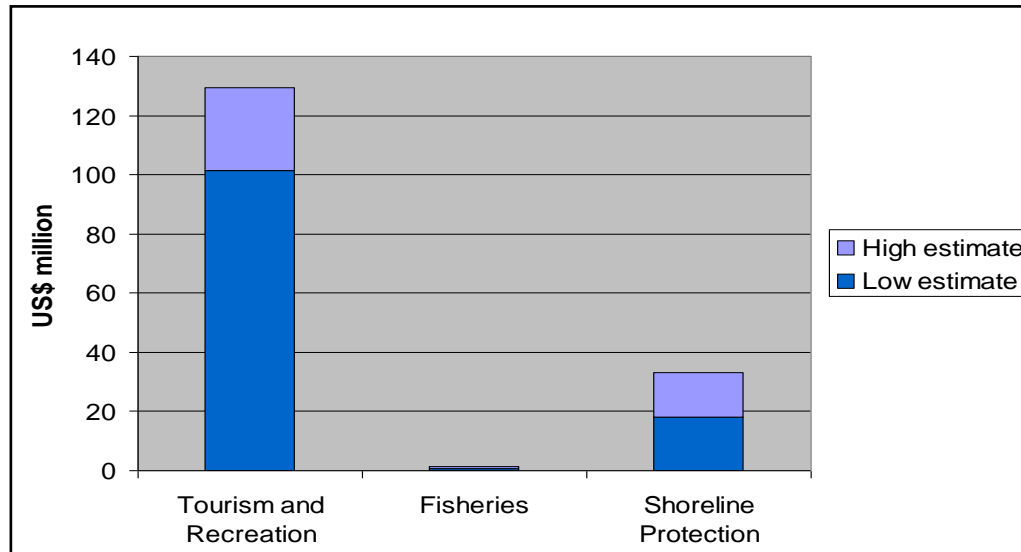
Species	Data Used in Study	Status of Stock
Atlantic sailfish (East Atlantic stock) <i>(Istiophorus albicans)</i>		Cause for concern on the status of this stock because the abundance indices and estimated catches from coastal fisheries have decreased over recent years.
Sharks: Blue shark <i>(Prionace glauca)</i>		Very preliminary results indicated that both the North and South Atlantic stocks appear in good condition (close to un-fished biomass levels).
Sharks: Shortfin mako <i>(Isurus oxyrinchus)</i>		Very preliminary results indicated that the North Atlantic stock may have experienced depletion and that the South Atlantic stock may have decreased since 1971 but to a lesser extent than the North Atlantic stock. Stock biomass level could not be narrowly estimated.

Source: Fisheries Division, 2012⁵⁰

Coral reef and mangrove ecosystems also provide shoreline protection services that have been valued as part of a project by the World Resources Institute (WRI) in 2008 (Figure 2.10). It is worth noting that a study is being undertaken as part of the Project for Ecosystem Services to develop a model for determining the shoreline protection service provided by coral reefs in Tobago. Such data will be useful for long term planning and assessment of the impact of coral reef loss on coastal development.

⁵⁰ Fisheries Division Records, (2012). Data request from the Fisheries Division, Ministry of Food Production, Land and Marine Affairs on April 30, 2012. (Unpublished information). Status of Fish Stocks in Trinidad and Tobago.

Figure 2.10. Economic Contribution of Coral Reefs in Tobago.



Source: Burke et al., 2008⁵¹

2.1.3 Species Diversity

There are a number of different sources of data and information on species diversity and abundance in T&T; data on distribution is much more limited. *Table 2.7* provides a summary of data and information of major categories of plant and animal species in T&T based on the most up-to-date available information. Since the fourth national report to the CBD in 2010 there have been few studies undertaken which have provided more up-to-date, reliable information on species numbers. However, updates worth noting include:

- Diversity and abundance of insect species with the exception of butterflies continue to remain underreported.
- In a study of bird diversity and abundance in T&T published by Kenefick et al. (2011), an update was provided to bird species diversity, which notes that of 467 bird species observed in T&T, a total of 433 species are resident in both islands, and 34 species are migratory⁵².
- The number of alien invasive species (flora and fauna) decreased from 36 in 2010 to 32 in 2012 according to data from the GISD.

⁵¹ Burke, L., Greenhalgh, S., Prager, D., & Cooper, E. (2008). *Coastal Capital –Economic Valuation of Coral Reefs in Tobago and St. Lucia*. Washington D.C., US: World Resources Institute (WRI).

⁵² Kenefick, M., Restall, R., & Hayes, F. (2011). *A Field Guide to the Birds of Trinidad and Tobago*. London, UK: A & C Black Ltd.

Table 2.7. Number of Plant and Animal Species in Trinidad and Tobago.

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
Kingdom					
Plants	Plants	about 3,900	-	84	Baksh-Comeau et al., 2013 ⁵³ ; Van den Eynden et al., 2008 ⁵⁴
	Angiosperms	3627	2465 indigenous species 1207 exotics species	70	Baksh-Comeau, et al., 2013 ⁵³ ; Van den Eynden et al., 2008 ⁵⁴
	Mangroves	7	7 are found in Trinidad and 4 are found in Tobago	0	Bacon, 1993 ⁵⁵ ; Juman, 2010 ⁵⁶
	Seagrasses	4	3 are found in Trinidad and 4 are found in Tobago	0	Juman, 2010 ⁵⁶
	Pteridophytes (ferns and fern allies)	343	30 families, 324 indigenous species and 19 exotic species	14	Baksh-Comeau et al., 2013 ⁵³

⁵³ Baksh-Comeau, Y., Hawthorne, W. D., Harris, S. A., Maharaj, S. S., & Filer, D. (2010). *The Vascular Flora of Trinidad and Tobago: A checklist and Conservation Status*. (Unpublished Report). University of the West Indies, Trinidad and Tobago.

⁵⁴ Van den Eynden, V., Oatham, M. P., & Johnson, W. (2008). How free access internet resources benefit biodiversity and conservation research: Trinidad and Tobago's endemic plants and their conservation status. *Oryx*, 42 (3), 400-407.

⁵⁵ Bacon, P. R. (1993). Mangroves in the Lesser Antilles, Jamaica and Trinidad and Tobago. *In*: Lacerda, L. D. (1993). Conservation and sustainable utilization of mangrove forests in Latin America and Africa regions, Part I - Latin America Mangrove Ecosystems Technical Reports Vol. 2 ITTO/ISME Project PD114/90, 155-210.

⁵⁶ Juman, R. A. (2010). *Wetlands of Trinidad and Tobago*. Trinidad: Institute of Marine Affairs.

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
Animals	<i>Vertebrates</i>				
	Mammals (land and marine)	100 including 67 bat species	-	2 endemic species: 1 rodent: Trinidad spiny rat (<i>Proechimys trinitatus</i>) 1 deer: Trinidad Red Brocket <i>Mazama trinitatis</i>	Kenny, 2008 ⁵⁷ ; Gomes, 2012 ⁵⁸ ; IUCN, 2012 ⁵⁹ ; McKnight & Emmons, 2008 ⁶⁰
	Birds	433	Trinidad - 227 resident; 17 regularly bred; 168 migratory species and 49 vagrant/wanderer species Tobago - 240 resident species; 92 resident; 17 regularly bred; 122 migratory and 26 vagrant/wanderer species	Pawi/piping guan (<i>Pipile pipile</i>) Trinidad motmot (<i>Momotus bahamensis</i>)	ffrench, 1991 ⁶¹ Kenefick et al., 2011 ⁶²

⁵⁷ Kenny, J. (2008). *The Biological Diversity of Trinidad and Tobago*. Maraval, Trinidad: Prospect Press.

⁵⁸ Gomes, G. (2012). Trinibats. Retrieved from <http://www.trinibats.com/index.html> and through personal communication.

⁵⁹ International Union for Conservation of Nature (IUCN), (2012). Red List of Threatened Species. Retrieved from www.iucnredlist.org

⁶⁰ McKnight, M. & Emmons, L. 2008. *Proechimys trinitatus*. In: International Union for Conservation of Nature (IUCN), (2013). IUCN Red List of Threatened Species. Version 2013.2. Retrieved from www.iucnredlist.org/details/18301/0

⁶¹ ffrench, R. (1991). *A Guide to the Birds of Trinidad and Tobago* (2nd ed.). Ithaca, NY: Cornell University Press.

⁶² Kenefick, M., Restall, R., & Hayes, F. (2011). *A Field Guide to the Birds of Trinidad and Tobago*. London, England: A & C Black Ltd.

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
	Fish (Freshwater)	37-40	21 families in Trinidad 7 families found in Tobago	9 freshwater fish: - <i>Cheirodon pulcher</i> (Characidae) - <i>Hemibrycon guppyi</i> OC (Characidae) - <i>Hemibrycon taeniurus</i> OC (Characidae) - Mountain Stream Sardine <i>Hypessobrycon axelrodi</i> OC (Characidae) Calypso Tetra - <i>Hoplerythrinus cinereus</i> (Erythrinidae) - <i>Ancistrus maracasae</i> (Loricariidae) - <i>Hypostomus robinii</i> OC (Loricariidae) - <i>Lasiancistrus trinitatis</i> (Loricariidae) - <i>Poecilia boesemani</i> (Poeciliidae)	Phillip, 1998 ⁶³ ; Living Natural Treasures, n.d. ⁶⁴

⁶³ Phillip, D. (1998). *Biodiversity of Freshwater Fishes of Trinidad and Tobago, West Indies*. (Doctoral dissertation). Retrieved from Research@StAndrews.

⁶⁴ Living Natural Treasures, (n.d.). Checklist of Endemic Freshwater Fish Species. Retrieved from <http://lntreasures.com/trinidadff.html>

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
	Fish (Marine)	1013 coastal and marine finfish species Up to 957 species	942 species of teleost fishes 71 species of elasmobranchs	4 marine fishes: <i>Acanthemblemaria johnsoni</i> <i>OC (Chaenopsidae)</i> <i>Starksia rava (Labrisomidae)</i> Tawny Blenny <i>Starksia sella (Labrisomidae)</i> Darksaddle Blenny <i>Ogilbichthys tobagoensis</i> (Bythitidae) Tobago Coralbrotula	Ramjohn, 1999 ⁶⁵
	Amphibians	38 species	10 families represented	7 frogs: <i>Mannophryne olmonae</i> (Anura - Dendrobatidae) Bloody Bay Fragrant Frog <i>Mannophryne trinitatis</i> (Anura - Dendrobatidae) Yellow-throated Frog	Murphy, 1997 ⁶⁶ ; Living Natural Treasures, n.d. ⁶⁷

⁶⁵ Ramjohn, D. D. (1999). Checklist of Coastal and Marine Fishes of Trinidad and Tobago. Fisheries Information Series No. 8, Fisheries Division, Ministry of Agriculture, Land and Marine Resources.

⁶⁶ Murphy, J. C. (1997). *Amphibians and Reptiles of Trinidad and Tobago*. Malabar, FL: Krieger Publishing Company.

⁶⁷ Living Natural Treasures, (n.d.). Checklist of Endemic Amphibian Species. Retrieved from <http://lntreasures.com/trinidad.html>

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
				<p><i>Phyllodytes auratus</i> (Anura - Hylidae) El Tucuche Golden Tree Frog</p> <p><i>Leptodactylus nesiotus</i> (Anura - Leptodactylidae) Trinidad Thin-toed Frog</p> <p><i>Pristimantis charlottevillensis</i> (Anura - Strabomantidae) Charlotteville Litter Frog</p> <p><i>Pristimantis turpinorum</i> (Anura - Strabomantidae) Bloody Bay Litter Frog</p> <p><i>Pristimantis urichi</i> (Anura - Strabomantidae) Urich's Litter Frog</p>	
	Reptiles	98 species including marine turtles (93 according to Murphy,	<p>Marine Turtles – 13 species in 7 families</p> <p>Crocodylians- 1 species in 1 family</p>	<p>4 reptiles:</p> <p><i>Erythrolamprus ocellatus</i> (Squamata Ophidia - Colubridae) Tobago False Coral Snake</p> <p><i>Leptophis stimsoni</i> (Squamata</p>	Murphy, 1997 ⁶⁸

⁶⁸ Murphy, J. C. (1997). *Amphibians and Reptiles of Trinidad and Tobago*. Malabar, FL: Krieger Publishing Company.

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
		1997)	Lizards- 34 species in 9 families Snakes – 50 species in 9 families. Boos 2001 reports 44 species of snakes in Trinidad and 21 in Tobago	Ophidia-Colubridae) Gray Lora <i>Typhlops trinitatus</i> (Squamata Ophidia - Typhlopidae) Trinidad Worm Snake <i>Proctoporus shrevei</i> (Squamata Sauria - Gymnophthalmidae) Luminous Lizard	Boos, 2001 ⁶⁹ ; Living Natural Treasures, n.d. ⁷⁰
	Invertebrates				
	Marine Invertebrates	523 species	85 crustaceans	1 endemic marine benthic amphipod <i>Ampelisca paria</i>	IMA, 1999 ⁷¹ ; Gobin, 2007 ⁷² ; Gobin, 2010 ⁷³
	Mollusc	56 molluscs	-	1 land snail <i>Drymaeus mossi</i>	IMA, 1999 ⁷¹
	Annelida (marine)	201 polychaetes	-	1 endemic polychaete <i>Johnstonia duplicate</i>	Gobin, 2010 ⁷³
	Nematoda (marine)	70 nematodes	-	-	Gobin, 2007 ⁷²

⁶⁹ Boos, H. E. A. (2001). *The Snakes of Trinidad and Tobago*. College Station, TX: Texas A&M University Press.

⁷⁰ Living Natural Treasures, (n.d.). Checklist of Endemic Reptile Species. Retrieved from <http://lntreasures.com/trinidadr.html>

⁷¹ Institute of Marine Affairs (IMA), (1999). Number of Marine Invertebrate Species in Trinidad and Tobago. *In: The Government of the Republic of Trinidad and Tobago (GoRTT)*, (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

⁷² Gobin, J. F. (2007). Free-living Marine Nematodes of hard-bottom substrates in Trinidad and Tobago, West Indies. *Bulletin of Marine Science*, 81 (1), 73-84.

⁷³ Gobin, J. F. (2010). Free-living Marine Polychaetes (Annelida) inhabiting hard-bottom substrates in Trinidad and Tobago, West Indies. *Revista de biología tropical*, 58 (1), 147-157.

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
	Echinodermata (marine)	55 echinoderms	-	-	-
	Porifera (marine)	56 sponges	-	-	Hubbard, 1990 ⁷⁴
	Arthropoda (terrestrial)	212 chelicerata 43 crustacea (freshwater and terrestrial) 11 myriapoda 4,154 insecta 267 spiders	10 scorpions 659 Butterflies	6 endemic scorpions and 5 endemic butterflies Wasp- <i>Mischocyttarus baconi</i> Butterflies- <i>Nymphidium trinidadii</i> the Trinidad Metalmark, and <i>Calospila urichi</i> Ant- <i>Pheidole ariipoensis</i> Longhorned beetle- <i>Piruapsis antennatus</i> Tortoise beetles- <i>Cephaloleia rubra</i> and <i>Cephaloleia brunnea</i> Stonefly- <i>Anacroneuria isleta</i>	Rostant, 2005 ⁷⁵ ; Barcant, 1970 ⁷⁶ ; Sewlal, 2011 ⁷⁷

⁷⁴ Hubbard, R. (1990). Sponges Porifera of the order Dictyoceratida, Dendroceratida, and Verongiida class Demospongiae from Trinidad and Tobago. *Caribbean Marine Studies*, 11, 54-67.

⁷⁵ Rostant, W. G. (2005). Freshwater decapod communities of Trinidad & Tobago. (Doctoral dissertation). The University of the West Indies, St Augustine, Trinidad.

⁷⁶ Barcant, M. (1970). *Butterflies of Trinidad and Tobago*. London, UK: Collins Publishing.

⁷⁷ Sewlal, J. N. (2011). Checklist of Trinidad and Tobago Spider Families. Retrieved from http://www.caribbean spiders.com/checklist_of_spiders_in_trinidad.htm

Major Categories of Plant and Animal Species		Number of Species Recorded in Trinidad and Tobago	Additional Notes	Number of Endemics	Source
				Katydid- <i>Cocconotus unicolor</i> Tarantulas- <i>Psalmopoeus cambridgei</i> and <i>Lasiodora trinitatis</i> Wall crab spider- <i>Selenops willinki</i> Goblin spider- <i>Scaphiella simla</i> Scorpions- <i>Microtityus rickyi</i> and <i>Tityus trinitatis</i> Velvet worm- <i>Macroperipatus torquatus</i> Freshwater crab- <i>Microthelphusa odaelkae</i> Ghost shrimp- <i>Pseudobiffarius caesari</i>	
	Cnidaria	41 corals	Up to 40 species mainly found in Tobago	-	Kenny, 1988 ⁷⁸ ; Laydoo, 1990 ⁷⁹ ; Juman, 2010 ⁸⁰

⁷⁸ Kenny, J. (2008). *The Biological Diversity of Trinidad and Tobago*. Maraval, Trinidad: Prospect Press.

⁷⁹ Laydoo, R. S., Bonair, K. & Alleng, G. (1998). Buccoo Reef and Bon Accord Lagoon, Tobago, Republic of Trinidad and Tobago. In: *Caribbean Coastal Marine Productivity (CARICOMP) Coral Reef, Seagrass, and Mangrove Site Characteristics* (Kjerfve, B. ed.). UNESCO, Paris, pp. 345.

⁸⁰ Juman, R. A. (2010). *Wetlands of Trinidad and Tobago*. Trinidad and Tobago: Institute of Marine Affairs.

2.1.4 Genetic Diversity in T&T

Genetic diversity in T&T is not as well researched and understood as ecosystem and species diversity. Most data and information on genetic diversity are available for species of agricultural importance and these are described in *Chapter 4* of this report.

Status and Trends in Driving Forces

There are a number of driving forces which are increasingly affecting biodiversity and associated human well-being in the country. Many of the direct drivers have already been mentioned in the previous sections on status and trends. This section provides consolidated information on the main direct and indirect forces of change, and recognizes that data availability for the island of Trinidad is generally better than that for the island of Tobago (both in the extent and quality of the data).

2.1.5 Direct Drivers of Change

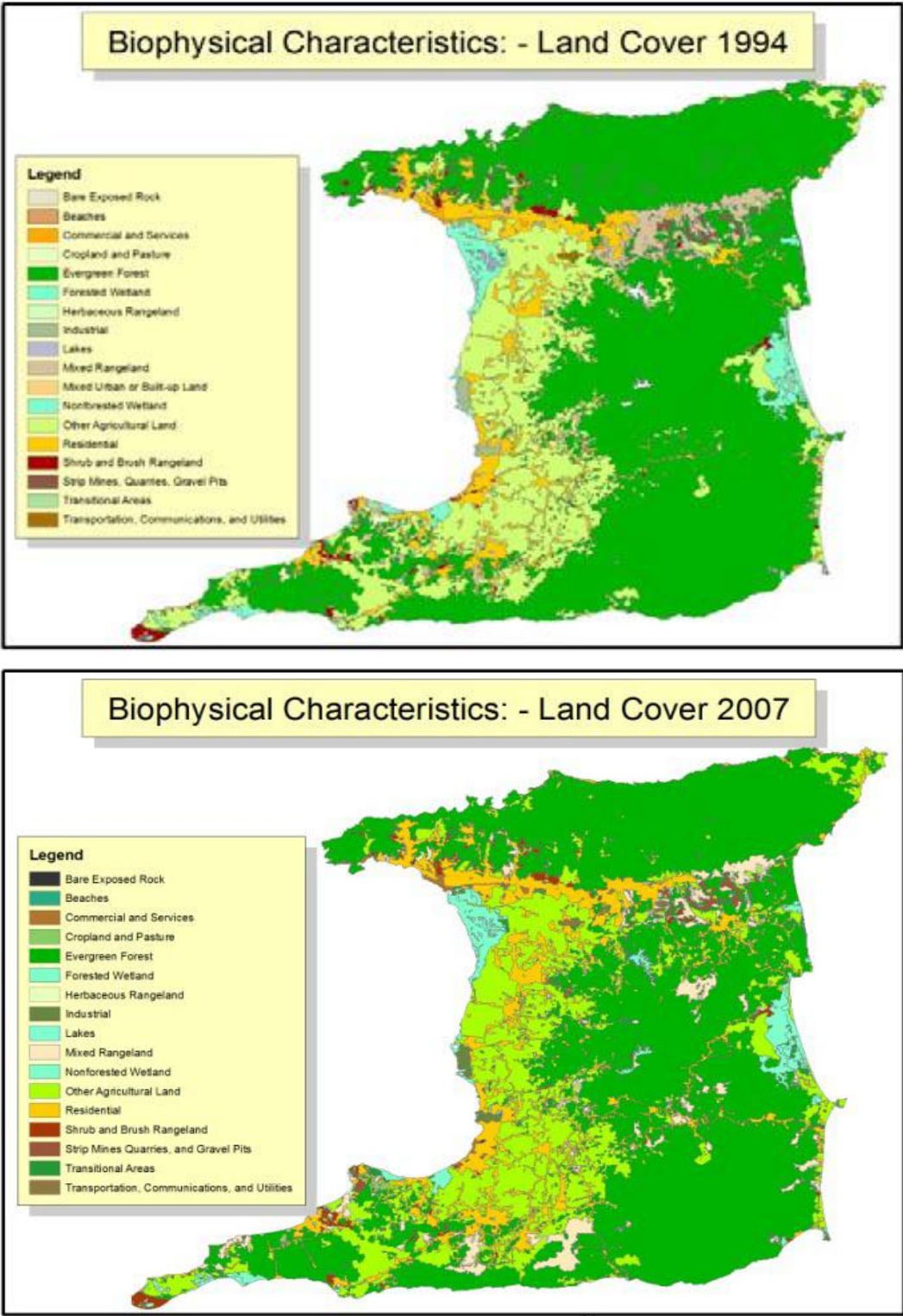
2.1.5.1 Land Use and Land Cover Change

Land use and land cover changes are collectively the main driving force contributing to biodiversity loss in all biomes in T&T – similar to many other parts of the globe. Deforestation and conversion of land, principally for agriculture and housing, have been the main human influences on the landscape, and these have resulted in the reduction in extent of forests and coastal ecosystems, as well as greater fragmentation of remaining natural systems. Information obtained from FAO Aquastat (2012) indicates that between the years 1990 to 2010 T&T experienced an average loss of 750 ha or 0.31% forest cover per year due to land use pressures⁸¹.

Figure 2.11 shows comparative land use/land cover maps for Trinidad for two years, 1994 and 2007. These maps indicate that the most extensive conversion has occurred in the western parts of the island and along a belt on the southern foothills of the Northern Range. Between 1994 and 2007, the most significant change was the increase in the extent of urban/residential development on the island. Urban/residential development has been spreading both eastward across the island, and further into the valleys (or watersheds) of the Northern Range. In recent years, the rate of housing development has increased significantly because of programmes, especially those which were Government-led, to increase the number of houses for low-income families.

⁸¹ Food and Agricultural Organization (FAO) Aquastat, (2012). Use of the Aquastat Database. Retrieved from <http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en>

Figure 2.11. Land Use and Land Cover Maps of Trinidad in 1994 and 2007.

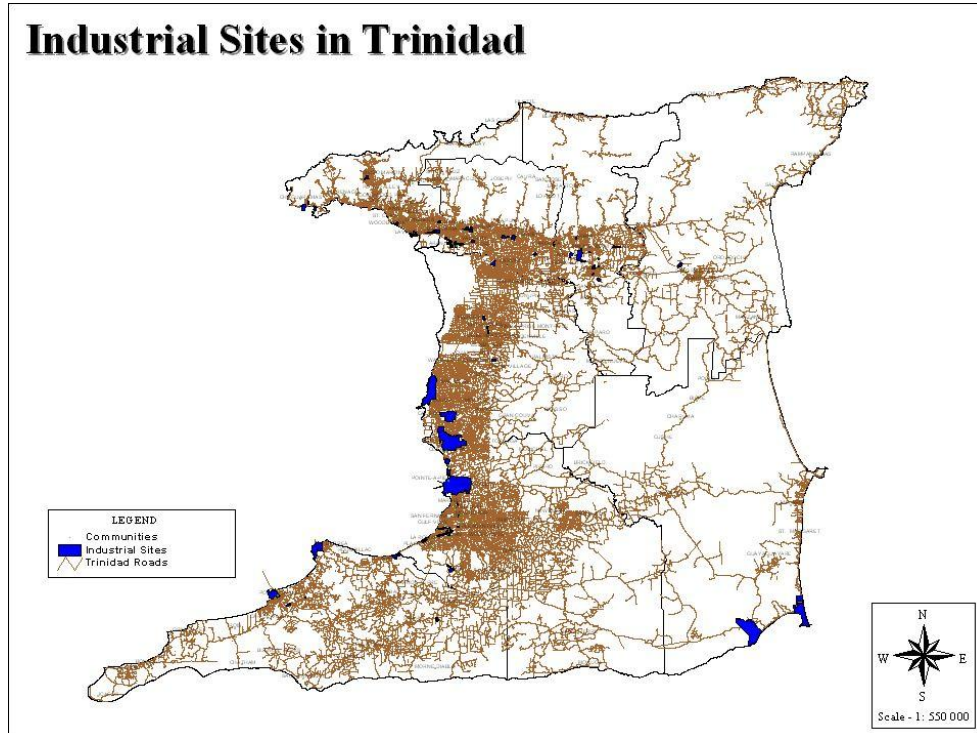


Source: Opadeyi, 2010⁸²

⁸² Opadeyi, J. (2010). *Managing Our Land, Managing Our Future*. Trinidad and Tobago: The University of the West Indies, St. Augustine.

Industrial development in Trinidad, largely driven by the growing petrochemical sector over the last several years, has resulted in the conversion of significant tracts of coastal ecosystems, principally mangroves along the western coast of Trinidad to industrial estates – the largest of which is the Point Lisas Industrial Estate (*Figure 2.12*). Some coastal conversion is also seen in the south-western region of the island. As is also evident from *Figure 2.12*, road networks are very extensive and would ultimately result in greater fragmentation of and between ecosystems.

Figure 2.12. Map Showing Industrial Sites and Road Networks in Trinidad.



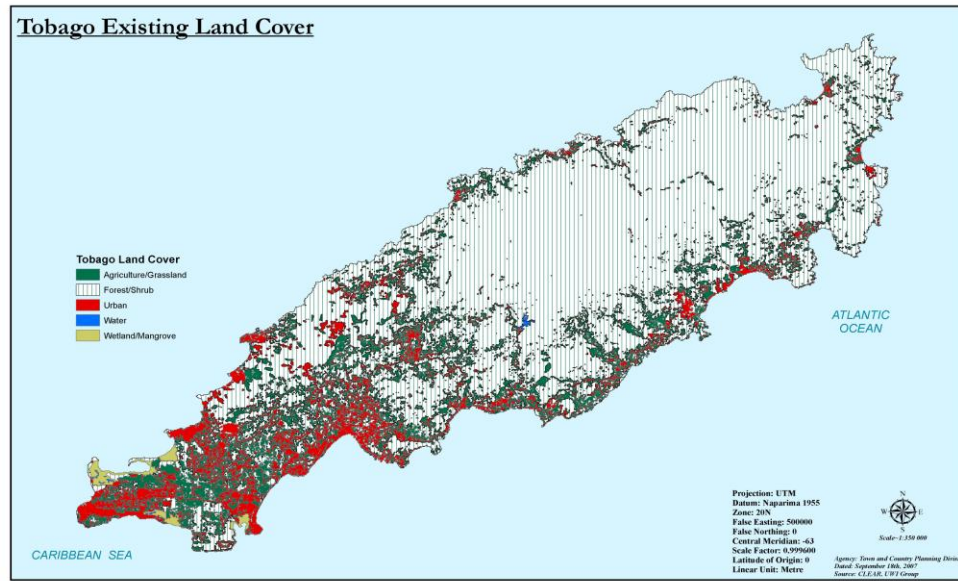
Source: Town and Country Planning Division, Ministry of Planning, Housing and Environment 2008⁸³

In Tobago, the location of infrastructural development is shifting from the south-western parts of the island to the eastern parts. In recent years, the rate of housing development has increased significantly because of programmes, similar to those in Trinidad, which were Government-led, and sought to increase the number of houses for low-income families. Significant alterations of the landscape have occurred in the south-western part of the island, and along the south coast mainly for urban development (including hotel construction associated with the growing tourism

⁸³ Town and Country Planning Division, Ministry of Planning, Housing and Environment (TCPD), (2008). Map Showing Industrial Sites and Road Networks in Trinidad. *In: The Government of the Republic of Trinidad and Tobago (GoRTT), (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>*

industry) and agriculture (*Figure 2.13*). As is evident from the map, this development has been intensive.

Figure 2.13. Land Use/Land Cover Map of Tobago.



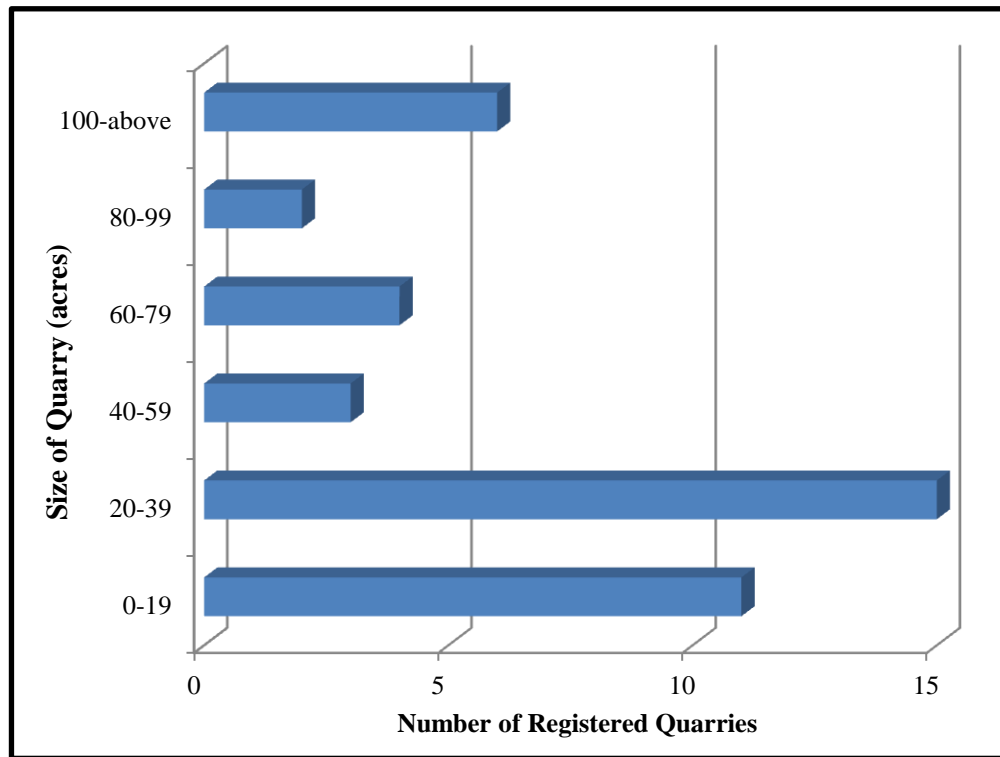
Source: Town and Country Planning Division, 2006⁸⁴

The other factors contributing to changes in land cover are quarrying, logging and fires. Quarrying has been receiving increasing attention in T&T as an activity which affects biodiversity principally through the removal of large tracts of forest, through pollution of waterways, and through noise pollution. Degradation by quarrying is particularly destructive and pushes the ecosystem beyond its limits of regeneration. Therefore, land degraded by quarrying requires rehabilitation in order to regenerate quickly. According to the Ministry of Energy and Energy Affairs (2012), there are currently 42 registered quarries (compared to 49 registered quarries in 2009), which occupy a total land area of 2,011 acres⁸⁵. Thirty three of these 42 quarries are located on state lands where 29 quarries mine sand and gravel⁸⁵. Six of the state land quarries exceed 100 acres with the largest quarry covering approximately 238 acres of land (*Figure 2.14*)⁸⁵. These large expanses of land would have experienced clearing of forests, damage to water courses, communities and affected wildlife sanctuaries, in order to meet the local demand for aggregate.

⁸⁴ Town and Country Planning Division, Ministry of Planning, Housing and Environment (TCPD), (2006). Land Use/Land Cover Map of Tobago. In: The Government of the Republic of Trinidad and Tobago (GoRTT), (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

⁸⁵ Ministry of Energy and Energy Affairs (2012). Data Request from the Ministry of Energy and Energy Affairs on August 30, 2012. (Unpublished information). Quarries in Trinidad and Tobago.

Figure 2.14. Size Distribution of Registered Quarries in Trinidad and Tobago.

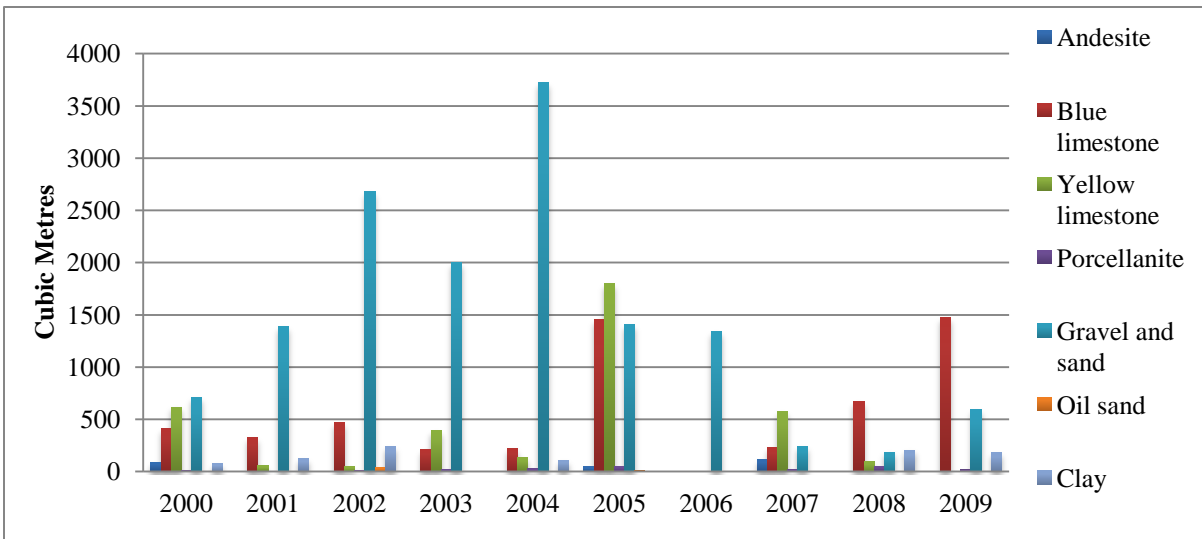


Source: Ministry of Energy and Energy Affairs, 2012⁸⁶

The increase in certain types of quarries up until 2009, such as sand and gravel, blue limestone and plastering sand occurred to meet the local ‘boom’ in demand for construction material, and it was driven mainly by government-led infrastructural development under a national initiative commonly known as the 2020 Vision Strategy - initiated in 2006. Prior to 2006, several large projects were undertaken by the government which drove the demand for construction aggregate as seen in *Figure 2.15*. Such rapid development was made possible by the country’s buoyant economy at that time. Although the regulation of quarry development is governed under law [the Minerals Act and the Water Pollution (Amendment) Rules, 2006], the approach to the establishment, and operation and rehabilitation of quarries is still regarded as largely unsustainable. As such, quarrying continues to have significant deleterious effects in important ecosystems such as the Northern Range (in the Maracas and Arima Valleys and in the Valencia area).

⁸⁶ Ministry of Energy and Energy Affairs, (2012). Data Request from the Ministry of Energy and Energy Affairs on August 30, 2012. (Unpublished information). Size Distribution of Registered Quarries in Trinidad and Tobago.

Figure 2.15. Output of Quarries in Trinidad and Tobago, 2000-2009.



Source: CSO, 2012⁸⁷

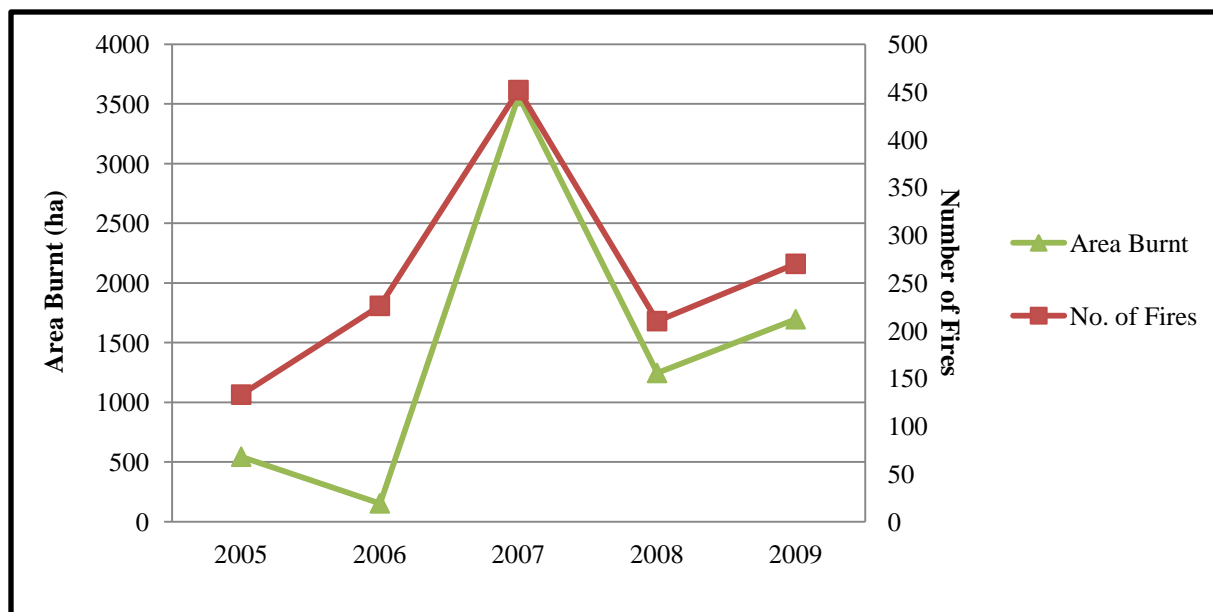
Logging, especially illegal logging, is a contributing factor to decreasing forest cover in T&T. In 1998 and 1999, only a small percentage of logs were removed from natural forests on state lands - most were derived from plantations such as teak, (*Tectona grandis*) and pine (*Pinus caribaea*). However, from the year 2000, the outturn from natural forest, plantations and the overall total forest showed a general decline. It should be noted that sawn log outturn does not necessarily indicate the levels of ‘deforestation’ because forests are removed for other land use purposes, and current expert opinion is that logging does not lead to deforestation directly.

Every year, fires destroy significant tracts of vegetation throughout T&T. An insignificant number of the fires are thought to be started by natural factors such as lightning. In T&T, fires are most often initiated because of malicious acts, slash and burn agriculture, hunting, careless discard of cigarettes and other acts of negligence⁸⁸. *Figure 2.16* shows the number of fires and area of land burnt on an annual basis between 2005 and 2009 (most current available data).

⁸⁷ Central Statistical Office (CSO) of Trinidad and Tobago, (2012). Data request from Central Statistical Office on April 30, 2012. (Unpublished information). Output of Quarries in Trinidad and Tobago between 2000 and 2009.

⁸⁸ Northern Range Assessment, (2005). Report of an Assessment of the Northern Range, Trinidad and Tobago: People and the Northern Range. State of the Environment Report 2004. Environmental Management Authority of Trinidad and Tobago.

Figure 2.16. Number of Forest Fires and Area of Land burnt in Trinidad and Tobago between 2005 and 2009.



Source: ECLAC, 2011⁸⁹

Even though less natural forest is burned compared to agricultural and plantation land, the damage is far worse in terms of biodiversity loss. Fires are also cumulative where a forest that has burnt once is more prone to subsequent burning. The data generally indicates that natural forests are not under the greatest threat from fires but rather savannas (such as Aripo Savannas), agricultural lands and plantations, teak (*Tectona grandis*) and pine (*Pinus caribaea*) often suffer the most extensive damage (Table 2.8).

⁸⁹ Economic Commission for Latin America and the Caribbean (ECLAC), (2011). *An Assessment of the Economic Impact of Climate Change on the Agriculture Sector of Trinidad and Tobago*. Retrieved from http://www.eclac.org/portofspain/noticias/paginas/0/44160/Trinidad_and_Tobagocar1325.pdf

Table 2.8. Number and Area Burnt of Forest Fires within Different Land Use Types in Trinidad and Tobago, 2010.

County	Natural Forest		Secondary Forest		Teak Plantation		Pine Plantation		Agricultural Lands		Savanna/Grasses		Other		Grand Total	
	No. of fires	Area Burnt (Ha)	No. of fires	Area Burnt (Ha)	No. of fires	Area Burnt (Ha)	No. of fires	Area Burnt (Ha)	No. of fires	Area Burnt (Ha)	No. of fires	Area Burnt (Ha)	No. of fires	Area Burnt (Ha)	No. of fires	Area Burnt (Ha)
St. George	28	1404.7	113	1388.7	0	1.5	14	260	46	689.8	87	1069.3	15	349.9	303	5163.9
St. Andrew/ St. David	7	23.5	27	107.8	5	73.5	7	174	48	164	22	77.9	2	4	118	624.7
Caroni	0	0	3	28.5	2	625	9	32.5	26	148.7	67	233.6	31	100.7	138	1169
Victoria	0	0	0	0	21	455.6	0	0	0	0	0	0	0	0	21	455.6
St. Patrick	2	44.8	20	639	11	15551.7	7	122.5	1	27.2	5	54.4	1	33.7	47	2473.3
Nariva/ Mayaro	1	1	7	64.4	0	0	0	0	24	45.4	15	340.3	5	9.8	52	460.9
Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	38	1474	170	2229	39	2707.3	37	589	145	1075	196	1776	54	498	679	10347.4

Source: ECLAC, 2011⁹⁰

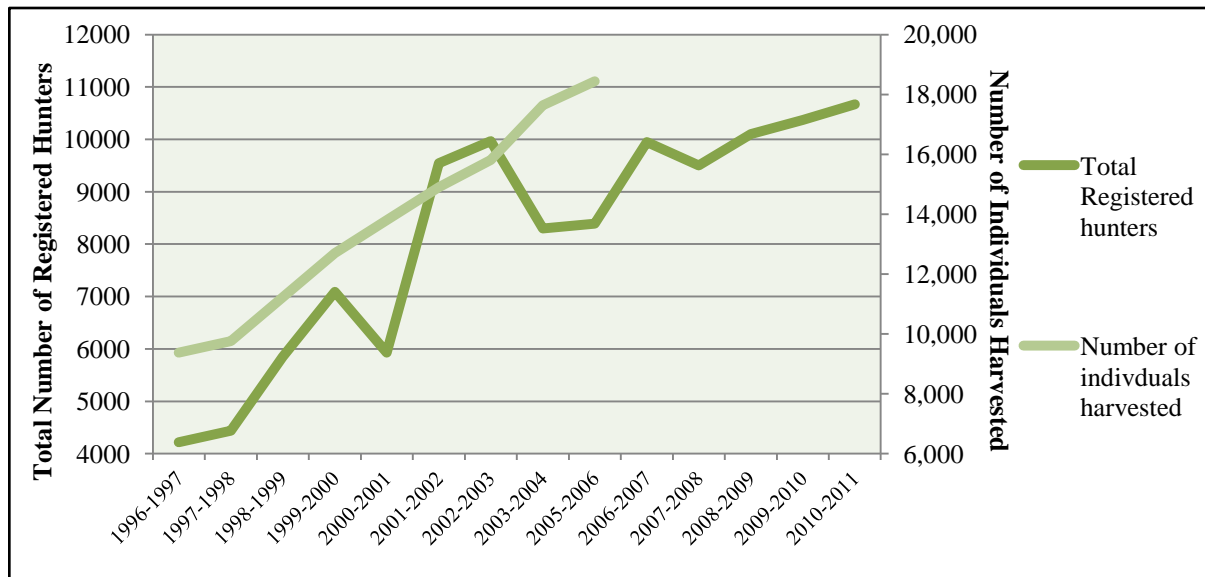
⁹⁰ Economic Commission for Latin America and the Caribbean (ECLAC), (2011). *An Assessment of the Economic Impact of Climate Change on the Agriculture Sector of Trinidad and Tobago*. Retrieved from http://www.eclac.org/portofspain/noticias/paginas/0/44160/Trinidad_and_Tobagolcarl325.pdf

2.1.5.2 Harvest and Resource Consumption

Activities such as timber extraction, wildlife hunting, and fishing are all potential threats to the integrity of local biodiversity. As previously described, although the removal of timber is not contributing to deforestation as compared to other activities (housing, agriculture and quarrying), more research is required to determine the effects of this activity on forests.

Wildlife hunting is an activity which is regulated by law and is becoming increasingly popular in T&T. *Figure 2.17* shows that there was a steady increase in the numbers of wildlife animals hunted annually between 1996 and 2011, with the recorded number of animals hunted more than doubling during that period. *Figure 2.17* also shows the number of registered hunters and the number of individuals harvested per season. The trend of increasing numbers of hunters has continued within recent hunting seasons to reach noticeable peaks of over 10,000 in the 2010/2011 season compared to just over 4,000 in the 1996/1997 season⁹¹.

Figure 2.17. Total Annual Numbers of Wildlife Animals Hunted and the Number of Registered Hunters, 1996-2011.



Source: Forestry Division, 2012⁹¹

It is unlikely that the increasing harvest numbers reported by the Forestry Division are an indication of an increasing resource base (i.e. that the numbers of animals in the wild are increasing), rather it would more likely indicate that more pressure is being placed on the wildlife resources. The Northern Range Assessment (2005) reported declines in populations such as the wildhog (*Tayassu tajacu*) and the Lappe (*Cuniculus paca*), and noted that the Red Brocket

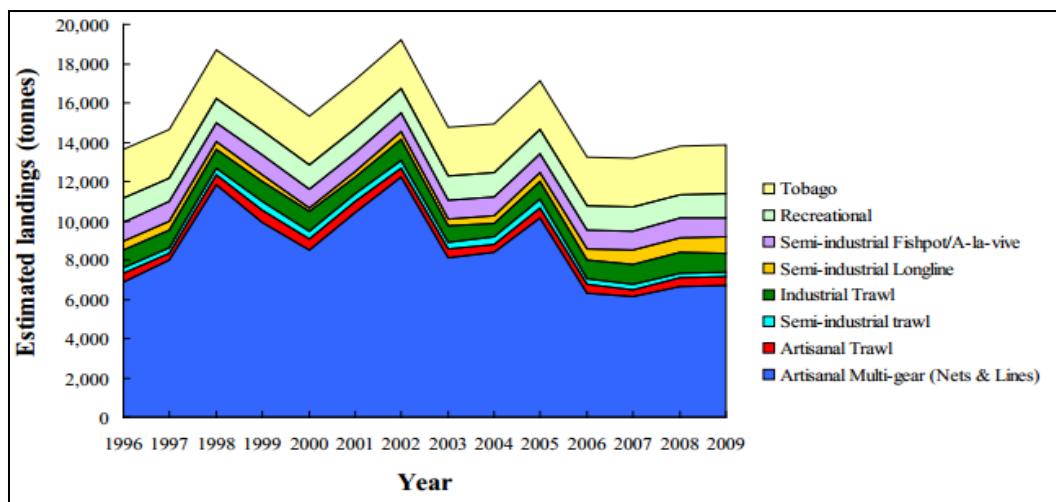
⁹¹ Forestry Division, (2012). Data Request from the Forestry Division on June 30, 2012. (Unpublished information). Total Annual Numbers of Wildlife Animals Hunted and the Number of Registered Hunters between 1996 and 2011.

deer (*Mazama americana trinitatis*) was vulnerable⁹². In addition to these, Kenny (2008) reported on the vulnerability of other species that are hunted: the Red Howler Monkey (*Alouatta seniculus insularis*) and the White-fronted Capuchin (*Cebus albifrons trinitatis*) are routinely hunted and consumed⁹³. The White-fronted Capuchin is described as uncommon in Trinidad, and the Northern Range Assessment (2005) reported significant decreases in the Red Howler Monkey populations⁹². The Ocelot (*Leopardus pardalis*) which is the least common of the land dwelling mammals in the country is also killed by hunters. The endemic Pawi (*Pipile pipile*), categorized by the IUCN Red List as critically endangered, is also hunted for food⁹⁴.

T&T's marine fisheries are under serious threat similar to most other fisheries in the world. *Figure 2.18* indicates an overall decline in fish landings after 2002, and as of 2009, recovery was still not evident. Current data on catch per unit effort for T&T indicates already declined or declining fisheries (*Table 2.6*). Moreover, certain deductions could be made from available data for T&T.

It is worth mentioning that there is pressure on other forms of local food sources which impacts our biodiversity, for example, harvesting of local crab species, fishing within freshwater and brackish water systems for local species such as crayfish, oysters, black conch, and cascadura.

Figure 2.18. Estimated Landings by Fleet from the Marine Capture Fisheries in Trinidad and Tobago, 1996-2008.



Source: Fisheries Division, 2011⁹⁵

⁹² Northern Range Assessment, (2005). Report of an Assessment of the Northern Range, Trinidad and Tobago: People and the Northern Range. State of the Environment Report 2004. Environmental Management Authority of Trinidad and Tobago. 184pp.

⁹³ Kenny, J. (2008). *The Biological Diversity of Trinidad and Tobago: A naturalist's notes*. Trinidad and Tobago: Prospect Press.

⁹⁴ International Union for Conservation of Nature (IUCN), (2012). Red List of Threatened Species. Retrieved from www.iucnredlist.org

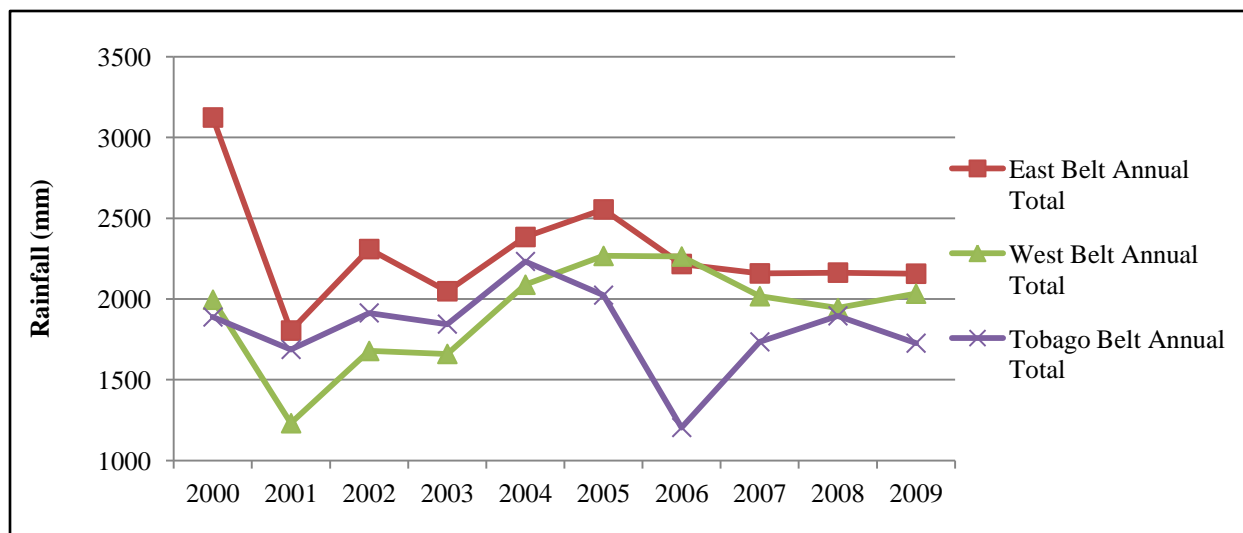
⁹⁵ Fisheries Division, (2011). Estimated Landings by Fleet from the Marine Capture Fisheries in Trinidad and Tobago, 1996-2008. In: The Government of the Republic of Trinidad and Tobago (GoRTT), (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

2.1.5.3 Climate Variability, Change and Associated Effects

The average temperature of T&T is 26°C with an average annual temperature variation of about 2°C. Highest temperatures are generally recorded during the dry season (Jan-May) and can reach to averages of 35°C. At higher elevations, such as in Trinidad’s Northern Range and in Tobago’s Main Ridge, temperatures tend to be lower than at sea level. There is an average rainfall of 1,750 mm per year with much of the rain being concentrated in the wet season (June-December). Rainfall is also unevenly distributed with the heaviest being recorded along the eastern Northern Range and the eastern side of Trinidad, while heaviest rainfall in Tobago is experienced along the Main Ridge.

Figure 2.19 shows the changing trends of the rainfall pattern between the periods 2000 to 2009. Information obtained from the PRECIS model projects less rainfall for the southern Caribbean because of climate change, which may have negative consequences for biodiversity⁹⁶.

Figure 2.19. Change of Annual Rainfall Totals between East and West Belts in Trinidad and the Tobago Belt, 2000-2009.



Source: CSO, 2012⁹⁷

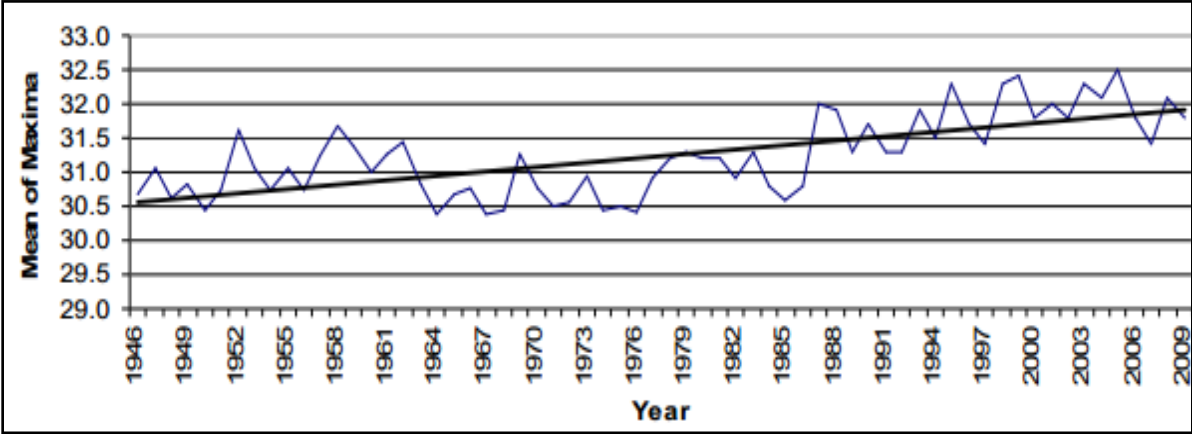
Figure 2.20 shows the mean annual air temperature for Trinidad from 1946 to 2009. The increase is persuasive with recent reports indicating a total increase in temperature of 1.7°C over the period 1961-2009⁹⁷. This is compared with an increase of 0.6°C over the period 1961-1990. What these data indicate is an increase in the warming rate since 1990. It can therefore be

⁹⁶ Campbell, J. D., Taylor, M. A., Stephenson, T. S., Watson, R. A., & Whyte, F. S. (2011). Future climate of the Caribbean from a regional climate model. *International Journal of Climatology*, 31 (12), 1866-1878.

⁹⁷ Central Statistics Office (CSO) of Trinidad and Tobago, (2012). Data request from Central Statistical Office, April 30, 2012. (Unpublished information). Change of Annual Rainfall Totals between East and West Belts in Trinidad and the Tobago Belt between 2000 and 2009.

concluded from the long-term data that air temperatures in T&T are increasing, and that the rate of increase is also rising.

Figure 2.20. Mean Air Temperature in Trinidad and Tobago during the Period 1946-2009.



Source: ECLAC, 2011⁹⁸

The impact of rising global temperatures is well illustrated in the case study presented in *Box 2.3* of the impact of rising sea surface temperatures on coral reef ecosystems in Tobago.

⁹⁸ Economic Commission for Latin America and the Caribbean (ECLAC), (2011). *An Assessment of the Economic Impact of Climate Change on the Agriculture Sector of Trinidad and Tobago*. Retrieved from http://www.eclac.org/portofspain/noticias/paginas/0/44160/Trinidad_and_Tobagocar1325.pdf

Box 2.3. Coral Reef Declines in Tobago.

In July - October 2010, a steady increase in Sea Surface Temperatures (SST) throughout the Caribbean led to surface water temperatures well beyond the normal threshold for the region (29.5°C). With SSTs of over 31°C, coral colonies around Tobago started suffering from temperature and UV-induced bleaching. In Speyside, where SSTs of 32°C were measured, some sites had 100% bleaching of all coral colonies. Elevated temperatures persisted for many weeks and helped fuel the most active Atlantic hurricane season on record and the most severe and extensive mass coral bleaching event ever observed in the Caribbean.

Selected sites surveyed by CCC during the 2005 mass-bleaching event were re-surveyed in 2010 in order to get an impression of changes in coral cover as well as bleaching and disease prevalence. An analysis was undertaken of 68 coral reef sites surveyed at 7m and 12m, along the north-eastern coast of Tobago between August and December 2010. These surveys were conducted in roughly the same locations in both monitoring periods. Surveys conducted at the same reef sites in 2005 and 2010 showed a significant reduction in live hard coral cover from 27% in 2005 to 13% in 2010 at 12m (t-test, $P < 0.05$). At 7m, there was also a strong decline in coral cover from 24% in 2005 to 10% in 2010. Sites on the Caribbean Sea side of the island experienced the most significant declines in coral cover over the 5 year period. This was reflected in the fact that coral bleaching levels in 2005 were particularly high along the Caribbean coast while sites in Speyside had lower bleaching levels. In contrast, the mass-bleaching event of 2010 saw Speyside reefs being severely affected by coral bleaching whereas Caribbean sites had lower bleaching levels compared to 2005, particularly at 12m depth. On average, approximately half of the coral colonies observed were bleached (~56%). Furthermore, a third of these colonies suffered from one or more coral diseases. Approximately a third of sites visited had bleaching levels of 90% or higher with some sites such as Black Jack Hole, one of Speyside's prime dive sites, displaying coral bleaching across all coral colonies. Coral bleaching was significantly higher at shallower depths (regression analysis, $p < 0.05$) although there was no apparent correlation between coral disease prevalence and depth. Coral bleaching at 7m was slightly higher in 2010 than 2005 whereas bleaching at 12m was higher in 2005.

Bleaching between coral species appeared indiscriminate with dominant coral taxa being *Montastrea spp.*, *Siderastrea spp.*, *Diploria strigosa* and *Colpophyllia natans*. Sites that suffered the highest coral bleaching also suffered from sponge necrosis. Sponge necrosis was particularly high on Speyside reefs amongst Barrel Sponges, *Xetospongia muta* and Yellow Tube Sponge, *Aplysina fistularis* colonies. Where sponge necrosis was witnessed, it started before the onset of coral bleaching and is likely to have been caused by the unusually warm SSTs in the area. Sponge necrosis was not seen in 2005, indicating that the impact of the 2005 mass-bleaching event was particularly severe for the marine environment of Speyside.

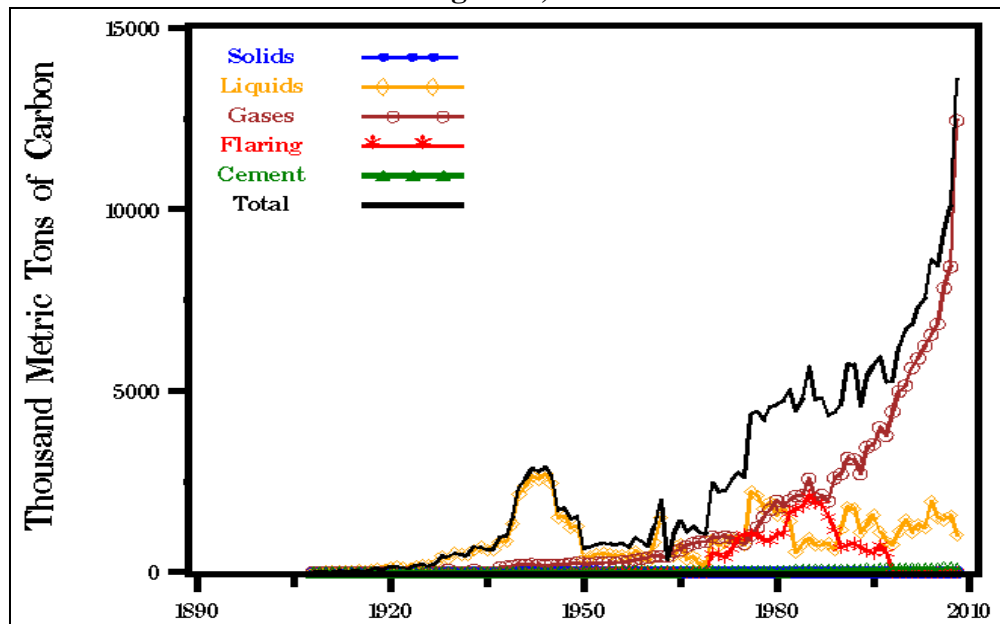
Coral diseases became prevalent after the 2005 mass bleaching event. Coral colonies on the Caribbean side of Tobago were frequently infected with a variety of coral diseases particularly yellow band disease which was commonly found on *Montastrea* coral colonies. Other coral diseases that were seen included White Plague, Black Spot Syndrome and Aspergillosis. Coral colony die-off following the 2005 bleaching outbreak was further exacerbated by hurricane Thomas which took place on the 29th of October, 2010. Shortly thereafter, there was a high influx of mud from land runoff, resulting in high sedimentation levels which lasted for weeks, particularly within the sheltered bays along the Caribbean coastline. There was also direct coral damage from debris hitting the reefs. Charlotteville in particular suffered from prolonged and unusually high sedimentation levels.

Source: CCC, 2012⁹⁹

⁹⁹ Coral Cay Conservation (CCC), (2012). *Tobago Coastal Ecosystems Mapping Project: Final Report- Results of Community and Scientific Work*. Retrieved from <http://www.coralcay.org/science-research/scientific-reports/>

The Caribbean is responsible for less than 0.1% of the world's carbon dioxide emissions, but emissions have been increasing steadily for over a decade¹⁰⁰. Data available from the Carbon Dioxide Information Analysis Centre (CDIAC) through the United Nations Millennium Development Goals reporting process (2011) indicates that, based on global monitoring, T&T's carbon dioxide emissions more than doubled over the period 1990 to 2010 (*Figure 2.21*). In 2009, carbon dioxide emissions in T&T were estimated at 42,540.9 kilotonnes¹⁰¹.

Figure 2.21. Trinidad and Tobago's Carbon Dioxide Emissions Based On Global Monitoring Data, 1890-2010.



Source: CDIAC, 2011¹⁰²

As a small island developing state (SIDS), T&T is at risk of losing significant portions of its low-lying coastal lands to sea level rise (driven by climate change). Sutherland et al. (2008) reported that over the period 1984 to 1992, sea level around T&T rose by 1.6 mm to 3.0 mm¹⁰³. Projections to 2050 indicate a rise of approximately 0.05 m above recorded sea level height in 2001, a change of approximately 1 mm per year (*Figure 2.22*)¹⁰⁴. These data, along with data provided by the Intergovernmental Panel on Climate Change (IPCC) (2007) point to an increase in the rate of sea level rise. These changes would have serious impacts on local coastal ecosystems, the livelihoods of coastal communities, coastal development and human well-being.

¹⁰⁰ Economic Commission for Latin America and the Caribbean (ECLAC), (2011). An Assessment of the Economic Impact of Climate Change on the Energy Sector in Trinidad and Tobago. Retrieved from http://www.eclac.org/portofspain/noticias/paginas/0/44160/Trinidad_and_Tobagocar1325.pdf

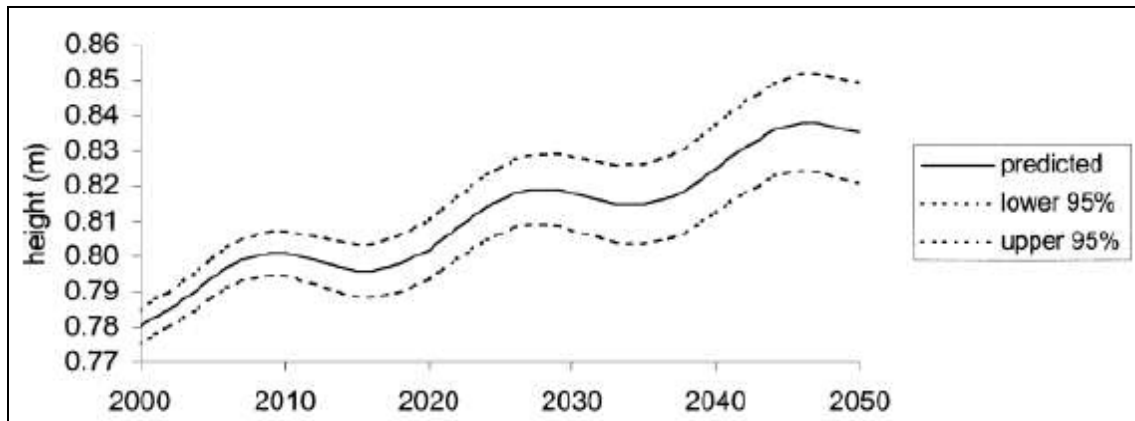
¹⁰¹ The World Bank Group, (2012). CO2 Emissions. Retrieved from <http://data.worldbank.org/indicator/EN.ATM.CO2E.KT>

¹⁰² Carbon Dioxide Information Analysis Centre (CDIAC), (2011). *Fossil-Fuel CO₂ Emissions*. Retrieved from http://cdiac.ornl.gov/trends/emis/t_t.html

¹⁰³ Sutherland, M., Dare, P., & Miller, K. (2008). Monitoring Sea Level Change in the Caribbean. *Geomatica*, 62 (4), 428-436.

¹⁰⁴ Miller, K. M., Hamilton, J., & Neale, D. (2005). Vertical Datums in a fault zone: Influences of plate tectonics in Trinidad, West Indies. Cairo, Egypt: FIG. Retrieved from https://www.fig.net/pub/cairo/papers/ts_33/ts33_04_miller_et_al.pdf

Figure 2.22. Predicted Annual Mean Sea Level in Port of Spain Trinidad, 2000-2050.

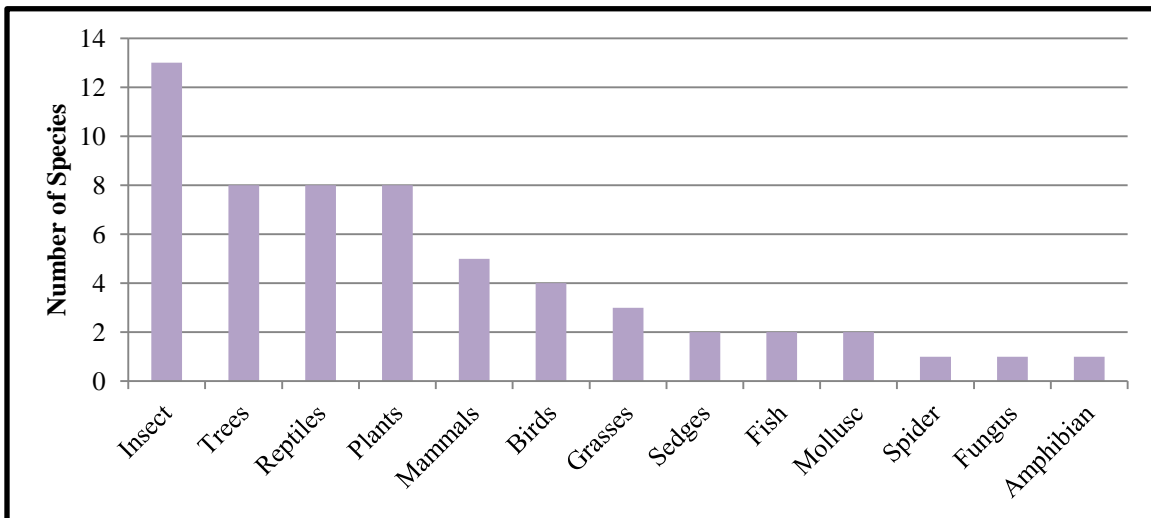


Source: Miller et al., 2005¹⁰⁵

2.1.5.4 Exotic Species

It is reported that there are 57 exotic species recorded in T&T – of which 21 are found in Trinidad and 4 are found in Tobago¹⁰⁶. There has been high numbers of exotic trees introduced mainly for agricultural and other commercial purposes. Birds, reptiles and insects also show large number of exotic species (*Figure 2.23*).

Figure 2.23. Exotic Species by Group in Trinidad and Tobago.



Source: GISD, 2012¹⁰⁶

¹⁰⁵ Miller et al., (2005). In: The Government of the Republic of Trinidad and Tobago (GoRTT), (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

¹⁰⁶ Global Invasive Species Database (GISD), (2012). Invasive Species in Trinidad and Tobago. Retrieved from <http://www.issg.org/database/species/search.asp?st=sss&sn=&rn=Trinidad%20and%20Tobago&ri=18272&hci=-1&ei=-1&fr=1&lang=EN&sts=sss>

Alien invasive species (a subset of exotic species) have been known to increase competition within ecological niches, reduce local biodiversity and have devastating impacts on commercially important crops. The most recent invasive species spotted near the reefs of Tobago is the Lion Fish (*Pterois* spp) which is known to affect coral reefs and its inhabitants. The IMA has embarked on educating the locals of Tobago on measures of control for this invasive species (Box 2.4).

Box 2.4. Divers Spot Lion Fish Excerpted from the Tobago News

The venomous and threatening Lion Fish has been spotted in Tobago and it is feared that if not controlled in time, it would destroy or negatively impact all sectors of marine life and marine activity. Based on this threat, the Institute of Marine Affairs (IMA) has embarked on a series of workshops across Tobago to educate fishermen and dive tour operators on the lionfish and control of it.

According to a release issued by the Institute of Marine Affairs, the fish was captured in Castara. The lion fish has venomous spines and therefore handling the fish must only be done with thick gloves. The institute is also advising that consumption of the lionfish is not recommended.

Jahson Alemu, a Coral Reef Ecologist at the IMA explained that the lionfish originated from the South Pacific and Indian Ocean and is now being found in the Caribbean Sea and Atlantic Ocean and seems to be thriving in these waters. He explained that the biggest problem with the lionfish is that they feed on other reef fishes such as red snappers and groupers, one of primary fishes caught by fishermen on a daily basis. He stated that it is also a highly venomous fish.

It is the intention of the IMA to control the spread of the fish in the waters of Trinidad and Tobago as much as possible and Alemu confirmed that so far, agencies such as the THA as well as fisher men and dive tour operators have shown a lot of enthusiasm in working together to get rid of the fish.

At the workshops persons are being taught how to use simple household items to capture the fish such as fish nets, which can easily be acquired at any pet store. PVC pipes, paint pails, or any containers can also be used to hold the lionfish since Alemu says, the lionfish is not safe to be handled with bare hands.

He also demonstrated how the use of a homemade spear gun that can be used to kill the fish if found. Alemu advises that if any lionfish is spotted, contact should be made with the IMA or the Fisheries Division of the THA.

If one is stung by the lion fish spines, the affected area should be treated with hot water for up to thirty minutes.

Source: Tobago News, 2012¹⁰⁷

2.1.6 Indirect Drivers of Change

Generally, data and information on indirect drivers of change are much less extensive than that for direct drivers. The key indirect drivers are described in the following sections.

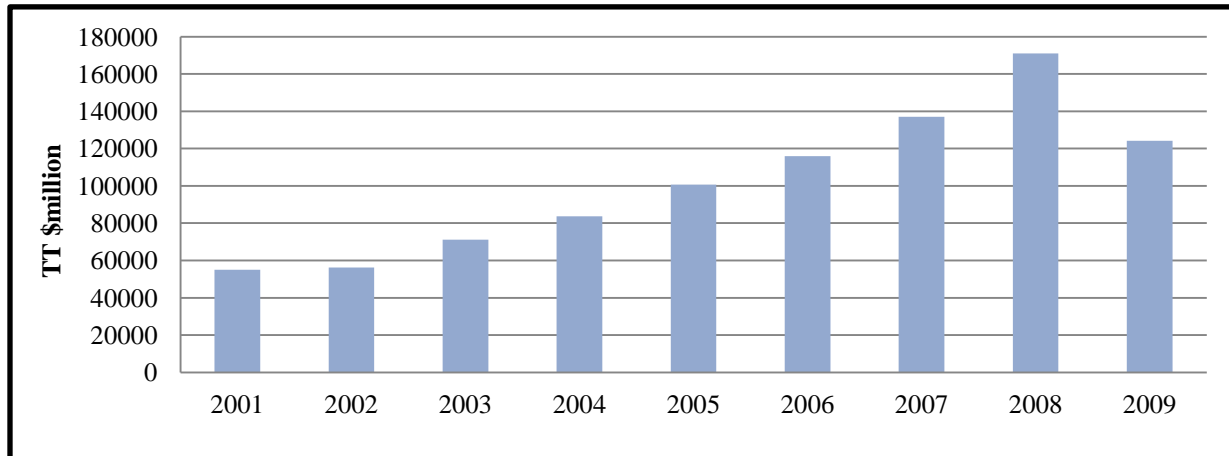
¹⁰⁷ Chulhan, K. (2012, September 13). Divers Spot Lion Fish. *Tobago News*. Retrieved from http://www.thetobagonews.com/news/DIVERS_SPOT_LION_FISH-169727616.html

2.1.6.1 Economic Forces

Many of the changes which have been experienced over the last decade in the direct drivers of change affecting T&T's biodiversity (land use change, pollution and high rates of consumption) have been mostly on account of rapid economic growth in T&T. In fact, it is probably fair to say that economic growth has been the most important indirect driving force contributing to biodiversity loss in T&T.

Owing to a very prosperous energy sector, T&T sustained a very high rate of development for several years – one of the fastest rates of development in Latin America and the Caribbean (LAC); the trend in annual GDP growth is shown in *Figure 2.24*. In the Caribbean, T&T is the leading producer of crude oil, and internationally, it ranks as the sixth largest exporter of Liquefied Natural Gas¹⁰⁸. The oil and gas sector (energy sector) contributes 40% to GDP, 80% to the number of exports but only 5% of the employment rate¹⁰⁹. The local availability of oil and gas has led to the development of a number of downstream petrochemical industries such as ammonia and methanol, and it has also spawned significant growth in other sectors such as construction. In turn, this led to increasing demand for other extractive resources such as minerals, and non-extractive resources such as land space for housing and industry.

Figure 2.24. GDP Growth of Trinidad and Tobago, 2001-2009.



Source: CSO, 2012¹⁰⁹

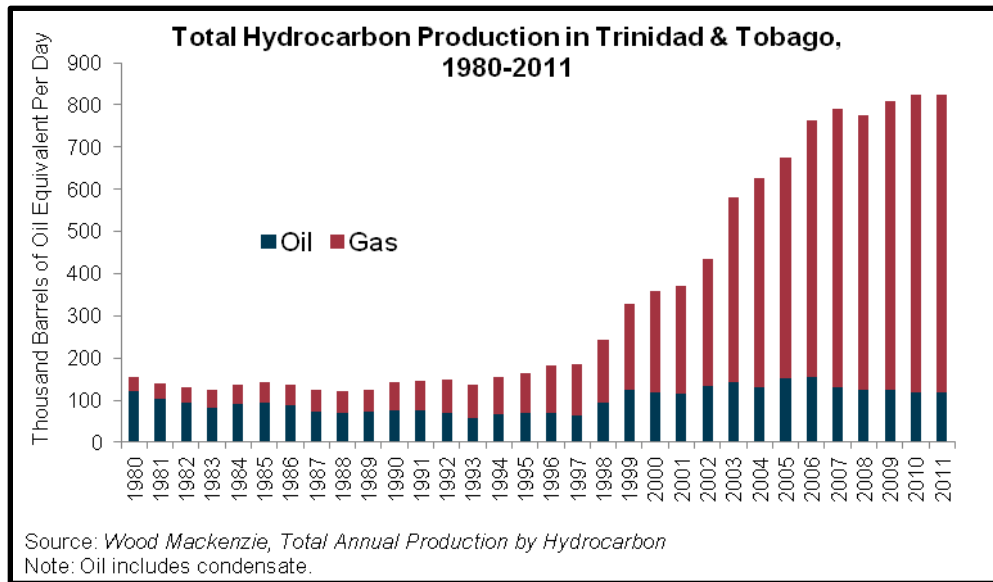
T&T has seen a surge of hydrocarbon production from the year 2000 to 2011 (*Figure 2.25*). With greater hydrocarbon production there is greater revenue earned but it must be taken into consideration that T&T's hydrocarbon production accounts for 40% of its GDP. Human

¹⁰⁸ United States Energy Information Administration (USEIA), (2012). Trinidad and Tobago. Retrieved from <http://www.eia.gov/countries/country-data.cfm?fips=TD&trk=m>

¹⁰⁹ Central Statistical Office (CSO) of Trinidad and Tobago, (2012). Data request from Central Statistical Office, April 30, 2012. (Unpublished information). GDP Growth of Trinidad and Tobago between 2001 and 2009.

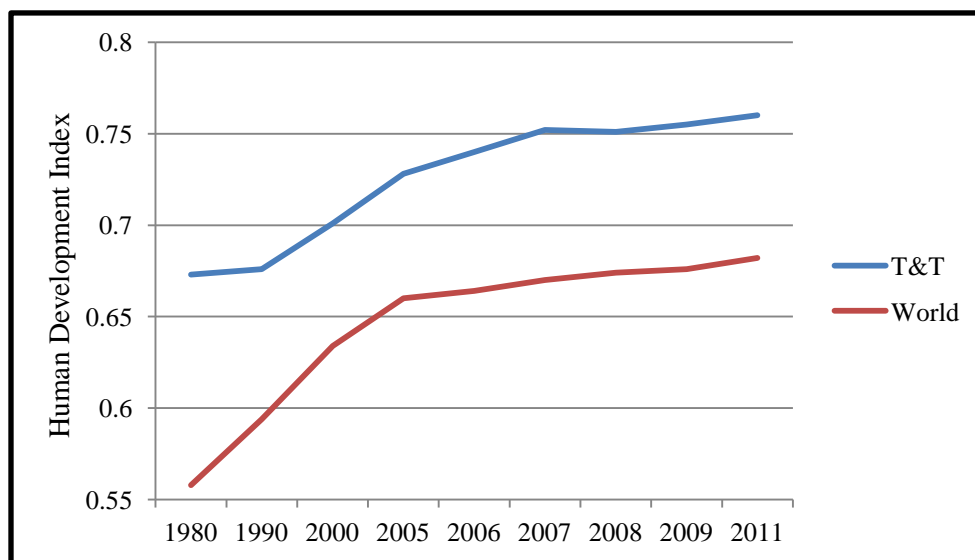
Development Index (HDI) has also increased in relation to hydrocarbon production (Figure 2.26). With greater hydrocarbon production there is greater demand for resources such as land space and water. The indirect improvement of quality of life (HDI) can show relation to loss of biodiversity.

Figure 2.25. Total Hydrocarbon Production in Trinidad and Tobago, 1980-2011.



Source: UNDP, 2011¹¹⁰

Figure 2.26. A Comparison of Human Development Index of Trinidad and Tobago with the rest of the World, 1980-2011.



Source: UNDP, 2011¹¹⁰

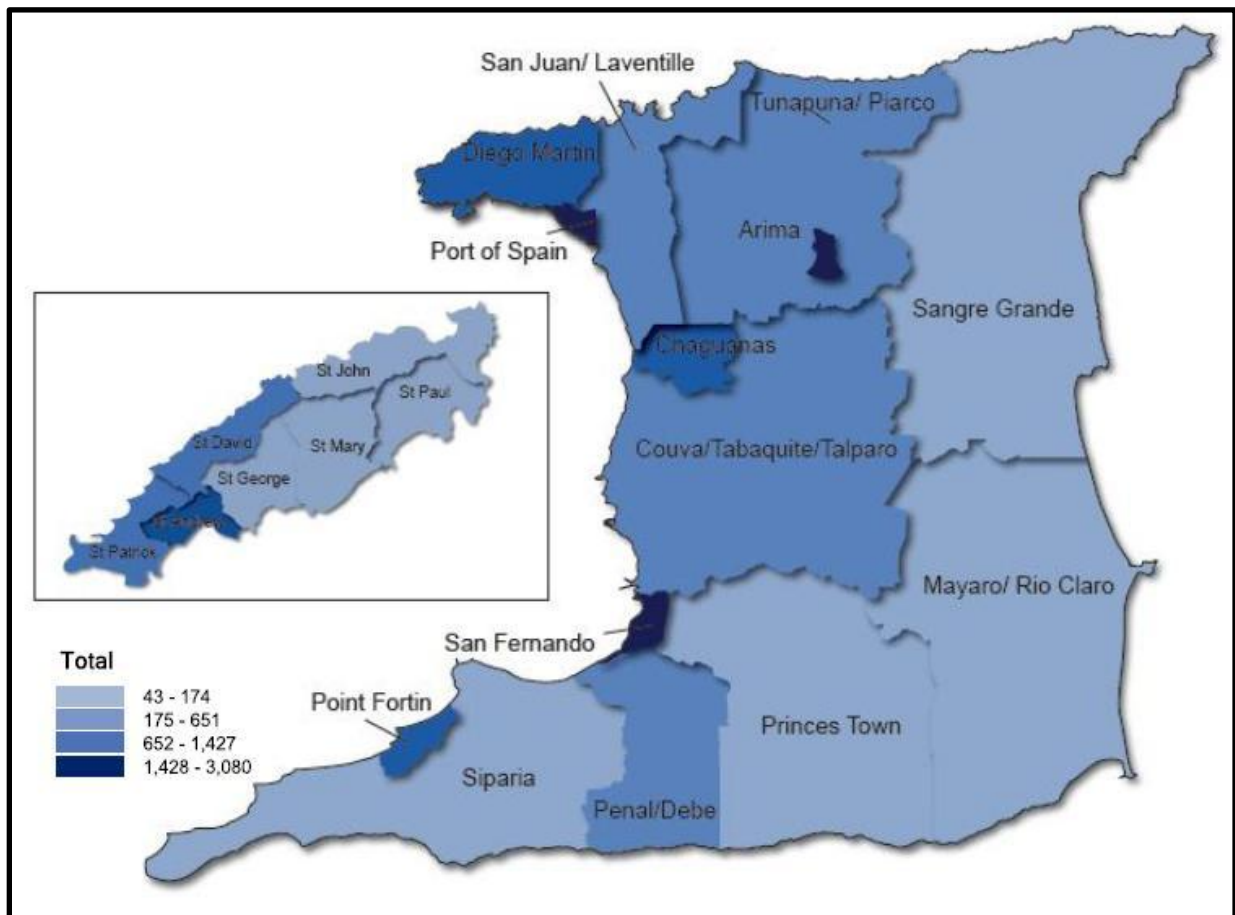
¹¹⁰ United Nations Development Programme (UNDP), (2011). *Human Development Report- Sustainability and Equity: A Better Future for All*. New York City, NY: Human Development Report Office of the United Nations Development Programme.

2.1.6.2 Demographic Changes

Based on the 2011 census, T&T's resident population stands at 1.3 million. The majority of the population lives on the island of Trinidad (approximately 1,268,000 people) with the remainder (approximately 56,000 people) residing in Tobago. Population density is increasing in certain areas with most of the growth occurring in and around the major urban areas on both islands (Figure 2.27).

Because of the population distribution, certain ecosystems – such as coastal ecosystems and certain sections of the mountain ranges have been affected (as described in Section 2.3.1.1 on land use and land cover changes).

Figure 2.27. Population Distribution in Trinidad and Tobago, 2011.



Source: CSO, 2011¹¹¹

¹¹¹ Central Statistical Office (CSO) of Trinidad and Tobago (2011). *Trinidad and Tobago (2011) Population and Housing Census Demographic Report*. Trinidad and Tobago: Central Statistical Office.

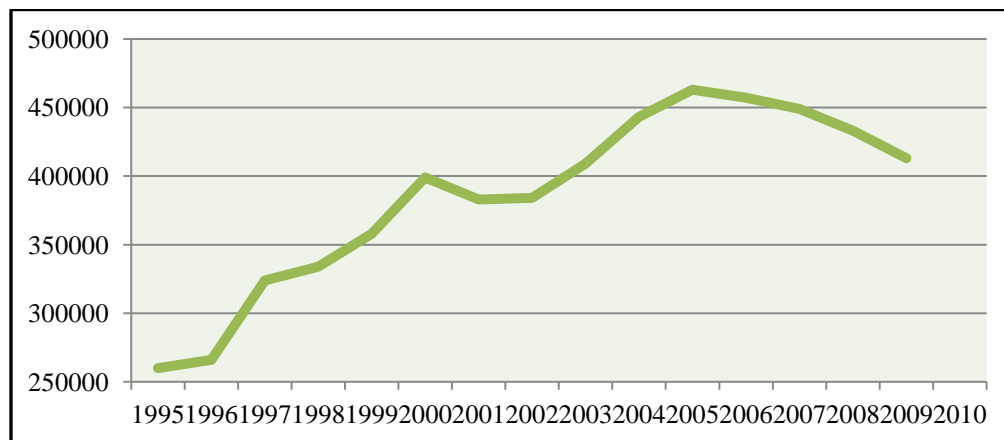
2.1.6.3 Governance and Legal Framework

Despite the very high rate of development in the country, it is interesting to note that no new environmental legislation was passed in T&T since 2001. Much of the existing environmental legislation is outdated, and even where more current laws and policies exist, there has been limited/ineffective implementation. The country's biodiversity has been, and continues to be under increasing threat from human activities. There is urgent need to establish instruments and mechanisms that will allow for more effective management of biodiversity.

2.1.6.4 Tourism

The tourism industry has played a significant role in driving changes in land use/land cover with great emphasis in Tobago in terms of creating infrastructure for tourist use. As *Figure 2.28* shows, tourist arrivals almost doubled from 1995 to 2010. This level of increased arrivals led to the need for the expansion of the hotel industry, and thus caused a high probability of greater pressure on coastal ecosystems to carry the recreational load.

Figure 2.28. Tourist Arrivals in Trinidad and Tobago between 1995 and 2010.



Source: TDC, 2011¹¹²

Summary of Driving Forces Affecting Biodiversity

Table 2.9 provides a summary of the status of, trends in and main threats to biodiversity in T&T, based on a biome analysis.

¹¹² Tourism Development Company Limited (TDC), (2011). Stopover Visitor Arrivals to Trinidad & Tobago, by Months 1995-2010. Retrieved from <http://www.tdc.co.tt/pdf/TnTStopoverMth1995toDec2010.pdf>

Table 2.9. Summary of Status, Trends in and Threats to Major Biomes/Ecosystems in Trinidad and Tobago.

Main biomes	Status			Trends			Driving Forces								
							Land Use/Land Cover Change				Pollution		Alien Invasive Species	Overharvesting	Climate Change & Variability
	Extent of Biome	Integrity of Ecosystem Services	Associated Species Abundance	Extent of Biome	Integrity of Ecosystem Services	Associated Species Abundance	Urban including Housing	Agriculture	Industrial	Quarrying	Chemical	Solid Waste			
Forests	Fair	Fair	Fair	Declining	Rapidly Declining	Declining	High	High	Med	High	Low	Low	Med	High	Med
Inland Freshwater Systems	Stable	Fair	Fair	Stable	Declining	Declining	Med	High	High	High	High	High	Med	High	Med
Coastal Systems-Wetlands	Fair	Fair	Fair	Declining	Declining	Declining	High	High	High	Med	High	Med	Med	High	High
Coastal Systems-Coral Reefs	Poor	Poor	Fair	Declining	Declining	Declining	High	High	Low	Low	High	High	Med	Med	High
Marine	No data	Good	Fair	No data	Declining slowly	Declining	No data	No data	No data	No data	Med	No data	No data	High	No data

Notes to table:

For driving forces, three categories of the extent of impact are used – High, Medium and Low.

No data – Data not sufficient to make an assessment

The colour of the boxes indicates the degree of certainty/confidence assigned to each factor - given as follows:

	High
	Medium
	Low

Source: GoRTT, 2011¹¹³

¹¹³ The Government of the Republic of Trinidad and Tobago (GoRTT), (2012). Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Retrieved from <http://www.cbd.int/doc/world/tt/tt-nr-04-en.pdf>

In summary, the following are noted as the major cause-effect chains in the degradation of Trinidad and Tobago's biodiversity:

- ✓ Rapid economic growth on account of the oil and gas industry in T&T has driven societal changes and changes in land use/land cover especially (though not exclusively) in western Trinidad and in south-western Tobago. These have been exacerbated by lack of effective governance and implementation of laws/policies, as well as by other stressors such as overharvesting, climate change and alien invasive species.
- ✓ On account of these changes, there have been significant modifications especially in the country's forests and coastal systems.
- ✓ There has also been pollution of inland freshwater systems and coastal regions on account of land use activities (principally housing/urbanisation, agriculture, industrialization and quarrying)
- ✓ Loss of ecosystem integrity has had some very direct and severe consequences, the most pressing including:
 - Greater severity of flooding in recent years in areas most modified by human activities. These also coincide with areas of highest urban and residential development.
 - Lower quantities of good-quality water from inland water sources for human consumption.
 - Loss of suitable habitats for wildlife and fragmentation of habitats, resulting in reductions in the abundance and distribution of species on both islands, as well as a higher vulnerability of certain species to endangerment and extirpation.
 - Economic losses in tourism and fisheries in Tobago associated with extensive coral reef degradation.
 - Higher fish prices due in part to depleted marine stocks.

Chapter 3 The Socio-Economic Contributions of Biodiversity

Introduction

As described in *Chapter 1*, ecosystem services, or the goods and services produced by nature, are essential for human existence and well-being. Unfortunately, despite this vital importance, we see a continued decline in the health, quality and extent of ecosystems and losses of biodiversity globally and locally here in Trinidad and Tobago (T&T) as established in *Chapter 2* of this report.

While a large variety of pressures on biodiversity and drivers of change are in action (*Chapter 2, Section 2.3*), the degradation of biodiversity resources and ecosystems can be partially attributed to the poor inclusion of the total value of ecosystem services to human well-being, both in social and economic terms in decision making processes at all scales.

Too often conservation has been viewed to be in conflict with economic growth and social development, with stakeholders in these fields seemingly having clashing objectives and speaking different languages. Fortunately, over the last decade we have seen the beginnings of a shift in this thinking, starting with the landmark Millennium Ecosystem Assessment in 2000, which formalized the concept of ecosystem services and clearly articulated the ways in which ecosystems and biodiversity are essential for social and economic human well-being and more recently with the United Nations Environment Programme (UNEP) backed, The Economics of Ecosystems and Biodiversity study and initiative (TEEB) which draws attention to the economic benefits of biodiversity and the costs of biodiversity degradation.

3.1.1 Objectives

This chapter aims to provide a description of the variety of recorded and unrecorded ways in which biodiversity contributes to the welfare of T&T's residents. By illustrating the socio-economic importance of biodiversity, this chapter also aims to contribute to efforts to mainstream biodiversity into private and public sector policymaking and the day to day decisions of individuals. Specifically this chapter aims to:

1. Assess the current contribution of Trinidad and Tobago's biodiversity, including associated ecosystem services to national welfare.
2. Assess the distribution of these benefits provided by biodiversity across various stakeholders, sectors, and geographic spaces.
3. Where possible, assess the impact of biodiversity loss and degradation on national welfare.
4. Estimate the value of important ecosystems that support human well-being, in the context of compensation.

3.1.2 Economics in the Context of the Convention on Biological Diversity (CBD) Framework

The use of economic tools for biodiversity conservation is mentioned in four articles of the CBD:

- Article 7, which calls on Parties to “Identify components of biological diversity important for its conservation and sustainable use” and to “Monitor important components of biological diversity”, relating these requirements to the indicative list of categories set down in Annex I. In turn, these Annex 1 categories include ecosystems, habitats, species, communities, genomes and genes of economic importance and value.
- Article 11, which requires Parties to “adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity”.
- Article 20, which stresses the need to generate and allocate sufficient funding to biodiversity. This includes all Parties providing “financial support and incentives in respect of those national activities which are intended to achieve the objectives of this Convention”, and developed country Parties generating “new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfil the obligations of this Convention”.
- Article 21 establishes “a mechanism for the provision of financial resources to developing country Parties for purposes of this Convention” and calls for Parties to “consider strengthening existing financial institutions to provide financial resources for the conservation and sustainable use of biological diversity”.

These explicit mentions of biodiversity in these Articles fall into three broad categories: economic valuation, improved financing for biodiversity and economic incentive measures.

Economic Assessment of Key Ecosystems in Trinidad and Tobago

3.1.3 Coral Reefs

Coral reefs present some of the most biologically diverse and productive ecosystems on the planet and as a result provide a wide range of ecosystem services^{114,115}. In Tobago these include: regulation of coastal erosion, fisheries habitat, regulation of biotic environment in the form of

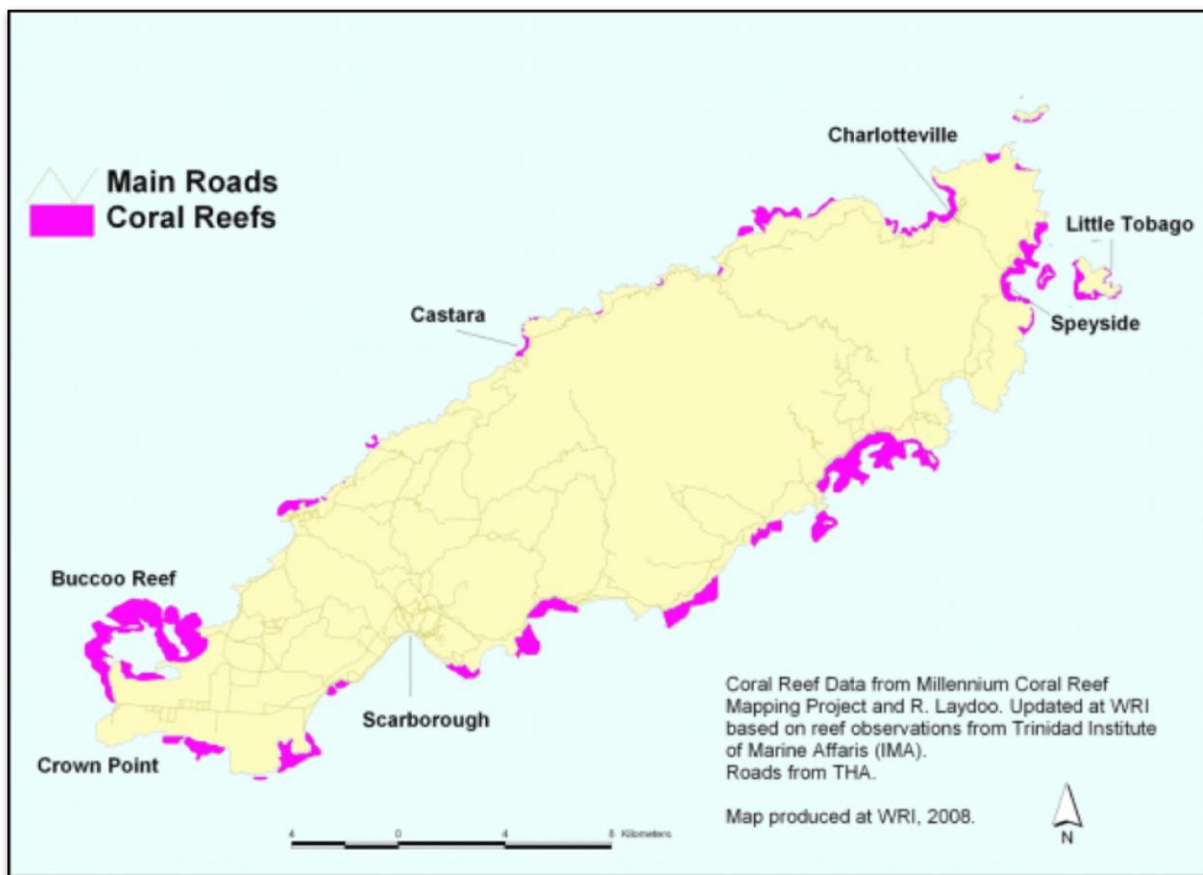
¹¹⁴ Odum H., & Odum, E. (1955). Trophic Structure and Productivity of a Windward Coral Reef Community on Eniwetok Atoll. *Ecological Monographs*, 291-319.

¹¹⁵ Connell, J. (1978). Diversity in Tropical Rain Forests and Coral Reefs. *Science*, 199 (4335), 1302-1310.

blue carbon, and of course cultural services in the form of tourism and recreational activities such as diving and snorkelling.

One of the primary and most valuable ecosystem services provided by coral reefs in T&T is shoreline protection or erosion regulation services¹¹⁶. *Figure 3.1* illustrates that coral reefs protect approximately 50% of Tobago's coastline, and their presence is highly correlated with areas of settlement and coastal tourism, such as in the major tourist centers of Buccoo, Crown Point and Speyside which are centered around large reefs.

Figure 3.1. Geographic Distribution of Main Coral Reefs of Tobago.



*Source: WRI, 2008*¹¹⁶

A recent economic valuation study conducted by the WRI revealed that the shoreline protection service in Tobago, which reduces the erosion of sandy beaches, and infrastructural damage, was worth an estimated US\$18-33 million per year (TT\$115-211 million per year) in 2006¹¹⁶. It is likely that the importance and value of this service will increase in coming decades with

¹¹⁶ World Resources Institute (WRI), (2008). Coastal Capital- Economic Valuation of Coral Reefs in Tobago and St. Lucia. Retrieved from <http://www.icran.org/pdf/Coastal%20Capital%20Working%20Paper%20-%20Final.pdf>

inevitable rising sea levels associated with anthropogenic climate change increasing the risk of high coastal erosion rates.

Coral reefs also act as an important breeding ground and habitat for a wide variety of commercially exploited seafood species. While coral reef fisheries don't hold as much as an economic importance as other marine fisheries, they are still a vitally important component of marine ecosystems and provide subsistence and commercial fishing resources, and are especially important for lobster and a number of other species. Annual direct economic impact of fisheries was estimated to be between US\$640,000-912,000 per year (TT\$4.1-5.8 million), based on the value actual income earned from the sale and processing of harvested fish resources in 2006¹¹⁷. Annual indirect economic impacts such as the repair of equipment associated with fishing activities such as nets, fish pots, boats were estimated to be between US\$118,000 and US\$235,000 in 2006 (between TT\$755,200 and TT\$1.5 Million)¹¹⁷.

These figures for direct and indirect economic impacts of reef associated fisheries are likely significant underestimates of its economic importance, especially its contribution as a supplementary food source to individuals and communities in Tobago due to the limited data collection of landings in Tobago. This economic estimate utilizes approximate landings recorded by the Fisheries Division as a measure of fisheries exploitation. As indicated in *Chapter 2*, estimates for Tobago have remained unchanged since 1996 and are thus potentially unreliable and significant underestimates of landings.

Coral reefs act as a major tourist attraction across the globe as millions of scuba divers, snorkelers and tourists travel significant distances with the explicit intention of enjoying the abundant and rich biodiversity associated with coral reefs. Constituting 46% of GDP, tourism and its related activities are essential for Tobago's economic and social welfare providing vital income and employment for its residents. Of surveyed visitors to Tobago, 40% found ecotourism an important factor in influencing their decision to visit Tobago. Furthermore, approximately 60% of tourists visit the Buccoo Reef¹¹⁸. Services that are provided to enable visitors to enjoy the recreational services of Tobago's reefs include glass bottom boat tours, guided snorkeling tours, and guided scuba-diving tours. These services provide a number of indirect/spin-off benefits, such as boat repair and construction, provision of fruit and snacks for tourists, and the local sale of equipment. The value of direct economic benefits provided by reef associated tourism is estimated to be US\$43.5 million per year in 2006 which equated to approximately 15% of Tobago's GDP¹¹⁷. This figure includes the net revenue from accommodation, miscellaneous

¹¹⁷ World Resources Institute (WRI), (2008). *Coastal Capital- Economic Valuation of Coral Reefs in Tobago and St. Lucia*. Retrieved from <http://www.icran.org/pdf/Coastal%20Capital%20Working%20Paper%20-%20Final.pdf>

¹¹⁸ Tobago House of Assembly (THA), (2003). The Policy and Development Institute (PRDI) and Department of Tourism. Tobago Visitor's Exit Survey Report, 2003.

expenditures, glass bottom boat/snorkeling tips and diving. The value of indirect economic benefits provided by reef associated tourism is estimated to be between US\$58-86 million per year in 2006¹¹⁷.

3.1.4 Forest Ecosystems

Forest ecosystems are visually one of the most prominent ecosystems in T&T, with Trinidad’s Northern and Central Range forests visible from almost every part of the island, and Tobago’s Main Ridge forests spanning almost three quarters the length of the island¹¹⁹. These forests provide a number of provisioning, cultural and regulating services which contribute to the well-being of every resident of T&T.

Timber

While the landscape of T&T is dominated by semi-evergreen seasonal forest with two main canopy species (*Carapa guianensis*, common name crappo and *Eschweilera subglandulosa*) a wide variety of species is commercially exploited (*Table 3.1*). In T&T the vast majority of forested land is owned by the state, with some forestry occurring on private estates.

Table 3.1. The 10 Most Important Timber Species in Trinidad and Tobago Ranked by Size of Growing Stock.

Rank (Growing Stock)	Scientific Name	Common Name
1 st	<i>Mora excelsa</i>	Mora
2 nd	<i>Tectona grandis</i>	Teak
3 rd	<i>Pinus caribaea</i>	Caribbean Pine
4 th	<i>Spondias mombin</i>	Hogplum
5 th	<i>Pentaclethra macroloba</i>	Fineleaf
6 th	<i>Sterculia caribaea</i>	Mahoe
7 th	<i>Carapa guianensis</i>	Crappo
8 th	<i>Eschweilera subglandulosa</i>	Guatecare
9 th	<i>Pachira insignis</i>	Chataigne
10 th	<i>Licania ternatensis</i>	Bois gris

Source: FAO, 2010¹²⁰

There are over 80 licensed sawmills in T&T (at least 2 of which are in Tobago) which rely on a combination of local and imported round woods¹²¹. *Table 3.2* illustrates the distribution of these

¹¹⁹ Northern Range Assessment, (2005). Report of an Assessment of the Northern Range, Trinidad and Tobago: People and the Northern Range. State of the Environment Report 2004. Environmental Management Authority of Trinidad and Tobago.

¹²⁰ Food and Agricultural Organization (FAO), (2010). *Forest Resource Assessment*. Rome: FAO Press.

¹²¹ The Government of the Republic of Trinidad and Tobago (GoRTT), (2011). National Forest Policy. Retrieved from <http://www.ema.co.tt/new/images/policies/forest.pdf>

mills across Trinidad with the vast majority located in the counties of St. George, Victoria and St. Patrick. The number of mills has increased by 25% between the years 1998-2008, in keeping with the growth evident in timber harvest in this period. In T&T, there are approximately 218 businesses recorded by the CSO in the wood and related products industry between sawmills, extractors, and final sellers/distributors. Data on precise number of individuals involved in these businesses is not available, however it is estimated that between 1,500 to 3,000 individuals are employed in this industry based on the employment size group provided in CSO data. The collection of timber is regulated by a monetary instrument enforced by the Forestry Division which uses a royalty system whereby sawmills pay the government a royalty based on the class of wood, and volume in cubic feet harvested.

Table 3.2. Geographic Distribution of Sawmills, 1998-2008.

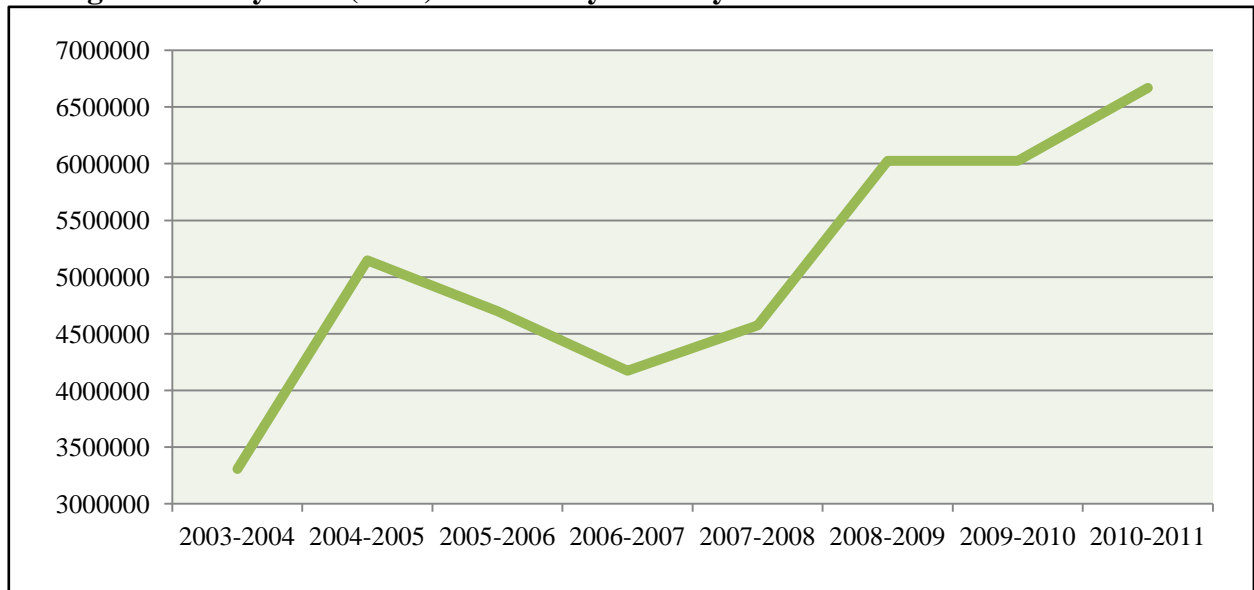
Sawmills – Number of Licensed Operations by Major Divisions										
	County									
Year	Total	St. George	St. David	St. Andrew	Caroni	Nariva	Victoria	Mayaro	St. Patrick	Tobago
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1998	68	16	3	4	7	7	16	1	13	1
1999	68	16	3	4	7	7	16	1	13	1
2000	74	16	1	8	10	8	13	1	16	1
2001	81	21	0	6	11	8	16	1	17	1
2002	81	21	0	6	11	8	16	1	17	1
2003	81	21	0	6	11	8	16	1	17	1
2004	84	21	0	6	11	8	17	2	18	1
2005	79	15	0	8	6	8	17	2	22	1
2006	82	14	0	9	10	5	17	2	24	1
2007	88	15	0	6	7	9	20	3	28	1
2008	85	13	0	5	9	8	20	1	28	1

Source: Forestry Division, 2009¹²²

Figure 3.2 shows Forestry Division Royalties collection, indicating a slight increase over the last decade to a peak collection of TT\$6,667,499 for the 2010-2011 periods. *Figure 3.3* shows total volume of forest outturn fluctuates on an annual basis with the latest available year (2008) indicating an outturn of 46,780 cubic meters.

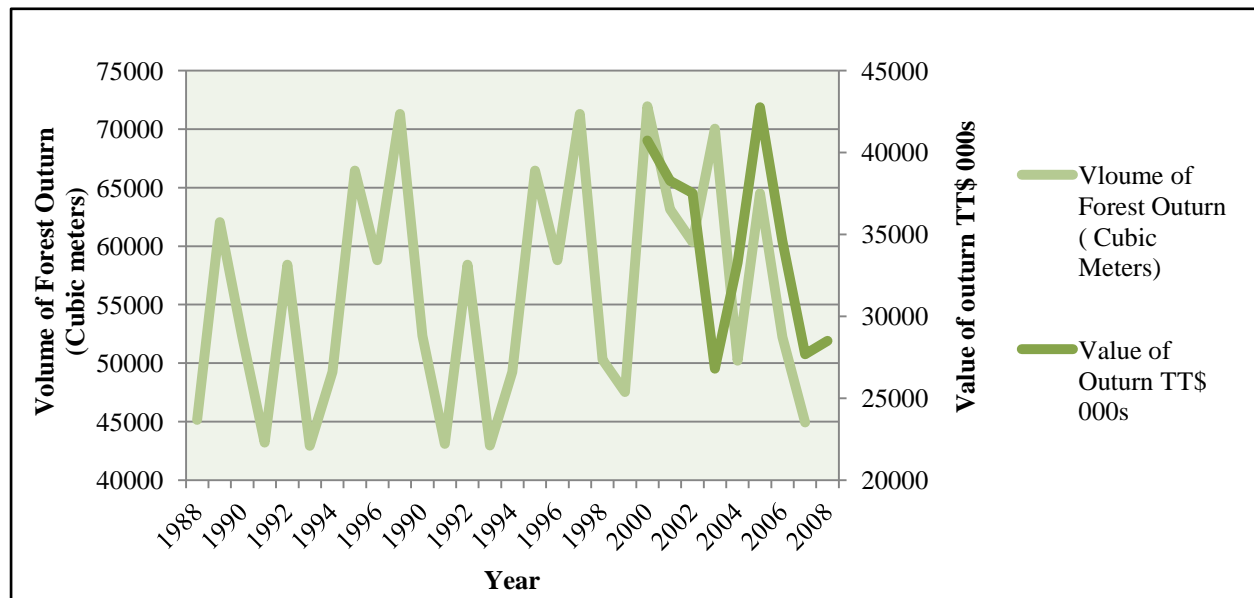
¹²² Forestry Division, (2009). Table Showing the Geographic Distribution of Sawmills in Trinidad and Tobago, 1998-2008. (Unpublished information).

Figure 3.2. Royalties (TTD) collected by Forestry Division between 2003 and 2011.



Source: Forestry Division, 2010¹²³

Figure 3.3. Value and Volume of Timber Outturn by Trinidad and Tobago's Forests.



Source: Forestry Division, 2010¹²³

Most recently available data indicates that the value of timber-related activities to the economy stood at TT\$28 million in 2011, or around 0.03% of GDP, a decline from a peak of TT\$42 million in 2003 or around 0.07% of GDP¹²⁴.

¹²³ Forestry Division, (2010). In: Pantin, D. & Ram, J. (2010). Facilitating Financing for Sustainable Forest Management in Small Islands Developing States and Low Forest Cover Countries. Country Case Study: Trinidad and Tobago.

¹²⁴ Central Statistical Office (CSO) of Trinidad and Tobago, (2012). Data request from Central Statistical Office on April 30, 2012. (Unpublished information).

This halving of the relative economic importance of timber to GDP is partially attributable to the decline in forest outturn of 33% between 2003 and 2011, but is largely due to the rapid growth of the economy as a whole which has significantly expanded for a similar time period.

Water Purification

As an ecosystem service, the provision of clean water is vitally important to the physical and economic well-being of all residents in T&T. The physical structures of forests in T&T store, purify and regulate the flow of water for human needs. In Trinidad, 60-80% of surface water is provided by the Northern Range forests where this water is used for human consumption and many economic activities, such as the food, beverage and tobacco industries¹²⁵. These industries constitute the largest in the non-energy manufacturing sector contributing 4.4% of national GDP in 2011 with output valued at TT\$3.88 billion¹²⁶. A recently concluded piloting valuation study of Northern Range ecosystem services for the Project for Ecosystem Services (ProEcoServ) estimated the annual value of water purification to be TT\$520 million annually¹²⁷. This is quite a significant figure and potentially one of the most economically important ecosystem services provided by forest or any other ecosystem nationwide, due to the high cost of developing substitutes such as desalination plants.

Soil and Flood Regulating Services

Regulating services such as flood regulation, soil retention and carbon sequestration/storage are arguably the most important services provided by the forests of T&T. Unfortunately these are also the least recorded ecosystem services. The importance of these services has been highlighted in recent years, due to an increasing severity and frequency of costly flood events throughout Trinidad, especially in the valleys of western Trinidad. The estimated values of a number of regulating services at the scale of a square hectare of forest in T&T are given in *Table 3.3*. It was estimated that the total value of soil retention and flood regulation services is approximately TT\$508 million annually. While this figure is a preliminary estimate using a value transfer methodology, it is likely within the correct order of magnitude of the economic importance of this service when the cost of one flood event in August, 2012 was estimated to be over TT\$100 million in damages in the Diego Martin Valley¹²⁸.

¹²⁵ Northern Range Assessment, (2005). Report of an Assessment of the Northern Range, Trinidad and Tobago: People and the Northern Range. State of the Environment Report 2004. Environmental Management Authority of Trinidad and Tobago.

¹²⁶ Gosein, M. (2011). *The Status of the Food and Beverage Industry in Trinidad and Tobago and Opportunities for Cluster Development*. Retrieved on June 30, 2012 from Trinidad and Tobago Manufacturers' Association: [http://www.ttma.com/attachments/Status%20of%20Food%20and%20Beverage%20Sector\(1\).pdf](http://www.ttma.com/attachments/Status%20of%20Food%20and%20Beverage%20Sector(1).pdf)

¹²⁷ Girvan, A., & Teelucksingh, S. (2012). Final Report of ProEcoServ Technical Consultancy 2- Environmentally adjusted National Accounts for Trinidad and Tobago's sustainable future. Retrieved from http://proecoservtt.weebly.com/uploads/1/2/2/3/12239290/final_report_proecoserv.pdf

¹²⁸ The Guardian, (2012, August 15). Over \$100m in losses in Diego Martin floods. *The Guardian*. Retrieved from <http://www.guardian.co.tt/news/2012-08-15/over-100m-losses-diego-martin-floods>

Table 3.3. Estimated Value of Ecosystem Services (ES) from Forests in Trinidad, 2010.

Ecosystem Service	ES Value (USD per ha per year)
Climate Regulation	1088
Erosion Control	346
Flood Prevention	5
Water Purification	359
Sustainable timber	397
Total value	2195

Source: Girvan & Teelucksingh, 2012¹²⁹

Non-Timber Forest Products (NTFPs)

A number of other products are harvested from forests in T&T on a small scale in order to provide income and enhanced health to a number of individuals. Non-timber forest products were previously one of the most essential goods to pre-Colombian settlers of Caribbean islands providing subsistence income in the form of fruits and other edibles, medicinal plants and craft materials¹³⁰.

Globally, in some instances, rural poor derive 25% to 100% of their income from the NTFP sector^{130,131}. However, due to T&T's relative economic strength, this figure will likely be towards the lower end of the spectrum. Furthermore, NTFPs are still likely an important contributor to the livelihoods of those residing in rural areas.

3.1.5 Wetlands

With an estimated annual value of between US\$200,000-900,000 per hectare per annum, the wide range of regulating, cultural and provisioning services provided by mangroves and other wetland ecosystems cannot be ignored¹³². In T&T, wetlands are primarily populated by mangrove vegetation (red, black and white mangrove species) and in a few cases; marshes or grass dominated wetlands¹³³.

¹²⁹ Girvan, A., & Teelucksingh, S. (2012). Final Report of ProEcoServ Technical Consultancy 2- Environmentally adjusted National Accounts for Trinidad and Tobago's sustainable future. Retrieved from http://proecoservtt.weebly.com/uploads/1/2/2/3/12239290/final_report_proecoserv.pdf

¹³⁰ John, L. (2005). *The Potential of non-timber forest products to contribute to rural livelihoods in the Windward islands of the Caribbean*. Caribbean Natural Resources Institute (CANARI) Technical Report No. 334.

¹³¹ Burt, M. (2002). *Survey on the usage of Traditional Plants Derivatives in St. Lucia*. (Unpublished report). Ministry of Agriculture, Forestry & Fisheries, St. Lucia.

¹³² United Nations Environment Programme- World Conservation Monitoring Centre (UNEP-WCMC), (2006). *In the front line: shoreline protection and other ecosystem services from mangroves and coral reefs*. Cambridge: UNEP-WCMC.

¹³³ Juman, R. (2010). *Wetlands of Trinidad and Tobago*. Trinidad and Tobago: Institute of Marine Affairs.

Coastal Erosion Protection

Mangrove forests play an important role in the reduction of coastal erosion as waves dissipate its energy upon impact with the roots and stems of mangroves. Due to the west coast of Trinidad facing towards the open ocean, it encounters significant coastal erosion issues. The location of a number of key mangrove forests such as the Nariva Swamp, the Fishing Pond mangroves, Matura Bay mangroves, Galeota Point mangroves and Guayaguayare mangroves are vitally important to reducing erosion rates along Trinidad's east coast. The importance of these coastal protection services must be emphasised in the context of sea level rise associated with climate change. Mean sea level is expected to rise by 0.35 m globally by the end of the century according to the A1B scenario¹³⁴. This rise is expected to vary greatly from region to region and ultimately, T&T may face greater rates of sea level rise. Due to the economic importance of coasts and coastal infrastructure in T&T to a variety of stakeholders, and the high cost of coastal engineering solutions, valuation studies on mangrove ecosystems are essential to ensure efficient solutions to this inevitable consequence of climate change. The satellite image in *Figure 3.4* illustrates the coastal protection role mangroves serve, such as protecting a key national highway which connects the heavily populated North West peninsula to all other areas of Trinidad.

Figure 3.4. Satellite Image of a Mangrove Ecosystem along the Audrey Jeffers Highway



Source: Google, 2012¹³⁵

¹³⁴ Intergovernmental Panel on Climate Change (IPCC), (2007). *Climate Change 2007: Working Group I: The Physical Science Basis, 11.9.4 Sea Level Rise*. Cambridge : Cambridge University Press.

¹³⁵ Google, (2012). Audrey Jeffers Highway, Port of Spain. Street Map. Retrieved from <https://www.google.com/maps/preview/@10.6644356,-61.5365414,1587m/data=!3m1!1e3>

Habitat Provision

Wetlands in T&T serve as the primary habitat for a number of species including the national bird of Trinidad, the Scarlet Ibis. The Nariva Swamp is home to 45 mammal species, 30 reptile species, 33 fish species, 204 bird species, 19 frog species, 213 insect species, and 15 mollusc species. The Caroni Swamp houses the largest mangrove forest and second largest wetland in T&T and is a habitat for a wide variety of species, including mussels, oysters, and fish. From an economic standpoint, the importance of this service is captured in the value of commercially exploited wildlife or other activities such as tourism.

Tourism

Like many natural systems and ecosystems, wetlands and mangrove forests in Trinidad attract a high number of visitors each year requiring a number of services, such as, tour and boat guides. This attraction is due to the ecosystem's aesthetic qualities and the wide variety of biodiversity it supports. The Caroni Swamp attracted 32,400 visitors in 2007 climbing 6% from 30,439 in previous years¹³⁶. With the average cost of a tour ranging between TT\$50-60, estimated revenue from tour guide services amount to approximately TT\$1.9 million per annum. This estimate does not capture the additional benefits provided by this activity which range from employment for tour guides, employment for the individuals that maintain the boats used for tours, employment and revenue for bus operators and other individuals in the transport sector who transport tourists to and from the Caroni Swamp.

3.1.6 Marine Ecosystems

Fisheries

Marine fisheries provide an important ecosystem service to T&T due to consumption per capita of fish and seafood products of 14 kg per year (global average consumption is 13.7 kg)¹³⁷. The fisheries sector comprises a variety of subsectors, namely; marine fisheries, aquaculture, inland fisheries and the ornamental fish trade. Of these subsectors, marine fisheries dominate in terms of production, investment and employment¹³⁷. Total fish and seafood production amounted to 13,945 metric tonnes (MT) in 2010, of which marine capture fisheries comprised the vast majority of production at 13,931 MT¹³⁷. The total value of fisheries amounted to US\$39 million in 2009 or approximately TT\$240 million contributing to approximately 0.09% of GDP in 2005¹³⁷. While the contribution of fisheries to GDP is minimal, employment of individuals

¹³⁶ Forestry Division, (2012). Data Request from Forestry Division, June 30, 2012. (Unpublished information).

¹³⁷ Food and Agriculture Organization (FAO) of the United Nations, (2012). *The State of World Fisheries and Aquaculture*. Rome, Italy: Food and Agriculture Organization of the United Nations.

directly and indirectly remains an important proportion of the labour force - approximately 7,085 persons or 1.18% of the workforce¹³⁸.

A large variety of marine species are fished in T&T (*Table 3.4*). The most important species in terms of landings measured by volume are the Spanish mackerel (carite), tuna, bonito, croaker, shrimp and shark¹³⁹. It is important to note that due to the influence of the rich and fluvial discharges from the Amazon and Orinoco River systems, the waters around Trinidad support a much more diverse and productive range of exploitable species than other eastern Caribbean islands¹⁴⁰.

Table 3.4. Popular Marine Species in the Fisheries of Trinidad and Tobago.

Scientific Name	Common Name
<i>Acanthocybium solandri</i>	Wahoo, King fish
<i>Arius proops</i>	Catfish, Gillbacker
<i>Bagre bagre</i>	Catfish
<i>Caranx hippos</i>	Cavalli, Crevalle jack
<i>Carcharhinus limbatus</i>	Black tip shark
<i>Cetropomus ensiferus</i>	Snook, Brochet
<i>Chaeodipterus faber</i>	Paoua, Atlantic spade fish
<i>Chloroscombrus chrysurus</i>	Patto, Atlantic bumper
<i>Conodon nobilis</i>	Yellow cro-cro, Cro-cro grunt
<i>Coryphaena hippurus</i>	Dolphin fish, Dorado
<i>Cynoscion jamaicensis</i>	Silver salmon, Weakfish
<i>Decapterus tabl</i>	Robon, Redtail scad, Jack
<i>Diapterus rhombeus</i>	Blinch
<i>Elagatis bipinnulata</i>	Rainbow runner
<i>Epinephelus flavlimbatus</i>	Grouper
<i>Epinephelus itajara</i>	Yellowfin grouper
<i>Euthynnus alletteratus</i>	Grouper, Jewfish
<i>Haemulon bonariense</i>	Bonito, Little tunny
<i>Haemulon melanurum</i>	Grunt, Black Grunt
<i>Haemulon plumieri</i>	Grunt, Cottonwick grunt
<i>Hemicaranx amblyrhynchus</i>	Grunt, White grunt
<i>Hurudichthys affinis</i>	Palomette, Bluntnose jack
<i>Holocentrus ascensionis</i>	Flying fish, Four wing flying fish

¹³⁸ Food and Agriculture Organization (FAO) of the United Nations, (2004). *The State of World Fisheries and Aquaculture*. Rome, Italy: Food and Agriculture Organization of the United Nations.

¹³⁹ Fisheries Division, (2011). *Fisheries and Aquaculture Statistics*. Trinidad and Tobago: Ministry of Agriculture, Land and Marine Resources.

¹⁴⁰ Agard, J. B. R., Hubbard, R. H., & Griffith, J. K. (1996). The relation between productivity, disturbance and the biodiversity of Caribbean phytoplankton: applicability of Huston's dynamic equilibrium model. *Journal of Experimental Marine Biology and Ecology*, 202 (1), 1-17.

Scientific Name	Common Name
<i>Istiophorus albica</i>	Sqirrelfish, Maryanne
<i>Thunnus albacares</i>	Sailfish, Atlantic sailfish
<i>Thunnus atlanticus</i>	Yellowfin tuna
<i>Lutjanus griseus</i>	Blackfin tuna, Albacore (Tobago)
<i>Lutjanus jocu</i>	Pargue, Black pargue, Grey snapper
<i>Lutjanus purpureus</i>	Pargue, Dog snapper
<i>Lutjanus synagris</i>	Redfish, Southern red, Redfish
<i>Macrodon ancylodon</i>	Lane snapper, Walliacke, Redfish
<i>Makaira nigricans</i>	Yellow mouth salmon
<i>Micropogonias furnieri</i>	Marlin, Blue marlin
<i>Mugil curema</i>	Cro-cro, Racando, White mouth
<i>Oligoplites saurus</i>	Croaker
<i>Opisthonema oglinum</i>	Mullet, White mullet
<i>Paraexocoetus</i>	Zapate
<i>brachypterus</i>	Atlantic thread herring, Herring
<i>Penaeus notialis</i>	Pink shrimp, Southern pink shrimp
<i>Penaeus schmitti</i>	White shrimp, Southern white shrimp
<i>Penaeus subtilis</i>	Brown shrimp, Southern brown shrimp
<i>Rhizoprionodon lalandii</i>	Puppy shark, Shark
<i>Rhomboplites aurorbens</i>	Plumhead, B-Liner, Redfish, Vermilion snapper
<i>Scomberomorus</i>	Carite, Serra Spanish mackerel
<i>brasiliensis</i>	
<i>Scomberomorus cavalla</i>	Kingfish, King mackerel
<i>Seriola rivoliana</i>	Amberjack
<i>Sphyrna guachancho</i>	Barracuda
<i>Sphyrna lewini</i>	Hammerhead shark
<i>Strongylura Marina</i>	Garfish, Atlantic needlefish
<i>Tarpon atlanticus</i>	Tarpon, Grande ecaille
<i>Trachinotus carolinus</i>	Pompano, Florida pompano
<i>Trichiurus lepturus</i>	Cutlassfish
<i>Xiphopenaeus kroyeri</i>	Seabob, Honey shrimp, Jinga

Source: FAO, 2012¹⁴¹

Sea Turtle Based Tourism

One of the most unique and popular tourist attractions offered by Trinidad, and to a lesser extent Tobago, is the tour of sites frequented by the leatherback turtle (*Dermochelys coriacea*). At least five coastal communities around Trinidad rely to some extent on turtle nesting and hatching related tourism. Two of the most popular nesting sites, Grand Riviere and Matura, are also home to the two communities that benefit the most from the cultural and aesthetic service provided by nesting turtles. Direct income is earned through the provision of guide services, employment and numerous indirect benefits.

¹⁴¹ Food and Agriculture Organization (FAO) of the United Nations, (2012). *The State of World Fisheries and Aquaculture*. Rome, Italy: Food and Agriculture Organization of the United Nations.

Between 2005 and 2011, Grand Riviere has experienced a threefold increase in the number of visitors, with 21,000 individuals visiting in 2011¹⁴². This resulted in receipts of TT\$105,000 to the government through the sales of permits. Direct economic benefits felt by tour operators were estimated to be approximately TT\$660,000¹⁴². Additionally, 32 individuals are employed as data collectors and local tour guides who are not attached to a tour operator within the community by the Forestry Division. Some of the most important benefits derived from this tourism activity are spin off or indirect benefits where over the last decade, there has been an increase in the development of accommodations from one major hotel and a few guest houses to five small resorts and twelve guesthouses with a total of 150 rooms¹⁴². In total, the various accommodation options employ 92 persons during the turtle season.

Food establishments, bars and small shops and those involved in related activities that operate within the community are driven by tourists. The total average annual revenues for each of these establishments primarily driven by tourist activity was TT\$31 million¹⁴².

Matura is another community which has built up a strong socio-economic relationship with turtle nesting activities. Nature Seekers, the local non-governmental organization (NGO) involved in leatherback turtle research, protection and tourism reported 15,637 individuals taking tours in 2009. Tours offered by Nature Seekers range in cost from TT\$30-96, putting estimated revenue at between TT\$0.4-1.5 million¹⁴². This is not a unique case as a community that derives significant income from turtle watching activities. For Tobago, the beaches of Turtle Beach, Grafton Beach, and Mt. Irvine Back Bay are also visited by local and international tourists, with 3,252 non-resident visitors recorded visiting¹⁴³. The estimated value of these visits was between TT\$512,190-819,504 per year¹⁴³. Like estimates for Matura, this figure only partially captures the value of tourism since it excludes a number of direct and indirect benefits.

Aggregating Benefits

While data paucity and incongruence result in difficulty in aggregating data, it must be attempted to at least determine the magnitude of the contribution of biodiversity to national welfare with what data is available, as an illustrative and informative exercise. *Table 3.5* provides a summary of all the quantitative and qualitative socio-economic data compiled for this Chapter. When available data on certain ecosystems are summed, they are worth an estimated TT\$1,827-2,107 million per year. For available values, they are likely significant underestimates of economic value since they are based on underestimates of utilization (in the case of wild meat and marine fisheries) or lack of inclusion of indirect benefits (in the case of some tourist goods). Also,

¹⁴² Bachan, A. (2012). Economic Value of Sea Turtles and the Environment and as a Catalyst for Developing Sustainable Communities. Retrieved in August, 2012 from http://www.ema.co.tt/docs/events/economic_value.pdf

¹⁴³ Lalsingh, G. (2011). Save Our Sea Turtles- Summary of Sea Turtle Nesting Activity. Retrieved from <http://sos-tobago.org/wp-content/uploads/2011/03/2011-Summary-Report1.pdf>

estimates do not account for valuable ecosystem services of non-timber forest products, all services from wetlands and other smaller ecosystems, such as inland freshwater, savannas and seagrass beds. Therefore, the actual contribution of biodiversity to national economic well-being is likely significantly greater. Despite being an underestimated value, this number is quite significant when compared to T&T's GDP of TT\$140 billion in 2011 where ecosystem services account for at least 1% of GDP annually when aggregated¹⁴⁴. They are likely to be worth significantly more when all other ecosystem services and where non-financial benefits are considered.

Table 3.5. Aggregating Estimated Economic Benefits of Biodiversity.

Ecosystem	Service	Benefit value (TT\$M) (year)	Benefit Employment	Other Indicators	Economic Importance Nationally	Social Importance
Coral Reefs	Coastal Protection	115-211 (2006)	N/A	N/A	High	High
	Coral Reef Associated Fisheries-Tobago	4.8-8 (2006)	N/A	N/A	Low	Medium
	Reef Associated Tourism	371-550 (2006)	N/A	N/A	High	High
Forest Ecosystems	Recreational hunting	N/A	10,669 Registered Hunters	18,447 individuals harvested	Medium	Low
	Eco-tourism**	7.8 (2001-2007 avg.)	N/A		Low	High
	Timber	28 (2011)	1500-3000	46780 m ³	Medium	Medium
	Water , provision and regulation	520	N/A	60% of purified water provided by Northern range	High	High
	Non Timber forest products	N/A	N/A	N/A	Medium	High
	Flood Regulation and Soil retention	508	N/A	N/A	High	High

¹⁴⁴ The World Bank, (2012). *World Bank Annual Report 2012*. Washington D.C., US: The World Bank.

Ecosystem	Service	Benefit value (TT\$M) (year)	Benefit Employment	Other Indicators	Economic Importance Nationally	Social Importance
Wetlands	Coastal Erosion Protection	N/A	N/A	N/A	Medium	N/A
	Habitat Provision	N/A	N/A	Wetlands and swamps home to over 50 species	Medium	High
	Tourism	N/A	N/A	32400 visitors to Caroni Swamp (2007)	Low	High
	Provisioning services – Shellfish	N/A	N/A	N/A	Low	Medium
Marine Ecosystems	Fisheries	240 (2009)	7,085 (2005)	13,931 Metric tonnes	High	High
	Tourism- Turtle related	32-34	N/A	N/A	Medium	High

Source: Various

**This value is a gross underestimation, based only on the over-night revenues and associated tours of a single eco- resort.

Conclusion

Based on information gathered in this assessment, the contribution of biodiversity to the economic and social well-being of T&T's citizens is undeniably significant. Biodiversity creates livelihoods that enhance physical and mental health and provide employment and income for those who need it most due to their position on the socio-economic fringes of society. The use of and importance of these resources are generally skewed towards the lowest income rural counties and parishes of T&T. This makes the maintenance and enhancement of biodiversity quality an essential component of improving the standards of living for those who need it most. While the relatively high importance of biodiversity and ecosystem services to certain social, economic and cultural groupings of individuals has been recognized, it is important to note that many key services such as water provisioning and flood regulation provided by biodiverse ecosystems are essential nationwide, regardless of socio-economic status.

Chapter 4 Analysis of Agrobiodiversity Resources in Trinidad and Tobago

Introduction to Agrobiodiversity

It is widely held to be true that biological diversity (biodiversity) is crucial to the ability of ecological systems to adapt to changing environmental conditions such as climate change, habitat loss and invasive species; likewise the sustainability of agricultural systems depends on the adaptation of agroecosystems to changing environmental conditions.

By definition, “*Agrobiodiversity refers to all crops and animal breeds, their wild relatives, and the species that interact with and support these species, e.g., pollinators, symbionts, pests, parasites, predators, decomposers, and competitors, together with the whole range of environments in which agriculture is practiced, not just crop lands or fields. It encompasses the variety and variability of living organisms that contribute to food and agriculture in the broadest sense, and that are associated with cultivating crops and rearing animals within ecological complexes. It comprises genetic, population, species, community, ecosystem, and landscape components and human interactions with all these. It also includes many habitats and species outside of farming systems that benefit agriculture and enhance ecosystem functions*”¹⁴⁵.

While agrobiodiversity is a complex system, its current state worldwide has several key drivers which are behind its decrease: agricultural intensification, habitat loss and land use change, globalization and climate change. Most of these drivers are anthropogenic in origin – not fundamentally based in natural changes in ecological systems. The rapidly increasing population, competition for land, domination of global food sources by multi-nationals and rapidly changing environmental conditions caused by climate change, are among the subsets of these drivers. This has drastically eroded the genetic diversity of agroecosystems, resulting in conditions that may have far reaching implications for sustained global food security.

The Trinidad and Tobago Context

It has been officially recognised by the Government of the Republic of Trinidad and Tobago (GoRTT) that the issue of food security is one of national security, an issue that is linked to the sustainable development of T&T. According to the Ministry of Food Production, Land and Marine Affairs (MFPLMA), “...the concept of food security is defined as including physical, social and economic access to food that meets people’s dietary needs as well as their food preferences”¹⁴⁶. The production levels of the local agricultural sector as well as its contribution

¹⁴⁵ Diversitas, (2011). Glossary- Agrobiodiversity or Agricultural Biodiversity. Retrieved from <http://www.diversitas-international.org/resources/glossary>

¹⁴⁶ Ministry of Food Production, Land and Marine Affairs, (2012). The National Food Production Action Plan 2012-2015. Retrieved from <http://www.sidctt.com/Uploads/NationalFoodProductionActionPlan2012-2015.pdf>

to GDP have dropped consistently over the past few years, with the sector accounting to 0.6% of GDP in 2006. Conversely, the food import bill amounted to over 10% of total imports in 2010, an inordinately large amount. While some agricultural products do have substantial production values, consumption consistently outstrips local production in all sector products. This leaves the population vulnerable to shifting and volatile world markets, as food availability depends largely on foreign exchange and foreign markets. *Box 4.1* provides a synopsis of the profile of the agricultural sector in T&T.

Box 4.1. A Brief Profile of the Agricultural Sector in Trinidad and Tobago.

The results of the 2004 Agricultural Census revealed that the total number of agricultural holders in Trinidad and Tobago was 19,143 of which 18,169 or 94.9% were recorded in Trinidad and 974 or 5.1% in Tobago. This represents a decline of 11,423 holders or approximately 37.4% when compared to the total number of holders, 30,566, recorded in the previous Agricultural Census which was conducted in 1982.

The total number of holdings in Trinidad and Tobago in 2004 was 18,968. The majority of holdings were less than 10 hectares in area. The breakdown is as follows:

- Under 0.5 ha - 22%
- 0.5 to < 1 ha - 12.8%
- 1 to < 2 ha - 18.2%
- 2 to <5 ha - 34.1%
- 5 to < 10 ha - 8.9%
- 10 to < 50 ha - 3.7%
- Over 50 ha - 0.3%

The vast majority of holders (89.4%) were concentrated within six regions. The region of Couva/Tabaquite/Talparo recorded the highest number with 3,078 holders. There were 2,812 holders enumerated in the region of Princes Town, 2,099 in Mayaro/Rio Claro, 2,460 in Sangre Grande, 2,227 in Penal/Debe, 2,221 in Tunapuna/Piarco and 1,342 holders were found in the region of Siparia.

Private holders accounted for 19,055 or approximately 99.5% of which 18,505 were classified as “Individual/Household/Sole Proprietor” and 550 as “Joint Partnership”. The remaining 0.5% of holdings were primarily Private Companies and Government Institutions. In 1982, the total number of Private Holders was 30,422 or 99.5%.

Source: GoRTT, 2008¹⁴⁷

T&T can be said to be in a precarious position as it relates to food security. This is because T&T does not produce the amount of food necessary to sustain its population. T&T is dependent on an ever increasing food import bill of a record TT\$4 billion, the majority of which is accounted by staple crops¹⁴⁸. With a higher focus on agricultural production locally, care must be taken that

¹⁴⁷ The Government of the Republic of Trinidad and Tobago (GoRTT), (2008). Trinidad and Tobago Second Country Report on the State of Plant Genetic Resources for Food and Agriculture. Retrieved from <http://www.fao.org/docrep/013/i1500e/Trinidad%20and%20Tobago.pdf>

¹⁴⁸ Trinidad Express Newspaper, (2012, October 9). Beating the Food Import Bill. *Trinidad Express Newspaper*. Retrieved from http://www.trinidadexpress.com/business-magazine/BEATING_THE_FOOD_IMPORT_BILL-173423831.html

the genetic diversity of crops and livestock for food security is not eroded in the efforts to increase food production.

The Agrobiodiverse Resources of Trinidad and Tobago

Like in most countries, especially Small Island Developing States (SIDS), the competition between land uses in the face of limited resources has significantly impacted the agricultural sector over the past decades in T&T. With growing needs for housing, expansion of urban areas and the growing sprawl of industry, much of the traditional “small holder” farms and farming communities have succumbed to land scarcity. Compounding this is the greater emphasis placed on more intensive forms of agriculture, thought at the time (and by many today) to be necessary to sustain the steadily growing population’s food security needs. This has had a severe impact on not only the traditional farming communities and genetic resources of T&T, but also on the culture and practices revolving around the agrobiodiverse resources in T&T¹⁴⁹.

Agrobiodiversity in T&T comprises a wide range of plants and animals that contribute to the human well-being of the population – not only through sustenance, but through medicinal, cultural and aesthetic uses. For this report, the genetic resources of agrobiodiversity can be categorised into cultivated crops (with special emphasis on the MFPLMA focal commodity crops), medicinal plants, forestry resources, ornamental/culturally important species, strategic/economically important crops and livestock/aquaculture.

4.1.1 Cultivated Crops

Much of the “foundation” of the current agrobiodiversity in T&T has developed from the migrant history of T&T, with immigrants bringing with them agrobiodiverse resources from around the world. With many of these crops being cultivated for over one hundred years, several have become landraces forming a critical component of T&T’s crop biodiversity¹⁴⁹.

From a policy perspective, the GoRTT has placed special emphasis on the role of cultivated crops in the context of national food security. To this end, the Ministry of Food Production, Land and Marine Resources in its National Food Production Action Plan 2012-2015, has itemised a list of four focal commodity crop groups that have been identified as crucial for the enhancement of food security: staples, vegetables, legumes/pulses and fruits. The overall objective of this focus, based on the criteria of accessibility, availability, affordability and sustainability, is the medium term increase in T&T’s self sufficiency in each commodity within the focal groups –

¹⁴⁹ The Government of the Republic of Trinidad and Tobago, (2008). Trinidad and Tobago Second Country Report on the State of Plant Genetic Resources for Food and Agriculture. Retrieved from <http://www.fao.org/docrep/013/i1500e/Trinidad%20and%20Tobago.pdf>

based on production as the indicator¹⁵⁰. Table 4.1 indicates the priority commodity crops, along with estimated targets and general state of diversity.

Table 4.1. Estimate Targets for Priority Commodity Crops, 2012-2015.

Commodity Food Group	Commodity	Current Production (tonnes)	Production Targets for 2015(tonnes)	State of Diversity		
				Increasing	Decreasing	Remain Stable
Staples	Rice	2,273	7,500		√	
	Sweet Potato	3,150	13,090			√
	Cassava	5,454	18,182			√
	Breadfruit	10	13			√
Vegetables	Tomatoes	2,150	3,100			
	Hot Peppers	710	1,800			√
	Cucumber	1,320	1,760			
	Pumpkin	1,790	1,950		√	
	Melongene	540	586	√		
	Ochro	940	1,000			
	Dasheen	340	400			√
	Onion	--	2000			
Fruits	Banana	<5	400			
	Citrus	1,537	1,780	√		
	Mangoes	50	55			√
	Pineapple	462	700			√
	PawPaw	1,716	3,432			√
Pulses	Pigeon Peas	130	160			√
	Bodi	970	1,100			

Source: MFPLMA, 2012¹⁵⁰

As mentioned previously, as the competition for land use and more production ensued, there has been a steady downward trend in the cultivation of these local landraces. Therefore, while the focus on several of these landrace crops might indeed promote food security, there is also the crucial benefit of promoting the maintenance of these landraces.

4.1.2 Strategic/Economically Important Crops

Apart from those commodities that play a crucial role in national food security, the GoRTT has identified strategic crops that have a natural advantage in T&T and possess great economic opportunities. In addition, this list of strategic crops is supported by priority efforts at the University of the West Indies (UWI).

¹⁵⁰ Ministry of Food Production, Land and Marine Affairs (MFPLMA), (2012). The National Food Production Action Plan 2012-2015. Retrieved from <http://www.sidctt.com/Uploads/NationalFoodProductionActionPlan2012-2015.pdf>

One of the major crops identified is Cocoa (*Theobroma cacao*) which has had a long cultural and historical presence in T&T, as well as falling within one of the most premium markets for crops worldwide. Cocoa from T&T has long been regarded as one of the finest varieties globally and is used in the production of some of the most premium and exclusive chocolate producers in Europe and Japan. The cocoa produced from T&T fetch prices of more than US\$5,000 per tonne as opposed to approximately US\$3,000 per tonne for "regular" varieties of cocoa.

Cocoa was once a dominant crop produced in T&T, with levels approaching 36,000 tonnes per year being produced at the turn of the 20th century. Now declining to just under 600 tonnes today; cocoa is being produced by an amalgamation of approximately 1,700 small holder farmers in rural communities. However, cocoa has benefitted from decades of genetic conservation and stockpiling in contrast to the loss of genetic diversity in major crops due to intensification of agriculture, the decline in traditional farming and a lack of investment in genetic resource conservation. This now serves as a robust backbone for the renewed interest in increasing production. In fact, the International Cocoa Genebank at UWI's Cocoa Research Unit is the most active cacao collection in the world.

The research at UWI also complements the efforts of the GoRTT and its agencies responsible for agrobiodiversity. Two of UWI's focal crops are hot peppers and breadfruit, which have been identified as focal commodity crops in the MFPLMA's action plan. These crops, along with a few others, have been subject to intensive research and conservation over the past few years due to their movement from marginal crops grown in backyards to possible sources of economic and food security stability. Work is currently underway to better understand the diversity of the current collections with the intention of widening the genetic base to promote more utilisation of these crops.

4.1.3 Livestock/Poultry/Aquaculture

4.1.3.1 Dairy/Beef

Livestock species in T&T are not wholly indigenous to the country and are dependent on importation and utilisation of a limited number of breeds. Issues have arisen due to the lack of research and information on the genetic diversity of the current breeds being utilised, as well as a lack of any real policy to govern the breeding of livestock.

The main product of the dairy production systems in T&T is milk, which for the most part stays amongst the community of farmers within which it is produced, with only a small outflow to the general population. Importation of milk and milk products accounts for 92.4% of the milk

product market¹⁵¹. This gives an indication of the ability of the existing production system to meet demands. However, the production system itself is mostly sustainable, in terms of breeding, rearing and the supply of feed, the dairy production system can currently sustain itself.

The system is reliant on four main breeds of cattle – Holstein, Jamaica Hope, Jersey and Australian Milking Zebu. However, all of these breeds have elements of Holstein genes, which make categorisation difficult and complicates understanding of the overall genetic composition of the cattle used in the dairy industry¹⁵¹. This lack of information on the genetic makeup may leave farmers and producers at risk for genetically-based difficulties depending on environmental stressors, breeding and utilisation. This saturation of Holstein genes has come about by unevaluated importation and use of purebred Holstein semen where the resulting impact on genetic diversity has not been determined.

In the meat production sector, beef is the main product accounting for 20% of local market demand, with almost 40% of this beef being an offshoot of the dairy sector. The remainder of the demand (80%) is supplied by imports, which again indicates a dependence on the international market. Furthermore, the local production system does not satisfy local demand, even though the demand for beef is approximately 3.2 kg/capita, lower than the global average¹⁵¹.

The main breeds utilised in the beef sector are the Zebu, Jamaica Red and Charbray, with some utilisation of the Buffalypso and other Water Buffalo breeds, which are all in steady decline. Much of the decline in the overall beef industry has resulted from a decrease in number of farms due to the heavy competition for land use for residential and commercial purposes. This has indented the amount of land needed and available for foraging type systems such as beef production, which has further impacted the sizes of breeds, the breeding stock and genetic diversity within the production system. While all the major breeds share the same genetic difficulties as the dairy sector, the production of the buffalypso, a breed type stabilised by crossing several imported breeds, is directly identifiable with T&T as its origin, and being specially adapted to the environmental conditions of the tropics¹⁵¹.

4.1.3.2 Small Ruminants

The main products of the small ruminants sector are the fresh meat of sheep (mutton) and goats (chevron). Additionally, there are secondary by-products such as goat milk and the consumption of edible offal (internal organs and entrails) by many members of the population. As in the dairy and beef industries, all of the breeds are imported with similar issues of breeding and the loss of genetic diversity. The sector is also burdened by high costs, lack of land and low levels of

¹⁵¹ Ministry of Agriculture, Land and Marine Resources, (2005). Trinidad and Tobago's Country Report for FAO's State of the World's Animal Genetic Resources.

production which often do not cross 5% of the local demand.

The main breeds of sheep used in the small ruminant industry are the Barbados Black Belly, West African, Virgin Island White and Blackhead Persian. These species have been locally adapted but are now at risk of being lost due to unregulated crossbreeding with exotics such as the Kathadin and Dorper.

The main breeds of goat used are the Anglo Nubian, Saanen, British Alpine and Toggenburg which are all imported. Apart from these, there is a locally adapted Creole breed¹⁵².

4.1.3.3 Poultry

The poultry industry produces the main products as follows: fresh/chilled/frozen whole birds and parts, table eggs, processed products – sausages, canned meats and offal. The production of the poultry industry satisfies almost 96% of the local chicken demand of approximately 36 kg/capita for chicken and provides a cheaper source of protein for the population. High levels of horizontal and vertical integration within the sector allow for a high level of sustainability but it is highly dependent on input importation. Other poultry products are not as popular as chicken and the combined per capita consumption of these (turkey, duck, geese and guinea fowl) are approximately 0.8 kg/capita. The main breeds used in the poultry sector are:

- Chicken (meat): Ross, Cobb, Hubbard, Arbor Acres
- Chicken (eggs): Hyline Brown, Bovano Brown, Rhode Island Red, Hubbard Golden Camel, Hisex Brown and ISA Brown
- Duck: Common duck (*Anas platyrhynchos* and Peking duck), Muscovy duck (*Cairina moschata*) and the Mule/Mallard
- Turkey: White Turkey Poultry

4.1.3.4 Pigs

The main products from the pig industry are fresh cut pork and processed pork products. While the pig industry satisfies almost 80% of the local demand, the industry is entirely dependent on imported products, which makes the industry at risk for external shocks. The main breeds utilised are Landrace, Duroc, Yorkshire and Hampshire, with regular importation of semen from the USA and the UK¹⁵².

¹⁵² Ministry of Agriculture, Land and Marine Resources, (2005). Trinidad and Tobago's Country Report for FAO's State of the World's Animal Genetic Resources.

4.1.3.5 Aquaculture

It has become widely recognised that the world's capture fisheries are becoming increasingly strained, with some alarming predictions being made for the future of these fisheries at the level of current consumption and exploitation levels. In T&T, aquaculture has gone through intermittent periods of boom and bust, supported by the interests of businesses and producers larger than the average small holder producer of aquaculture products. The major products produced in local aquaculture are ornamental fish, tilapia, and cascadura. *Table 4.2* show the total aquaculture products sold over the period 2007-2009.

Table 4.2. Quantity of Aquaculture Products Sold between 2007 and 2009.

Types of Aquatic Species	Unit of Measurement	2007	2008	2009
Ornamental Fish	Numbers	120,100	144,150	76,963
Tilapia	Kgs	9,769	8,093	14,752
Cascadura	Kgs	9,030	4,611	9,195
Other	Kgs	0	30	2,909

Source: CSO, 2010¹⁵³

Conservation Efforts for Agrobiodiversity

4.1.4 In Situ Conservation

In situ conservation of agricultural biodiversity in T&T focuses on the state and presence of these local landraces, adapted by generations of farmers since their introduction as unique crop species. As mentioned in previous sections, the general downward trend in small holder farming and traditional forms of agriculture due to the pressure for land use and more intensive producing agricultural systems and crops, has resulted in many of these local landraces being lost or in danger of being lost.

One of the greatest constraints to a proper and comprehensive management of in situ conservation is a lack of knowledge about 'who is growing what and where'. Predominantly, in situ conservation of these landraces occurs on traditional small holder farms where they have been grown for generations. Unfortunately, there has been a lack of inventories and accurate crop

¹⁵³ Central Statistical Office (CSO) of Trinidad and Tobago, (2010). Agricultural Statistics. Retrieved from <http://www.cso.gov.tt/category/statistics-category/agricultural-statistics>

data between farmers and the various agriculture and food production authorities. However, even if spatial information is gathered, there still remains a lack of capacity of front-end personnel who are responsible for the gathering of such information. Regardless of these setbacks, it is clear that there has been a constant decline in the cultivation of these landraces and the effort to identify and work with farmers cultivating these landraces is therefore vital.

Efforts have been underway to conserve these landraces, however much of this has been focused on the movement towards *ex situ* methods of conservation. This is due to the lack of incentives for farmers to continue cultivating these landraces for which public consumption has been waning in the context of other higher profile crops; lack of GoRTT staff with the necessary capacity to support on-farm conservation as well as numbers of staff; and a lack of financial support from the important private sector for conservation efforts.

However, in recognition of these constraints and the need for the promotion of these landraces, the GoRTT has implemented a Public Sector Investment Project (PSIP), 'Implementing a Comprehensive Crop Biodiversity Programme for Trinidad and Tobago' (*Box 4.2*). The enhanced stature of many of these landraces has also been raised by their inclusion in the National Food Production Action Plan, which will concurrently seek to raise production levels, as well as public marketing and promotion. It should be noted that there has been an upswell in permaculture operations that have utilized native species for agro-biodiversity conservation.

One of the primary priorities for management and conservation of *in situ* agrobiodiversity genetic resources is the development of comprehensive inventories and databases of the current state of these resources. Without such knowledge, the development of management and conservation strategies is difficult to place within a framework that will support continued national food security and the adaptability and resilience of the agroecosystem.

Box 4.2. Summary of Project on “Implementing a Comprehensive Crop Biodiversity Conservation in Trinidad and Tobago”.

This project was specifically developed to address the loss of crop biodiversity as a result of changing agricultural practices, industrialization, housing, climate change and socio-economic factors. The wider objectives of this project are to fulfil the obligations of the Government of the Republic of Trinidad and Tobago (GORTT) to (a) the Global Strategy for Plant Conservation (GSPC) (Decision VI/9 of the COP to the Convention on Biological Diversity) and (b) the International Treaty on Plant Genetic Resources for Food and Agriculture (IT-PGRFA). The GORTT is a Party to both Treaties. The purpose of the project is to develop and implement a structured Plan of Action for the Ministry of Food Production, Land and Marine Affairs (MFPLMA) to meet national objectives formulated within the framework of GSPC and IT-PGRFA.

General Objectives

The general objective of this project is to develop the institutional capacity and capability to adopt recommendations of the National Biodiversity Strategy and Action Plan (NBSAP) for Trinidad and Tobago. The NBSAP focuses on the conservation and sustainable utilization of the country's crop biodiversity resources and identifies national goals and targets for the country.

At the same time the national goals and targets of the NBSAP are harmonized with the obligations of the GORTT to the GSPC. The GSPC was adopted in Decision VI/9 of the Conference of Parties (COP) to the CBD and the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA).

The specific objectives include:

- (i) Conserve local crop biodiversity sustainably.
- (ii) Build capacity for the conservation of crop genetic resources.
- (iii) Using crop genetic resources sustainably for the benefit of the farming community.
- (iv) Promote education and public awareness about local crop biodiversity.
- (v) Encourage farmers' participation in local crop diversity conservation (in situ conservation).
- (vi) Conserve crop germplasm by in vitro methods.
- (vii) Increase public awareness about plant biodiversity and the environment.

The Action Plan includes:

- Training in crop genetic resources management
- Documenting crop genetic resources
- Ex situ conservation of crop biodiversity
- In situ conservation of crop biodiversity
- Education and public awareness about crop biodiversity
- Implementation of international treaties
- Maintenance of conservation facilities

This project began in 2008 and is expected to be completed in 2019.

4.1.5 Ex Situ Conservation and Utilization Efforts

Ex situ conservation efforts are managed and undertaken by several organisations and institutions in T&T. These include: the Food Production Department at UWI in St. Augustine, the Cocoa Research Unit (CRU) of UWI, The Caribbean Agricultural Research and Development Institute (CARDI) and the Sugar Cane Research Station, Caroni (1975) Limited.

These ex situ conservation efforts run the gamut from international collections such as the International Cocoa Genebank at UWI, working collections of crop germplasm such as those from the Centeno Research Station, breeding stations at government livestock facilities and basic seed bank facilities at the Ministry of Food Production (MFP) and UWI.

Much of these ex situ efforts are focused on evaluation and research into quality attributes, pest and disease resistance, growth and development studies. In addition, many of these efforts – especially within government stations – are focused on utilization of stored genetic resources for use in the field by farmers. The Artificial Breeding Centre maintained by the Livestock Division, provides limited insemination services to beef cattle farmers, while the La Reunion Plan Propagation Station at Centeno provides high quality/evaluated planting material to farmers. For crops, germplasm collections take the form of local, regional or international collections. Many collections in T&T are centred on local and introduced sources of germplasm for evaluation and utilization.

The Food Production Department at UWI serves as one of the institutions which has assembled collections of crop germplasm and/or has placed particular focus on certain aspects of research involving these crops. The crops can be sub-divided into staples, vegetables, legumes & pulses, and fruit species. Of all 28 crops reviewed, it appears that cocoa, citrus and hot peppers have received greatest research focus at UWI – with most recent emphasis on cocoa and peppers (*Table 4.3* for the major commodity crops being collected at UWI).

Table 4.3. Major Commodity Crops being Collected at the University of the West Indies.

Crop	Scientific Name	Number of Accessions held at UWI	Number of Species	Number of Varieties	Type of Collection	Storage Methods	Location of Germplasm
Bananas	<i>Musa spp.</i>	17	-	N/A	Currently under rehabilitation	Living collection	The University Field Station
Breadfruit	<i>Artocarpus altilis</i>	Not declared	-	34	Regional, Imported International	Living collection	The University Field Station
Cassava	<i>Manihot esculenta</i>	40	-	Undeclared	-	-	-
Cocoa	<i>Theobroma cacao</i>	Not declared	-	2400	International	Living collection	El Carmen, Piarco
Peppers	<i>Capsicum spp.</i>	Not declared	5 domesticated	330	National, Regional, International	Seed bank	UWI, St. Augustine
Pigeon peas	<i>Cajanus cajan</i>	Not declared	-	-	-	-	-
Pumpkin	<i>Cucurbita moschata</i>	0	-	-	-	-	-
Rice	<i>Oryza sativa</i>	-	-	-	Under construction	-	-
Sweet potatoes	<i>Ipomoea batatas</i>	1	-	Undeclared	-	-	-
Tomato	<i>Lycopersicon esculentum</i>	-	-	-	Select varieties assembled	Seeds	-
Yams	<i>Dioscorea spp.</i>	30-34	-	Undeclared	-	-	-
Fruit species		14	-	Undeclared	-	-	-

Source: Modified from GoRTT, 2008¹⁵⁴

¹⁵⁴ The Government of the Republic of Trinidad and Tobago (GoRTT), (2008). *Country Report on the State of Plant Genetic Resources for Food and Agriculture*. Trinidad and Tobago: Food and Agricultural Organization.

Conclusions and Recommendations for Improving the Monitoring and Assessment of Agrobiodiversity

While it appears that steps are being made in the right direction for improving the conservation, management and utilization of agricultural genetic resources in T&T, there still exists no real mechanism for the continued monitoring of the agrobiodiversity resources in T&T. Without such a mechanism, policy-relevant assessments will always be prone to variability and vagueness, dependent on data that is not fully dependent.

It is imperative that a system of nationally specific, internationally clarified indicators for agricultural genetic diversity be developed for T&T, so that monitoring of these resources can take a more coherent and consistent form. This is particularly important with the advent of the new policy and strategic movements by the MFPLMR which states that the effectiveness and efficiency of these interventions ought to be measured and evaluated as part of a framework for holistic management of natural ecosystems to preserve the genetic resources of wild types of species of agricultural importance. A relevant set of indicators can be the benchmark for these species and where similar interventions can be measured, ensuring that there are consistent methods of evaluation.

Chapter 5 Legal and Policy Framework

In a bid to analyse the biodiversity-related policies and legislations in Trinidad and Tobago (T&T), a review of the existing policy and legislative framework relating to biodiversity was performed, and opportunities for the development of payment of ecosystem services were assessed. Approximately twelve (12) policies and fifty three (53) pieces of legislation which govern biodiversity were reviewed for the purposes of this report.

General Policies

5.1.1 National Environmental Policy

The National Environmental Policy (NEP) is the Government of the Republic of Trinidad and Tobago's (GoRTT) overarching statement relating to the environment and conservation of natural resources. Unlike other policy documents which are guiding in nature, the NEP has been given legislative force through Section 31 of the Environmental Management Act Ch. 35:05 (rev. 2009).

Section 31 of the Act provides: "The [Environmental Management] Authority and all other governmental entities shall conduct their operations and programmes in accordance with the National Environmental Policy..."

Chapter 3 of the NEP sets out the government's recognition of biological diversity and the need to ensure its conservation and wise use. The NEP provides inter alia that the GoRTT shall promote:

- (a) "The conservation and management of biologically significant areas of T&T through the designation of environmentally sensitive areas;
- (b) The protection and conservation of threatened, vulnerable, rare or endangered species through the declaration of environmentally sensitive species;
- (c) Enhanced management of our biodiversity resources;
- (d) Communication and cooperation with agencies that have responsibility for biodiversity and with other interested stakeholders;
- (e) Opportunities for the sharing of information on biological diversity among government agencies, the public and private sector, non-governmental organizations (NGOs), community-based organizations (CBOs) and other special interest groups;
- (f) Adoption of procedures and practices to integrate biodiversity concerns into national sectoral policies, plans and programmes;

- (g) Education and Awareness on biodiversity conservation to all sectors of the society to empower people of all stakeholders in the development and management of living resources;
- (h) The involvement of all stakeholders in the development and management of living resources, through the institutionalisation of public participation in the decision making process;
- (i) Promotion of ex situ conservation approaches, where appropriate, as a complement to in situ conservation programmes;
- (j) Implementation of international commitments relating to the Convention on Biological Diversity (CBD), United Nations Convention to Combat Desertification (UNCCD), Ramsar, Convention on International Trade in Endangered Species (CITES) and Specially Protected Areas and Wildlife (SPAW).”

In Section 3.1 of the NEP, the GoRTT expressed its commitment to the establishment of “a system of protected areas through the designation of Environmentally Sensitive Areas (ESA) for parts of the environment that are significant examples of the country’s national heritage and of great importance to the sustenance of life, science, the country or the international community”. Section 3.2 makes a similar pledge with respect to species by pledging to “establish a system for the protection of animals and plants in T&T which scientific evidence suggest are either rare, endemic, endangered, vulnerable or keystone species through the designation of Environmentally Sensitive Species (ESS)”.

The NEP also specifically addresses certain ecosystems such as coastal and marine systems and forests. Section 3.5 of the Policy outlines the following objectives of the NEP with respect to forests:

- (a) To ensure that lands best suited for the provision of forest produce and services for the community remain under permanent forest cover;
- (b) To maintain the total areas of land zoned for forest reserve and prevent its conversion into non-forest uses such as agriculture and mining;
- (c) To ensure sustainable use of forests including extraction of timber and wild meat;
- (d) Establish and enforce legislation to ensure the protection and wise use of forest resources and to regulate the harvest of these resources; and
- (e) To maintain protected forest areas for conservation purposes.

Wetlands are also specifically addressed in the NEP in Section 3.6. The commitment is to “protect, manage and restore wetlands in order to sustain their ecological and socio-economic values and functions for current and future generations”. Section 3.7 of the NEP focuses on water resources and the promise of the GoRTT to “ensure that development decisions that impact on water resources are guided by acceptable water quality and quantity criteria and that these criteria can be met on a sustainable basis”.

The NEP also recognizes the impact of certain economic activities on biological diversity and seeks to integrate its needs in such activities. Section 3.8 of the NEP acknowledges the exploitation of mineral resources but seeks to promote its sustainability as follows:

“A variety of naturally occurring non-renewable resources (petroleum, natural gas, sand, gravel and oil) are extracted for use in different aspects of economic development. The extraction methods can cause short or long-term negative impacts on the environment such as habitat loss, soil, water, air or noise pollution, aesthetic degradation, through the visual scarring of the landscape and irreversible damage to the environment. In order to minimise these negative impacts, the Government will:

- (a) Enforce rehabilitation programmes by operators at mining sites;
- (b) Regulate mining activities in environmentally sensitive areas; and
- (c) Discourage wastage of mineral resources such as oil and gas.
- (d) Establish and enforce pollution reduction and control for extractive industries, so as to protect the quality of water, land and air.”

5.1.2 National Climate Change Policy

The National Climate Change Policy (NCCP) aims to provide guidance for the development of an appropriate administrative and legislative framework in harmony with other sectoral policies. This framework would pursue a low-carbon development path for T&T through suitable strategies and actions to address climate change, including sectoral and cross sectoral adaptation and mitigation measures.

The NCCP is guided by the following mutually interactive objectives:

- (a) reducing or avoiding greenhouse gas emissions from all emitting sectors;
- (b) enhancing carbon sinks;
- (c) conserving and building resilience of human and natural systems to adapt to the adverse impacts of climate change, including through capacity building and the application of cleaner and energy efficient technologies;
- (d) protection of the natural environment and human health; and
- (e) enhanced agricultural production and food security.

The NCCP proposes that the goal of the policy to obtain a low carbon development path could be achieved, in part, through the incorporation and integration of the core objectives to existing and proposed sectoral policies. This should be done by revising relevant policies where applicable, as well as through the drafting and amendment of relevant legislations. The NCCP also proposes

that the development of relevant strategies and action plans would be implemented over defined time periods.

Some of the mitigation and adaptation measures proposed by the NCCP include:

- (a) Increasing the use of alternative fuels and fuel switching in the transportation sector;
- (b) Conserving forests and protecting natural systems that contribute to carbon sequestration;
- (c) Maximising the use of the carbon market;
- (d) Assessing sectoral vulnerability to climate change by conducting vulnerability analyses and formulating adaptation options, including technological application, in biophysical and socio-economic systems; and
- (e) Enhancing the resilience of natural biophysical systems so as to maximize ecosystem services such as the natural coastal defence properties of coral reefs and mangrove systems, through the development of a system of national protected areas, including for water catchment.

The NCCP identifies the Multilateral Environmental Agreements Unit of the Ministry of the Environment as the coordinating body for the implementation of the Climate Change Policy.

5.1.3 National Biodiversity Strategy and Action Plan for Trinidad and Tobago

The National Biodiversity Strategy and Action Plan (NBSAP) was formulated to provide support to the GoRTT to plan for the conservation and sustainable use of the country's biodiversity, within the context of its socio-economic development programmes. The NBSAP defines biological diversity as the variety of all living things and the habitats in which they live.

The NBSAP provides a blueprint for tangible action, and suggests systems and programmes to enhance our capacity to manage and use biodiversity sustainably. These include measures that will:

- (a) Build Education and Awareness Programmes in biodiversity conservation on existing initiatives and fill gaps in formal approaches;
- (b) Collaborate with corporate businesses (such as the industrial sector) as they can contribute financing, expertise on advertising, public relations and communications;
- (c) Use cultural and artistic traditions, including drama, as vehicles for environmental education and awareness programmes;
- (d) Improve law enforcement success rate and utilize it as an important tool for management and sensitization on biodiversity conservation.

- (e) Strengthen NGOs and CBOs to play a greater role in the conservation and management of biodiversity towards sustainable livelihoods;
- (f) Integrate policy objectives for biodiversity conservation into policy statements for all sectors;
- (g) Develop a clear policy process for adoption by Government entities (including National Budgets) and ensure that strategic action plans of these entities incorporate implications on biodiversity conservation and the environment as a whole; and
- (h) Institutionalize public participation in the development of government policy for the conservation and management of biodiversity.

5.1.4 Working for Sustainable Development in Trinidad and Tobago (2012)

The Working for Sustainable Development in Trinidad and Tobago (WSDTT) Policy states that the vision of T&T is to pursue a Green Economy. A stated goal of the green economy is to prevent the loss of biodiversity and ecosystem services.

With its stated objective of forging a green economy, the third Pillar of the WSDTT is the environment. It is recognized that environmental sustainability is a critical component of global economic and social well-being.

The WSDTT pays homage to the importance of biodiversity and protected areas as follows:

“Biodiversity is the variability of all living organisms including animal and plant species and their genetic make-up, and of the terrestrial, aquatic and marine ecosystems of which they are part... Trinidad and Tobago has a high biological diversity to surface area ratio due to its small size and geographical relationship shared with the South American continent. Its terrestrial ecosystems include evergreen seasonal, semi-evergreen seasonal, seasonal montane forests, littoral woodlands, forests, marshes, mangrove woodlands, palm marshes and savannas. The marine ecosystems includes the nation’s water masses, mud bottoms, coral reefs, sandy bottoms, rocky shores, seagrass beds and mudflats. Both these ecosystems support 2,160 species of flowering plants, 420 species of birds, 100 mammals, 55 snakes, 25 amphibians, 85 reptiles, 36 species of reef building corals and a wide array of corals. The islands’ biological resources are of significant importance to all sectors in Trinidad and Tobago namely agriculture, fishing, recreation, tourism and culture. However, society’s growing consumption of resources and increasing populations have led to a rapid loss of biodiversity, eroding the capacity of earth’s natural systems to provide essential goods and services on which human communities depend”.

The WSDTT advocates the establishment of a network of protected areas as follows:

“One of the ways in which biodiversity can be protected is through the establishment of protected areas (PA)...The primary reason of establishing PAs for biodiversity is the conservation of genetic diversity, species, ecosystems and natural habitats, and as a tool for the maintenance and recovery of viable populations of rare or threatened species in their natural environment. Trends indicate that the present rate of exploitation of Trinidad and Tobago’s natural biodiversity is detrimental for sustainable development. For instance, the national current hunting rates have resulted in a serious decline of the game animal population, while fishing and forestry data also show that these resources are in decline. In addition, development pressures and increasing pollution are imposing an additional burden on ecosystems and their ability to provide their services.”

The Buccoo Reef has been singled out in the WSDTT for specific mention in terms of its management and protection. It recognizes its importance as a tourist destination but the adverse impacts associated with the said tourism activity is as follows:

“Buccoo Reef receives an estimated 45,000 visitors every year. Glass-bottom boat tours of Buccoo Reef typically include a stop at Coral Gardens, where the boat anchors on sand adjacent to the coral formations to allow passengers to snorkel over the Coral Gardens. The improper use of anchors is a major cause of coral reef damage on many reefs around Tobago, where marine tourism activities are concentrated....An initiative undertaken by the Department of Marine Resources and Fisheries as well as the Buccoo Reef Trust to counteract this problem involved the installation of suitable moorings in Buccoo Reef Marine Park to be used by reef tour operators.”

The WSDTT identifies the need for the sustainable use of land resources of T&T. The need for a new National Physical Development Plan is as follows:

“Competing demands for limited land resources have become more critical. Land area under built development is currently in the vicinity of 14% (2010), with approximately 53% of the country’s land space allocated to forestry and conservation and 33% to agriculture. This emphasizes the urgency of a new National Physical Development Plan.”

The drive for a new development plan would include legislative intervention. The WSDTT further provides:

“Likewise, the Planning and Facilitation of Development Bill, subject to Parliamentary review in mid-2012, will assist in correcting the disconnect between the socio-economic

and physical planning dimensions, as well as several other deficiencies plaguing the administration of planning. This new legislation will be introduced shortly and is geared towards significantly altering the way in which planning is undertaken, particularly in the delegation of powers”. As an interim measure, a firm decision has been taken by the Government of Trinidad and Tobago, which debars development of any kind and construction on and beyond 300 feet contour line of the Northern Range¹⁵⁵.

In focusing on land issues, there is significant attention paid to forested areas. In T&T, there is recognition that forestry reserves are being degraded at an unprecedented rate. Currently, there is a National Forest Policy but its ecological services, its added-value and downstream industries are not recognised in national accounting. The WSDTT provides:

“Forestry is included as part of the agricultural sector and is currently estimated to contribute approximately 0.69% to the Gross National Product, approximately \$85.7 million. In order to sustainably manage national forests Trinidad and Tobago needs to optimally use its forest resource while simultaneously protecting native genetic species and ecosystem diversity. While Trinidad and Tobago has a strong history of Sustainable Forest Management, significant institutional and policy weaknesses can lead to further deterioration of this tradition unless remedial measures are taken. Both natural forests and plantations are affected by over-harvesting, encroachment, fires and other forms of damage; although the extent of these have not been quantified and police patrols probably help reduce illegal activities. Forest conservation is receiving decided emphasis.”

Green intervention in Tobago also includes initiatives to protect the coastal and watershed areas. The Integrated Watershed and Coastal Area Management Project (IWCAM) is one of these projects in eight Caribbean Sea countries, funded by the Global Environment Facility (GEF).

A major problem identified by the WSDTT was the disparate number of institutions engaged in water management. Accordingly, “the formulation and subsequent approval of the National Integrated Water Resources Management Policy in 2005 constituted a major step in this country’s water sector reform since it has established a coherent, cohesive and sustainable institutional framework for Integrated Water Resources Management”.

¹⁵⁵ Working for Sustainable Development in Trinidad and Tobago (WSDTT), (2012). Environmental, Economic and Social Well-being for today and tomorrow. (p. 47) Retrieved from <http://www.planning.gov.tt/sites/default/files/content/mediacentre/documents/Working%20for%20Sustainable%20Development%20in%20Trinidad%20and%20Tobago.pdf>

The WSDTT highlights quarrying as a specific problem facing land resources in T&T as follows:

“In Trinidad and Tobago, quarries provide a source of aggregate materials for the construction industry. Noise pollution, air pollution, high water consumption, however, are serious issues that are typical in the industry. Additionally, habitat loss and flooding adversely affects biodiversity and reduces the sustainability of land use. Fortunately there are means of mitigating these effects and reducing their long-term impact without requiring the cessation of the activity...Stronger regulation of quarry operators requires the combined efforts of multi-stakeholder teams, and a greater awareness by quarry operators of the value of biodiversity.”

5.1.5 Medium-Term Policy Framework 2011-2014: Innovating for Lasting Prosperity (2011)

The Medium Term Policy Framework (MTPF) articulates an action plan for the GoRTT over the period 2011-2014 and is intended to bring focus to the work of the Government over the next three (3) years. The MTPF embraces the “theme ‘Innovation for Lasting Prosperity’ which outlines Government’s perspective and intent on the socio-economic transformation that needs to take place in order to achieve our commitment to the people of T&T of ‘Prosperity for All’”.

The MTPF pledges to introduce new administrative arrangements for the conservation of biological resources as follows:

“The country’s biological resources will be conserved for future generations through new administrative arrangements for their management namely the implementation of the National Parks and Recreation Authority. The setting up of the Authority will protect environmentally sensitive areas while simultaneously creating green spaces for recreational activities thus enhancing the quality of life of citizens. The new Forest Policy and the new Protected Areas Policy will be implemented through the proposed Forest and Protected Areas Management Authority.”

5.1.6 Comprehensive Economic Development Plan for Tobago: Clean, Green, Safe and Serene

The Comprehensive Economic Development Plan for Tobago (CEDPT): Clean, Green, Safe and Serene came into effect in Tobago in 2006. The CEDPT sets out the strategies and development initiatives for Tobago for a four year period ending in 2010. It was envisaged that the policy would be updated after this period. To date, the policy has not been updated but the strategies and initiatives proposed therein continue to be implemented.

The CEDPT was the product of a decision taken by the Cabinet of Trinidad and Tobago in consultation with the THA. This was in light of the urgent need to improve the quality of life of the people of Tobago and to bring the island within the mainstream of national economic development in the medium term.

The overarching strategy is to increase Tobago's contribution to the GDP of the archipelagic state, redefine existing sources of foreign exchange to make them more productive and identify new high value added products and services that can be targeted for growth. The CEDPT provides a number of strategies to promote the development of Tobago to provide a high standard of living for present and future generations within an environment that is clean, green, safe and serene.

The CEDPT envisions an environmentally sensitive and conscientious Tobago, promoting the conservation of its natural resources with the establishment and implementation of standards, systems and regulations to ensure sustainable use and protection of the environment.

The CEDPT identifies two opportunities for achieving this vision. These are the proposed shift to use of environmentally friendly compressed natural gas (CNG) and the high level of natural diversity which underlies Tobago's tourism product. A number of challenges have been identified, which include unregulated change in land use, poor monitoring and enforcement, inability to treat with garbage and waste and lack of vulnerability assessments in the design and construction of infrastructure.

The CEDPT also proposes the establishment of a CEDP Implementation Secretariat located within the Division of Finance and Planning of the THA which would have responsibility to ensure that the strategies of the Plan are implemented in the various departments of the THA. Also proposed is the establishment of a Committee to oversee the implementation of the CEDPT and other development plans for Tobago. While the THA has primary responsibility for matters in Tobago, the Environmental Management Authority (EMA) and Town and Country Planning Division also has jurisdiction over environmental and planning in Tobago. The CEDPT envisages a full devolution of national agencies such as the EMA and the Town and Country Planning Division to the THA due to the higher environmental standards that need to be adhered to on the island.

Specific Policies

5.1.7 National Forest Policy

National plans have been promulgated to address specific components of biological diversity. One such plan is the National Forest Policy (NFP). The NFP provides:

“The purpose of this National Forest Policy is to guide the sustainable management of the forest resources of Trinidad and Tobago, including the use of these resources, and the impacts and consequences of that use... This Policy addresses forests located on both public and private lands, and therefore encompasses State Lands, protected areas, Forest Reserves and lands that are in private ownership.”

The NFP advocates six major objectives. These include:

- (a) To optimize the contribution of forest resources to livelihoods; cultural and spiritual/religious use, while ensuring sustainable use of forests, including extraction of timber and wildlife;
- (b) To protect native genetic, species and ecosystem diversity;
- (c) To maintain and enhance the natural productivity of forest ecosystems and ecological processes (watershed functions, etc.) to provide important ecosystem services;
- (d) Regulate access to forest goods and genetic resources through appropriate legislative, administrative and policy measures which ensure that these goods are sustainably extracted, without compromising biodiversity and ecosystem patterns, processes and services;
- (e) To develop legislative, administrative and policy measures to protect intellectual property rights arising from forest resources; and
- (f) To ensure that the results of research and development, including traditional knowledge, and the benefits arising from the commercial and other utilization of genetic resources are shared in a fair and equitable way to benefit local and national stakeholders.

5.1.8 National Integrated Water Resources Management Policy

The National Integrated Water Resources Management Policy (NIWRMP) recognizes that:

“The national goal for the water sector is to support the socio-economic development of Trinidad and Tobago through the integrated management of the water resources and the

water environment (land, air, flora and fauna), satisfying and managing the growing demands for all water users in a sustainable, efficient and effective manner, while maintaining and/or enhancing the quality of the environment and the integrity of ecosystems, and minimizing damage and losses to life and property due to water related disasters.”

Some of the objectives of the NIWRMP that mitigates the negative impacts on biological diversity are:

- (a) To protect and co-manage watersheds and wetlands as sources of water;
- (b) To promote conservation and wise use of water resources;
- (c) To establish an integrated framework for water resources management, particularly as it relates to planning and environmental management;
- (d) To maintain and enhance the quality of Trinidad and Tobago’s surface, ground, and coastal waters;
- (e) To restore natural water systems in forests, rivers, wetlands, and coastal areas to restore water conservation capacity and maintain healthy ecosystems;
- (f) To protect water systems from pollution;
- (g) To prevent and minimise the impacts of flood, drought, and other water-related emergencies;
- (h) To protect and enhance the enabling environment of natural water systems (i.e. land, aquifers, and natural ecosystems); and
- (i) To integrate the management and development of watersheds and coastal areas.

5.1.9 National Water Resources Management Strategy

The objective of the National Water Resources Management Strategy (NWRMS) study is:

“To support the socioeconomic development on the basis of sustainable resource use (surface water and groundwater), while protecting and restoring the natural environment, in particular the wetlands and forests.”

The measures being proposed in the NWRMS include:

“Environmental measures aim at improving the environmental and ecological condition of the water system and the ecosystems that depend on it; these measures might involve the construction of waste water treatment plants but also a different priority setting of water distribution in favour of the ecological system; pollution monitoring, effluent permit and water quality criteria.”

5.1.10 National Wetlands Policy

The National Wetland Policy (NWP) for T&T provides a rational framework through which the wise use of our wetlands can be achieved. These principles are also consistent with fulfilling our obligations under the Convention on Wetlands.

The NWP sets out the wetland policies of the GoRTT as follows:

- (a) The Government of Trinidad and Tobago will promote awareness and understanding of the wetland resources in Trinidad and Tobago and actively encourage participation of landowners, non-governmental organizations and institutions in wetland conservation;
- (b) The Government of Trinidad and Tobago, in keeping with the wise use principle as defined under the Convention on Wetlands, will develop exemplary practices in support of wetland conservation and sustainable wetland use when it designs and implements government programmes on publicly owned land and waters;
- (c) The Government of Trinidad and Tobago will preserve outstanding examples of all wetland types in Trinidad and Tobago by including them in a system of national parks and other protected natural areas;
- (d) The Government of Trinidad and Tobago will be an active partner in cooperative activities, which promote wetland conservation in Trinidad and Tobago and the Caribbean region;
- (e) The Government of Trinidad and Tobago will support and promote the development within Trinidad and Tobago of the scientific and technological expertise needed for wetland conservation and ensure that this expertise is accessible to planners, managers, regulators and other decision-makers; and
- (f) The Government of Trinidad and Tobago will identify weaknesses in the present institutional and organizational structures relevant to wetland conservation and will develop activities for their improvement.

An important objective of the wetlands policies contained in the NWP is to “commit all levels of government to a goal of no net loss of wetlands and their values and function, on publicly-owned lands and waters”.

5.1.11 National Protected Areas Policy

The National Protected Areas Policy (NPAP) was developed to “provide guidelines for the selection, designation and management of all Protected Areas established for the conservation of natural heritage in T&T. The Policy recognises that these areas may contain features with significant cultural, spiritual/religious, historical, and archaeological heritage value and will therefore require specific management in collaboration with relevant stakeholders”.

The main goal of the NPAP is to “establish an appropriate framework for the selection, legal designation and management of a national system of protected areas. This includes elaboration of a classification system for the designation of a comprehensive and rationalised system of protected areas, the establishment of effective institutional arrangements for management, development of mechanisms for sustainable financing, identification of human resource capacity needs, resolution of policy conflicts, development of enabling legislation and tools and guidelines for effective management”.

The NPAP sets out seven strategic actions necessary for achieving its goal of the establishment of a system of protected areas as follows:

- clear classifications for protected areas;
- criteria for the identification of protected areas;
- recommendations for rationalising institutional arrangements for management of protected areas;
- guidelines for institutionalising participatory approaches to protected areas management;
- guidance for development of an enabling legislative framework;
- guidance on conflict resolution for conflicting uses of protected areas; and
- guidelines for the development of the necessary human and financial resource capacity.

5.1.12 National Action Programme to Combat Land Degradation in Trinidad and Tobago

The National Action Programme to Combat Land Degradation in Trinidad and Tobago (NAPCLD TT) aims “to promote and enable the population of Trinidad and Tobago to exercise better choices as they relate to the use and management of land resources. The approach of the NAP is one which engages the Government, the private sector, affected communities, the NGO and community sector and the population at large to work in partnership to reduce land degradation and promote wise use and sustainable land management.... The main goal of the NAP is to ensure the sustainable management and protection of land resources with a view to meeting immediate and future socio-economic development, cultural and ecological needs.”

Some of the objectives of the NAPCLD TT that are relevant to biological diversity are as follows:

Short-Term: 2006 to 2008

- (a) Expand implementation of reforestation projects and develop a single set of criteria for measuring success;
- (b) Strengthen monitoring and enforcement mechanisms for a number of activities, including squatting (agricultural and residential), dumping of solid waste, illegal logging, illegal mining/quarrying, setting of bush and forest fires;
- (c) Strengthen the mechanism for community participation in land management projects;
- (d) Promote the principle of wise use of land resources and sustainable management by introducing ecologically sustainable agricultural production techniques in selected communities; and
- (e) Improve water resources management.

Medium-Term: 2009 to 2013

- (a) Rehabilitate degraded areas;
- (b) Protect catchment areas and surface and underground water resources;
- (c) Extend forested areas and protect existing forest areas; and
- (d) Improve river water quality.

Long-Term: 2014 to 2020

- (a) Achieve sustainable land use and management;
- (b) Establish a balance between utilisation of land resources (soils, minerals, oil and natural gas, water resources, forests) and ecological needs;
- (c) Rehabilitate all degraded land to mitigate negative efforts; and
- (d) Improve water resources management to ensure year-round water supply.

Legislation

Table 5.1 summarizes the existing legislation in Trinidad and Tobago that is relevant to biodiversity.

Table 5.1. Existing Legislations in Trinidad and Tobago with respect to Biodiversity.

Legislation	Summary
General Protection of Fauna in Trinidad and Tobago	
Conservation of Wildlife Act Ch. 67:01 (rev. 2009)	<p>Provides for the designation of areas where species of fauna cannot be hunted. These are known as game sanctuaries. The First Schedule to the <u>Conservation of Wildlife Act 67:01 (rev. 2009)</u> lists the twelve game sanctuaries declared pursuant to Section 3(2) in Trinidad and Tobago.</p> <p>By and large responsibility for administering this Act resides with Game Wardens. There is a Wildlife Conservation Committee that advises on the conservation of wildlife in T&T. The <u>Conservation of Wildlife Act Ch. 67:01 (rev. 2009)</u> has also developed a conservation model based on protection of certain specific species of fauna and prohibits the hunting of these species.</p>
Marine Areas (Preservation and Enhancement) Act Ch. 37:02 (rev. 2009)	<p>Provides for the designation of specific marine areas for the protection of fauna. To date only one area has been designated a restricted area that is the Buccoo Reef off the island of Tobago. Regulations have been made to prevent the taking or removal of any fish, bird or mangrove from restricted areas as per <u>Regulations 3(1) (c) and (d) of the Marine Areas (Preservation and Enhancement) Regulations</u>. The definition of fish as contained in <u>Regulation 2</u> is quite wide and includes “corals, crabs, lobsters, shrimps, turtles, turtle eggs and any species of marine fauna”.</p>
Summary Offences Act Ch. 11:02 (rev. 2009)	<p>Provides protection for species of fauna. This however is limited to certain domesticated species.</p>
Fisheries Act Ch. 67:51 (rev. 2009)	<p>The <u>Fisheries Act Ch. 67:51 (rev. 2009)</u> was first enacted in 1916 and was later amended in 1966 and 1975. It is the principal legislation governing domestic fishing in Trinidad and Tobago and applies to rivers and the territorial sea. The <u>Fisheries Act Ch. 67:51 (rev. 2009)</u> envisages the enactment of a system of regulations for fishing.</p> <p>To date regulations have been made relating to the use of nets including monofilament nets and mesh; the sale of designated species of fish less than eight and twelve inches in size; the removal of fish, shellfish, crabs and shrimp from designated areas; the operation of boats and vessels; the dragging of nets and seine; removal of oysters from the Ortoire River; the protection of turtle and turtle eggs; procedures for the resuscitation of turtles; the use of turtle excluder devices and demersal fishing.</p>

Legislation	Summary
Protection of Specific Species of Fauna in Trinidad and Tobago	
Environmental Management Act Ch. 35:05 (rev. 2009)	The primary piece of legislation providing for the protection of species of fauna which are deemed environmentally sensitive (rare, endemic, endangered, vulnerable or keystone) is the <u>Environmental Management Act Ch. 35:05 (rev. 2009)</u> .
Environmentally Sensitive Species Rules, 2001	In 2001, the <u>Environmentally Sensitive Species Rules, 2001</u> came into force allowing the Environmental Management Authority the power to designate species as being environmentally sensitive. As of 2012, only three species have been designated as environmentally sensitive species. These are the West Indian Manatee (Legal Notice No. 123 of 2005), the Trinidad Piping Guan (Legal Notice No. 124 of 2005) and the White Tailed Sabrewing Humming Bird (Legal Notice No. 125 of 2005).
Fisheries (Conservation of Marine Turtles) Regulations Ch. 67:51 (rev. 2009)	Turtles have been singled out for specific legislative protection in Trinidad and Tobago. This has been facilitated under the <u>Fisheries Act Ch. 67:51 (rev. 2009)</u> and its Regulations. Turtle Excluder Devices were approved by regulations contained in <u>Legal Notice No. 195 of 1999 made pursuant to the Fisheries (Conservation of Marine Turtles) Regulations</u> .
Regulation of Trade and Invasive Species: Importation of Specific Species of Fauna	
Animals (Diseases and Importation) Act Ch. 67:02 (rev. 2009)	The primary piece of legislation regulating the import of certain species of animals into Trinidad and Tobago is the <u>Animals (Diseases and Importation) Act Ch. 67:02 (rev. 2009)</u> .
Mongoose Act Ch. 67:55 (rev. 2009)	<u>Section 2(1) of the Mongoose Act Ch. 67:55 (rev. 2009)</u> provides: “No person shall import or cause to be imported into T&T any live animal of the description known as mongoose.”
Control of Importation of Live Fish Act Ch. 67:52 (rev. 2009)	<u>Section 2(1) of the Control of Importation of Live Fish Act Ch. 67:52 (rev. 2009)</u> provides: “No person shall without the consent by Notification of the Minister, import into T&T any live fish other than live fish indigenous to T&T.”
Beekeeping and Bee Products Act Ch. 67:53 (rev. 2009)	<u>Section 7 of the Beekeeping and Bee Products Act Ch. 67:53 (rev. 2009)</u> provides “Every owner or person having the charge or management of an apiary shall cause the apiary to be registered with the Inspector. Any person who makes default in registering the apiary is guilty of an offence against this Act”. <u>Section 9(b)</u> also provides: “The Minister may make regulations for restricting and regulating the importation or exportation of bees, bees products and bees supplies into or out of T&T.”

Legislation	Summary
Beekeeping and Bee products Regulations made pursuant to the Beekeeping and Bee products Act (rev. 2009)	<u>Section 23 of the Beekeeping and Bee products Regulations made pursuant to the Beekeeping and Bee products Act (rev. 2009)</u> provides: “The importation of Queen Bees and bee supplies shall be allowed only on the written consent of the Inspector and subject to compliance with these Regulations.” <u>Section 24</u> of the Regulations further provides: “Any person who desires to import bees or bees supplies into T&T shall make written application to the Chief Technical Officer (Agriculture) for a permit authorising the said importation.”
Territorial Sea Ch. 1:51 (rev. 2009)	<u>Section 6(A) of the Territorial Sea Ch. 1:51 (rev. 2009)</u> provides: “Where in the contiguous zone an officer has reasonable cause to suspect that the...health laws have been or are likely to be infringed by a vessel, such officer may stop, board and search the vessel and may direct that vessel to proceed to such place as he may specify”.
Regulation of Trade and Invasive Species: Exportation of Fauna	
Conservation of Wildlife Act Ch. 67:01 (rev. 2009)	The exportation of fauna from Trinidad and Tobago is primarily regulated under the <u>Conservation of Wildlife Act Ch. 67:01 (rev. 2009)</u> . Section 81(1) of the Act provides: “No animal shall be exported or carried coastwise without the written permission of the Chief Game Warden.”
Regulation of Trade and Invasive Species: Related Legislation	
Tobago House of Assembly Act Ch. 25:03 (rev. 2009)	Under the <u>Tobago House of Assembly Act Ch. 25:03 (rev. 2009)</u> , the Tobago House of Assembly has responsibility for formulating and implementing policy related to the environment, fisheries, plant and animal quarantine in the island of Tobago.
Zoological Society of T&T Ordinance No. 12 of 1952	<p><u>Section 4 of the Zoological Society of T&T Ordinance No. 12 of 1952</u> provides: “The objects of the Society shall be...(b) the advancement of Zoology and Animal Physiology and it shall be lawful for the Incorporated Trustees to do all acts and things including the raising of funds for the purpose of carrying out the said objects or any of them.”</p> <p>The Zoological Society of Trinidad and Tobago was first established in 1942 and later constituted as body corporate by Ordinance No. 12 of 1952 dated 5th April 1952. Conservation is an integral part of the Zoo’s mandate and it carries out this mandate through the maintaining and breeding of endangered and threatened species, either for research or as stock and replenishment of the wild populations as well as partnering with leading conservation groups both locally and internationally.</p>

Legislation	Summary
General Protection of Species of Flora in Trinidad and Tobago	
State Lands Act Ch. 57:01 (rev. 2009)	Pursuant to Section 4(2) of the <u>State Lands Act Ch. 57:01 (rev. 2009)</u> all rights of ownership in respect of state lands is exercisable by the Commissioner of State Lands. The statutory responsibilities entrusted to the Commissioner of State Lands include inter alia the administration, management and protection of State Lands, the prevention of squatting and encroachment, the issue of mining and other leases and licenses and the grants of rights and liberties over the foreshore or lands under territorial waters.
Forests Act Ch. 66:01 (rev. 2009)	<p>The management of forests on State lands is usually facilitated through the declaration of forests as forest reserves and the handing over of the management of such reserves to the Forestry Division of the relevant Ministry. Forests resources in Trinidad and Tobago are primarily regulated under the <u>Forests Act Ch. 66:01 (rev. 2009)</u>. The Act inter alia establishes a permitting system to manage the felling, removal and transport of timber.</p> <p>The <u>Forests Act Ch. 66:01 (rev. 2009)</u> also makes provision for the making of Rules to protect of species of flora and even individuals. Section 23 of the Act provides: “The Minister may make rules providing for the preservation of trees remarkable for size, rarity or beauty, whether generally or in individual cases, and for permission to lop or fell some.”</p>
Felling of Trees (Permits) (Private Land) Rules, 2000	The <u>Felling of Trees (Permits) (Private Land) Rules, 2000</u> were made as a result of the amendment to the <u>Forests Act</u> which established the legal framework for controlling the cutting of trees on private lands (<u>Legal Notice No. 309 and No. 310 of 2000</u>). Basically, these Rules require a person to apply for a permit to clear fell trees over ten centimetres (4 inches) in diameter at a height of 1.3 meters (4 feet 3 inches) above the ground on a given parcel of land. They further require a person to prove ownership of the land on which the tree is found, ownership of the tree, that removal of the tree will not have adverse infrastructural impacts and that the tree is not of historical, cultural, or environmental significance. Where a permit is granted for the felling of a tree on a slope of 30 degrees or more, the permit holder is required to replant one tree per felled tree on the said slope, unless there is already a replacement tree within ten meters of the felled tree.
Town and Country Planning Act Ch. 35:01 (rev. 2009)	Protection of species of flora and individuals is also afforded through the Town and Country Planning Act. The basis of this protection however is linked to preserving or enhancing amenities within a particular community or area. <u>Section 20(1)</u> of the Act provides: “If it appears to the Minister that it is expedient in the interests of amenity to make provision for the preservation of any tree, trees or woodlands in any area, he may for that purpose make an order...(a) for prohibiting...the cutting down, topping, lopping or wilful destruction

Legislation	Summary
	of trees...(b) for securing the replanting...of any part of a woodland area that is felled in the course of forestry operations...". In addition, in granting planning permission for development under <u>Second Schedule, Part IV, Section 5 of the Town and Country Planning Act (rev. 2009)</u> , the Town and Country Planning Division may make provisions for "Preservation or protection of forests, woods, trees, shrubs, plants and flowers".
Tobago House of Assembly Act Ch. 25:03, (rev. 2009)	Section 25 (1) of the <u>Tobago House of Assembly Act Ch. 25:03, (rev.2009)</u> provides: "Without prejudice to section 75(1) of the Constitution, the Assembly shall, in relation to Tobago, be responsible for the formulation and implementation of policy in respect of the matters set out in the Fifth Schedule."
Protection of Specific Species of Flora	
Environmental Management Act No. 3 of 2000	In Trinidad and Tobago there is little legislation providing direct protection for species of flora. The primary piece of legislation providing protection for specific species flora is the <u>Environmental Management Act No. 3 of 2000</u> . <u>Section 41 of the Act</u> provides: “(1) The Authority may prescribe in accordance with section 26(e) the designation of...any species of living plant... as an "environmentally sensitive species", requiring special protection to achieve the objects of this Act. (2) For the purpose of subsection (1), designation shall be made by Notice published in the Gazette.”
Environmentally Sensitive Species Rules, 2001	The <u>Environmentally Sensitive Species Rules, 2001</u> in establishing guidelines for the designation of environmentally sensitive species provides for protection of species of flora. To date no species of flora have been designated as environmentally sensitive.
Forests Act Ch. 66:01 (rev. 2009)	Other than species which have been deemed to be environmentally sensitive the only other species of flora that is protected is the Balata tree. Balata trees growing both on state lands and private lands are protected under the <u>Forests Act Ch. 66:01 (rev. 2009)</u> .
Trade of Flora and Invasive Species	
The Plant Protection Act No. 2 of 2001 Ch. 63:56 (rev. 2009)	The primary piece of legislation dealing with the trade of species of flora is the <u>Plant Protection Act Ch. 63:56 (rev. 2009)</u> which seeks to control the movements of plants, pest and diseases into and out of Trinidad and Tobago. The Act is therefore key in managing the threat of invasive species of flora.
Plant (Export Prohibition) Act Ch. 63:54 (rev. 2009)	<u>Section 3 of the Plant (Export) Prohibition Act Ch. 63:54 (rev. 2009)</u> , the Minister may, by Order, prohibit or restrict, subject to such conditions as may be set out in the Order, the exportation from T&T of any plant or of any specified kind of plant named in the Order.

Legislation	Summary
I.C.2 Banana (Export Control) Order and Rubber Plants and Seeds (Export Control) Order	Pursuant to the <u>I.C.2 Banana (Export Control) Order and Rubber Plants and Seeds (Export Control) Order</u> , it is prohibited to export any type of banana plant, rubber plants and seeds.
Cocoa (Import and Export) Act 64:21 (rev. 2009)	<u>Section 3</u> of the <u>Cocoa (Import and Export) Act 64:21 (rev. 2009)</u> gives the Minister the power to make regulations for the better carrying out of the Act which governs the import and export of cocoa. However, the law more or less is designed to deal with financial issues surrounding such importation and exportation of cocoa.
Exportation of Fruit Act Ch. 63:53 (rev. 2009)	Under <u>Section 8</u> of the <u>Exportation of Fruit Act Ch. 63:53 (rev. 2009)</u> the export or attempt to export fruit must comply with the requirements of this Act and its Regulations
Flora: Related Legislation	
Protection of New Plant Varieties Act Ch. 82:75 (rev. 2009)	The genetic diversity of flora is addressed under the <u>Protection of New Plant Varieties Act Ch. 82:75 (rev. 2009)</u> . However the focus of this Act is on the rights of persons in relation to the creation of new varieties of flora.
Highways Act Ch. 48:01, (rev. 2009)	Basic protection for flora is given under <u>Section 31(1)</u> of the <u>Highways Act Ch. 48:01, (rev.2009)</u> which provides that "...a highway authority may...erect and maintain guards or fences and otherwise do anything expedient for the maintenance or protection of trees, shrubs and grass..."
Summary Offences Act Ch. 11:02 (rev. 2009)	There are a number of offences that have been established relating to the destruction of flora. For example, under the <u>Summary Offences Act Ch. 11:02 (rev. 2009)</u> : <u>Section 19</u> provides that: "Any person who steals, or unlawfully and maliciously roots up, destroys or damages the whole or part of any tree, sapling, shrub or underwood, wheresoever growing...is liable". <u>Section 21</u> provides that: "Any person who steals or unlawfully and maliciously roots up, destroys or damages any plants, root, fruit or vegetable production growing in any garden, orchard, nursery ground, greenhouse or conservatory is subject to section 127, liable...". <u>Section 25(1)</u> provides that: "Any person who wilfully or maliciously commits any damage to any real or personal property whatsoever, either of a public or private nature, for which no punishment is otherwise provided is liable...". <u>Section 25</u> is extended by <u>Section 26</u> to any person who wilfully or maliciously commits any injury to any tree, sapling, shrub or underwood for which no punishment is provided for is liable..."

Legislation	Summary
Malicious Damage Act Ch. 11:06 (rev. 2009)	The <u>Malicious Damage Act Ch. 11:06 (rev. 2009)</u> also creates two offences relating to flora. Section 17 provides: “Any person who unlawfully and maliciously sets fire to any crop of sugar cane...or...hay, grass, corn, or grain, or to any cultivated vegetable produce...or other matter used as fuel...or to any plantation of cocoa, coffee, or other trees, or to any part of any wood...wheresoever the same may be growing ...is liable...”. Section 19 provides: “Any person who unlawfully and maliciously cuts, breaks, barks, roots up, or otherwise destroys or damages the whole or any part of any tree, sapling, or shrub, or any underwood, growing in any park, pleasure ground, garden, orchard, or avenue, or in any ground adjoining or belonging to any dwelling house...is liable...”
Ecosystems: Designation and Management of Protected Areas	
State Lands Act Ch. 57:01 (rev. 2009)	Under the <u>State Lands Act Ch. 57:01 (rev. 2009)</u> the Commissioner of State Lands is effectively the landlord for lands including forests belonging to the State. Approximately thirty six forest reserves have been designated under the <u>State Lands Act Ch. 57:01 (rev. 2009)</u> and its predecessor <u>Crown Lands Act</u> . Forest reserves have been established to primarily manage timber resources through a permitting system.
Conservation of Wildlife Act Ch. 67:01 (rev. 2009)	<u>Section 3(2) of the Conservation of Wildlife Act Ch. 67:01 (rev. 2009)</u> , provides for the establishment of game sanctuaries. The First Schedule to the <u>Conservation of Wildlife Act</u> lists the twelve game sanctuaries declared pursuant to Section 3(2) in Trinidad and Tobago. Game sanctuaries have been designated for the protection of the hunting and taking of wild animal species within a specific area.
Forests (Prohibited Areas) Order	The <u>Forests (Prohibited Areas) Order</u> made under Section 2 of the <u>Forests Act</u> designates two categories of prohibited areas being areas forming part of a Forest Reserve or State Lands declared by the Minister. The Order lists thirteen specified areas being part of a Forest Reserve or State lands and nine game sanctuaries as prohibited areas. A number of these prohibited areas are also declared as forest reserves under the State Lands Act and as Wild Life Sanctuaries under the Conservation of Wildlife Act.
Environmental Management Act Ch. 35:05 (rev. 2009)	The <u>Environmental Management Act Ch. 35:05 (rev. 2009)</u> provides for the designation of sensitive areas. <u>Section 41</u> of the EM Act states: “(1) The Authority may prescribe in accordance with section 26(e) the designation of a defined portion of the environment within Trinidad and Tobago as an environmentally sensitive area.”
Environmentally Sensitive Areas Rules, 2001	The <u>Environmentally Sensitive Areas Rules, 2001</u> rules were made to empower the designation of sensitive areas. <u>Section 3(1)</u> of the Rules lists the four circumstances under which the EMA may declare an area to be environmentally sensitive. These Rules provide support for the designation of species as being environmentally sensitive through the protection of their habitat.

Legislation	Summary
Chaguaramas Development Authority Act Ch. 35:02 (rev. 2009)	The Chaguaramas area of the North Western Peninsula of the island of Trinidad has been developed pursuant to legislation and the rights vested in the Chaguaramas Development Authority under the <u>Chaguaramas Development Authority Act Ch. 35:02 (rev. 2009)</u> . The Act places the responsibility on the CDA regarding the establishment and maintenance of green spaces. <u>Section 14(3)(b)</u> of the Act provides: that the CDA may provide and maintain car parks, piers, public parks or gardens and other public amenities. <u>Section 21(1)</u> of the Act also prohibits the occupation and possession of lands vested in the CDA without its permission.
Water and Sewerage Authority Act Ch. 54:40 (rev. 2009)	The Water and Sewerage Authority pursuant to the <u>Water and Sewerage Authority Act Ch. 54:40 (rev. 2009)</u> has been vested with the powers to restrict land use and activities to protect against pollution to its water supply.
Marine Areas (Preservation and Enhancement) Act Ch. 37:02 (rev. 2009)	Protected marine areas may be declared under the <u>Marine Areas (Preservation and Enhancement) Act Ch. 37:02 (rev. 2009)</u> . Only one area has been designated a restricted area which is the Buccoo Reef off Tobago. Regulations have also been made to prevent the removal of any fish, bird or mangrove from restricted areas as per <u>Regulations 3(1)(c) and (d) of the Marine Areas [Preservation and Enhancement] Regulations (rev. 2009)</u> .
Fisheries Act 67:51 (rev. 2009)	The <u>Fisheries Act 67:51 (rev. 2009)</u> also provides for the declaration of prohibited areas that may be used to protect spawning grounds of commercially important species of fish. To date no prohibited areas have been declared.
National Trust of Trinidad and Tobago Act Ch. 40:53 (rev. 2009)	<u>Section 4</u> of the <u>National Trust of Trinidad and Tobago Act Ch. 40:53 (rev. 2009)</u> provides for the establishment of the National Trust of Trinidad and Tobago. The National Trust of Trinidad and Tobago has been vested with the powers to protect the built heritage of Trinidad and Tobago and any associated natural ecosystem.
Ordinance - Tobago Main Ridge	The Tobago Main Ridge Forest Reserve is on record as the oldest legally protected forest reserve geared specifically towards a conservation purpose. It was established on April 13th, 1776 by an Ordinance which states in part, that the reserve is "for the purpose of attracting frequent showers of rain upon which the fertility of lands in these climates doth entirely depend". The Main Ridge Reserve was submitted in 2011 as a UNESCO World Heritage Sites and is currently on its tentative listing.

Legislation	Summary
Ecosystems: Related Legislation	
Agricultural Fires Act Ch. 63:02 (rev. 2009)	The <u>Agricultural Fires Act Ch. 63:02 (rev. 2009)</u> regulates the setting of fires and the establishment of a fire season.
Sawmills Act Ch. 66:02 (rev. 2009)	The ability to operate a sawmill is controlled by the Conservator of Forests under Sections 2 and 9 of the <u>Sawmills Act Ch. 66:02 (rev. 2009)</u> . The regulation of the operations can assist in controlling unauthorised cutting of timber by removing the natural market for such illicit activities.
Agricultural Small Holdings Tenure Act Ch. 59:53 (rev. 2009)	The <u>Agricultural Small Holdings Tenure Act Ch. 59:53 (rev. 2009)</u> was created to provide security for small farmers who comprise the bulk of agricultural practitioners in T&T.
Minerals Act Ch. 61:03 (rev. 2009)	The <u>Minerals Act Ch. 61:03 (rev. 2009)</u> seeks to regulate mining (non petroleum resources) in Trinidad and Tobago. Pursuant to the Act, the Director of Minerals is required to advise the operators of mines, in consultation with relevant Ministries, on methods of rehabilitation of lands and to enforce the rehabilitation of State lands affected by mining in consultation with relevant Ministries.
Ecosystems: Management of Wetland Resources	
Malaria Abatement Act Ch. 28:50 (rev. 2009)	The <u>Malaria Abatement Act Ch. 28:50 (rev. 2009)</u> seeks to regulate the spread of malaria through the management of breeding grounds such as swamp areas for vectors.
Ecosystems: Management of Water Resources	
Town and Country Planning Act Ch. 35:01 (rev. 2009)	The <u>Second Schedule, Part IV, Clause 8 of the Town and Country Planning Act Ch. 35:01 (rev. 2009)</u> , provides that: “development plans can make provisions for “prohibiting, regulating and controlling the deposit or disposal of waste materials and refuse, the disposal of sewage and the pollution of rivers, lakes, ponds, gullies and the seashore.”
Dry River Act Ch. 26:50 (rev. 2009)	<p><u>Section 9 of the Dry River Act Ch. 26:50 (rev. 2009)</u> provides:</p> <p>“The Corporation may make Bye-laws and Regulations for all or any of the following purposes: (c) forbidding absolutely or regulating the drainage from any public or private sewer or drain into the said River; (d) for the prevention of the deposit of filth or rubbish in the bed or on the banks of the said River between the limits mentioned above.”</p>

Legislation	Summary
Waterworks and Water Conservation Act Ch. 54:41 (rev. 2009)	<u>Section 15 (1) of the Waterworks and Water Conservation Act Ch. 54:41 (rev. 2009)</u> provides: “The Minister may make regulations for the governance of Water Improvement Areas and, without prejudice to the generality of this power, any such regulations may make provision for -... (g) the maintenance, preservation, and safeguarding of the waterworks in the Areas.”
Water Improvement Area (Caroni Irrigation), Regulation made pursuant to the Waterworks and Water Conservation Act (rev. 2009)	<u>Section 7 of the Water Improvement Area (Caroni Irrigation), Regulation made pursuant to the Waterworks and Water Conservation Act (rev. 2009)</u> provides: “Any person who shall, without authority, fish by means of a fish trap in any irrigation works is liable...”
Highways Act Ch. 48:01 (rev. 2009)	<u>Section 36(3) of the Highways Act Ch. 48:01 (rev. 2009)</u> , provides: “If a person, without the consent of the highway authority, alters, obstructs or interferes with a ditch, gutter, drain, watercourse, bridge, culvert, tunnel, pipe or barrier which has been constructed, laid or erected by the Authority...or which is under its control...that person is liable..”
Municipal Corporations Act Ch. 25:04 (rev. 2009)	<u>Section 145</u> provides: “A person who impedes the free flow of water in- (a) any ditch, drain or water-course in or adjoining any street within a Municipality; (b) any ditch, drain or water-course on any land into or through which water from any such street flows or any ditch, drain or water-course under any such street, is guilty of an offence. <u>Section 232(i)</u> provides: “Municipal Corporations are responsible for the “maintenance, control and enhancement of the physical environment including-monitoring water-courses, beaches and water-front areas, swamps, forests, game sanctuaries, savannas, parks and other open spaces.” <u>Section 232(f)</u> provides: “The following function is exercisable by a Corporation in the Municipality in addition to those already vested in it under this Act the provision, maintenance and control of such parks, recreation grounds, beaches and other public spaces as the president may from time to time by Order prescribe.”
Summary Offences Act Ch. 11:02 (rev. 2009)	<u>Section 18 of the Summary Offences Act Ch. 11:02 (rev. 2009)</u> provides: “Any person who unlawfully and wilfully takes and destroys any fish in any water which is private property is liable to a fine of one hundred dollars in addition to the value of the fish taken or destroyed.”

Legislation	Summary
Archipelagic Waters and Exclusive Economic Zone Act Ch. 51:06 (rev. 2009)	<u>Section 12 (2) of the Archipelagic Waters and Exclusive Economic Zone Act Ch. 51:06 (rev. 2009)</u> provides: “The passage of a foreign ship shall be considered prejudicial to the peace, good order or security of Trinidad and Tobago where it engages in the archipelagic waters in the following activities... (h) any act of wilful and serious pollution contrary to the Convention (i) any fishing activities without the consent of the Minister... Contravention of this section will result in liability on summary conviction to a fine of twenty-five thousand dollars and to imprisonment in Trinidad and Tobago.”
Continental Shelf Act Ch. 1:52 (rev. 2009)	<u>Section 3(1) of the Continental Shelf Act Ch. 1:52 (rev. 2009)</u> provides: “Any rights exercisable by T&T outside territorial waters with respect to the seabed and subsoil and their natural resources are hereby vested in the State. (2) A person who conducts or attempts to carryout any activities...without first having obtained a licence from the Minister, shall be deemed to have infringed these rights.”
Motor Launches Act Ch. 50:08 (rev. 2009)	The regulation of motor launches is covered by the <u>Motor Launches Act Ch. 50:08 (rev. 2009)</u> , which under <u>Section 4</u> , requires annual inspection. This inspection is used to ensure that unseaworthy vehicles are not allowed on the waters of T&T, thus minimising the environmental impact.
Shipping Act Ch. 50:10 (rev. 2009)	The regulation of merchant vessels is done under the <u>Shipping Act Ch. 50:10 (rev. 2009)</u> which by <u>Section 316</u> empowers the detention of ships that may be unsafe or unfit to proceed to sea. This action can be used to ensure that unseaworthy vehicles are not allowed on the waters of T&T, thus minimising the environmental impact.

Chapter 6 Recommendations

Introduction

At the CBD's Tenth Conference of the Parties (COP10) in Nagoya in 2010, country parties determined a new biodiversity strategic plan for 2011–2020 and within this plan developed the Aichi Targets (refer to Chapter 1 for more information on the Aichi Targets). At the COP10, parties also took a decision to revise and update National Biodiversity Strategy and Action Plans (NBSAPs) in the context of the new strategic plan, ensuring that the Aichi targets are mainstreamed with NBSAPs. In this regard, in 2011, T&T began preliminary efforts towards revising its NBSAP. The following overarching conclusions can be made after an assessment of all available information on biodiversity resources, policy and management in T&T:

1. There is need for strengthening of the legal policy and regulatory frameworks for biodiversity management;
2. There is need for revision of the current national biodiversity management framework;
3. There is little evidence of mainstreaming of biodiversity in T&T, and there is need for a more strategic approach for mainstreaming.

The remainder of this chapter therefore focuses on recommendations for addressing each of these conclusions.

Strengthening the Legal, Policy and Regulatory frameworks for Biodiversity Management

Despite the existence of numerous laws relating to biodiversity, many are obsolete or require revision to reflect current management trends in biodiversity. While initiatives have been undertaken to review and revise some of these laws (such as the Forests Act and the Conservation of Wildlife Act), many remain in draft form and are yet to be enacted. It is estimated that there are approximately four pieces of biodiversity-related legislations which are in draft, approximately five which are now obsolete and approximately twenty two which require revision. In addition, there is an urgent need for the development of new policies and legislations, particularly with regard to the management and trade of wildlife in T&T.

There currently exists a fragmented and uncoordinated approach to the conservation of biodiversity. The existing policy and legislative framework provides basic protection for species of flora, fauna and ecosystems in T&T, and management approaches have been largely reactive in nature. This is indicated by the fact that it is species or habitats which have been identified as environmentally sensitive, severely degraded or highlighted by the public as flagships, which have received direct protection. Furthermore, no policy regarding wildlife or species protection has been implemented to date.

There is a clear need for a holistic approach to biodiversity conservation. The National Environmental Policy (NEP), the new National Forest Policy (NFP) and the National Protected Areas Policy (NPAP) sets out a comprehensive strategy for moving forward for the protection of forest resources and protected areas.

In a bid to improve biodiversity management in T&T, creation of fiscal incentives to promote the conservation of biological resources is a potentially effective tool. One such incentive is the creation of a system for the Payment for Ecosystem Services (PES). As an initial step, the use of public payment schemes, whereby the GoRTT purchases ecosystem services, would appear to be the most attractive option. However, the legislative framework would need to be amended to facilitate such a scheme.

The recommended amendments to the existing policy and legislative framework relating to biodiversity are identified below:

1. Regulations and/or guidelines regulating the import and export of flora and fauna into Trinidad and Tobago which are consistent with international conventions to which Trinidad and Tobago is a signatory (such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora) need to be enacted and/or issued.
2. Rules need to be issued in accordance to the Forestry Act which is responsible for the preservation and protection of trees remarkable for size, rarity or beauty throughout Trinidad and Tobago.
3. Amendment of the Conservation of Wildlife Act to include provision for the development of management and recovery plans for species designated as protected.
4. Amendment of the Conservation of Wildlife Act to include provision for the regulation of the hunting of partially protected species of fauna during the open season on privately owned land.
5. Amendment of the Conservation of Wildlife Act to establish a mechanism for monitoring, identification and verification of specimens hunted pursuant to a hunting licence.
6. Amendment of the Forests Act to make provision for protection for an individual of a species of fauna.
7. Amendment of Fisheries Act to permit the designation of temporary marine protected areas.
8. Amendment of Forests Act, State Lands Act and other applicable laws to promote community co-management of private lands which are situated within areas designated as protected.
9. Implementation of Convention of Wetlands (Ramsar, Iran, 1971) into domestic legislation.
10. The consolidation of the Conservation of Wildlife Act, Forests Act and Sawmills Act to regulate issues relating to forests, wildlife and protected areas.
11. The establishment of a Forest, Wildlife, Parks and Protected Areas Authority mirrored after the organisational structure of the Environmental Management Authority.

12. The removal of the regulation of environmentally sensitive species and environmentally sensitive areas in Trinidad and Tobago to the Forest, Wildlife, Parks and Protected Areas Authority. It is recommended that the Environmental Management Authority will therefore have responsibility for pollution and development while the Forest, Wildlife, Parks and Protected Areas Authority will have responsibility for the management of forest, wildlife, parks and protected areas.

National Biodiversity Management Framework: Institutional and Governance Frameworks

At present national biodiversity management in Trinidad, and to a lesser extent in Tobago, is in principle, centralized and managed by the Environmental Management Authority (EMA) and the Ministry of Environment and Water Resources (MEWR). Together the EMA and the MEWR take responsibility for leading the development and implementation of environmental policies, plans and strategies; for initiating and supporting environmental-related activities; and for meeting the country's obligations to international environmental treaties and agreements. In a cabinet reshuffle in June 2012, the environmental portfolio was removed from the Ministry of Housing and the Environment, and placed under a newly created Ministry of Environment and Water Resources. This move can result in greater political priority being placed on the environmental sector with greater opportunities for resources devoted to biodiversity and ecosystem management. The cabinet reshuffle also created 30 other ministries, many of which are involved in decision-making and implementation of policies that impact biodiversity. *Table 6.1* provides a qualitative assessment of the stakes that selected ministries hold with respect to biodiversity in T&T. A review of biodiversity management programmes indicates that civil society is increasingly playing a role in key aspects of biodiversity management such as education and raising awareness, research and monitoring, and capacity building for biodiversity management.

In Tobago, the Tobago House of Assembly (THA) has a memorandum of agreement with the EMA to support the implementation of the EMA's mandate in Tobago, working principally through the THA's Department of Natural Resources and the Environment and supported by a number of other divisions including agriculture, marine and fisheries resources, and tourism and transportation. The strong environmental NGO lobby in Tobago has facilitated greater inclusion of civil society inputs into biodiversity management planning, decision-making and implementation, and an overall more decentralized approach for biodiversity management when compared with Trinidad.

Table 6.1. Government Ministries in Trinidad and Tobago with a stake in Biodiversity Management.

Government Ministries	Stake		
	Low	Medium	High
Ministry of Community Development	√		
Ministry of Education		√	
Ministry of Energy and Energy Affairs		√	
Ministry of Finance and the Economy		√	
Ministry of Food Production			√
Ministry of Foreign Affairs	√		
Ministry of Health			√
Ministry of Housing			√
Ministry of Labour and Small and Micro-Enterprises Development	√		
Ministry of Legal Affairs	√		
Ministry of Local Government		√	
Ministry of National Security	√		
Ministry of Planning and Sustainable Development			√
Ministry of Public Administration		√	
Ministry of Public Utilities			√
Ministry of Science and Technology	√		
Ministry of Tertiary Education and Skills Training			√
Ministry of the People and Social Development	√		
Ministry of Tobago Development			√
Ministry of Tourism			√
Ministry of Trade, Industry and Investment		√	
Ministry of Transport			√
Ministry of Works and Infrastructure			√

6.1.1 Need for Revision of Current Biodiversity Management Framework

The current biodiversity management framework in Trinidad is weakened by its highly centralized nature which serves to reduce collaboration among many of the stakeholders involved in biodiversity management; these stakeholders are listed in *Table 6.2*. At the government level, a highly sectoral approach to policy development and implementation exists which creates limited opportunities for: (i) aligning sectoral policies with those of the EMA or MEWR, (ii) examining how different policies affect biodiversity, and (iii) monitoring the impacts of sectoral policies on biodiversity. At the level of civil society, the highly centralized biodiversity management framework results in biodiversity management planning and decisions made without inputs from NGOs, CBOs and local authorities. These stakeholders are involved in on-the-ground implementation of biodiversity management projects, institutions undertaking

research projects in biodiversity and ecosystem services, and the private sector that funds many biodiversity initiatives. Biodiversity management decisions often tend to reflect limited ability for improving the state of biodiversity, low resonance with development needs, and limited buy-in and support from civil society due to a highly centralized structure, low political priority and lack of coordination of efforts.

Table 6.2. List of Stakeholders in Biodiversity Management in Trinidad and Tobago.

<u>TT Government Ministries and Agencies</u>	<u>Civil Society</u>
<p>Central Statistical Office (CSO) Commissioner of State Lands (CSL) Department of Marine Resources and Fisheries, Tobago (DMRF) Department of Natural Resources and the Environment, Tobago (DNRE) Division of Tourism and Transportation, Tobago (DTTT) Environmental Management Authority of Trinidad and Tobago (EMA) Forestry Division Green Fund Institute of Marine Affairs (IMA) Ministers of Parliament (MPs) Ministry of Energy and Energy Affairs (MEEA) Ministry of Environment and Water Resources (MEWR) Ministry of Community Development (MCD) Ministry of Finance and the Economy (MFE) Ministry of Food Production (MFP) Ministry of Local Government (MLG) Ministry of Planning and Sustainable Development (MPSD) Ministry of People and Social Development (MPSoD) Ministry of Science and Technology (MST) Ministry of Tobago Development (MTD) Ministry of Tourism (MoT) Ministry of Works and Infrastructure (MWI) National Wetlands Committee Office of Disaster Preparedness and Management (ODPM) Office of the Prime Minister (OPM) Tobago House of Assembly (THA) Town and Country Planning Division (TCPD)</p>	<p>Academics/ Researchers Caribbean Agricultural Research and Development Institute (CARDI) Centre for Agricultural Bioscience International (CABI) Community Organisations Farmers and Farmer Associations Fishers and Fishing Associations Hunters and Hunter Associations Individual opinion shapers Media Small and Medium Enterprise (SMEs) Tobago ENGOs and CBOs including Environment Tobago Trinidad ENGOs and CBOs including Caribbean Natural Resources Institute (CANARI) and The Cropper Foundation (TCF) Sustainable Economic Development Unit (SEDU)</p>

Water and Sewage Authority of Trinidad and Tobago (WASA)	
<p style="text-align: center;"><u>Private Sector</u></p> <p style="text-align: center;">Chambers of Commerce Embassies Energy and non-energy companies Tobago Tourism Private Sector Yacht Owners</p>	<p style="text-align: center;"><u>Intergovernmental Organisations</u></p> <p style="text-align: center;">Association of Caribbean States (ACS) Caribbean Community (CARICOM) Food and Agricultural Organisation of the United Nations (FAO) UNDP GEF Small Grants Programme (SGP) Inter-American Development Bank (IDB) Organisation of American States (OAS) United Nations Economic Commission for Latin America and the Caribbean (UNECLAC) United Nations Educational Scientific and Cultural Organisation (UNESCO) United National Environment Programme Global Environment Facility (UNEP GEF) United National Environment Programme Regional Office for Latin America and the Caribbean (UNEP ROLAC)</p>

All signs point to a biodiversity management framework where efforts are coordinated by the EMA and/or MEWR; decision-making for biodiversity management is done in an ongoing participatory manner; and responsibility for management is effectively shared among the different sectors that impact or manage biodiversity. These sectors include civil society which currently undertakes a significant amount of research and implementation of biodiversity management projects. Such a framework would be in keeping with global efforts by the CBD and others to mainstream biodiversity into national sectors. Additionally, there have been multi-stakeholder committees that have been established for certain aspects of biodiversity management. These include the National Wetlands Committee, the Buccoo Reef Management Committee, the Land Reclamation Committee, the Biodiversity Advisory Council, the National Sea Turtle Task Force, and there are plans underway for the establishment of a Parks and Protected Areas Policy. *Box 6.1* provides a description of each of these committees.

Box 6.1. National Biodiversity-Related Management Committees in T&T.

- The National Wetlands Committee (NWC) was established in Trinidad & Tobago as a Cabinet-appointed multi-stakeholder coordinating committee for wetlands management, directly catalysed by requirements of the Ramsar Convention. This body became the key driver for wetlands management in Trinidad & Tobago, including implementation of the Ramsar vision, framework of principles and strategic plan through the National Wetlands Policy and annual workplans. The role of the NWC is in setting policy directions, strategies, developing projects and capacity-building. The NWC intends to establish local multi-stakeholder Cabinet-appointed management committees for all Ramsar sites in Trinidad & Tobago to implement strategies that are developed by the NWC at the local level (*CANARI Policy Brief 9*).
- The Buccoo Reef Management Committee (BRMC) - The BRMC was set up as the committee to oversee the management of the Buccoo Reef as an environmentally sensitive area. The role of the Committee is to oversee the management of the Buccoo Reef Marine Park and to achieve the Objectives of Designation as stipulated in the Buccoo Reef National Park Notice 2004, in accordance with the Management Plan prepared by the IMA in 1995. The BRMC comprises representatives of:
 - State agencies - the T&T Coast Guard, IMA, Fisheries Department, THA Department of Natural Resources and the Environment, EMA, Department of Tourism, Trinidad and Tobago Police Service, Maritime Services Division
 - Civil society - a Buccoo Reef Tour Operator, Buccoo Village Council, Mt Pleasant Credit Union, and Canaan/Bon Accord Village Council, BRT, Southwest Fishing Association, Environment Tobago.
- Land Reclamation Committee of Trinidad and Tobago (LRC) - established by Cabinet in December 2006 to review applications for land reclamation and other coastal structures, whilst ensuring that subject to environmental or hazard considerations, all residents of Trinidad and Tobago are granted free access to beach fronts. The Committee's appointment ended in May 2009 but was re-instated in 2010.
- The National Sea Turtle Task Force - in May 2012, the EMA proposed the creation of a National Sea Turtle Task Force (which included a wide cross section of stakeholders), as recommended in the Sea Turtle Recovery and Action Plan (STRAP), to oversee the management of sea turtles in Trinidad and Tobago. This recommendation came as a result of years of an intensive stakeholder participatory approach which resulted in the STRAP. However, in August 2012, under the new ministry of Environment and Water Resources a new ministerial committee – Sea Turtle Management Committee, comprising solely of ministerial agencies to undertake the same functions of the proposed Task Force.
- The Biodiversity Advisory Council (BAC) was established in 2005 to plan strategically for the implementation of biodiversity related programmes, plans, policies and legislation including NBSAP, Wetlands Policy and National Environmental Policy (NEP). The BAC comprises 13 representatives from governmental agencies, NGOs and the EMA. It is worth noting the functions of the BAC since they are in keeping with the recommendations put forward for the establishment of a biodiversity management committee. The functions of the BAC are to:
 - Provide advice to the Board of the EMA regarding the management of natural resources, environmentally sensitive areas and species;
 - Prepare recommendations, decisions or other programmes and measures with a view to:
 - Protecting or conserving ecosystems and biodiversity or components thereof such as certain species, habitats and sites of ecological importance;
 - Coordination of research to support planning and implementation
 - Serve as liaisons between communities, management committees and the EMA;
 - Recommend and advise on financial mechanisms and other resources to assist in the management of biological diversity;
 - Advise on programmes for education and public awareness;
 - Undergo various capacity building exercises to make proficient decisions concerning the management of biodiversity.

Sources: IMA, 2012¹⁵⁶; Homer, 2005¹⁵⁷

¹⁵⁶ Institute of Marine Affairs (IMA), (2012). Partnerships. Retrieved from <http://www.ima.gov.tt/home/partnerships.html>

¹⁵⁷ Homer, F. (2005). National Capacity Needs Self-Assessment: Background and Approach to Initiating Capacity Building for Implementation of the Rio Conventions. The Trust for Sustainable Livelihoods. Retrieved from <http://www.sustrust.org/documents/NCSA%20Trinidad%20background%20and%20approach%20Jun05.pdf>

Mainstreaming Biodiversity

Mainstreaming is the integration of biodiversity and ecosystem services concerns into the full range of decision-making across governments, business and wider society as a means of addressing underlying causes (drivers) of biodiversity loss. Recent attempts at mainstreaming have placed focus on sectors that have not been traditionally involved in biodiversity issues, such as economic and development planning sectors. A major aspect of mainstreaming is communicating the importance of biodiversity to human well-being and consequently its loss, and incorporating the economic value of biodiversity and the ecosystem services that it underpins as an input in decision-making.

A very compelling argument can be made for integrating biodiversity into the planning processes of other sectors in T&T, as it has been identified that sectors such as housing, agriculture, tourism, and mining and extraction, are major drivers of biodiversity degradation and loss. However, mainstreaming of biodiversity has been undertaken by only a few sectors and in a manner that suggests an opportunistic rather than a strategic approach and lack of an overall mainstreaming strategy.

There are a few examples of mainstreaming in T&T:

1. The government's current Medium Term Policy Framework, 2011-2014 mentions biodiversity in the context of promoting agricultural production and food security, and has included environmental sustainability as part of its ecotourism, water management and waste management plans.
2. The Certificate of Environmental Clearance process is of key importance in mainstreaming biodiversity as it requires Environmental Impact Assessments to be undertaken for certain development activities with a potential significant effect on the environment.
3. An opportunity for mainstreaming biodiversity is in the development of a National Spatial Development Plan (NSDP) led by the Ministry of Planning and Development, and coordinated by a multidisciplinary cabinet-appointed committee that includes a prominent biodiversity specialist. The process of developing the NSDP calls for the development of spatial development scenarios which must consider environmental management within its strategy. In addition, the Project for Ecosystem Services (*Box 6.2*) is expected to provide inputs for the NSDP on the spatial location of important ecosystem services.

Box 6.2. The Project for Ecosystem Services in T&T – A New Government Initiative.

The Project for Ecosystem Services (ProEcoServ) was launched in 2010 by the United Nations Environment Programme (UNEP) with funding from the Global Environment Facility (GEF). It is a four-year, global initiative that aims to better integrate ecosystem assessment, scenario development and economic valuation of ecosystem services into national sustainable development planning in countries that were involved in the original Millennium Ecosystem Assessment. The project is expected to develop the capacity of decision makers, users and beneficiaries of ecosystem services to assess trade-offs and development choices that contribute to strengthened biodiversity and ecosystem resilience, and to develop and apply appropriate ecosystem management tools within sectoral planning frameworks and macroeconomic planning models.

The Trinidad and Tobago component of ProEcoServ began in December 2010 and is being led locally by the government of Trinidad and Tobago and the University of the West Indies (UWI) through the Department of Life Sciences at the St. Augustine Campus, and is supported by The Cropper Foundation. Activities are being implemented in three sites around the country - the Nariva Swamp, the eastern Northern Range, and the Buccoo area in Tobago. The focus is on bundles of key ecosystem services that are important to supporting human well-being both within pilot sites, and the country at large. These services include the following: erosion regulation, carbon sequestration and storage, agriculture, pollination, and coastal erosion.

The main outputs of the local ProEcoServ project include:

- Valuation, and assessment of tradeoffs between and amongst ecosystem services studied in each of the three pilot sites and spatial mapping of these data
- Working with relevant government agencies in T&T to identify opportunities for inclusion of ecosystem services into national development strategies, and other environment/development laws and instruments
- Review the national accounting system in T&T and identify opportunities for greater inclusion of ES through the development of a method for doing so (using the eastern Northern Range as the pilot site)
- Development of a case study for Payment for Ecosystem Services in one of the case study sites

Source: CCC, 2012¹⁵⁸

Conclusion

The recommendations made for improving biodiversity management in T&T are by no means exhaustive. It has been established that there are many aspects of biodiversity management which need to be addressed, and it is therefore highly unlikely that biodiversity management in T&T will be drastically improved overnight. However, one of the first steps for biodiversity management should be the establishment of a biodiversity management committee. Following this, the committee can then prioritize actions to be taken for improving national biodiversity management in Trinidad and Tobago.

¹⁵⁸ Coral Cay Conservation, (2012). *Tobago Coastal Ecosystems Mapping Project: Final Report- Results of Community and Scientific Work*. Retrieved from <http://www.coralcay.org/science-research/scientific-reports/>

**PART B: ACTIVITIES, ACCOMPLISHMENTS AND PLANS FOR
THE EMA**

ACTIVITIES, ACCOMPLISHMENTS AND GOALS OF THE EMA

Strategic Goals

TO PROTECT AND IMPROVE AIR QUALITY TO REDUCE AND ELIMINATE ANY RISK TO HUMAN AND ECOSYSTEM HEALTH

Establishment of a Second Ambient Air Quality Monitoring Station

The Environmental Management Authority (EMA) installed a second Ambient Air Quality Monitoring (AAQM) Station on the port of Pt. Lisas. The station is serviced and maintained by Rose Environmental Limited.

TO PROTECT AND RESTORE THE WATER QUALITY OF INLAND AND NEAR-SHORE COASTAL WATERS TO SAFEGUARD HUMAN HEALTH AND ECOSYSTEMS HEALTH

The Water Pollution Rules, Permitting Process

For 2012, a sector specific approach was pursued for permitting beginning with the water and wastewater sector. Based on information contained in Source Register database 50 such facilities were identified as eligible for permitting. The Permits issued in 2012 are as follows:

- ArcelorMittal Point Lisas Limited
- WASA Frederick Settlement Wastewater Treatment Plant
- WASA Carlsen Field Wastewater Treatment Plant
- WASA Caroni Water Treatment Plant
- WASA Couva North Wastewater Treatment Plant
- WASA North Oropouche Water Treatment Plan
- WASA Caura Water Treatment Plant
- WASA Acono Water Treatment Plant
- WASA Lluengo/Narango Water Treatment Plan
- WASA Lange Park Wastewater Treatment Plant
- WASA Edinburg Wastewater Treatment Plant
- WASA Maloney Wastewater Treatment Plant
- WASA Curepe Wastewater Treatment Plan
- Sissons Paints Limited (*subsequently cancelled*)
- S.M. Jaleel & Company Limited
- Ansa McAl Chemicals Limited
- Universal Foods Limited

- Nutrimix Feed Limited (Marabella)

Also undertaken in 2012 were education and public initiatives (involving the print and electronic media) aimed at sensitising the public about the Water Pollution Rules (WPR), that is, the responsibility of companies under these rules, how they will benefit the public and what the EMA has accomplished so far in implementing them. The following are some specific deliverables:

- A survey was developed (10 questions) using ‘Survey Monkey’ to assess industry perception of the WPR and knowledge of water pollution in general. The survey was posted on the EMA’s website and social media sites for the period May 11 to July 11 (74 persons participated). Three (3) persons who completed the survey in full were randomly selected and awarded a prize. The results indicated a lack of understanding in:
 - differentiating between the Source Registration and Permitting processes; and
 - the differences between the First Schedule and the Second Schedule.
- Press releases were developed regarding permitting initiatives within East Port of Spain, and regarding the Water Pollution Permit (WPP) status for the Arawak 2 Processing Division and ArcelorMittal, Point Lisas Limited facilities.

Demonstration of Water Quality Testing Equipment

The EMA facilitated a water testing exercise with a Form 4 Biology class at the Caribbean Union College Secondary School, in Maracas. After discussions with the class, demonstrations along with explanations were conducted at the Maracas River. At the end of the session students received a basic understanding of how to operate the instruments used to test water quality and to identify changes in the quality of water using these instruments. They were also more informed of the impacts that human activities can have on the quality of water and how those impacts can affect entire ecosystems.

TO PROTECT COMMUNITIES AND ECOSYSTEMS FROM THE HEALTH CONSEQUENCES OF HAZARDOUS CHEMICALS SPILLS AND THE UNSAFE HANDLING AND DISPOSAL OF SOLID AND HAZARDOUS WASTES

Competent Authority Functions under the Basel Convention on the Control of Transboundary Movements Of Hazardous Wastes and their Disposal

As the designated Competent Authority for the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal (Basel Convention), the EMA manages the notification process as defined by the convention. The EMA processed eight (8)

Notifications for Export (six [6] for France, one [1] for South Korea and one [1] for Canada which was subsequently withdrawn).

Investigation – Impact of Odour on the St. Barbara's Spiritual Shouter Baptist Primary School, Mausica

On March 26, 2012 the EMA received several complaints regarding the stench emanating from the A2PD facility located in Mausica. Site visits to the A2PD facility were conducted to assess site conditions and impart recommendations for amending the concern. Through discussions with A2PD measures were identified and implemented to control the odour problem included de-sludging of existing ponds; decommissioning of old ponds, which were the major source of the stench; increasing aeration of the wastewater; installing concrete surfaces for easy maintenance of the ponds and re-designing the wastewater treatment system.

A follow up site visit was conducted on August 22, 2012 by the EMA to the A2PD facility to verify site conditions and progress since April 2012. During this visit, the EMA confirmed that there was no significant stench emanating from the facility and that other processing improvements were ongoing. Consultations were also held with representatives from the Education Facilities Company Limited who were working at the nearby primary school since the time of the complaint, and they informed that there has been “a great improvement” with regards to the foul odour since the intervention of the EMA.

Investigation – Potential Breach of a Certificate of Environmental Clearance

In July 2012, the EMA investigated reports that the Home Construction Company Limited (HCL) breached the conditions in a CEC that was issued to HCL in 2004 for the construction of a residential area in Santa Rosa and remediation of a lead contaminated site for the development of a residential community (The Crossings). According to the conditions of the issued CEC, a lead contaminated area encapsulated in concrete present on the site would be a restricted area. However, upon investigation the EMA discovered works in a lead containment area and the construction of a retention pond which was not approved by the EMA.

HCL was served a Notice of Violation (NOV) by the EMA and HCL in the short term was required to stop all works on the lead contaminated site, fence the area and label it a hazardous waste site.

The EMA provided oversight in regards to soil and water quality sampling, guidance in the review of analytical reports of the testing results and evaluation of consultant proposals to identify a suitable company with the expertise to undertake the required remediation works.

TO PROTECT, CONSERVE, AND/OR RESTORE SELECTED ECOSYSTEMS AND SPECIES TO ENSURE THE BIODIVERSITY OF TRINIDAD AND TOBAGO IS SUSTAINED

National Biodiversity Assessment Project

The National Biodiversity Assessment of Trinidad and Tobago (NBATT) was a collaborative effort among the EMA, the University of the West Indies and the Cropper Foundation. It took stock of the depth and breadth of biodiversity information in Trinidad and Tobago, in order to establish a baseline for future research, policy and action for sound use of biological resources.

It builds on the findings of the Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity (CBD) (2010), and several other scholarly publications and reports which have been compiled on biodiversity in T&T over the years, by framing its findings and recommendations within the context of the Aichi Targets and their five strategic goals:

1. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
2. Reduce the direct pressures on biodiversity and promote sustainable use
3. Improve the status of biodiversity, by safeguarding ecosystems, species and genetic diversity
4. Enhance the benefits to all from biodiversity and ecosystem services
5. Enhance implementation through participatory planning, knowledge management and capacity building

The final report of the NBATT was submitted to the EMA in December 2012 and the main findings of the report are:

- There is a continuous decline in the structure and function of all major ecosystems in Trinidad and Tobago.
- In many instances, the changes to ecosystems have contributed to economic development but at the expense of key ecosystem services important to human well-being.
- The loss of biodiversity has a significant cost to the national society which depends on the services provided by ecosystems.
- Biodiversity is a significant contributor to agricultural diversification, and has potential for increased economic contributions.
- While significant efforts have been placed on biodiversity related research in the past 20 years, there are still significant gaps in its coverage.

The main recommendations arising out of the assessment are:

- Improved Biodiversity Management can be achieved through Environmental Policy and Legislative change
- The current biodiversity management framework requires urgent revision.
- A more strategic approach to the mainstreaming of biodiversity is needed.
- Suggested requirements for the revision and implementation process of the National Biodiversity Strategy and Action Plan (NBSAP)

Regional Invasive Alien Species Project

Invasive alien species (IAS) are a major threat to the vulnerable marine, freshwater and terrestrial biodiversity of Caribbean islands and the people who depend upon it for their livelihood. As such, Caribbean States have recognised the need for developing an integrated regional strategy and expressed interest in combining their efforts in fulfilling their responsibilities under the international conventions on biodiversity conservation such as Convention for Biological Diversity (CBD), Specially Protected Areas and Wildlife (SPAW) Protocol and the Protocol Concerning Pollution from Land-Based Sources and Activities (LBS Protocol).

The EMA endorsed the regional project “Mitigating the Threats of Invasive Alien Species in the Insular Caribbean”, proposed by CABI through UNEP for funding by the Global Environment Facility (GEF) in 2009.

The Trinidad and Tobago element of the project has associated with it three projects aimed at managing, analysing and mitigating the impact and spread of three species/conditions threatening the country’s biodiversity resources. These species are the Green mussel (*Perna viridis*), Red palm mite (*Raoiella indica*) and the causative fungus of Frosty Pod Rot (*Moniliophthora roreri*). Associated with each project is an analysis of the status of the species locally, pathways of entry and spread, effective mitigation measures and education and awareness.

To date educational material in the form of posters and brochures have been developed for use primarily at ports of entry and for general awareness. These educational materials have been made available to the EMA for inclusion in our educational outreach efforts. In 2012, the National Invasive Species Strategy was finalized by the Committee and focus group consultations were conducted on the document. A plan was also formulated to ensure the sustainability of the IAS Committee after the end of the current GEF funded project in mid 2014.

Aripo Savannas Photography Competition/Calendar

The public education and awareness activities to be implemented in the Aripo Savannas are guided by the Interpretive Management Plan (IP) developed through a participatory process by Caribbean Natural Resources Institute (CANARI) in 2008. The IP communicates the themes and messages that address the conservation requirements of the Aripo Savannas Environmentally Sensitive Area (ASESA) to different target audiences.

In this regard the EMA together with the Aripo Savannas Stakeholders Management Committee (ASSMC) hosted an “Aripo Savannas Revealed” National Photography competition was launched in early June, 2012 with a focus on the biodiversity and conservation of the Aripo Savannas. The objectives of the competition were:

- To promote awareness and interest in the flora, fauna and cultural resources of the ASESA through photography
- To build awareness of and support for management of the ASESA as a unique national resource
- To promote nature photography as a media through which the community can enjoy and appreciate its natural heritage.

There were 199 photographs submitted which were sorted by age and category. Preliminary judging was held in July and a total of 36 photographs were short listed for the final round of judging in August. The results were announced at a prize giving ceremony held in the Marriott Hotel in October which was attended by the Minister of the Environment and Water Resources. The winning photographs were also featured in the EMA’s 2013 annual calendar.

Sea Turtle Symposium

On May 28, 2012 the EMA hosted the first national sea turtle symposium at the Hyatt Regency Center. Invitees included representatives of various Ministries and agencies, scientists, NGOs, CBOs, universities, persons involved in or related to sea turtle conservation as well as companies whose activities could potentially impact on the habitats or lives of these animals. The objectives of this symposium were to announce the plans of the EMA to designate five sea turtle species (leatherback, green, hawksbill, olive ridley and loggerhead) as Environmentally Sensitive Species (ESS) under the ESS Rules 2001, form a Sea Turtle Support Network that could link interested parties in conservation and habitat protection and to provide information and raise awareness on sea turtles.

The symposium was attended by over 200 persons. Special guest speakers included sea turtle expert Professor Scott Eckert who delivered two presentations on this day.

Marine Turtle Conservation Project with Nature Seekers

The EMA met with Nature Seekers (NS) in January 2012 and collaborated with this community-based organization (CBO) on a project that aimed at reducing the number of sea turtles caught and killed in gill nets through providing and encouraging the use of alternative fishing methods. Since then the EMA has been involved in consultations with fishermen in order to determine fishing methods that they were interested in pursuing instead of the harmful gillnets. The project will ensure that 35 selected boat owners from 7 communities along the North East coast use alternative gear instead of gillnets during the leatherback turtle peak nesting season in Trinidad (February to May).

Nature Seekers has sought the expertise of Price Waterhouse Coopers to assist in the revision of the project proposal. Nature Seekers met with various government agencies and the GEF Small Grants Programme during December 2012 to submit and present on the project and currently are awaiting approval. It has been suggested that the project be done in 2 phases, phase one will be a pilot project and will be funded by the GEF-SGP (once approved) and phase 2 will be funded by the Green Fund and will be a larger long-term project (once approved).

Sea Turtle Management Committee

Further to the National Sea Turtle Symposium held by the EMA, one of the objectives was the formation of a national Sea Turtle Support Network of Trinidad and Tobago (STSNTT). The role of the STSNTT was to have the overall responsibility of overseeing the management of the sea turtles to achieve the objectives of designation as Environmentally Sensitive Species (ESS) and the implementation of the Sea Turtle Recovery and Action Plan (Forestry et al. 2010).

The Ministry of the Environment and Water Resources (MEWR) convened a committee in August 2012 under the chairmanship of the Wildlife Section, Forestry Division, to chart the way forward on addressing national sea turtle management, with an emphasis on Grande Riviere. The objectives of the committee are:

1. To assess accessibility and condition of nesting beaches and to determine the nesting density of the various beaches.
2. To determine the extent of coastal and riverine erosion on these nesting beaches
3. To build and improve communication between and amongst state and civil society stakeholders and to network with regional and international marine turtle agencies with the aim of managing marine turtle populations
4. To evaluate the socio-economic benefits derived from turtle nesting activities
5. To assess the impact of land-based and marine-based pollution on turtle nesting sites

6. To investigate the impacts of seismic surveys and offshore oil and gas exploration on marine turtles
7. To determine the impact of fishing operations on offshore foraging marine turtles and make recommendations to eliminate turtle bycatch and mortality in fishing gear
8. To make recommendations to improve *inter alia*: law enforcement and protection of habitats and species both on the nesting and offshore foraging grounds
9. To identify research opportunities for sustainability and protection of marine turtles and
10. To engage in a public awareness and education program with a view to disseminating information on marine turtle conservation and protection

This ministerial committee comprises of relevant agencies and divisions under the MEWR: Forestry Division, EMA, Institute of Marine Affairs, Water and Sewerage Authority (WASA), Environmental Policy and Planning Division (EPPD) and Drainage Division. The EMA's role in the committee is to provide necessary technical support to address sea turtle management in Trinidad and Tobago.

TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT FROM THE EFFECTS OF NOISE AND MAINTENANCE OF THE FUNDAMENTAL RIGHTS OF THE INDIVIDUAL TO ENJOYMENT OF PROPERTY WHILST STILL ALLOWING REASONABLE SOCIAL, CULTURAL AND ECONOMIC ACTIVITY

EMA's 2012 Noise Campaign

The EMA launched its 2012 nationwide Noise Campaign in February 2012 to highlight the chronic issue of Noise in Trinidad and Tobago. The campaign entitled "Music is Our Culture, Noise is Not," specifically targeted event promoters and venue owners. The promotion also focused on those who required relief from noise issues as the police can take action against noise issues under various pieces of legislation.

The noise campaign included ads via press, radio, TV, movie theatre advertising (Movie Towne north and south), AdNet ads located at various locations across T&T, water taxi ads, bus stop shelters, e-billboard advertising, via multiple website ads and through social media. The campaign has brought significant awareness to the general public and was re-introduced for the end of year 2012 celebrations such as: Divali, Christmas, New Years and into Carnival 2013.

TO MODIFY AND/OR DEVELOP LEGISLATION, POLICIES, PROCEDURES AND SYSTEMS TO FACILITATE THE WORK OF THE EMA

Air Pollution Rules (APR)

In February 2012, a further revised draft of the APR (2009) was forwarded to the Minister of Housing and the Environment for consideration. In June 2012, the EMA received from the Office of the Chief Parliamentary Counsel (CPC) the most recent draft of the Air Pollution Rules and the Air Pollution (Fees) Regulations. A final version of the draft APR was settled upon at the pre-Law Review Committee (LRC) meeting in October 2012. On November 21st and November 28th, 2012, both the draft APR 2012 and the Air Pollution (Fees) Regulations 2012 were presented before the LRC and were confirmed.

Noise Pollution Control Rules, 2001 (NPCR)

Pursuant to rule 14 of the NPCR, the former Board of Directors of the EMA appointed the Noise Advisory Council.

Waste Management Rules

In April and May of 2012, the EMA received comments from two (2) key external stakeholders, namely the Ministry of Transport and the Customs and Excise Division, on the draft Waste Management Rules. The Rules were subsequently revised to include the above-mentioned amendments. Based on a directive from the Ministry of Environment and Water Resources, the EMA was instructed to formulate two (2) separate sets of rules namely the Solid Waste Rules and the Hazardous Waste Rules.

Beverage Containers Bill

As at 2012, the responsibility for the revision and finalization of the Beverage Containers Bill reside with the Ministry of Environment and Water Resources. The draft Bill has been significantly modified such that the regulation of the disposal of beverage containers is no longer within the purview of the EMA.

Enforcement

A total of twenty Notices of Violation and six Administrative Orders were issued in 2012 against violators in breach of the Certificate of Environmental Clearance Rules, 2001 and Noise Pollution Control Rules, 2001. Nine Consent Agreements were also executed in 2012.

Enabling Strategies

DEVELOP APPROPRIATE LEGISLATION POLICIES, PROCEDURES, AND SYSTEMS TO FACILITATE THE WORK OF THE EMA

Strategic Assessment for the Quarry Sector in Trinidad and Tobago

Designated Activities 23 and 8 of the Certificate of Environmental Clearance (CEC) Designated Activities Order were amended in 2007 and 2008 respectively and exempted quarries less than 150 acres from requiring a CEC. Recently, the Government of Trinidad and Tobago took steps to reinstate the requirement for quarries of all sizes to apply for a CEC.

The impact of quarrying on our environment has become more visible, particularly over the last few years and therefore measures must be put in place to ensure that we continue to manage our environment along the path of sustainable development.

It is proposed that a project be undertaken to assess the impacts of quarrying on the environment and use the results to identify and address current and future environmental requirements and challenges. The project will also involve the design and conduct of a full Strategic Environmental Assessment (SEA) for the Quarry Sector in Trinidad and Tobago to guide policy and future development plans.

This project is aimed at:

- Identifying areas in Trinidad and Tobago used for quarrying activities
- Understanding the impacts of quarrying on the physical, biological and socio-cultural environment in these areas
- Designing and conducting an SEA for the Quarry Sector in order to promote sustainable development.

CULTIVATE POSITIVE ATTITUDES TO ENVIRONMENTAL PROTECTION AND CONSERVATION THROUGH AWARENESS BUILDING, EDUCATION AND EFFECTIVE COMMUNICATION

National Sea Turtle Symposium

The Environmental Management Authority (EMA) hosted its first National Sea Turtle Symposium on May 28, 2012 at the Hyatt Regency, Trinidad. The event was well received as various Government Ministries and Agencies, CBOs and NGOs, both from Trinidad and Tobago, came out in their numbers to help inform and guide the EMA's designation process of

sea turtles as Environmentally Sensitive Species. They also indicated their support for the launch of the Sea Turtle Support Network for Trinidad and Tobago (STSNTT).

The symposium showcased past and current work regarding sea turtle protection and addressed the implementation of the Sea Turtle Recovery and Action Plan (STRAP) which was developed by the Forestry Division and the Wider Caribbean Sea Turtle Network (WIDECAST).

Attendees at this event amounted to approximately 180 representatives from various concerned individuals and communities across T&T which included: Dr. the Honourable Roodal Moonilal, former Minister of Housing and the Environment; Senator the Honourable Vasant Bharath, former Minister of Food Production, Land and Marine Affairs; Dr. Allan Bachan, Director of Turtle Village Trust; Dr. Scott Eckert, WIDECAST; members from University of Trinidad and Tobago, UWI, Fisheries Division, Atlantic LNG, Asa Wright Nature Centre, UNDP, Insitute of Marine Affairs, Save Our Turtles, The Police Service, Trini Eco Warriors, Zoology Society of T&T, North East Sea Turtles, interested members from the public; media and many others.

EMA's Annual World Environment Day activities (June 5th)

In commemoration of WED, the EMA hosted its third annual Green Lifestyle Show (GLS) on Sunday June 10, at the Hilton Trinidad and Conference Centre. One of the main objectives of the show was to engage people in becoming more aware of green alternatives and wise consumer choices. The GLS is now one of the EMA's signature events for World Environment Day and it provided a unique opportunity to bring together buyers and sellers of environmentally responsible goods and services.

The GLS grew from 63 exhibitors in 2011 to 80 interested exhibitors in 2012. These exhibitors showcased their various eco-friendly or 'green' alternatives to over 400 hundred visitors in attendance.

Categories for GLS 2012 included: Fashion, Health, Beauty and Fitness; Eco-Tourism and Recreation; Home, Garden and Lifestyle; Environmental Services; Industrial and Office Supplies and Products; Alternative (Renewable Energy); Recycling and Waste Management; Non-Governmental Organisations and Community-Based Organisations; Construction, Architecture and HSE and also Government Ministries, Agencies and Diplomatic Missions.

Green Leaf Awards

The EMA's Green Leaf Awards adopted the United Nations World Environment Day (WED) 2012 theme, "Green Economy: Does it include you?" This year the EMA rebranded its Green Leaf Award to recognise projects which reflected environmentally sound practices,

environmental sustainability, corporate responsibility, community involvement and a commitment to continuous improvement.

The Awards will now be hosted on a biennial basis with the next Awards scheduled to take place in June 2014.

Publications

Green Business Forum Magazine

In an effort to cultivate positive attitudes to environmental protection and conservation through awareness building, education and effective communication, the EMA in collaboration with the Ministry of Housing and the Environment hosted a Green Business Forum on March 23-24, 2011. A Green Business Magazine was produced in 2012 to document the information relayed at the forum for dissemination and follow-up workshops and the way forward in initiating some of the recommendations that emerged from this forum. The magazine was distributed to key stakeholders and the general public. This publication is also available on our website at www.ema.co.tt

Matura National Park (ESA) Booklet

As part of the EMA ongoing quest to build awareness of our Environmentally Sensitive Areas, the Matura National Park booklet was one such project geared towards highlighting the Matura National Park as an Environmentally Sensitive Area (ESA) and was distributed to key stakeholders and the general public. This publication is also available on our website at www.ema.co.tt

Aripo Savannas Strict Nature Reserve (ESA) Copybook

This copybook highlights the Aripo Savannas Strict Nature Reserve as an Environmentally Sensitive Area. These copy books were distributed to all schools in close proximity to the ESA, as well as others.

Noise FAQ Booklet

This booklet was designed to provide easier access and understanding of the EMA's Noise Pollution Control Rules. The publication was distributed to stakeholders and the general public, and is also available on our website at www.ema.co.tt

Certificate of Environmental Clearance Process Pullout

This and other publications sought to sensitise the public on the CEC Process. This pullout was published in the daily newspapers and accessible to the general public via the EMA's website.

Education and Public Awareness

The **Primary Schools' Programme, 2012, *Bringing Nature to You 2***, focused on developing a wetland ecosystem module for teachers of Standard Three students. The module was tested in (5) schools located within the Nariva Environmentally Sensitive Area (ESA). The objective however was to produce a wetlands module for use by any Primary school teacher in Trinidad and Tobago. This resource has therefore been distributed to all Primary schools with the assistance of the Ministry of Education. The module is also intended to supplement the Wetland Activity booklets that were developed during the 2011 programme. A field trip component to the module was included to give students the opportunity to be exposed to the natural environment on which their classroom learning is based.

The Nariva wetland ecosystem was identified as the most suitable location for this pilot project. Apart from being an ESA, the EMA is also coordinator and facilitator for the Nariva Swamp Restoration, Carbon Sequestration and Livelihoods Project, funded by the Green Fund. Taking this a step further to the primary schools in this area complemented and enhanced the communications, education and public awareness efforts, under the above-mentioned restoration project. This initiative also fulfils our obligation to sustain environmental education and awareness activities at the primary school level.

EMA's Annual Youth Environmental Workshop

The Public Education Unit hosted the fifth annual Youth Workshop, in Tobago to increase exposure of the youth of the sister isle to environmental management issues. Fifteen sixth form students engaged in several activities to gain a better understanding of the theme, *Green Economy – Does it include you?* Two dramatic pieces and a film entitled 'Supreme Being' were produced during the week.

One of the main goals of the workshop is the production of environmental education tools. Under the guidance of a facilitator, participants translate what they have learned into dramatic presentations, short films, artwork and poetry, portraying environmental messages that will be communicated to the wider public. To ensure continuity, the participants of this programme go on to join the youth arm of the EMA, the EMA's Youth Ambassador Programme.

Green Business Register (GBR)

The EMA launched its online Green Business Register (GBR) on the Authority's website this year. This was in an effort to encourage environmentally responsible behaviour among consumers and the business sector.

The GBR is a directory of over **100** individuals and organisations that operate within the growing "green economy" in Trinidad and Tobago. The listing represents a wide variety of sectors including, but not limited to, Agriculture, Construction, Food, Finance, Energy, Tourism, Recycling and Waste Management, and Industrial Supplies.

'Aripo Savannas Revealed' National Photography Competition

The EMA launched its first national photography competition, titled '*Aripo Savannas Revealed*' on June 1, 2012. The photography competition was aimed at building awareness of the Aripo Savannas Scientific Reserve, as an Environmentally Sensitive Area (ESA).

This photography competition attracted many individuals with over 150 guided visits to the Aripo Savannas during the month of June, 2012, with the winning photos from this competition contributing towards the EMA's 2013 calendar.

Following the success of this competition, the EMA's first national photography competition, the intent to build awareness of other Environmentally Sensitive Areas (ESA) was suggested through this medium.

EMA's Annual Secondary Schools' Eco-Song Competition

In 2012, the Secondary Schools' Eco-Song Competition entered its fifth year with thirteen schools and twenty two participants in the preliminary round. Twelve finalists moved on to the Finals which was opened to the general public for the first time in the competition's five year history. Instead of a weekday, the show was held on Saturday 24th November at the Central Bank Auditorium. The theme was 'Our Green Economy' and the clear winner in Category One (Forms 1-3) was Ferdinand Smith of Swaha Hindu College, with his song "Sow Yuh Seed", which cleverly depicted the importance of agriculture. Tenique Beckles of Couva West Secondary, who had won in Category One in 2011, returned to cop the title in Category Two, with her song, "We Must Plant Back".

A concert featuring key performances over the last five years is being planned and this is scheduled to take place in November 2013.

EMA's Youth Ambassadors' Programme

The group received the **National Youth/Community Organisation Award** at the National Youth Awards hosted by the Ministry of Gender, Youth and Child Development on August 12th, 2012. The EMA Youth Ambassadors also staged the first ever environmental concert at Queen's Hall on February 4, 2012 titled "OMG! Orient My Generation". Over 600 members of the public were treated to a combination of films, songs, dramatic and artistic presentations all in an effort to educate and raise awareness on pressing environmental issues in Trinidad and Tobago.

Environmental Club Programme

In 2012, the programme was rebranded as the EMA Enviro Club, a user-friendly title for the new purpose of providing support and direction to clubs beyond the initial stages of setting up a club. This new version on the Enviro Club programme is still in the early stages of development, but its potential as an environmental education tool is unmatched, given its pool of young people and teachers excited about the environment.

COORDINATE ENVIRONMENTAL MANAGEMENT ACTIVITIES IN TRINIDAD AND TOBAGO

The EMA in 2012, coordinated several informative sessions with the Woodbrook residents, event coordinators and planners, and venue owners to sensitise them on the issue of noise pollution. The EMA's Environmental Police Unit also met with the San Fernando police for training and informing them of the Noise Pollution Control Rules. Several other meetings and coordination efforts were held with regional corporations to address other environmental and community related matters.

PLANS FOR THE EMA 2013

Strategic Goals

TO PROTECT AND RESTORE THE WATER QUALITY OF INLAND AND NEAR-SHORE COASTAL WATERS TO SAFEGUARD HUMAN HEALTH AND ECOSYSTEMS HEALTH

Developing Ambient Water Quality Standards for Trinidad and Tobago

The objective of this project is to develop/propose water quality standards/guidelines for all watersheds in Trinidad and Tobago. The specific objectives for each watershed would be:

- Define and designate water use(s) for inland and coastal waters including groundwater;
- Develop water quality criteria to support the use(s) identified in 1 and;
- Develop anti-degradation policy to protect and preserve waters of a high quality.

It is intended that this project will be implemented in two phases; Phase I would involve a pilot study for designating water uses and criteria for two watersheds (1 in Trinidad and 1 in Tobago), the results of which will be used to inform the development of water quality standards for the entire country (Phase II).

TO PROTECT, CONSERVE, AND/OR RESTORE SELECTED ECOSYSTEMS AND SPECIES TO ENSURE THE BIODIVERSITY OF TRINIDAD AND TOBAGO IS SUSTAINED

To Increase Local and International Awareness of Environmentally Sensitive Areas and Species via the Production of a Video Documentary Series

In 2012 the EMA completed a video documentary for the Aripo Savannas Environmentally Sensitive Area. The success of this video documentary and its outreach potential can be used as a model for documenting the characteristics of the other environmentally sensitive areas (ESAs) and environmentally sensitive species (ESS).

The production of the video documentary series will highlight the following topics: characteristics, threats and management of the ESAs and ESS) which will contribute to the body of knowledge in the public domain about these special areas and species. The documentary will utilize footage and archived pictures of the biodiversity of the areas and species. The documentary can be produced internally by the EMA and aired on the local television channels, as well as via the internet (Facebook, YouTube etc.). The effectiveness of the video documentaries can be evaluated quantitatively by measuring the viewership on local television

stations and on social media sites. DVD copies of the video documentary will also be distributed to schools and other special interest groups.

TO BALANCE ENVIRONMENTAL PROTECTION AND ECONOMIC DEVELOPMENT AND FACILITATE THE EXPEDITIOUS PROCESSING OF CEC APPLICATIONS

To Better Inform the Certificate of Environmental Clearance (CEC) Process by Understanding the Potential Impacts of Seismic Surveys by the Development and Implementation of Guidelines

The Environmental Management Authority (EMA) is mandated to determine the environmental impact, which might arise out of any new or significantly modified construction, process, works or other activity, as outlined in the Certificate of Environmental Clearance (Designated Activities) Order, 2001 (CEC Rules, 2001). Seismic surveys (SS) are a vital part of oil and gas activities; it is an activity that requires appropriate mitigation measures due to the potential impacts on the marine environment. Currently, the conduct of seismic surveys is regulated under Activity 24 (Exploration for crude oil or natural gas) of the CEC Rules, 2001. The EMA currently does not require an Environmental Impact Assessment (EIA) for the approval of seismic survey projects. Although an EIA is not required, it is imperative that the resources within each area that the SS is being conducted are analyzed in order to determine what types of species may be affected by this activity. It is also necessary for the potential impacts on each population be identified in order to implement appropriate mitigation measures to minimize such impacts.

This project aims to have a long term beneficial socio-economic impact on T&T as it aims to collect marine baseline data in an attempt to protect commercially important marine fauna. The collection of such data will allow time and areas closures to be implemented during seismic surveys and other marine projects that may have potentially damaging impacts on marine life. As such, it would ensure that fish stocks are not compromised and that the fisheries of T&T are well managed.

TO PROTECT HUMAN HEALTH AND THE NATURAL ENVIRONMENT THROUGH THE TIMELY ENFORCEMENT OF STATUTES, ENSURING COMPLIANCE WITH PERMIT AND LICENSE CONDITIONS AND THE PROMOTION OF ENVIRONMENT STEWARDSHIP

Enforcement

The Department aims to issue and serve an average of twenty-five Notices of Violation in 2013 and resolve at least 50% of same by way of Consent Agreements.

TO MODIFY AND/OR DEVELOP LEGISLATION, POLICIES, PROCEDURES AND SYSTEMS TO FACILITATE THE WORK OF THE EMA

Air Pollution Rules (APR)

The draft APR and the draft Fees Regulations are to be accepted by Cabinet and laid in Parliament.

Noise Pollution Control Rules, 2001 (NPCR)

EMA's Internal Legislative Review Committee (LRC) to provide recommended amendments to the NPCR for the consideration of the Minister of the Environment and Water Resources.

Waste Management Rules

Legal is required to identify and procure a suitable Legal Consultant for the finalizing of the Hazardous Waste Rules on behalf of the EMA. This will involve the incorporating of public comments as well as re-consideration of the engagement of the public comment process.

Designation of ESS and ESA

Designation of the Ocelot and Golden Tree Frog as Environmentally Sensitive Species. Designation of five sea turtles, namely the Hawksbill Turtle, the Leatherback Turtle, the Olive Ridley Turtle, the Green Turtle and the Loggerhead Turtle

Enabling Strategies

ATTRACT, RETAIN AND DEVELOP COMPETENT STAFF

The EMA recognises that its people are the foundation of its operations and significant is being placed to ensure competent staff are retained and sustained within the Authority. The EMA intends to review its performance management system by revising its performance appraisal form. The EMA is also seeking to strategically improve training and development for staff based on urgency and need. Filling critical vacancies is also paramount to moving the organisation forward. Other matters requiring attention would be job description reviews, HR policy review, developing a Human Resources Information System and also restructuring the Human Resources department.

DEVELOP APPROPRIATE LEGISLATION POLICIES, PROCEDURES, AND SYSTEMS TO FACILITATE THE WORK OF THE EMA

Strategic Assessment for the Quarry Sector in Trinidad and Tobago

Designated Activities 23 and 8 of the Certificate of Environmental Clearance (CEC) Designated Activities Order were amended in 2007 and 2008 respectively and exempted quarries less than 150 acres from requiring a CEC. Recently, the Government of Trinidad and Tobago took steps to reinstate the requirement for quarries of all sizes to apply for a CEC.

The impact of quarrying on our environment has become more visible, particularly over the last few years and therefore measures must be put in place to ensure that we continue to manage our environment along the path of sustainable development.

It is proposed that a project be undertaken to assess the impacts of quarrying on the environment and use the results to identify and address current and future environmental requirements and challenges. The project will also involve the design and conduct of a full Strategic Environmental Assessment (SEA) for the Quarry Sector in Trinidad and Tobago to guide policy and future development plans. This project is aimed at:

- Identifying areas in Trinidad and Tobago used for quarrying activities
- Understanding the impacts of quarrying on the physical, biological and socio-cultural environment in these areas
- Designing and conducting an SEA for the Quarry Sector in order to promote sustainable development.

Legal Project

For 2013, Legal intends to undertake, through an Economic Consultant, the task of calculating economic benefit pursuant to section 66 (c) of the EM Act in six of the Department's current Administrative Civil Assessment Enforcement cases. (*Dr. Justin Ram sole sourced; project is in final stages of completion*)

Legislative Review

To undertake a comprehensive review of the EM Act, Chapter 35:05 and subsidiary legislation, identifying weaknesses and recommending amendments. This review will be finalized and submitted to the Minister with the responsibility for the environment with recommendations.

CULTIVATE POSITIVE ATTITUDES TO ENVIRONMENTAL PROTECTION AND CONSERVATION THROUGH AWARENESS BUILDING, EDUCATION AND EFFECTIVE COMMUNICATION

Publications

Nariva Swamp Restoration Project Pullout

A four page press document designed to share information on the Nariva Swamp Restoration Project. This will be published in the daily newspapers and be made available via the EMA's website.

Youth Ambassadors Comic book on Matura National Park

The EMA will also be launching a comic book on the Matura National Park. The Comic would be used as a tool to highlight environmental issues in and around Matura National Park. The comic book will incorporate a superhero and traditional local folklore characters to push messaging about safeguarding our ESA.

Nariva Photobook

Journey through the Nariva Swamp Restoration Project (NSRP).

Calendar 2014

Photographs from the intended Nariva Photography Competition are to be used in the production of the calendar.

Primary Schools Programme

In 2013, the EMA's Primary Schools' Programme, will be engaging in its primary schools initiative – "*Bringing Nature to You 3*". The programme will focus on schools in the Borough of Chaguanas, as a component of the Community Pilot Programme in Felicity. It will utilise a caravan type approach, to target all schools within the Borough focusing on issues related to waste disposal and wetland conservation.

The theme will focus on *Littering and Our Wetlands* and the presentations catered to the various levels of the primary school system and carry the over arching slogan - "Less Waste, Cleaner Space, Don't Litter!"

'Secrets of Nariva' National Photography Competition (done in collaboration with NSRP)

Following the Aripo Savannas Photography competition, the EMA would like to host another photography competition highlighting the ESA of the Nariva Swamp. Through the assistance and guidance of the Nariva Swamp Restoration Project (NSRP), the Nariva Swamp photography

competition titled ‘Secrets of Nariva’ will be conceptualized for 2013. These winning photos would again be used in the 2014 calendar. The annual calendar is intended as another vehicle through which the EMA continues its year-long public education messaging about our various ESAs and the many treasures that reside within. The calendar will also be used by the NSRP as part of its education and outreach activities.

WED Celebrations

The EMA will celebrate its 18th anniversary on World Environment Day, June 5, 2013. The EMA intends to host an exhibition open to the public, held at both its North and South offices from 10 a.m. to 4 p.m.

The exhibit will feature the work of the EMA, and will display various pieces of literature pertaining to the Certificate of Environmental Clearance Rules, Water Pollution Rules, Noise Pollutions Rules and Environmentally Sensitive Areas and Species Rules.

EMA’s 6th Annual Youth Environmental Workshop

In 2013, the EMA will host its 6th Annual Youth Environmental Workshop. The workshop will aim to: improve the knowledge, skills and abilities of the EMA’s Youth Ambassadors, by building awareness of key environmental issues; develop creative methods of communicating environmental messages; enhance cohesiveness and effectiveness of the group; and provide training in generating more innovative and resourceful strategies for environmental action and education.

Annual International Coastal Clean-up (ICC) 2013

The Coastal Cleanup is to be held at Chacachacare.

Environmental Club Programme Guidelines Booklet

In 2013, the EMA’s Enviro Club will launch a booklet documenting the guidelines and procedures of the revamped and rebranded Environmental Club Programme. This will be distributed to primary and secondary schools across Trinidad and Tobago. Additionally the EMA will be launching its Enviro Club Newsletter “On D Scene”.

EMA and You Campaign

The EMA proposes to launch a campaign titled “*EMA and You*”. The goals of the initiative are to clarify the organisation’s role and responsibilities, educate and influence positive attitudes and

behaviours with the public, and inform about the agencies responsible for specific environmental issues.

Launch of New EMA Website

The EMA has been commended on the success of its current website presence, which is accessed locally, regionally and internationally by way of the World Wide Web. The CR&PE department develops content for the website and also works with all other departments in the EMA to ensure that the work of the EMA is accurately represented.

The current website was revamped in 2007 and in an effort to address some of the inadequacies and to utilise current trends in web development to better reach all audiences (mobile users etc.), a website redesign and redevelopment was initiated in 2012. The new site is nearing completion and undergoing final review. It will be launched by August 2013.

Biodiversity Video Series - Collaboration with Biodiversity Unit

This video will feature a short documentary on the EMA's three Environmentally Sensitive Species (The West Indian Manatee, Pawi, White-Tailed Sabrewing Hummingbird), and three Environmentally Sensitive Areas (the Aripo Savannas Strict Nature Reserve, The Nariva Swamp Managed Resource Protected Area, and Matura National Park).

OPERATE THE EMA AS A MODEL FOR GOOD ENVIRONMENTAL MANAGEMENT PRACTICES

During the latter part of 2012, the HSE Unit embarked on acquiring a fire inspection certificate for the Elizabeth Street Office, to ensure compliance with Part V.26.(2). This was being sought from the Trinidad and Tobago Fire Service. Further training in fire prevention is required along with inspections and fire drills to be conducted. The Authority continues to work towards ensuring all its employees' are afforded a safe work environment.

APPENDIX 1 – BOARD OF DIRECTORS

- As at December 2012

1. Mr. Shyam Dyal-Deputy Chairman
2. Mr. Terrence Holmes
3. Mr. John Julien
4. Mr. Michael Rooplal
5. Ms. Ashvini Supersad
6. Dr. Lena Brereton-Wolffe

Notes:

- Mr. Kelvin Ramnath was appointed Chairman in July 2011 and died on July 21, 2012.

Board of Trustees

1. Mr. Shyam Dyal- Chairman (Ag)
2. Mr. Paolo Kernahan
3. Mr. Michael Rooplal
4. Dr. Lena Brereton-Wolffe

Co-ordination Committee

1. Mr. Shyam Dyal (Chairman)
2. Ms. Ashvini Supersad
3. Mr. Paolo Kernahan

Human Resource Committee

1. Mr. Michael Rooplal (Chairman)
2. Mr. John Julien
3. Mr. Shyam Dyal

Tenders Committee

1. Mr. Shyam Dyal
2. Mr. Michael Rooplal
3. Dr. Lena Brereton-Wolffe

Noise Advisory Committee

1. Mr. Terrence Holmes (Chairman)
2. Dr. Lena Brereton-Wolffe
3. Dr. Deborah Pinder
4. Dr. Wesley Shim
5. Ms. Gayatri Badri Maharaj
6. Frances Mitchell Wanliss

**PART C: ENVIRONMENTAL TRUST FUND AUDITED FINANCIAL
REPORT FOR THE YEAR ENDED, SEPTEMBER 30, 2012**



REPORT OF THE AUDITOR GENERAL OF THE REPUBLIC OF TRINIDAD AND TOBAGO ON THE FINANCIAL STATEMENTS OF THE ENVIRONMENTAL MANAGEMENT AUTHORITY - ENVIRONMENTAL TRUST FUND FOR THE YEAR ENDED 30 SEPTEMBER 2012

The accompanying Financial Statements of the Environmental Management Authority - Environmental Trust Fund for the year ended 30 September 2012 have been audited. The Statements comprise a Statement of Financial Position as at 30 September 2012, a Statement of Comprehensive Income, a Statement of Movement of Funds and a Statement of Cash Flows for the year ended 30 September 2012 as well as Notes to the Financial Statements numbered 1 to 13.

2. The audit was conducted by a firm of Accountants appointed by the Board of Directors with the written consent of the Auditor General. Their Report dated 2 September 2013 which is attached refers.

SUBMISSION OF REPORT

3. This Report is being submitted to the Speaker of the House of Representatives, the President of the Senate and the Minister of Finance and the Economy in accordance with the provisions of sections 116 and 119 of the Constitution of the Republic of Trinidad and Tobago.

10th January, 2014



Sharmar O'Pley
SHARMAN O'PLEY
AUDITOR GENERAL



Chartered Accountants
& Business Advisors

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

FINANCIAL STATEMENTS

30 SEPTEMBER 2012



Chartered Accountants
& Business Advisors

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

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Statement of Management Responsibilities

It is the responsibility of management to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the Authority as at the end of the financial year and of the operating results of the Authority for the year. It is also management's responsibility to ensure that the Authority keeps proper accounting records which disclose with reasonable accuracy at any time the financial position of the Authority. They are also responsible for safeguarding the assets of the Authority.

Management is responsible for the preparation and fair presentation of these financial statements in accordance with International Financial Reporting Standards. This responsibility includes designing, implementing and maintaining internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error, selecting and applying appropriate accounting policies, and making accounting estimates that are reasonable in the circumstances.


Management accepts responsibility for the annual financial statements, which have been prepared using appropriate accounting policies supported by reasonable and prudent judgments and estimates, in conformity with International Financial Reporting Standards. Management are of the opinion that the financial statements give a true and fair view of the state of the financial affairs of the Authority and of its operating results. Management further accepts responsibility for the maintenance of accounting records which may be relied upon in the preparation of financial statements, as well as adequate systems of internal financial control.

Nothing has come to the attention of Management to indicate that the Authority will not remain a going concern for at least the next twelve months from the date of this statement.



Trustee

Date *September 2, 2013*



Trustee

Date *September 2, 2013.*





Chartered Accountants
& Business Advisors

INDEPENDENT AUDITORS' REPORT

The Trustees
Environmental Management Authority -
Environmental Trust Fund

We have audited the accompanying financial statements of Environmental Management Authority – Environmental Trust Fund, which comprise the statement of financial position as at 30 September 2012, the statements of comprehensive income, movement of funds and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with International Financial Reporting Standards, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with International Standards on Auditing. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditors consider internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of Environmental Management Authority – Environmental Trust Fund as of 30 September 2012, and of its financial performance and cash flows for the year then ended in accordance with International Financial Reporting Standards.

PKF

Port of Spain
2 September 2013

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Partners Ainsley A. Mark | Michael G. Toney | René-Lisa Philip | Mark K. Superville

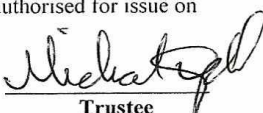
**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

STATEMENT OF FINANCIAL POSITION

		<u>ASSETS</u>	
		30 September	
	<u>Notes</u>	<u>2012</u>	<u>2011</u>
Cash Resources:			
Cash in hand and at bank	5	\$ 28,317,938	\$ 34,777,346
Short-term investments	6	<u>8,873,889</u>	<u>5,790,304</u>
Total Cash Resources		<u>37,191,827</u>	<u>40,567,650</u>
Other Assets:			
Accounts receivable and prepayments	7	4,537,155	1,778,930
Fixed assets	8	<u>44,784,349</u>	<u>43,257,828</u>
Total Non-Current Assets		<u>49,321,504</u>	<u>45,036,758</u>
Total Assets		<u>\$ 86,513,331</u>	<u>\$ 85,604,408</u>
<u>LIABILITIES AND FUNDS</u>			
Liabilities:			
Accounts payable and accruals	9	\$ 10,170,648	\$ 16,207,176
Deferred income	10	<u>344,725</u>	<u>733,941</u>
Total Liabilities		<u>10,515,373</u>	<u>16,941,117</u>
Funds:			
GORTT Fund		53,299,312	46,724,564
UNDP Fund		292,172	292,172
IBRD Fund		2,806,990	2,806,990
Nariva Swamp Restoration, Carbon Sequestration and Livelihood Project		753,631	-
Other Fund		863,709	857,421
Revaluation surplus		<u>17,982,144</u>	<u>17,982,144</u>
Total Funds		<u>75,997,958</u>	<u>68,663,291</u>
Total Liabilities and Funds		<u>\$ 86,513,331</u>	<u>\$ 85,604,408</u>

These financial statements were approved by the Board of Trustees and authorised for issue on
2 September 2013 signed on their behalf by:


Trustee


Trustee

(The accompanying notes form part of these financial statements)

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

STATEMENT OF COMPREHENSIVE INCOME

	For the year ended 30 September	
	<u>2012</u>	<u>2011</u>
Income:		
GORTT Fund	\$ 48,264,929	\$ 43,163,042
UNDP Fund	-	63,960
NSRCSL Project Fund	3,119,048	1,860,851
Other Fund income	6,288	312,350
Activities income	1,711,679	1,079,257
Highway Police Surveillance Bays Fund	3,694,085	-
Interest income	91,761	129,733
Gain on foreign exchange	<u>-</u>	<u>1,026</u>
	56,887,790	46,610,219
Project expenses	<u>(10,522,563)</u>	<u>(5,245,835)</u>
Income after project expenditure, carried forward	<u>46,365,227</u>	<u>41,364,384</u>

(The accompanying notes form part of these financial statements)

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

STATEMENT OF COMPREHENSIVE INCOME (CONT'D)

	For the year ended 30 September	
	<u>2012</u>	<u>2011</u>
Income after project expenditure, brought forward	<u>46,365,227</u>	<u>41,364,384</u>
Expenditure:		
Advertising and promotions	2,120,041	675,342
Audit fees	90,250	90,250
Conference costs	23,661	-
Contract services	804,967	661,893
Depreciation	1,694,848	1,553,065
Directors' expenses	77,732	64,197
Directors' fees	614,500	544,271
Interest and bank charges	22,441	16,484
Insurance	346,237	407,441
Loss on disposal of fixed assets	15,791	3,451
Loss on foreign exchange	4,965	-
Motor vehicle expenses	530,401	402,875
Maintenance contracts	583,724	483,876
Management fees	18,000	18,000
Office and general expenses	102,045	76,833
Permitting and compliance costs	1,177,658	784,336
Professional fees	203,937	122,284
Reference and research cost	358,455	241,307
Rent	1,974,528	1,424,792
Repairs and maintenance	3,045,213	380,863
Salaries and benefits	21,815,844	24,810,334
Security	831,116	788,188
Selection and recruitment costs	147,319	74,174
Supplies	594,109	599,577
Training	120,900	194,418
Travel	487,982	124,546
Utilities	<u>1,223,896</u>	<u>1,190,752</u>
	<u>39,030,560</u>	<u>35,733,549</u>
Total Comprehensive Income for the year	<u>\$ 7,334,667</u>	<u>\$ 5,630,835</u>

(The accompanying notes form part of these financial statements)

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

STATEMENT OF MOVEMENT OF FUNDS

For the year ended 30 September 2012

	GORTT Fund	UNDP Fund	IBRD Fund	NSRCSL Project Fund	Other Fund	Revaluation Surplus	Total
Balance as at 1 October 2010	\$ 40,423,598	\$ 505,253	\$ 3,051,959	\$ -	\$ 1,071,358	\$ 17,982,144	\$ 63,034,312
Equity adjustment	-	(1,856)	-	-	-	-	(1,856)
Funds received	43,163,042	63,960	-	1,860,851	312,350	-	45,400,203
Interest income	129,733	-	-	-	-	-	129,733
Activities income	1,079,257	-	-	-	-	-	1,079,257
Loss on disposal of fixed assets	(3,451)	-	-	-	-	-	(3,451)
Gain on disposal of foreign exchange	1,026	-	-	-	-	-	1,026
Expenditure	(38,068,641)	(275,185)	(244,969)	(1,860,851)	(526,287)	-	(40,975,933)
Balance at 30 September 2011	\$ 46,724,564	\$ 292,172	\$ 2,806,990	\$ -	\$ 857,421	\$ 17,982,144	\$ 68,663,291
Balance as at 1 October 2011	\$ 46,724,564	\$ 292,172	\$ 2,806,990	\$ -	\$ 857,421	\$ 17,982,144	\$ 68,663,291
Funds received	48,264,929	-	-	3,119,048	6,288	-	51,390,265
Interest income	91,761	-	-	-	-	-	91,761
Activities income	1,711,679	-	-	-	-	-	1,711,679
Highway Police Surveillance Bays project income	3,694,085	-	-	-	-	-	3,694,085
Loss on disposal of fixed assets	(15,791)	-	-	-	-	-	(15,791)
Gain on foreign exchange	(4,965)	-	-	-	-	-	(4,965)
Expenditure	(47,166,950)	-	-	(2,365,417)	-	-	(49,441,367)
Balance at 30 September 2012	\$ 53,299,312	\$ 292,172	\$ 2,806,990	\$ 753,631	\$ 863,709	\$ 17,982,144	\$ 75,997,958

The Highway Police Surveillance Bays Project Fund is a project funded by the Government of the Republic of Trinidad and Tobago to construct surveillance bays between the northern-bound and south-bound lanes of the Solomon Hochoy Highway. As a project of the Government, it has not been separately identified in the Statement of Movement of Funds.

(The accompanying notes form part of these financial statements)

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

STATEMENT OF CASH FLOWS

	For the year ended 30 September	
	<u>2012</u>	<u>2011</u>
Operating Activities:		
Net comprehensive income for the year	\$ 7,334,667	\$ 5,630,835
Adjustments:		
Depreciation	1,694,848	1,553,065
Loss on disposal of fixed assets	15,791	3,451
Equity adjustment	<u>-</u>	<u>(1,856)</u>
	9,045,306	7,185,495
Net change in accounts receivable and prepayments	(2,758,225)	1,043,576
Net change in accounts payable and accruals	(6,036,528)	3,454,323
Net change in deferred income	<u>(389,216)</u>	<u>(613,889)</u>
Cash (used in)/provided by Operating Activities	<u>(138,663)</u>	<u>11,069,505</u>
Cash Flows from Investing Activities:		
Purchase of fixed assets	<u>(3,237,160)</u>	<u>(441,348)</u>
Cash used in by Investing Activities	<u>(3,237,160)</u>	<u>(441,348)</u>
Net change in cash and cash equivalents	(3,375,823)	10,628,157
Cash and cash equivalents, beginning of year	<u>40,567,650</u>	<u>29,939,493</u>
Cash and cash equivalents, end of year	<u>\$37,191,827</u>	<u>\$40,567,650</u>
Represented by:		
Cash in hand and at bank	\$28,317,938	\$34,777,346
Short-term investments	<u>8,873,889</u>	<u>5,790,304</u>
	<u>\$37,191,827</u>	<u>\$40,567,650</u>

(The accompanying notes form part of these financial statements)

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS

30 SEPTEMBER 2012

1. Registration and Activities:

The Environmental Management Authority (the Authority) is a Statutory Authority established when Parliament assented to the Environmental Management Act, 1995 on 7 March 1995. The Authority was established to develop and implement institutional arrangements for the regulation and management of the environment in the Republic of Trinidad and Tobago.

The Environmental Trust Fund was established by the Environmental Management Act, 1995 to fund the operations of the Authority and is administered by five members of the Board of Directors, designated by the President to act as Trustees.

The Environmental Management Act, 1995 was repealed on 8 March 2000 and replaced by the Environmental Management Act, 2000. The new Act changed the financial year end of the Authority to 30 September.

During the twelve month period ended 30 September 2012, the Authority continued its work in enforcing the Noise Pollution Control Rules, 2001; the Noise Pollution Control (Fees) Regulation, 2001; Certificate of Environmental Clearance Rules; the Certificate of Environmental Clearance (Designated Activities) Amendment Order, 2007 & 2008; Certificate of Environmental Clearance (Designated Activities) Order, 2001; the Certificate of Environmental Clearance (Fees and Charges) Regulations, 2001; the Environmental Commission Rules of Practice and Procedure; Water Pollution (Amendment) Rules, 2006; Water Pollution Rules, 2001; Water Pollution (Amendment) Fees; Water Pollution (Fees) Regulations, 2001; the Environmentally Sensitive Areas Rules, 2001; and Environmentally Sensitive Species Rules, 2001.

The draft Waste Management Rules, 2008 is still being developed. The Authority has completed its Strategic Plan for the period 2010 - 2014.

2. Summary of Significant Accounting Policies:

(a) Basis of financial statements preparation -

These financial statements are prepared in accordance with International Financial Reporting Standards (IFRS), and are stated in Trinidad and Tobago dollars. The historical cost basis is used, except for the measurement at fair value of available-for-sale investments and certain other financial instruments.

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

2. Summary of Significant Accounting Policies (Cont'd):

(b) New Accounting Standards and Interpretations -

- i) The Authority has not applied the following revised International Accounting Standard (IAS) and specific amendments, which became effective during the current year, as they do not apply to the activities of the Authority:

IAS 12 Income Taxes - Limited scope amendment (recovery of underlying assets)

- ii) The Authority has not applied the following International Financial Reporting Standards (IFRSs), International Financial Reporting Interpretations Committee Interpretations (IFRICs), IASs and specific amendments that have been issued but are not yet effective as they either do not apply to the activities of the Authority or have no material impact on its financial statements, except for IFRS 9 Financial Instruments:

IFRS 1 First-time Adoption of International Financial Reporting Standards – Government Loans (effective for accounting periods beginning on or after 1 January 2013).

IFRS 9 Financial Instruments: Classification and Measurement (effective for accounting periods beginning on or after 1 January 2015).

IFRS 9 Financial Instruments: Accounting for Financial Liabilities and Derecognition (effective for accounting periods beginning on or after 1 January 2015).

IFRS 10 Consolidated Financial Statements (effective for accounting periods beginning on or after 1 January 2013).

IFRS 11 Joint Arrangements (effective for accounting periods beginning on or after 1 January 2013).

IFRS 12 Disclosure of Interest in Other Entities (effective for accounting periods beginning on or after 1 January 2013).

IFRS 13 Fair Value Measurement (effective for accounting periods beginning on or after 1 January 2013).

IFRIC 20 Stripping Costs in the Production Phase of a Surface Mine (effective for accounting periods beginning on or after 1 January 2013).

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

2. Significant Accounting Policies (Cont'd):

(b) **New Accounting Standards and Interpretations (cont'd) -**

ii) (cont'd) -

IAS 1	Presentation of Financial Statements – Amendments to revise the way other comprehensive income is presented (effective for accounting periods beginning on or after 1 July 2012).
IAS 12	Income Taxes – Limited scope amendment - recovery of underlying assets (effective for accounting periods beginning on or after 1 January 2012).
IAS 19	Employee Benefits – Amended standard resulting from the Post-Employment Benefits and Termination Benefits projects (effective for accounting periods beginning on or after 1 January 2013).
IAS 27	Consolidated and Separate Financial Statements – Reissued as IAS 27 Separate Financial Statements (effective for accounting periods beginning on or after 1 January 2013).
IAS 28	Investments in Associates – Reissued as IAS 28 Investments in Associates and Joint Ventures (effective for accounting periods beginning on or after 1 January 2013).
IAS 32	Financial Instruments; Presentation – Amendments to application guidance on the offsetting of financial assets and financial liabilities (effective for accounting periods beginning on or after 1 January 2014).

The adoption of IFRS 9 Financial Instruments may result in significant changes in the Authority's classification and presentation of financial instruments.

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

2. Significant Accounting Policies (Cont'd):

(c) Fixed assets and depreciation -

Land and building comprise offices occupied by the Authority and include land purchased for construction of new offices in Trincity. A valuation was completed on the building at #8 Elizabeth Street, St. Clair by independent valuer G. A. Farrell & Associates Limited. The effective date of the valuation was 4 January 2010 and the value of **TTS26 million** was determined after consideration and use of one or more of the following approaches: the Direct Sales Comparison Approach; the Income Approach; and the Cost Approach. Land and building are stated at historical cost/valuation, less depreciation in the case of building. Historical cost includes expenditure that is directly attributable to the acquisition of the items.

Subsequent costs are included in the asset's carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to the Authority and the cost of the item can be measured reliably. All other repairs and maintenance are charged to the Statement of Comprehensive Income during the financial period in which they are incurred.

Depreciation is calculated on the reducing balance method to write off the cost of assets to their residual values over their estimated useful life as follows:

Building	-	2% - 20% per annum
Furniture and fittings	-	10% per annum
Office equipment	-	20% per annum
Motor vehicles and computer equipment	-	25% per annum
Library/Information	-	10% per annum
Specialised equipment	-	20% per annum

Land is not depreciated as it is deemed to have an indefinite life.

Where the carrying amount of an asset is greater than its estimated recoverable amount, it is written down immediately to its recoverable amount.

Gains and losses on disposal of property, plant and equipment are determined by reference to their carrying amounts and are included in the Statement of Comprehensive Income.

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

2. Summary of Significant Accounting Policies (Cont'd):

(d) **Foreign currency -**

Monetary assets and liabilities denominated in foreign currencies are expressed in Trinidad and Tobago dollars at rates of exchange ruling at the Statement of Financial Position date. All revenue and expenditure transactions denominated in foreign currencies are translated at the rates of exchange ruling at the date of the transaction and the resulting profits and losses on exchange from trading activities are recorded in the Statement of Comprehensive Income.

(e) **Taxation -**

The Authority is exempt from taxation under the Environmental Management Act of 2000, Part VII Section 76. According to Section 76:-

'The Fund and the Authority shall be exempted from stamp duty, corporation tax, customs duties, value added taxes, motor vehicle taxes, fees, charges, assessments, levies and imposts on any income or profits or on assets which are acquired for use by the Fund or the Authority'

(f) **Use of estimates -**

The preparation of the financial statements in conformity with International Financial Reporting Standards, requires management to make estimates and assumptions that affect the reported amount of assets and liabilities. Also required is the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

(g) **Financial instruments -**

Financial assets and financial liabilities are recognised on the Authority's Statement of Financial Position when the Authority becomes a party to the contractual provisions of the instrument.

Cash and cash equivalents

Cash and cash equivalents consist of highly liquid investments with original maturities of three months or less and are carried at cost, which approximates market value.

Trade payables

Trade payables are stated at amounts due.

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

2. Summary of Significant Accounting Policies (Cont'd):

(h) Income and funding -

Funding was provided to the Environmental Management Authority - Environmental Trust Fund as follows:

- (i) Proceeds of a loan of US\$6.25 million from the IBRD to the Government of the Republic of Trinidad and Tobago (GORTT). The loan facility closed on 31 December 2000.
- (ii) Ongoing funding from the GORTT to cover recurrent and development programme expenditure. Government Grants are accounted for using the income approach. Under this approach, the grant is recognised in profit or loss on a systematic basis over the periods in which the entity recognises as expenses, the related costs for which the grant is intended to compensate.
- (iii) Grant funds are provided by the United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP) to fund specific activities that are set out in the relevant multilateral agreements. The main projects administered by the Environmental Management Authority Environmental Trust Fund during the financial year ended 30 September 2012 are the Second National Communication to the Convention on Climate Change; Phase V of the Institutional Strengthening Programme for the Phase-out of Ozone Depleting Substances; and Phase II of the Terminal Management Plan for the Phase-out of CFC's.
- (iv) A Memorandum of Agreement was signed on 20 April 2010 with the Minister of Planning, Housing and the Environment acting on behalf of the GORTT to receive funding from the Green Fund to continue with the Nariva Swamp Restoration, Carbon Sequestration and Livelihoods Project (NSRCSL Project). The project duration is from 20 April 2011 to 31 March 2017. Upon signing of the agreement, the first tranche of **TT\$8.471 million** was received. The total amount to be disbursed over the period is **TT\$68.545 million**. Future disbursements will be made based on approved progress reports.

(i) Comparative information -

Where necessary, comparative amounts have been adjusted to conform with changes in presentation in the current year.

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

3. **Financial Risk Management:**

Financial risk factors

The Authority is exposed to liquidity risk, currency risk, operational risk, compliance risk and reputational risk arising from the financial instruments that it holds. The risk management policies employed by the Authority to manage these risks are discussed below:

(a) **Liquidity risk -**

Liquidity risk is the risk that arises when the maturity of assets and liabilities do not match. An unmatched position potentially enhances net surplus for the year, but can also increase the risk of losses. The Authority has procedures with the object of minimising such losses such as maintaining sufficient cash and other highly liquid current assets.

(i) Risk management

The matching and controlled mismatching of the maturities and interest rates of assets and liabilities are fundamental to the management of the Authority. The Authority employs various asset/liability techniques to manage liquidity gaps. Liquidity gaps are mitigated by the liquid nature of a substantial amount of the Authority's assets as well as securing sufficient cash from the Government of the Republic of Trinidad and Tobago.

To manage and reduce liquidity risk the Authority's management actively seeks to match cash inflows with liability requirements.

(b) **Currency risk -**

Currency risk is the risk that the value of financial instruments will fluctuate due to changes in foreign exchange rates. Currency risk arises when future commercial transactions and recognised assets and liabilities are denominated in a currency that is not the Authority's measurement currency. The Authority is exposed to foreign exchange risk arising from various currency exposures primarily with respect to the United States dollar. The Authority's management monitors the exchange rate fluctuations on a continuous basis and acts accordingly.

(c) **Operational risk -**

Operational risk is the risk that derives from deficiencies relating to the Authority's information technology and control systems, as well as the risk of human error and natural disasters. The Authority's systems are evaluated, maintained and upgraded periodically.

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

3. Financial Risk Management: (Cont'd)

Financial risk factors (cont'd)

(d) Compliance risk -

Compliance risk is the risk of financial loss, including fines and other penalties, which arise from non-compliance with laws and regulations of the State.

(e) Reputational risk -

The risk of loss of reputation arising from the negative publicity relating to the Authority's operations (whether true or false) may result in a reduction in its revenue from government funding.

4. Critical Accounting Estimates and Judgements:

The preparation of financial statements in accordance with International Financial Reporting Standards requires management to make judgements, estimates and assumptions in the process of applying the Authority's accounting policies.

Estimates and judgements are continually evaluated and are based on historical experience and other factors, including expectations of future events that are believed to be reasonable under the circumstances. The Authority makes estimates and assumptions concerning the future and actual results could differ from those estimates as the resulting accounting estimates will, by definition, seldom equal the related actual results. The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below:

Changes in accounting estimates are recognised in the Statement of Comprehensive Income in the period in which the estimate is changed, if the change affects that period only. If the change affects a prior period, the Authority recognizes this change in the Statement of Movement of Funds in the current period.

The critical judgement, apart from that involving estimations, which has the most significant effect on the amounts recognised in the financial statements, is as follows:-

1. Which depreciation method for building and equipment is used.
2. Whether fixed assets are measured at cost or revalued amount.

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

4. Critical Accounting Estimates and Judgements: (Cont'd)

The key assumption concerning the future and other key sources of estimation uncertainty at the Statement of Financial Position date (requiring management's most difficult, subjective or complex judgements) that has a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year is with respect to building and equipment. Management exercises judgement in determining whether future economic benefits can be derived from expenditures to be capitalised and in estimating the useful lives and residual values of these assets.

5. Cash in Hand and at Bank:

	30 September	
	<u>2012</u>	<u>2011</u>
Petty cash	\$ 8,000	\$ 13,069
Republic Bank Limited -		
Operating account	15,847,982	17,786,531
Nariva Carbon Assessment Grant	222,209	10,581
NSRCSL Project Account	3,337,966	6,513,458
Highway Police Surveillance HPS Bays Project	569,381	4,817,696
First Citizens Bank Limited -		
Permit income account	7,176,251	4,438,438
RBTT Bank Limited -		
Institutional strengthening	18,167	18,167
Other projects	246,253	246,253
Biodiversity	14,062	14,062
Biosafety	97,490	97,490
National Capacity Needs Self Assessment	395,871	395,871
United Nations Framework Convention on Climate Change	343,442	343,442
Scotiabank Trinidad and Tobago Limited -		
Terminal Phaseout Management Plan	15,960	16,260
Fleet Card	24,904	66,028
	<u>\$ 28,317,938</u>	<u>\$ 34,777,346</u>

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

6. Short-term Investments:

	30 September	
<u>Available-for-Sale:</u>	<u>2012</u>	<u>2011</u>
Republic Bank Limited Pool Bond	\$ 2,171,383	\$ 2,137,484
Trinidad and Tobago Unit Trust Corporation	<u>6,702,506</u>	<u>3,652,820</u>
	<u>\$ 8,873,889</u>	<u>\$ 5,790,304</u>

7. Accounts Receivable and Prepayments:

	30 September	
	<u>2012</u>	<u>2011</u>
Accounts receivable	\$ 44,750	\$ 44,250
VAT receivable	4,074,018	1,347,801
Other receivables	180,357	73,460
Prepayments	<u>238,030</u>	<u>313,419</u>
	<u>\$ 4,537,155</u>	<u>\$ 1,778,930</u>

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

18.

8. Fixed Assets:

Cost/Valuation	Furniture and Fittings										Total
	Land	Building	Office Equipment	Motor Vehicles	Computer Equipment	Specialised Equipment	Library/Information				
Balance as at 1 October 2012	\$13,729,868	\$26,000,000	\$ 3,606,565	\$ 4,521,379	\$ 2,346,484	\$ 4,639,937	\$ -	\$ 332,331	\$ 55,176,564		
Additions	-	-	206,151	290,652	1,641,914	654,840	443,603	-	3,237,160		
Disposals	-	-	(47,169)	-	-	(17,514)	-	-	(64,683)		
Balance as at 30 September 2012	<u>13,729,868</u>	<u>26,000,000</u>	<u>3,765,547</u>	<u>4,812,031</u>	<u>3,988,398</u>	<u>5,277,263</u>	<u>443,603</u>	<u>332,331</u>	<u>58,349,041</u>		
Accumulated Depreciation											
Balance as at 1 October 2012	-	1,098,186	1,920,904	3,417,172	1,754,676	3,478,671	-	249,127	11,918,736		
Charge for the year	-	528,993	178,807	244,652	297,026	398,572	38,478	8,320	1,694,848		
Disposals	-	-	(40,612)	-	-	(8,280)	-	-	(48,892)		
Balance as at 30 September 2012	-	<u>1,627,179</u>	<u>2,059,099</u>	<u>3,661,824</u>	<u>2,051,702</u>	<u>3,868,963</u>	<u>38,478</u>	<u>257,447</u>	<u>13,564,692</u>		
Net Book Value											
Balance as at 30 September 2012	<u>\$13,729,868</u>	<u>\$ 24,372,821</u>	<u>\$ 1,706,448</u>	<u>\$ 1,150,207</u>	<u>\$ 1,936,696</u>	<u>\$ 1,408,300</u>	<u>\$ 405,125</u>	<u>\$ 74,884</u>	<u>\$ 44,784,349</u>		
Balance as at 30 September 2011	<u>\$13,729,868</u>	<u>\$ 24,901,814</u>	<u>\$ 1,685,661</u>	<u>\$ 1,104,207</u>	<u>\$ 591,808</u>	<u>\$ 1,161,266</u>	<u>\$ -</u>	<u>\$ 83,204</u>	<u>\$ 43,257,828</u>		

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

19.

8. Fixed Assets (Contd):

Cost/Valuation	Land	Building	Furniture and fittings	Office equipment	Motor vehicles	Computer equipment	Library/Information	Total
Balance as at 1 October 2010	\$13,729,868	\$ 26,000,000	\$ 3,597,751	\$ 4,500,363	\$ 2,346,484	\$ 4,232,703	\$ 332,331	\$ 54,739,500
Additions	-	-	8,814	25,300	-	407,234	-	441,348
Disposals	-	-	-	(4,284)	-	-	-	(4,284)
Balance as at 30 September 2011	13,729,868	26,000,000	3,606,565	4,521,379	2,346,484	4,639,937	332,331	55,176,564
Accumulated Depreciation								
Balance as at 1 October 2010	-	506,835	1,733,882	3,160,218	1,557,406	3,168,281	239,882	10,366,504
Charge for the year	-	591,351	187,022	257,787	197,270	310,390	9,245	1,553,065
Disposals	-	-	-	(833)	-	-	-	(833)
Balance as at 30 September 2011	-	1,098,186	1,920,904	3,417,172	1,754,676	3,478,671	249,127	11,918,736
Net Book Value								
Balance as at 30 September 2011	\$13,729,868	\$ 24,901,814	\$ 1,685,661	\$ 1,104,207	\$ 591,808	\$ 1,161,266	\$ 83,204	\$ 43,257,828
Balance as at 30 September 2010	\$13,729,868	\$ 25,493,165	\$ 1,863,869	\$ 1,340,145	\$ 789,078	\$ 1,064,422	\$ 92,449	\$ 44,372,996

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

9. **Accounts Payable and Accruals:**

	30 September	
	2012	2011
Accounts payable	\$ 676,279	\$ 656,852
Other payables	33,011	27,442
Accruals	1,587,800	1,868,593
Violations payable	2,983,607	1,977,405
Ministry of Public Utilities and the Environment		
- National Forest Inventory Project	340,797	340,797
Nariva Swamp Restoration, Carbon Sequestration and Livelihood Project	3,425,643	6,518,491
Highway Police Surveillance Bays Project	1,123,511	4,817,596
	\$ 10,170,648	\$ 16,207,176

10. **Deferred Income:**

This amount represents disbursed as follows:

	30 September	
	2012	2011
Records and Information Management (RIM) Project	\$ 344,725	\$ 554,477
UWI Aripo Savannah Biological Survey	-	179,464
	\$ 344,725	\$ 733,941

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

11. Funding:

Funds received during the year ended 30 September 2012 are as follows:

		30 September	
		<u>2012</u>	<u>2011</u>
External Funding			
UNDP	TT\$	\$ -	\$ 63,960
Other	TT\$	6,288	312,350
Core Funding			
GORTT	TT\$	47,875,713	42,549,153
Activities Income	TT\$	1,711,679	1,079,257
Highway Police Surveillance Bays Project Fund	TT\$	3,694,085	-
Nariva Swamp Restoration, Carbon Sequestration and Livelihood Project	TT\$	3,119,048	1,860,851

The Highway Police Surveillance Bays Project Fund is a project funded by the Government of the Republic of Trinidad and Tobago to construct surveillance bays between the northern-bound and south-bound lanes of the Solomon Hochoy Highway.

12. Fair Values:

Fair value is the amount for which an asset could be exchanged, or a liability settled between knowledgeable, willing parties in an arm's length transaction. The existence of published price quotation in an active market is the best evidence of fair value. Where market prices are not available, fair values are estimated using various valuation techniques, including using recent arm's length market transactions between knowledgeable, willing parties, if available, current fair value of another financial instrument that is substantially the same and discounted cash flow analysis.

The following methods have been used to estimate the fair values of various classes of financial assets and liabilities:

Current assets and liabilities -

The carrying amounts of current assets and liabilities are a reasonable approximation of the fair values because of their short-term nature.

**ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND**

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2012

13. Related Party Transactions:

Parties are considered to be related if one party has the ability to control the other party or exercise significant influence over the other party in making financial decisions.

Key management personnel are those persons having the authority and responsibility for planning, directing and controlling the activities of the Authority.

A number of transactions are entered into with related parties in the normal course of business. These transactions were carried out on commercial terms at market rates.

Balances and transactions with related parties and key management personnel during the year were as follows:

	30 September	
	<u>2012</u>	<u>2011</u>
Other expenses		
Directors' fees	\$ 614,500	\$ 544,271
Directors' expenses	77,732	64,197
Key management compensation		
Short-term benefits	\$ 2,169,228	\$ 2,503,233

PART D: FINANCIAL ASSISTANCE OR OTHER SUPPORT

There are no qualifying activities under Section 14 (1d) of the Environmental Management Act, Chapter 35:05, for the year 2012.



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