BIODIVERSITY STRATEGY & ACTION PLAN FOR TRINIDAD AND TOBAGO

2017-2022

gef

Government of the Republic of Trinidad and Tobago
Ministry of Planning and Development

EMA environmental management authority

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ACRONYMS

BES	Biodiversity and Ecosystem Services
COP	Conference of the Parties
EBA	Ecosystem-Based Adaptation
ECO-DRR	Ecosystem Disaster Risk Reduction
ET	Environment Tobago
CANARI	Caribbean Natural Resources Institute
CABI	Centre for Agriculture and Biosciences International
CBD	Convention on Biological Diversity
CBO	Community Based Organisation
CCA	Climate Change Adaptation
COPE	Council of Presidents of the Environment
CSO	Central Statistical Office
DAMME	Department of Agriculture, Marketing, Marine Affairs and the Environment
DMRF	Department of Marine Resources and Fisheries
DNRE	Department of Natural Resources and the Environment
EPPD	Environmental Policy and Planning Division
EMA	Environmental Management Authority
ET	Environment TOBAGO
FD	Forestry Division
GEF SGP	Global Environment Facility Small Grants Programme
GoRTT	Government of the Republic of Trinidad and Tobago
IMA	Institute of Marine Affairs
MEAU	Multilateral Environmental Agreements Unit
MPD	Ministry of Planning and Development
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-Governmental Organisation
NOC	National Oversight Committee
ORDKT	Office of Research Development and Knowledge Transfer
SDG	Sustainable Development Goals
SusTrust	The Trust for Sustainable Livelihoods
T&T	Trinidad and Tobago
TTIT	Trinidad and Tobago Institute of Technology
UWI	University of the West Indies
UTT	University of Trinidad and Tobago

1. EXECUTIVE SUMMARY

The first National Biodiversity Strategy and Action Plan (NBSAP) for Trinidad and Tobago (T&T) was approved by Cabinet in 2001 and set out a plan of action for the country. Forty-one (41) strategies spanning six (6) thematic areas were developed, with twenty-three (23) being prioritised for implementation. A number of actions were initiated and completed to varying degrees in alignment with the strategies laid out in the NBSAP. As a result of an updated Strategic Plan for Biodiversity, and the recent adoption of the global agenda for sustainable development as articulated in the sustainable development goals (SDGs), the revision of the NBSAP is required to ensure national priorities for biodiversity conservation are re-defined and integrated into other national and international programmes.

The revised NBSAP provides an update on the status of biodiversity in T&T taking into consideration the value of biodiversity and ecosystem services to human health and well-being; the threats to biodiversity and the legal and policy context in which this NBSAP will be implemented. The concept of ecosystem based adaptation approaches are introduced as mechanisms for consideration in addressing the national response to Climate Change.

The revised NBSAP for T&T will cover a 5-year period between 2017 and 2022 to facilitate reporting on progress towards the completion of the Strategic Plan for Biodiversity, which ends in 2020, and to support implementation and a mid-term review of the SDGs. The strategies and actions are centred on the 20 National Biodiversity Targets, which are aligned to the Aichi Biodiversity Targets. With the limited time remaining for the implementation of the Strategic Plan for Biodiversity, this revised NBSAP has prioritised 7 national targets that the GoRTT will focus on implementing. The remaining targets will be also be implemented directly through implementation of the prioritised targets or indirectly through existing regional or national initiatives. Below are the seven priority national targets and their proposed outcomes and outputs:

TARGET	OUTCOMES	OUTPUTS
1a. By 2020, at the latest, at least 50% of people are aware of the values and understanding of biodiversity. 1b. By 2020, at the latest, at least 30% of people are aware of the steps they can take to conserve and use biodiversity sustainably	Biodiversity conservation, biodiversity innovation and sustainable use become more evident in Trinidad and Tobago The mind-set of part of the population in T&T becomes more favourable to biodiversity conservation and sustainable use.	Schools, media are active participants in campaigns to improve and promote knowledge on biodiversity conservation and sustainable use. Periodic and diversified information on biodiversity conservation and sustainable use is available. Annual progress reporting from government agencies is available. EPPD, EMA, IMA, Forestry Authority and others engage chambers of

TARGET	OUTCOMES	OUTPUTS
		commerce and other private sector organizations in propagating sustainable use of biodiversity. Government policies in all sectors make progress to create an enabling environment for biodiversity conservation Regulatory agencies responsible for monitoring private sector activities such as mining, forestry, and agriculture collect data on the impact of these activities on biodiversity
5. By 2020, the rate of loss of all natural habitats, including marine habitats, is at least halved and degradation and fragmentation is significantly reduced	There is no further loss of primary natural habitats in T&T At least 30% of degraded natural habitats are recovering and their functionality is being restored. Fragmented ecosystems are actively reconnected via suitable bio-corridors.	Comprehensive land use policies and plans are developed and implemented at the national and local levels A national climate change adaptation strategy, which includes specific considerations for vulnerable natural habitats, is developed and implemented Robust monitoring and evaluation programmes are established in collaboration with the Universities and local communities to continuously track changes in the extent and integrity of natural habitats The PA instruments are harmonised and are strictly implemented/ enforced

TARGET	OUTCOMES	OUTPUTS
		Sustainable funding sources for the protection of natural habitats, including the Green Fund, are identified and mobilized against a clear management workplan
6. By 2020 at least 30% of the major commercially important fish, invertebrate stocks and aquatic plants are managed and harvested sustainably	Available statistics on commercial fish species and invertebrates harvested in accordance with management plans **The Spatial Monitoring and Reporting Tool** (SMART) is in place for monitoring and reporting illegal activities	TT national data collected and updated on implemented management plans (considering aquatic plants, illegal fishing stats, etc.) A national on-site audit program is elaborated Web based and mobile App is created to record findings and monitoring data Task force is created to assess and implement the SMART system for TT 30 landing sites in Trinidad with approved management plans 15 landing sites in Tobago with approved management plans Sustainable fishing material is completed (media, prints, video, outreach, environmental education) Fishing component is included into national awareness campaign
7a. By 2020 at least 30% of areas under agriculture are managed sustainably, ensuring	Sustainable management practices in T&T's agriculture sector have increased	Land use policy is updated to support sustainable agriculture and forestry practices

TARGET	OUTCOMES	OUTPUTS
conservation of biodiversity. 7c. By 2020 at least 50% of areas under forestry are managed sustainably, ensuring conservation of biodiversity.	Harvesting of natural forests is prohibited Sustainable harvesting of timber has increased Illegal bush fires and quarrying have decreased T&T population are more favourable to sustainable agricultural practices and forestry conservation	and implemented Education and outreach strategies are developed and implemented for agricultural and forestry sectors Monitoring and evaluation are established to track % of areas under agriculture that are managed sustainably
9a. By 2020, Invasive Alien Species (IAS), and Pathways are identified and prioritized for action 9b. By 2020, at least 40% of priority terrestrial IAS species present are controlled or eradicated at priority sites. 9c. By 2020, at least 50% of priority marine IAS species present are controlled or eradicated at priority sites. 9d. By 2020, measures are in place to manage pathways to prevent their introduction and establishment.	Targeted surveillance at all air and sea ports in place to effectively screen cargo, passengers and their luggage for detecting and eliminating any possible IAS threats National and International passengers informed of IAS risks, procedures of moving plants and animals and their products across borders, and penalties for violation	Existing laws and regulations, plans and policies governing the management and control of IAS are harmonised Draft National Invasive Species Policy approved and National Invasive Species Multi-Sectoral Coordinating Committee in place Specific IAS threats identified and updated at least annually for main trading and tourist markets by managers and policy makers in agriculture, tourism, environment and health sectors Regulations in place to manage IAS threats from ballast water, imported cargo (e.g. cars, tractors, machinery), ship hulls
11. By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of	All terrestrial and coastal marine areas important for biodiversity, ES, livelihoods and poverty alleviation are protected	Current status of biodiversity areas (protected areas?) and their importance for ES, livelihoods and poverty

TARGET	OUTCOMES	OUTPUTS
particular importance for biodiversity and ecosystem services, are managed consistent with approved plans.	Protected areas are managed effectively and according to their plans	alleviation is documented and clear. Protected areas management effectiveness is documented and under implementation Sound management plans of protected areas are completed.
12. By 2020 the extinction of at least 60% of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained	Threats to threatened species are reduced and conservation status of such species improved.	Legislative framework to address challenges and threats and improve protection is established Current status of threatened species and their habitats are documented. Threats to threatened species are documented and understood. Challenges to improving protection of threatened species and opportunities are highlighted. A participatory strategy to improve protection of and rehabilitate threatened species is developed, addressing challenges and capitalizing on opportunities.

The actions and responsible implementing agencies are defined with the NBSAP along with the risks to implementation. A capacity development plan, communications strategy and resource mobilization plan are defined as well.

The Ministry of Planning and Development (MPD) as the focal point for the CBD will be responsible for overseeing the implementation of this NBSAP. The Environmental Management Authority (EMA) and other relevant government agencies, non-governmental and community-based organisations (NGOs and CBOs) across the country that are involved in biodiversity conservation will provide technical support to MPD for implementation of the

strategies and actions outlined. Monitoring and evaluation of the implementation is provided via the indicators that were developed for each national biodiversity target.

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2. INTRODUCTION

2.1 Context

The first National Biodiversity Strategy and Action Plan (NBSAP) for Trinidad and Tobago (T&T) was approved by Cabinet in 2001 and set out a plan of action for the country. At that time the vision for the future of biodiversity conservation and sustainable use for T&T, as articulated in the 2001 NBSAP, was to "build our capacity to manage and conserve biodiversity resources by: increasing awareness of biodiversity in all sectors of the society, integrating biodiversity concerns into national policies and planning, encouraging participation of a wide cross-section of the national community in all the processes to accomplish this vision and building up our information base to support the above activities." Forty-one (41) strategies spanning six (6) thematic areas were developed, with twenty-three (23) being prioritised for implementation. Over the past 14 years a number of actions were initiated and completed to varying degrees in alignment with the strategies laid out in the NBSAP.

During this timeframe, the Convention on Biological Diversity (CBD) at its tenth (10^{th}) meeting of the Conference of the Parties, adopted a revised and updated Strategic Plan for Biodiversity, which includes the Aichi Biodiversity Targets, for the 2011-2020 period. The Millennium Development Goals also came to an end and the 2030 Agenda for Sustainable Development, which includes 17 sustainable development goals (SDGs), has been adopted to guide global sustainable development for the next fifteen (15) years. In light of these developments, the revision of the NBSAP is required to ensure national priorities for biodiversity conservation are re-defined and integrated into other national and international programmes.

The revised NBSAP for T&T will cover a 5 year period between 2017 and 2022 to facilitate reporting on progress towards the completion of the Strategic Plan for Biodiversity, which ends in 2020, and to support implementation and a mid-term review of the SDGs. The Ministry of Planning and Development (MPD) as the focal point for the CBD will be responsible for overseeing the implementation of this NBSAP. The Environmental Management Authority (EMA) and other relevant government agencies, non-governmental and community based organisations (NGOs and CBOs) across the country that are involved in biodiversity conservation will provide technical support to MPD for implementation.

2.2 Value of biodiversity to T&T

The synergy between humanity and biodiversity is a delicate balance that is being threatened through the reduction of natural ecosystems and species. The pressure from anthropogenic threats is weakening natural processes and has pushed livelihoods of vulnerable communities toward the brink of survival. For these reasons the conservation of biodiversity and the environment is essential to the future of humanity. The economic value of biodiversity in Trinidad and Tobago is seen through its forests and marine ecosystems as they are the natural resources that are needed for food, products and sustainable livelihoods. The added value of these ecosystems has greater benefit through preservation, rather than destruction.

The economic benefits from forests are important, not only for its use as a natural resource, but its added value from carbon sequestration. It also serves as a source for water, and prevention of disasters, such as forest fires. The economic benefits from marine ecosystems contribute toward food security through the fishing industry as well as prevention of disasters from storm surges. Protecting biodiversity contributes directly towards the national economy

and its degradation could lead to an increase in poverty and the loss of economy in Trinidad and Tobago.

2.2.1 Ecosystem Services

Terrestrial

The value of forests has become a significant resource for multiple sectors, from tourism to carbon stocks, and their protection is crucial for future resources. Their value transcends across socio-economic development in supporting local communities through non-traditional products made from wood, agriculture, and tourism opportunities. The value of a forest is also seen by the amount of carbon it holds, which has increased in value in recent years (Table 1).

Table 1: Estimated Values of Ecosystem Services from Trinidad and Tobago's Tropical Forests (Source Girvan and Teelucksingh 2012)

Ecosystem Service	**Ecosystem Service Value (2010) (US$ per Ha per Year)**
Climate regulation/ carbon sequestration	1,088
Erosion Control	346
Flood Prevention	5
Water Purification	359
Sustainable Timber	397
TOTAL Value	**2,195**

The ecosystem services provided by forests, as highlighted in Table 1, is valued at $2,195 (USD) per Ha a year (2010)[1]. Forests play a crucial role in the water cycle through purification and maintenance of the water table and support disaster risk reduction through erosion control and flood prevention. Carbon sequestration is by far the most valuable ecosystem service as demonstrated by Figure 1. The most valuable carbon sequestration forests are mangrove and swamp forests due to their high carbon value of climate regulation services.

[1] Girvan, A., and Teelucksingh, S. 2012. *Environmentally adjusted National Accounts for Trinidad and Tobago's sustainable future.* Prepared in satisfaction of the Project for Ecosystem Services, UWI ST. Augustine.

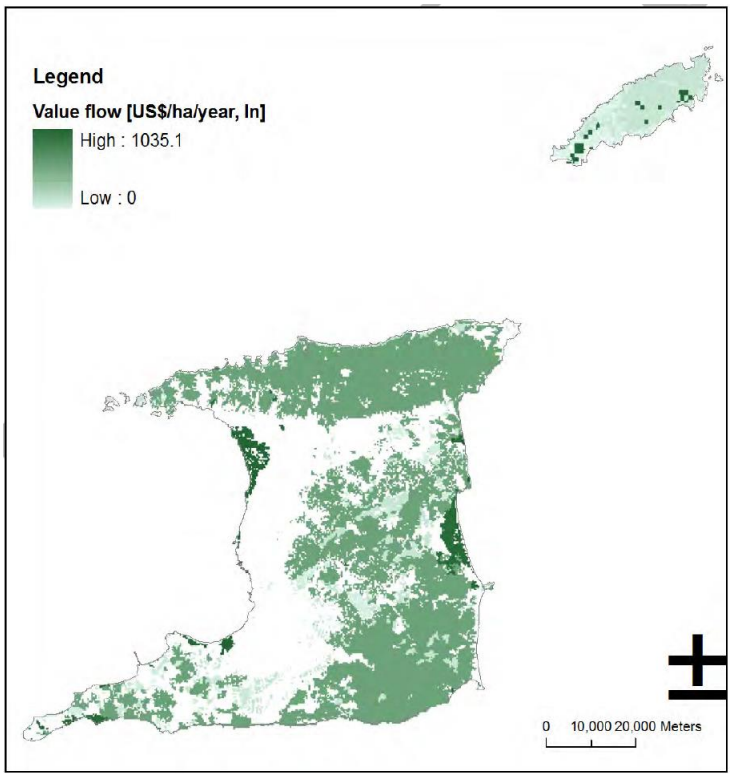
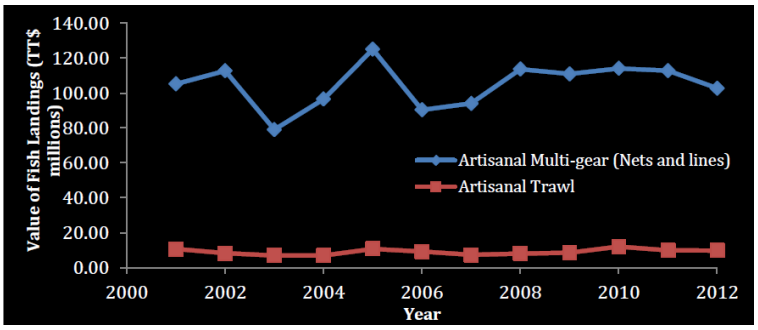


Figure 1: The distribution of the carbon sequestration values from mangrove forests and tropical forests from Trinidad and Tobago (Source: Ghermandi 2015).

Marine and Coastal

The value of the marine environment to the economy is seen in the fishing industry and through coastal protection. Fish populations have been heavily hit in the last century from uncontrolled fishing practices and industrial size fishing techniques to net large amounts fish. Large scale fishing has harmed local artisanal fishing communities by wiping out local fish populations and hurting small scale fishing, thus accelerating local poverty. In fact, approximately 60% of small-scale economic activities that contribute to the income of T&T are concentrated around the coastal communities[2]. Figure 2 shows the annual value of fish Landing ($TTD) of artisanal fishing in Trinidad and Tobago between 2001 and 2012.



[2] Ministry of the Environment and Water Resources. 2014. Trinidad and Tobago Draft Integrated Coastal Zone Management Policy Framework (2014). Available at http://www.ima.gov.tt/home/images/docs/Ingrated_Coastal_Zone_Mment_Policy_Framework1_Minister_April_2014.pdf. Accessed on 6 October 2016.

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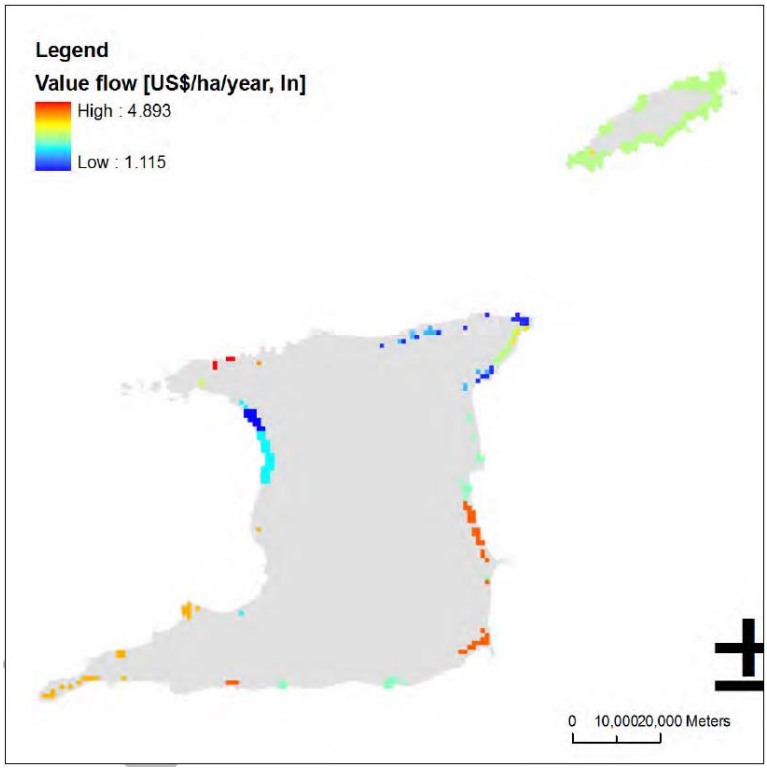


Figure 3: Map of the coastal protection value in Trinidad and Tobago (Sources Ghermandi 2015).

The value of costal ecosystems, such as coral reefs, mangrove forests and wetlands, is seen in the coastal protection they provide, which is valued between $3 (USD) and $133 (USD per hectare a year (Figure 3)[3]. They are also vital to mitigating against climate change threats such as sea level rise and coastal floods. In a case study done by the UNEP, coastal protection services provided by coral reefs, mangroves and mashes were valued at $49.6 million USD annually[4].

2.2.2 Tourism

The Tourism sector in T&T has been growing steadily. In 2014 Tourism contributed $4,882.0 million (TTD) to the economy which was an equivalent of 3.2% of the GDP (Figure 4). It is projected for the year 2025 to increase the total income to approximately $6,183.1 million (TTD)[5]. The impact is most seen from a social-economic perspective towards small communities who benefit from local tours and from non-traditional products, for example woodcrafts and artisan gifts.

[3] Ghermandi, A. 2015. Mapping ecosystem service values in Trinidad and Tobago. Report prepared as a contribution to the Project on Ecosystem Services (ProEcoServ). Port of Spain, Trinidad and Tobago. 25pp.

[4] UNEP. 2015. Success stories in mainstreaming ecosystem services into macro-economic policy and land use planning: evidence from Chile, Trinidad and Tobago, South Africa and Viet Nam. UNON Publishing Service Section. Nairobi, Kenya.

[5] World Travel and Tourism Council. 2015. Travel and Tourism Economic Impact 2015: Trinidad and Tobago. London, United Kingdom. 20pp.

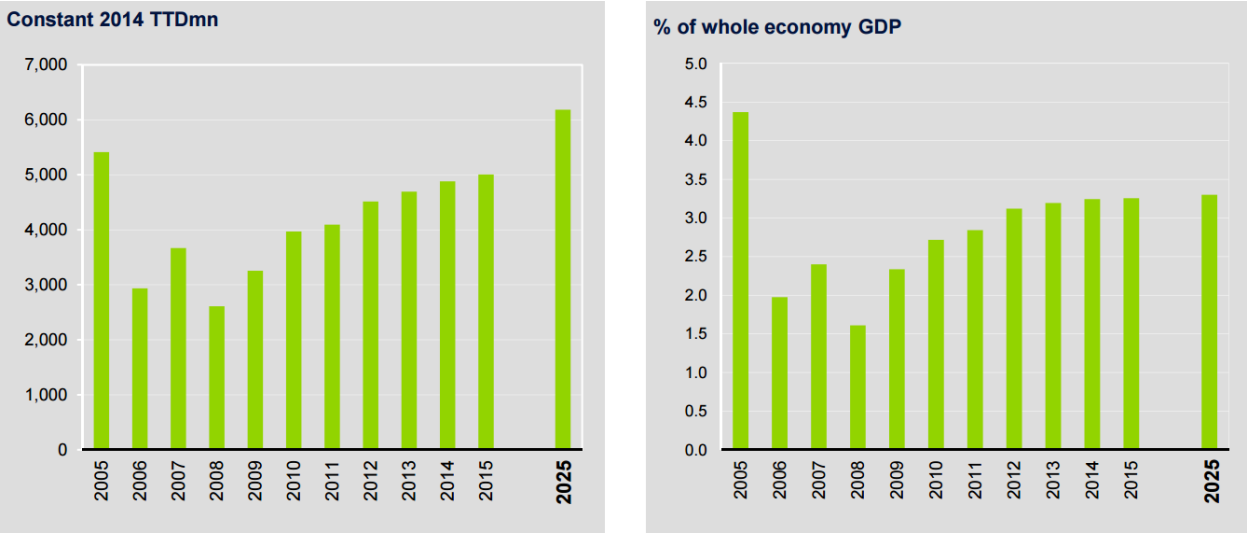


Figure 4: Tourism contribution for Trinidad and Tobago according to the value of income and the annual GDP between 2005 and 2015 with a 2025 future prediction (Sources WTTC Report for Trinidad and Tobago 2015).

In the last few years, eco-tourism has become a successful sector that supports both local communities and biodiversity conservation and management. In T&T, important tourist activities, such as turtle watching throughout the northeast coast are practiced; tours to mangroves forests, such as the Caroni and Nariva; scuba diving at the Buccoo Reef; and tours to the Asa Wright Nature Centre. 80.5% of the tourism's 3.2% contribution to the GDP is from tourism for leisure purposes (Figure 5)[6].

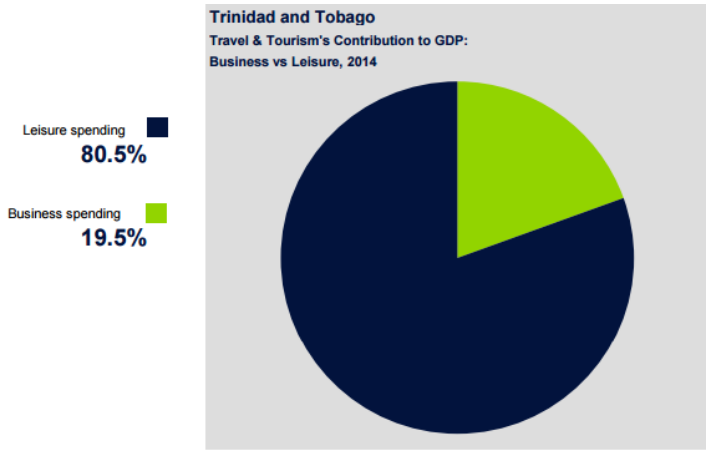


Figure 5: The percentage of travel and tourism contribution to GDP from leisure and business spending in Trinidad and Tobago (Source: WTTC Report for Trinidad and Tobago 2015)

Turtle watching has become a significant attraction and there are at least five dedicated communities that rely on turtle watching and hatching tourism, such as Grand Riviere and Matura. Grand Riviere, between 2005 and 2011, experienced a 300% increase in tourists,

[6] World Travel and Tourism Council. 2015. Travel and Tourism Economic Impact 2015: Trinidad and Tobago. London, United Kingdom. 20pp.

including 21,000 individuals visiting in 2011. The total income resulted in $105,000 (TTD) to the government through the sales of permits and the benefits through tour operators were estimated to be approximately $660,000 (TTD)[7]. The local community employed thirty-two individuals as data collectors and local tour guides and local businesses (hotels and restaurants) experienced and increase in revenue. In Matura, Nature Seekers, a local NGO involved in leatherback turtle research, protection and tourism, reported 15,637 tours in 2009 resulting in estimated revenue between $0.4 and $1.5 million (TTD). Grand Riviere also benefited indirectly from local tourism through hotels, restaurants and small local tourism venders[8].

It is also important to mention the impact of unregulated tourism activities on a delicate small island ecosystem. Large numbers of tourists can add additional stress on a fragile ecosystem, for example unregulated scuba diving within coral reefs can interfere with the natural synergy of the communities and damage delicate coral structures; unregulated sea turtle watching tours can add stress to the animals and cause them to not swim to shore or leave before laying their eggs on the beach. There several examples of human interference of the ecosystem that speaks to the need for appropriate regulation, planning and monitoring. A regulatory system such as this is lacking in T&T.

2.2.3 Ecosystem-Based Adaptations (EBA)

The value of ecosystem can also be seen through ecosystem-based adaptations (EBA) for disaster risk reduction in local communities in addition to supporting biodiversity conservation and the economy. Examples of EBA methodologies are Ecosystem based disaster reduction (Eco-DRR) and Climate Change Adaptation (CCA); however there are several similar methodologies that can be implemented. The main concept is to protect, preserve and improve the selected ecosystem to reduce the risk of disaster by using natural barriers (Table 2). Each ecosystem accounts for an economic and socio-economic value from prevention rather than recovery. Agriculture and production of non-traditional products can be used to help local communities while benefiting the biodiversity.

Table 2: Eco-DRR activities that potentially could be adapted according to the type of disaster/risk

Disaster/Risk	Eco-DRR Activity
Flooding	Forest restoration, mangrove forest restoration, wetland restoration, sustainable agriculture practices and estuary recovery
Hurricanes	Mangrove forest restoration, coral reef restoration and coastal restoration
Tsunamis	Coral reef restoration, mangrove forest restoration and coastal restoration.

[7] Bachan, A. (2012, May 28). *Economic Value of Sea turtles and the Environment and as a catalyst for* 26 *Developing Sustainable Communities.* Retrieved August 2012, from Enivronmental Mangement 27 Authority: http://www.ema.co.tt/docs/events/economic_value.pdf

[8] Bachan, A. (2012, May 28). *Economic Value of Sea turtles and the Environment and as a catalyst for* 26 *Developing Sustainable Communities.* Retrieved August 2012, from Enivronmental Mangement 27 Authority: http://www.ema.co.tt/docs/events/economic_value.pdf

Landslides	Forest restoration and sustainable agriculture practices
Drought	Forest restoration, wetland restoration and sustainable agriculture practices
Fires	Sustainable agriculture practices
Storm Surges	Coral reef restoration, mangrove forest restoration and coastal restoration

Examples of Eco-DRR are not directly found in T&T. However, a pilot project developed by the Caribbean Natural Resources Institute (CANARI), demonstrates the introduction of the concepts within a local community. The purpose of the project was to "improve resilience in livelihoods and ecosystems to disaster related to climate change; build capacities among inhabitants, especially those that are most vulnerable; manage ecosystems efficiently in order to respond adequately to climate change by means of investigation, learning inaction and development of abilities, as well as diffusion and communication of lesson learned"[9]. The project helped local communities assess its vulnerability towards risk and climate change and formulated an action plan to address the areas of risk. The community as well raised awareness through social media though photojournalism to emphasize their strategies and improvements of their environmental standards.

2.3 Status of biodiversity

2.3.1 Terrestrial

There are several, different accounts of the area (and percentage area) covered by forests in T&T. According to the GoRTT (2013), total forested area in Trinidad and Tobago declined from 256,346 Ha in 1970 to 226,413 Ha in 2010 – an approximate 12% decrease. Between 2010 and 2015, there was a reported increase in forested area on both islands to approximately 234,000 Ha (Figure 6; FAO 2010; FAO 2015). The increase in forest cover in T&T (Figure 6) over the 2010 – 2015 period is attributed (at least in part) to regeneration of secondary forest on abandoned sugar cane lands, abandoned cocoa and coffee plantations, and the increase in the cultivation of timber (Carlton Roberts pers. comm., 2016).

According to the Forestry Division (2016), it is estimated that forests now cover approximately 45.7% of the total land area in Trinidad and Tobago; of this, primary forests account for 26.6%. Of the total forested area, 55.94% belongs to the state, and 44.06% are private lands *(ibid)*. Based on figures presented in T&T's 2014 MDG report (GoRTT, 2014), total forest cover in in T&T in 2012 was reported to be approximately 48%. Helmer *et. al.* (2012) provide an estimate of forest cover in T&T as high as 73.2% of total land area, but this is likely an overestimate attributable to the methodology used.

[9] Caribbean Natural Resources Institute. 2013. Case study on a pilot project on community action to build climate change resilience in Caura Valley. Trinidad.CANARI, GEF, SGP, UNDP. Trinidad and Tobago.

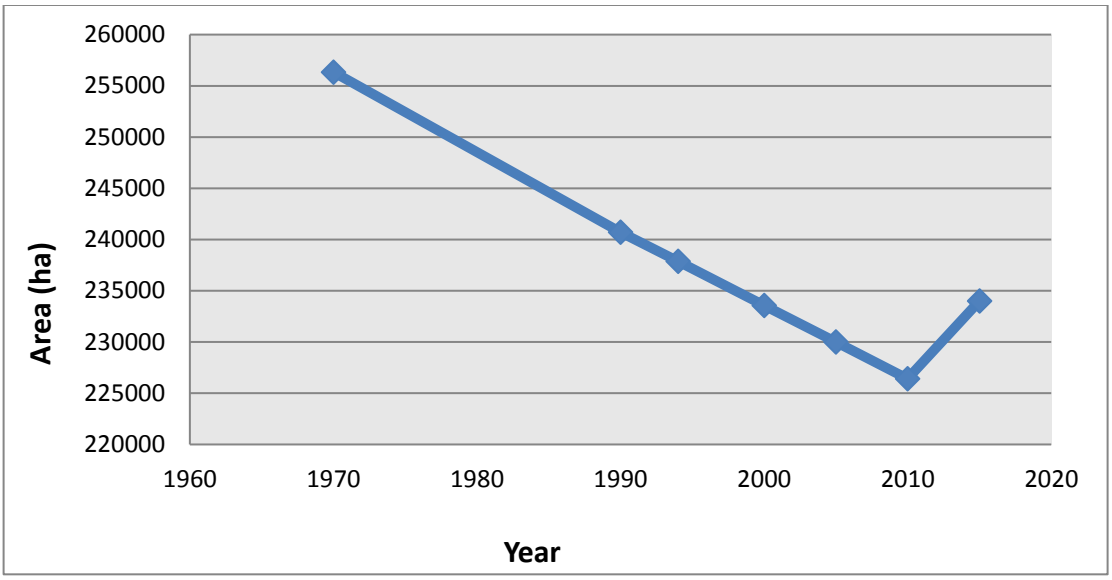


Figure 6: Change in Total Forested Area in Trinidad and Tobago (1970 – 2015)
Data sources: FAO Forest Resources Assessment (FRA) Trinidad and Tobago Country Report (2010); FAO Global FRA (2015)

Figures 7 and 8 show the most recent, published, and readily available account of the geographical distribution of different forest types across T&T based on 2007 Landsat imagery (Helmer *et al* 2012). It has been recognized that there are a few scientific inconsistencies in this published data, and the Forestry Division is currently working to bring greater accuracy to the results. Additionally, a survey of T&T's land use and land cover was conducted in 2015 using LIDAR Radar technology, but the results of this survey are not yet available.

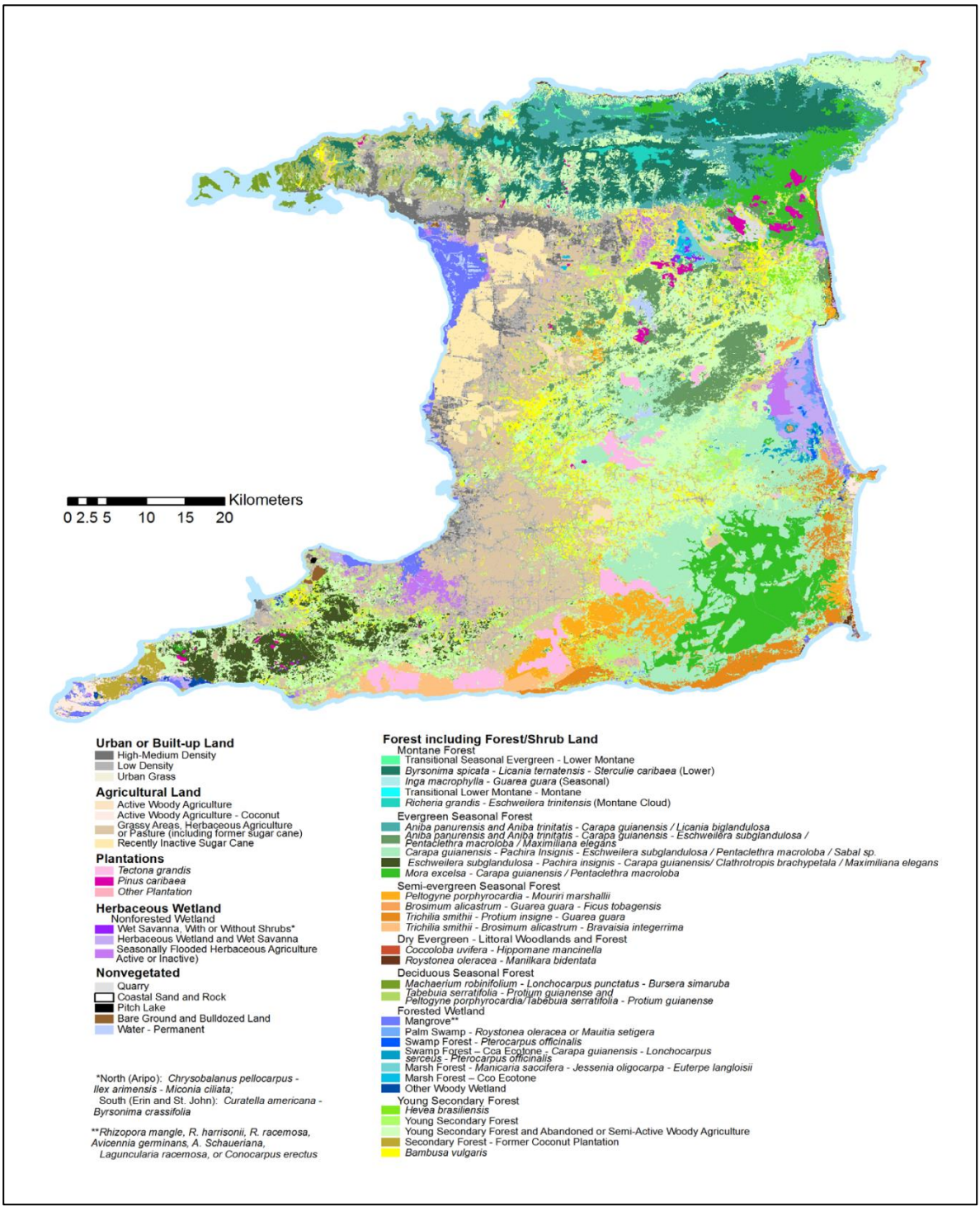


Figure 7: Trinidad Land Use/ Land Cover Map (updated 2007)
Source: Helmer *et al* (2012)

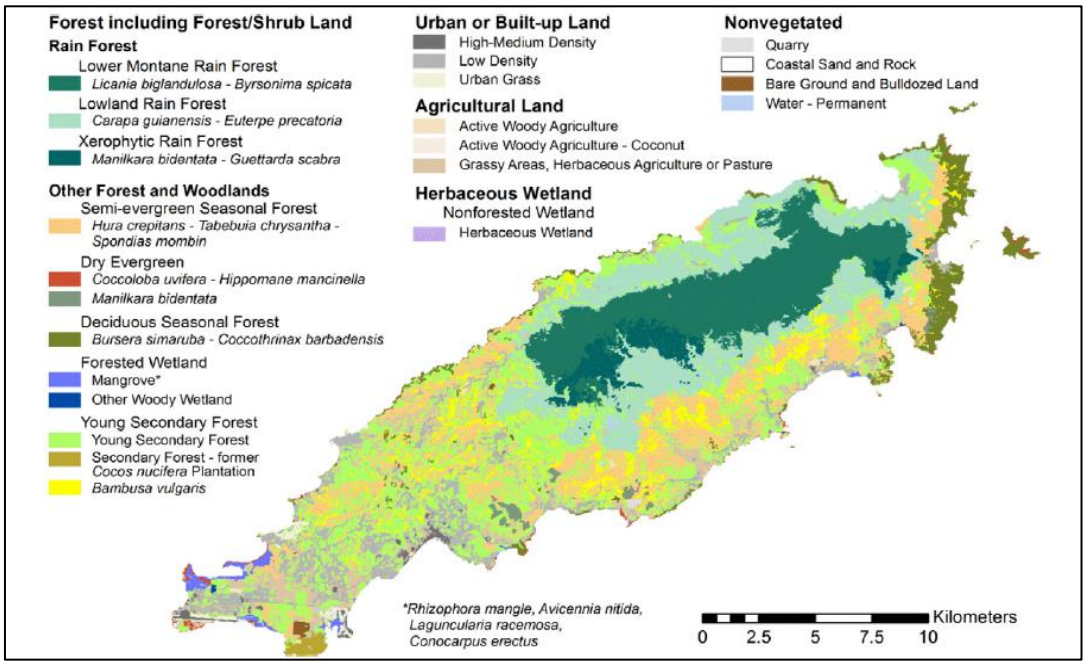
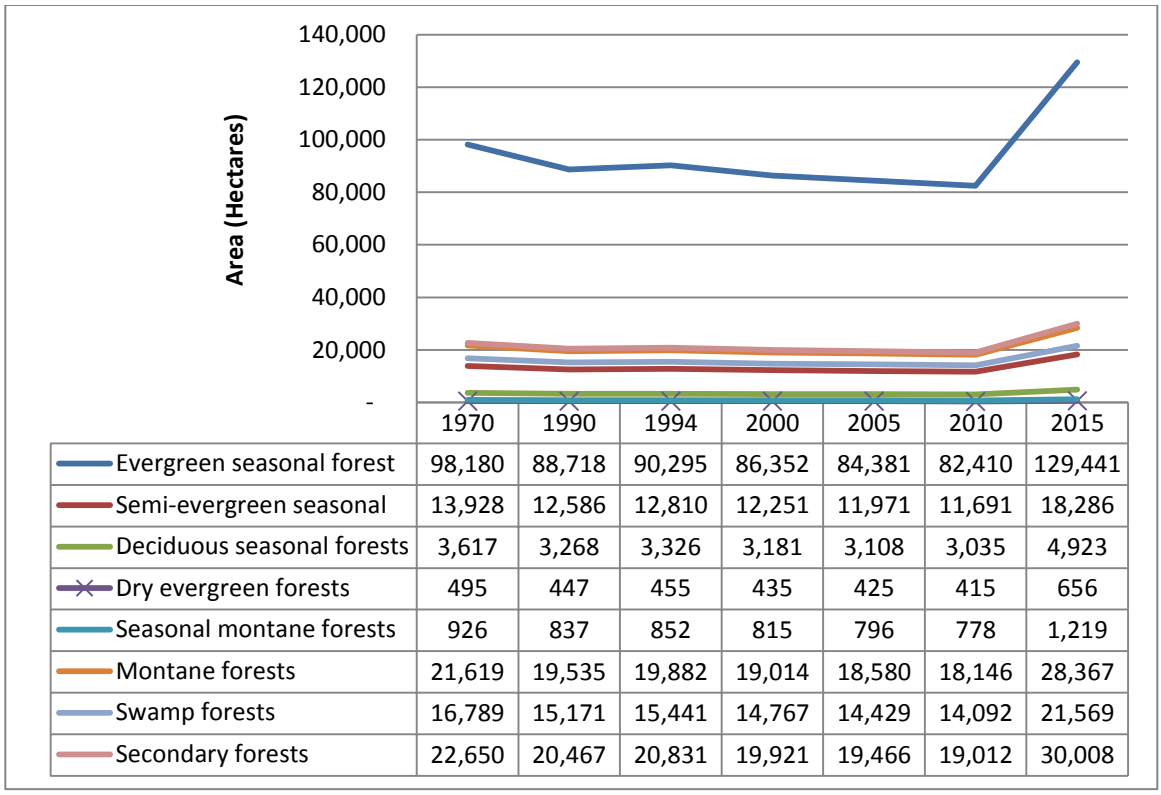


Figure 8: Tobago Land Use/ Land Cover Map (updated 2007)
Source: Helmer *et al* (2012)

Figure 9 shows the change in the area of natural forest in T&T between 1970 and 2015 by forest type. Up until 2010, all natural forest types – evergreen seasonal forest, semi-evergreen seasonal forest, deciduous seasonal forest, dry evergreen forest, seasonal montane forest, montane forest and swamp forest - showed a decline in extent. However between 2010 and 2015, there was a reported increase in the extent of all forests (not including plantation forests).

The percentage composition of forests in T&T by type as of 2015 (based on the 45.7% total forest cover in T&T) is shown in Table 3. As is evident, evergreen seasonal forest continues to account for the greatest percentage of forested area in the country. Although evergreen seasonal forest was the forest type that showed the greatest increase in extent between 2010 and 2015, deciduous seasonal forest showed the greatest percentage increase in 2015 over its 2010 extent.



	1970	1990	1994	2000	2005	2010	2015
Evergreen seasonal forest	98,180	88,718	90,295	86,352	84,381	82,410	129,441
Semi-evergreen seasonal	13,928	12,586	12,810	12,251	11,971	11,691	18,286
Deciduous seasonal forests	3,617	3,268	3,326	3,181	3,108	3,035	4,923
Dry evergreen forests	495	447	455	435	425	415	656
Seasonal montane forests	926	837	852	815	796	778	1,219
Montane forests	21,619	19,535	19,882	19,014	18,580	18,146	28,367
Swamp forests	16,789	15,171	15,441	14,767	14,429	14,092	21,569
Secondary forests	22,650	20,467	20,831	19,921	19,466	19,012	30,008

Figure 9: Forested Area in Trinidad and Tobago by Forest Classes (1970 – 2015)
Note: the forest classes included in this Figure are a sub-set of the full range of the forest classes that are included in the FAO statistics. Classes such as plantation forests and bamboo are not included in this figure.
Data Sources: (1970 – 2010 data): FAO Global Forest Resources Assessment, Country Report for T&T (2010); (2015 data): Calculated based on data in Table 3 (Forestry Division, 2016)

Table 3: Forest Cover by Type in Trinidad and Tobago as a Percentage of Total Forest Cover (2015)

Indigenous Forest Types	Percentage Cover	Location
Evergreen Seasonal	55.2	North East
Semi- Evergreen Seasonal	7.8	Southern Extremes
Deciduous Seasonal	2.1	Western Northern Range
Dry Evergreen	0.28	East Coast
Seasonal Montane	0.52	Northern Range
Montane	12.1	Northern Range
Swamp	9.2	Coastal
Secondary	12.8	Widely Distributed
TOTAL	**100**	

Source: Forestry Division (2016)

Based on Forest Resources Assessment (2015) data, the total area of plantation forests in T&T in 2015 was estimated to be 11,000 Ha. The change in the area of plantation forest between 1990 and 2015 is shown in Figure 10; and the percentage change over the 1990/2015 period is estimated at –26.6%.

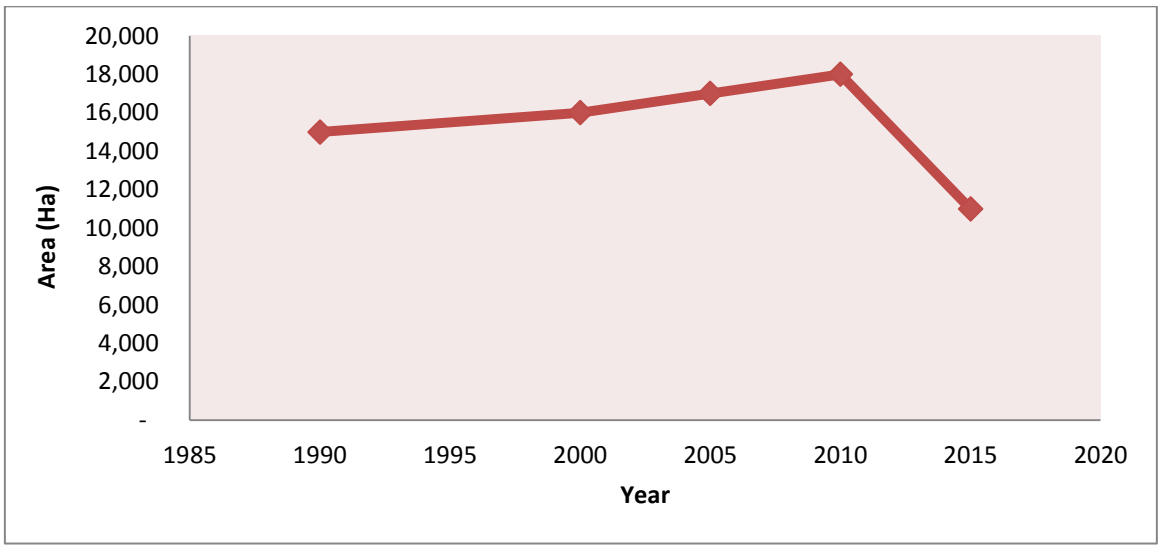
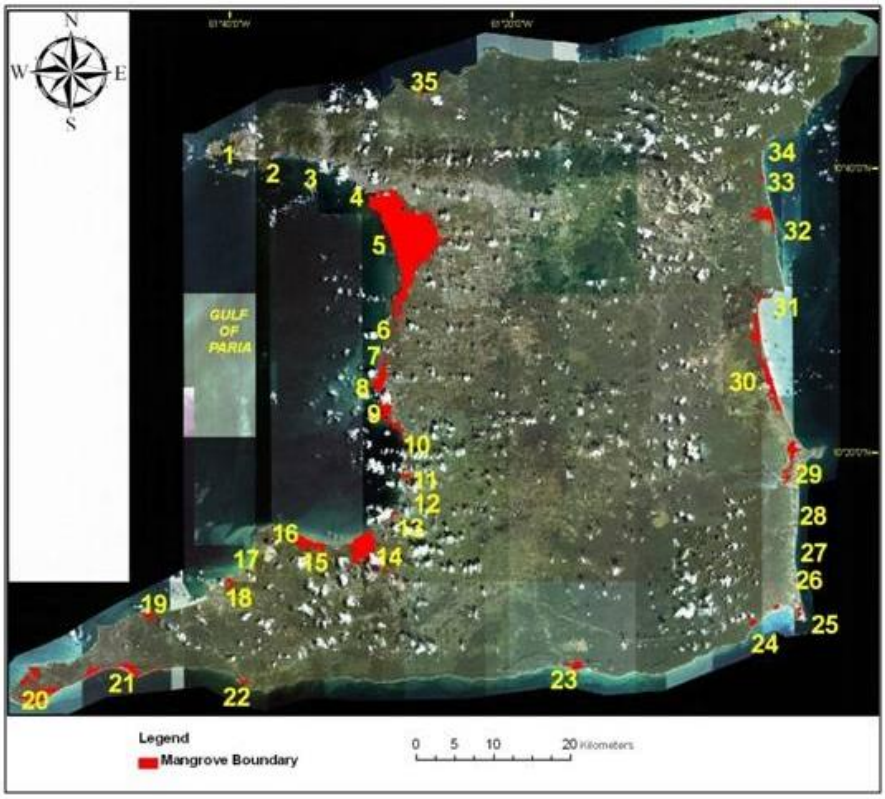


Figure10: Area Covered by Plantation Forests in Trinidad and Tobago (1990 – 2015)
Source: FAO 2015

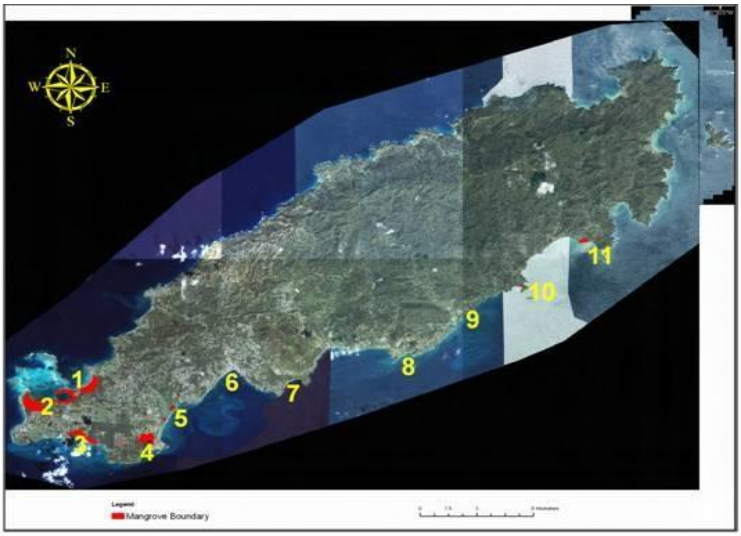
2.3.2 Coastal ecosystems

Mangrove forests are found on both the islands of Trinidad and Tobago (Figures 11 and 12). Data from 2007 (the most recent and accurate) indicate that at that time, total mangrove coverage in Trinidad was 9,146.4 Ha, and 222.9 Ha in Tobago – a combined total of 9,369.3 Ha (Juman and Ramsewak, 2013b). The distribution along the coastlines in Trinidad was found to be West coast – 7,532 Ha; East coast – 1,132.8 Ha; South coast – 481.3 Ha; and North coast – 0.3 Ha. In Tobago, the mangrove forests include 11 systems, and most are in the Windward coast.



1. Scotland Bay
2. Hart's Cut
3. Cuesa River
4. Sea Lots
5. Caroni
6. Waterloo
7. Orange Valley
8. Couva River
9. North Claxton Bay
10. South Claxton Bay
11. Guaracara River
12. Marabella River
13. Cipero River
14. Godineau
15. Rousillac
16. La Brea
17. Vessigny
18. Guapo
19. Irois Bay
20. Icacos
21. Los Blanquizales
22. Frank's Bay
23. Moruga Bay
24. Guayaguayare Bay
25. Pt Galeota
26. Southern Mayaro
27. Central Mayaro
28. North Mayaro
29. Ortoire
30. Nariva
31. Manzanilla Bay
32. Fishing Pond
33. Matura Bay
34. Rincon Bay
35. Maracas Bay

Figure 11: Map of Mangrove Forests in Trinidad (2007)
Source: Juman and Ramsewak, 2013b



1. Buccoo Bay
2. Bon Accord Lagoon
3. Kilgwyn Friendship
4. Petit Trou
5. Little Rockly Bay
6. Scarborough
7. Minster's Bay
8. Fort Gransby
9. Goldsborough Richmond
10. Belle Garden
11. Louis Dor

Figure 12: Map of Mangroves in Tobago (2007)
Source: Juman and Ramsewak, 2013b

Although data on mangrove extent prior to 2007 exist (Bacon, 1993; FAO, 2005), it is important to note that these earlier measures were limited by the lack of appropriate technological tools, and may therefore not be accurate (Juman and Ramsewak, 2013b). Trying to establish trends in mangrove extent using these earlier data will likely provide trends that are not credible. Box 4 provides an overview of the status of various mangrove systems across T&T, along with an account of the major pressures that are driving changes in these mangrove systems.

Marsh swamp – There are no aggregate, national-level data that indicate changes in marsh swamp area in Trinidad and Tobago. However, data from the Nariva Swamp indicate that over the period 1942 to 2003, the area covered by marsh decreased from 4,414 Ha to 3,166 Ha (Carbonell *et. al.,* 2007); and in the Caroni Swamp, between 1942 and 2007, marshlands decreased by an area of 523 Ha (Juman and Ramsewak, 2013). In both cases, changes were largely on account of hydrological changes in the swamps.

Coral Reefs – Figure 13 shows the areas where coral reefs are found around Trinidad and Tobago. Trends in area and diversity of Tobago's benthic reefs have been documented principally through studies undertaken at selected locations in Tobago in 1985, 2009 and 2013 at Buccoo, Arnos Vale, Culloden, Man-o-War Bay and Speyside (Hassanali 2009). Data on the impacts of coral bleaching in Tobago over the period 2010 – 2012 are also provided by Alemu and Clement (2014).

The data indicate that although hard coral cover declined at all sites in Tobago by approximately 33% over the 1985 – 2013 period, coral cover remained relatively stable ($p>0.05$). This would seem to indicate that the reefs in Tobago did not conform to the overall

decrease of 80% in hard coral cover that was reported by Gardner *et. al.* (2003) since the late 1970s. There was a decline in soft coral cover between 1985 and 2009; but this negative trend subsequently stabilized. Macroalgae cover in the reefs increased by a factor of 50 over the 1985-2013 period. The increases in algal and sponge cover on some reefs suggest coral-algal shifts and coral-sponge shifts/co-dominance may be occurring.

Selected results from the studies of Tobago's coral reefs are given in Tables 4 & 5, and in Figure 14, in order to highlight that although general trends have been reported across Tobago's reefs, there are differences in the trends in coral cover between and among various sites, species and water depth. One emerging observation is that hard coral decline appears to be higher in the shallower areas around Tobago (Figure 14).

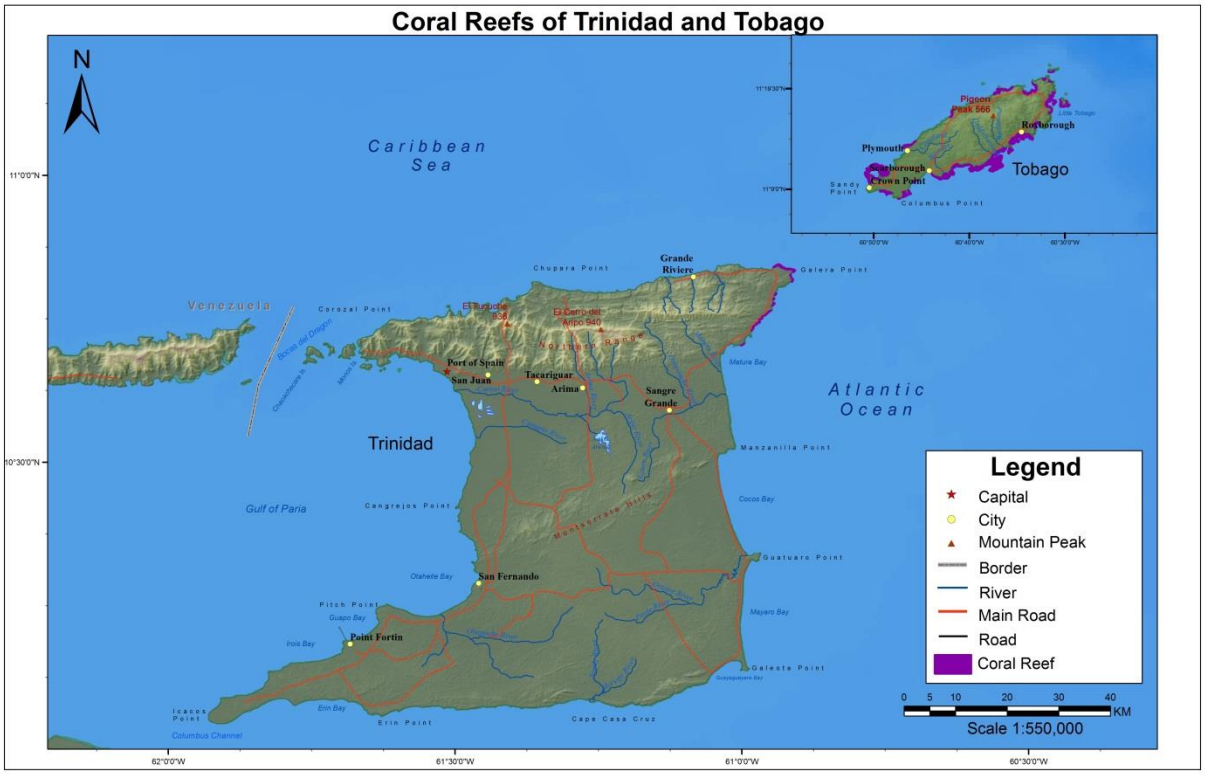


Figure 13: Coral Reef Locations Around Trinidad and Tobago
Source: Map produced by the IUCN (2106) based on data from UNEP-WCMC (2010)

Table 4: Percentage Change in Cover of *Siderastrea siderea* in Tobago Reefs Between 1985 and 2009
Source: Hassanali (2009)

Survey Locations	Mean *Siderastrea siderea* % cover		
	1985	2009	% Reduction in cover
3m Speyside	3.87	1.61	58
16m Culloden	7	2.58	63
9m Buccoo	5.7	0.46	92
16m Buccoo	27.33	2.89	89
21m Buccoo	10.75	1.17	89
9m Man-o-War Bay	16.2	1.11	93

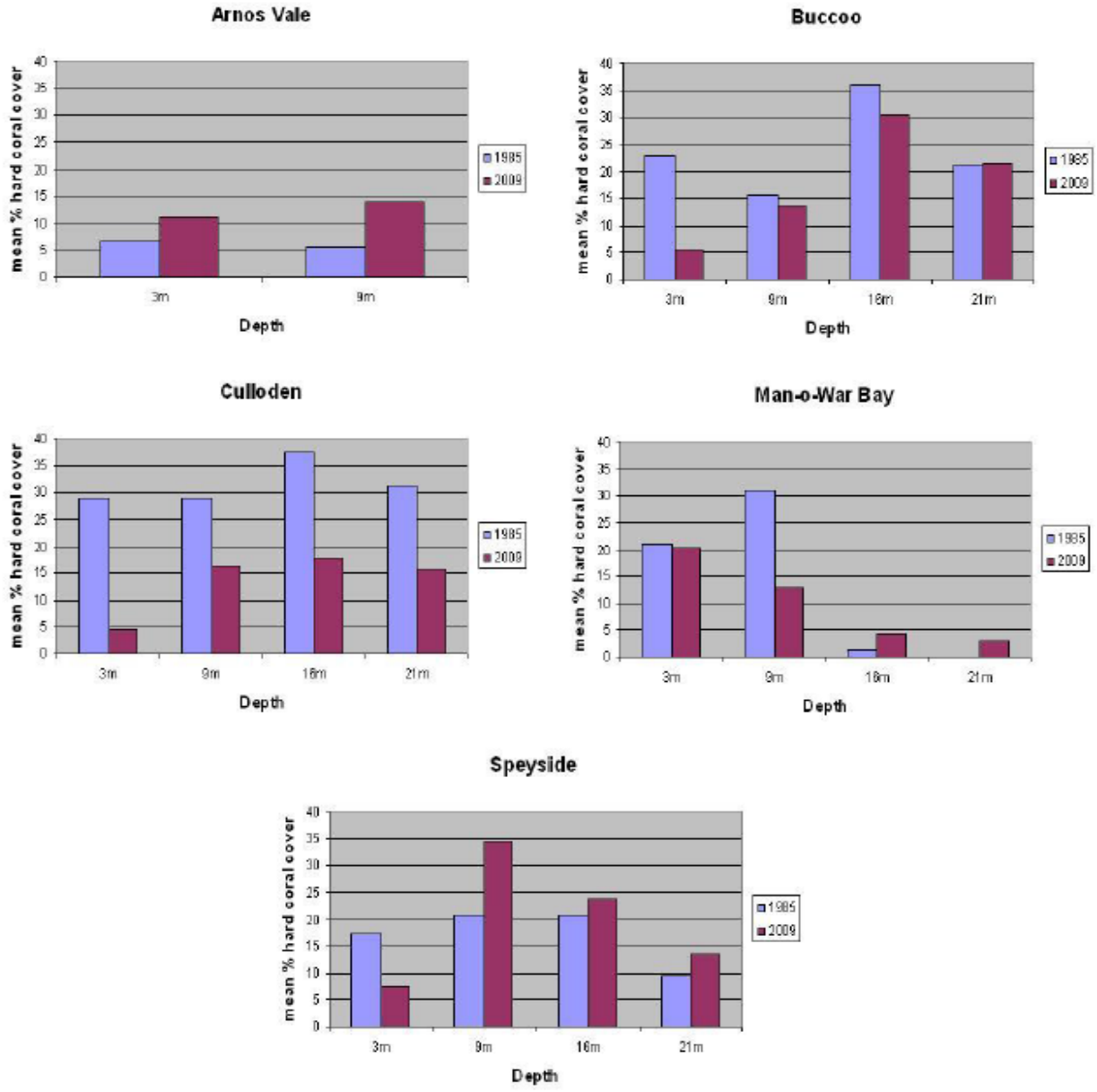


Figure 14: Changes in Hard Coral Cover in Sites Around Tobago (1985 and 2009)
Source: Hassanali (2009)

Not all species are equally vulnerable to bleaching. According to Alemu and Clement (2014), *Colpophyllia natans*, *Montastraea faveolata* and *Siderastrea sidereal* appear to be the most susceptible to bleaching (Table 5), and these are the species that together account for the highest composition on the reefs studied.

	Buccoo			Culloden			Speyside	
	2010	2011	2012	2010	2011	2012	2010	2011
Hard coral taxa	25.19	16.17	16.38	26.28	14.65	13.77	17.55	11.97
Acropora palmata	0.00	0.01	0.14	0.00	0.45	0.29	-	-
Agaricia agaricites	0.21	0.22	0.23	0.31	0.16	0.09	0.10	0.11
Agaricia fragilis	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Agaricia lamarcki	0.21	0.00	0.00	0.10	0.07	0.00	<0.01	<0.01
Colpophyllia natans	6.98	2.77	3.50	1.90	1.50	1.96	1.41	1.05
Dendrogyra cylindrus	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Dichocoenia stokesi	<0.01	<0.01	<0.01	0.05	0.11	0.01	-	-
Diploria clivosa	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Diploria labyrinthiformis	0.31	0.28	0.36	0.35	0.11	0.15	<0.01	<0.01
Diploria strigosa	1.13	0.85	0.73	1.80	1.77	1.97	<0.01	<0.01
Eusmilia fastigiata	0.32	0.21	0.05	-	-	-	0.20	<0.01
Favia fragum	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Isophyllastraea rigida	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Leptoseris cucullata	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Madracis decactis	0.31	0.02	0.02	0.10	0.04	0.03	0.10	0.00
Madracis mirabilis	<0.01	<0.01	<0.01	0.26	0.39	0.10	0.50	0.00
Meandrina meandrites	0.01	0.02	0.05	0.29	0.18	0.46	1.01	0.00
Millepora alcicornis	0.31	0.12	0.14	1.57	0.80	0.68	<0.01	<0.01
Montastraea franksi	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Montastraea cavernosa	0.99	0.17	0.29	0.91	0.31	0.51	0.31	0.10
Montastraea faveolata	11.88	10.13	9.65	17.51[ab]	7.59[a]	6.74[b]	10.97	8.32
Mussa angulosa	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mycetophyllia aliciae	<0.01	<0.01	<0.01	0.10	0.04	0.01	<0.01	<0.01
Mycetophyllia ferox	0.01	0.02	0.07	0.01	0.01	0.01	<0.01	<0.01
Porites astreoides	0.11	0.23	0.10	0.26	0.25	0.17	0.52	0.32
Porites furcata	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Scolymia wellsi.	0.02	0.02	0.02	0.01	0.05	0.02	<0.01	<0.01
Siderastrea radians	0.10	0.01	0.00	0.01	0.04	0.02	<0.01	<0.01
Siderastrea siderea	2.32	1.12	1.05	0.77	0.81	0.56	2.43	2.08
Stephanocoenis intercepta	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Macroalgae	15.87[a]	26.65	37.90[a]	20.68[a]	41.85	54.50[a]	4.08[a]	9.57[a]

The same superscript indicate significant pairwise comparisons ($p<0.05$) for reef taxa (bold print).
doi:10.1371/journal.pone.0083829.t003

Table 5: Change in the Percentage of Hard Coral Cover in Tobago's Reefs (2010 – 2012)
Source: Alemu and Clement (2014)

Seagrass communities in T&T are comprised of one or various combinations of four (4) particular species of seagrasses – Turtle grass (*Thalassia testudinum),* Shoal grass (*Halodule wrightii), Halophilia sp*. and Manatee grass (*Syringodium filiforme)*. Figures 15 and 16, which are based on data from 2001, provide a general idea of the location of seagrass beds around T&T, and indicate how the four (4) species of seagrasses are found in combinations around the islands.

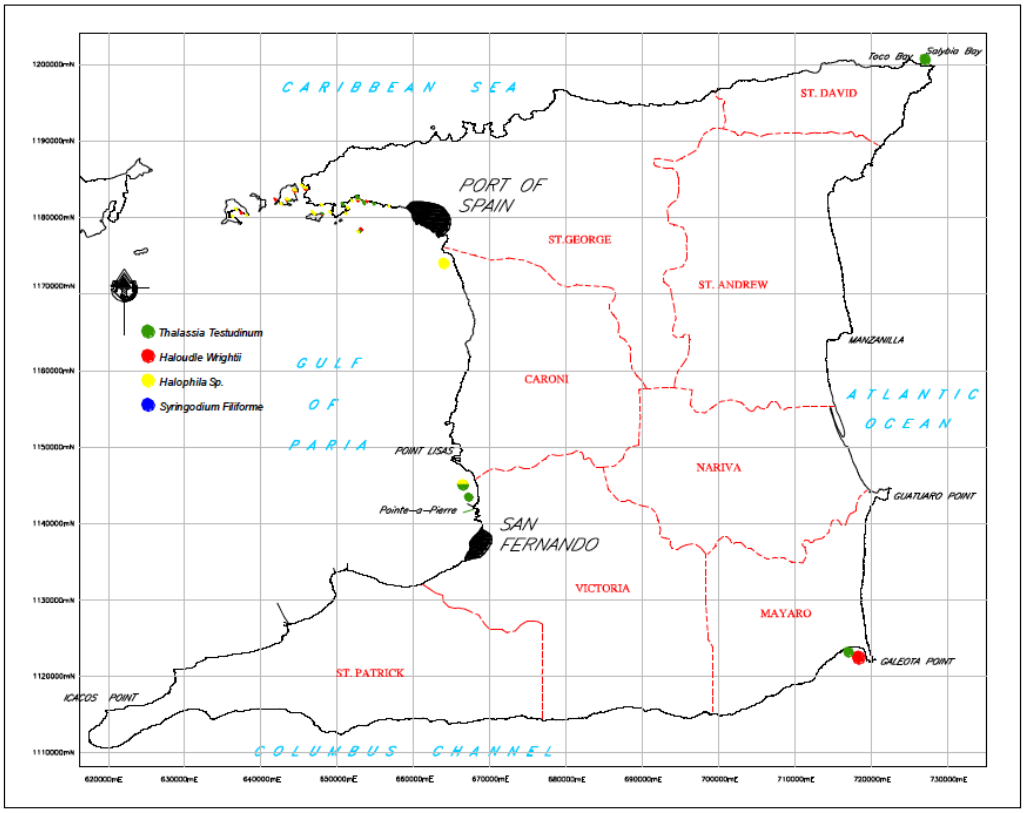


Figure 15: Seagrass Communities Around Trinidad and its Offshore Islands (2001)
Source: Juman and Alexander (2006)

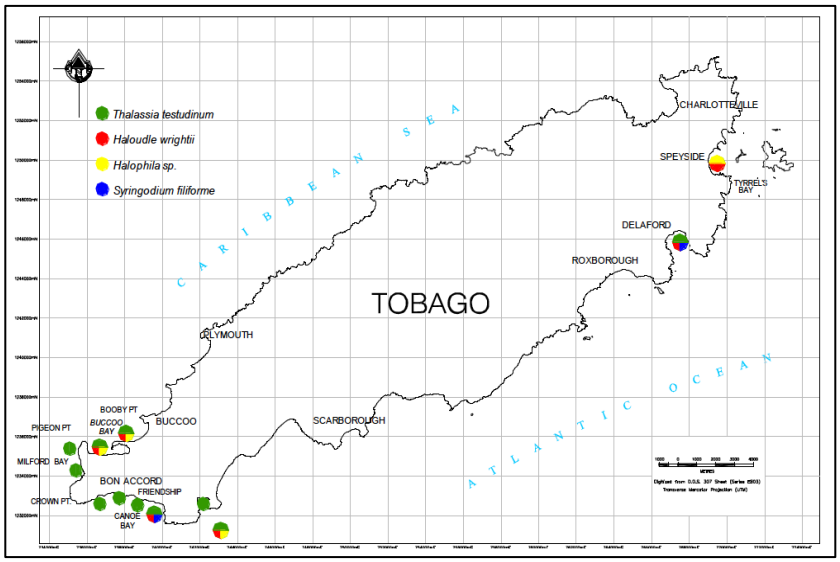


Figure 16: Seagrass Communities Around Tobago (2001)
Source: Juman and Alexander (2006)

Based on available data, it is not possible to provide a national aggregate figure for the current status or historical change in the area of seagrass beds around T&T. What is currently known is that the seagrass beds in the Buccoo Reef/ Bon Accord Lagoon Marine Protected Area

doubled in extent to 104 Ha between 1997 and 2010 (Juman, 2004; Juman 2012). However Thalassia dominated seagrass beds in many areas declined in extent between 2002 and 2009 (Figure 17). Based on the latest research (currently underway), there is evidence that Thalassia beds in La Guira / Kilgwyn, Tobago and along the northwest peninsula, Trinidad have now disappeared (Juman pers. comm., 2016). Human impacts – either by way of the degradation of coastal water quality, or through the removal/ smothering of seagrass beds to accommodate built development – are the main forces that drive change in seagrass communities. Research is currently underway to update the inventory of seagrass communities around Trinidad and Tobago (Juman pers. comm. 2016).

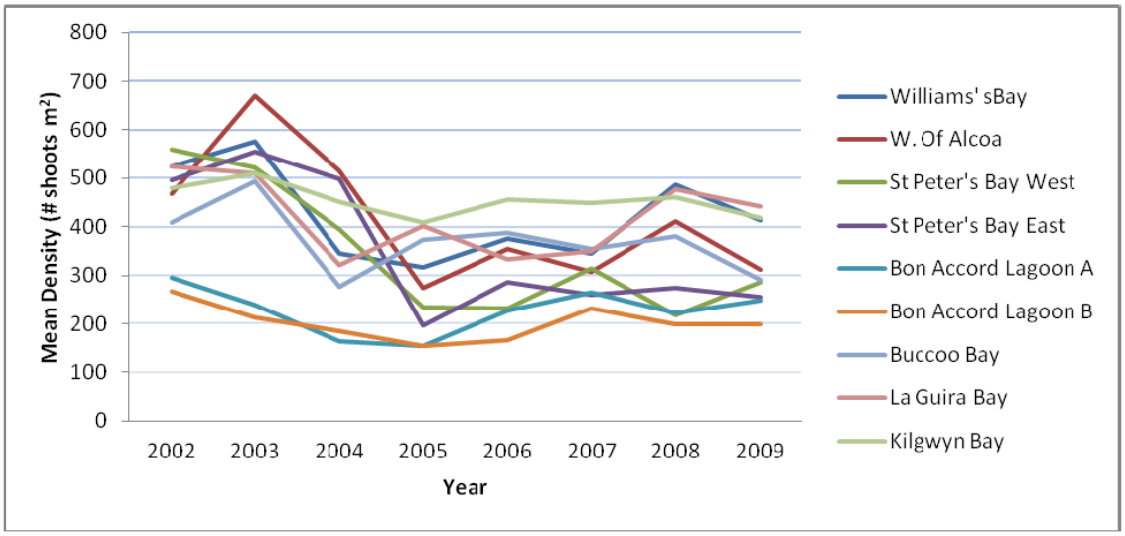


Figure 17: Mean *Thalassia testudinum* Shoot Density Measured at Monitoring Stations Around T&T between 2002 and 2009
Source: Juman 2011

2.3.3 Freshwater ecosystems

Systematic monitoring of the trends in freshwater ecosystems across T&T is not done. A river-monitoring programme undertaken between 2001 and 2006 (Surujdeo-Maharaj, 2010), which focused on selected heavy metals and a number of other physico-chemical parameters, indicated that the water quality and sediments in most rivers across T&T are of poor quality (Table 6).

Table 6: Assessment of the Biological and Physico-chemical Parameters of Rivers in T&T (2006)

Parameters	% of sites with negative impacts	Status of the rivers of T&T
(High) Habitat impairment	83	**Poor**
(Low) Biotic Diversity	78	**Poor**
(High) Nitrates	84	**Poor**

Parameters	% of sites with negative impacts	Status of the rivers of T&T
(Poor) pH	7	**Good**
(Low) Dissolved Oxygen	40	**Fair**
(High) Total Suspended Solids*	64	**Poor**
(High) Phosphates	92	**Poor**
(High) Biological Oxygen Demand	20	**Fair**
(High) Heavy metals in sediments	63	**Poor**
(High) Heavy metals in water	100	**Poor**

Source: (Surujdeo-Maharaj, 2010)

While Cadmium, Chromium and Nickel levels were generally found to be in moderate concentrations at river sampling sites, Zinc, Lead and Copper concentrations were often well above acceptable limits (Figure 18; Surujdeo-Maharaj, 2010). Concentrations of heavy metals also appeared to increase along the length of many rivers due to pollution loading. Along with the inputs of other pollutants (Mohammed et. al, 2009; 2011), this has implications for the coastal environment.

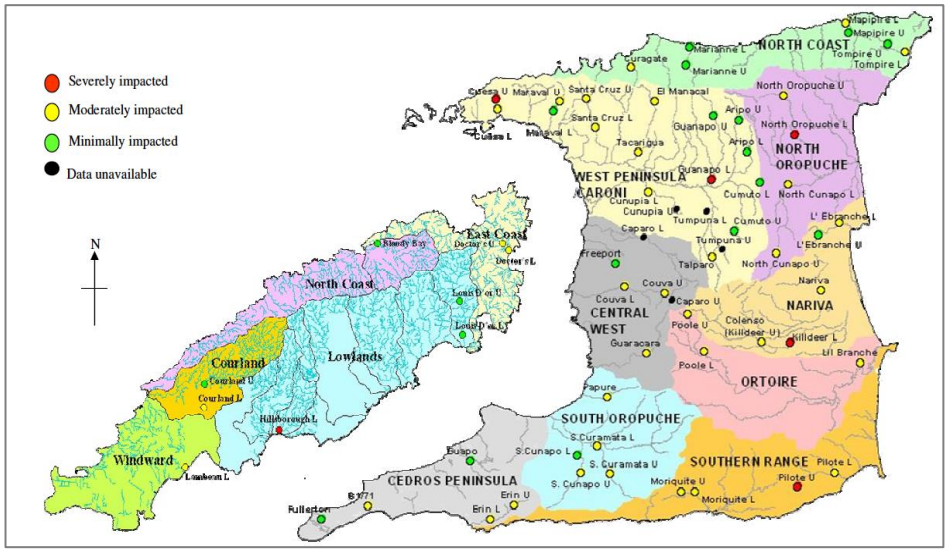


Figure 18: Heavy Metal Index for Aqueous Metals in Rivers Across Trinidad and Tobago
Source: (Surujdeo-Maharaj, 2010)

When the findings of this study are compared with the results of watershed quality assessment conducted in 1999 (Figure 19), which was presented in T&T's Fourth National Report (2010) and provides a baseline, there are a number of noteworthy differences:

- Overall, there seems to be a decline in water quality across the entire country.
- In 1999, watershed quality in the northwestern and southeastern regions of Trinidad was reported to be good in entire watersheds. However the heavy metal study (2010) indicates that there has been moderate to severe impact in these watershed areas due to heavy metal pollution.

- In 1999, watersheds across Tobago were reported to be in good condition, but the 2010 study highlighted areas where there are high levels of heavy metal pollution.

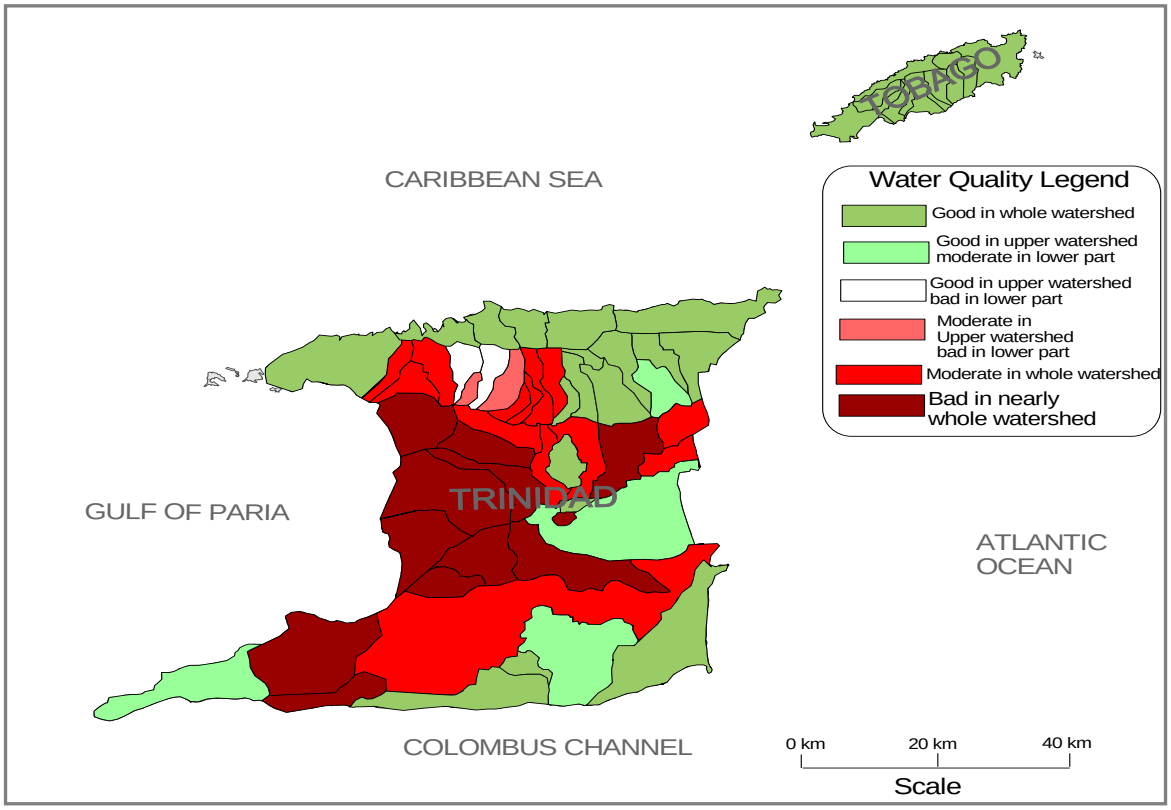


Figure 19: Surface Water Quality in Trinidad and Tobago (1999)
DHV Consultants/Delft Hydraulics/Lee Young and Partners, Government of Trinidad and Tobago (1999) in GoRTT (2010)

The pollutants in T&T's rivers are derived from a range of land use activities, including agriculture, industrial activity, transportation, and domestic runoff. Based on a study conducted by Maharaj and Alkins-Koo (2007), which would likely set the baseline for monitoring changes in biodiversity in T&T's rivers due to pollution, it is evident that the biodiversity in most of T&T's rivers is moderately to severely impaired (Figure 20; Surujdeo-Maharaj, 2010). The correlation between heavy metal pollution (shown in Figure 18) and impacts on biological diversity (Figure 20) is also very strong.

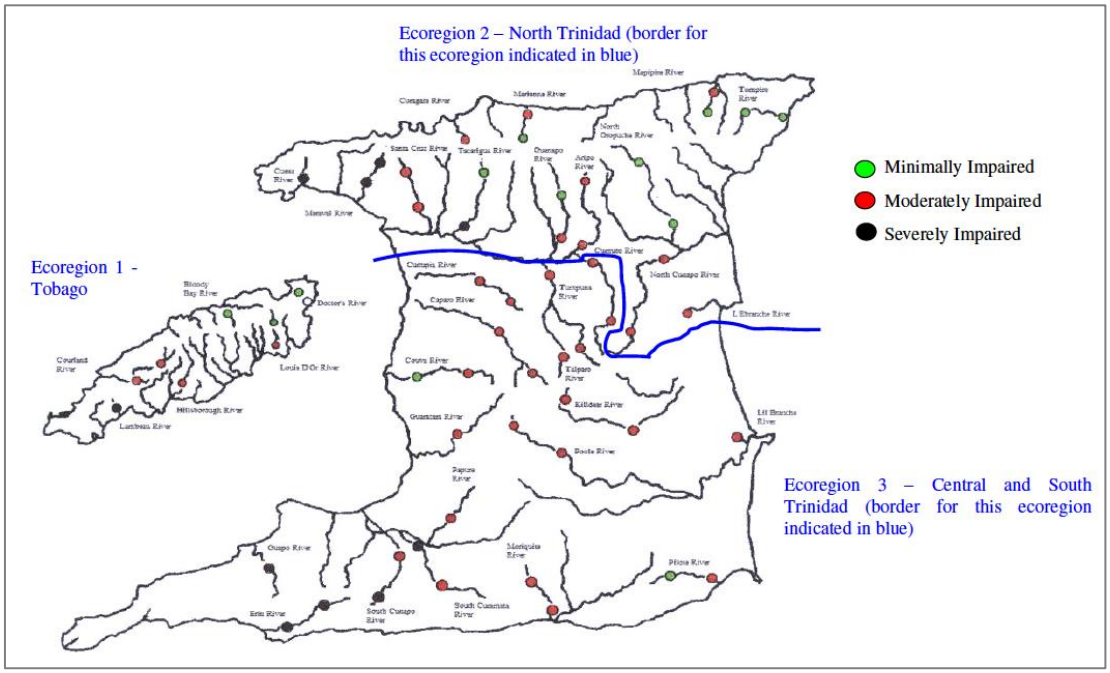


Figure 20: Biotic Impairment in Rivers of Trinidad and Tobago Based on an ASPT Score
Source: Maharaj and Alkins-Koo (2007) in Surujdeo-Maharaj (2010)

2.4 Species diversity and vulnerability

2.4.1 General status of species in Trinidad and Tobago

It is estimated that Trinidad and Tobago has lost approximately 8% of species from natural ecosystems around the country (UNEP-WCMC, 2016). Table 7 provides an update of the number of species (total and endemic in Trinidad and Tobago) based on most recent available data.

Table 7: Number of Species in Trinidad and Tobago

Major Categories of Plant and Animal Species	Number of Species	Number of Endemics	Source
Plants	3,638	53 plants	Comeau *et. al.* 2016
Mammals (land and marine)	100 including 67 bat species	2 mammals: 1 rodent: Trinidad spiny rat - *Proechimys trinitatus* 1 deer: Trinidad Red Brocket - *Mazama trinitatis*	Kenny, 2008 Gomes, 2015 IUCN, 2016 McKnight & Emmons, 2008
Birds	433	2 birds: - Pawi/piping guan (*Pipile pipile*) - Trinidad motmot (*Momotus bahamensis*)	ffrench, 1991 Kenefick et al., 2011

Major Categories of Plant and Animal Species	Number of Species	Number of Endemics	Source
Fish (Freshwater) - Stream	66	3 freshwater fish: - *Hemibrycon taeniurus OC* (Characidae) - *Ancistrus maracasae* (Loricariidae) - *Poecilia boesemani* (Poeciliidae)	Phillip et al, 2013
Fish (Freshwater) - Coastal	60	Not available	Phillip et al, 2013
Fish (Marine)	1,013 coastal and marine finfish species Up to 957 species	4 marine fishes: - *Acanthemblemaria johnsoni OC (Chaenopsidae)* - Tawny Blenny *Starksia rava (Labrisomidae)* - Darksaddle Blenny *Starksia sella (Labrisomidae)* - Tobago Coralbrotula *Ogilbichthys tobagoensis* (Bythitidae)	Ramjohn, 1999
Amphibians	38 species	7 frogs: - *Mannophryne olmonae* (Anura Dendrobatidae) Bloody Bay Fragrant Frog - *Mannophryne trinitatis* (Anura Dendrobatidae) Yellow-throated Frog - *Phyllodytes auratus* (Anura -Hylidae) El Tucuche Golden Tree Frog - *Leptodactylus nesiotus* (Anura - Leptodactylidae) Trinidad Thin-toed Frog - *Pristimantis charlottevillensis* (Anura - Strabomantidae) Charlotteville Litter Frog - *Pristimantis turpinorum* (Anura - Strabomantidae) Bloody Bay Litter Frog - *Pristimantis urichi* (Anura - Strabomantidae) Urich's Litter Frog	Murphy, 1997 Living Natural Treasures, n.d.
Reptiles	98 species including marine turtles (93 according to Murphy, 1997)	4 reptiles: - *Erythrolamprus ocellatus* (Squamata Ophidia - Colubridae) Tobago False Coral Snake - *Leptophis stimsoni* (Squamata Ophidia-Colubridae) Gray Lora - *Typhlops trinitatus* (Squamata Ophidia - Typhlopidae) Trinidad Worm Snake - *Proctoporus shrevei* (Squamata Sauria - Gymnophthalmidae) Luminous Lizard	Boos, 2001 Living Natural Treasures, n.d.
Marine Invertebrates	523 species	1 endemic marine benthic amphipod *Ampelisca paria*	IMA, 1999; Gobin, 2007; Gobin, 2010
Mollusc	56 molluscs	1 land snail *Drymaeus mossi*	IMA, 1999
Annelida (marine)	201 polychaetes	1 endemic polychaete *Johnstonia duplicate*	Gobin, 2010
Nematoda (marine)	70 nematodes	Not available	Gobin, 2007

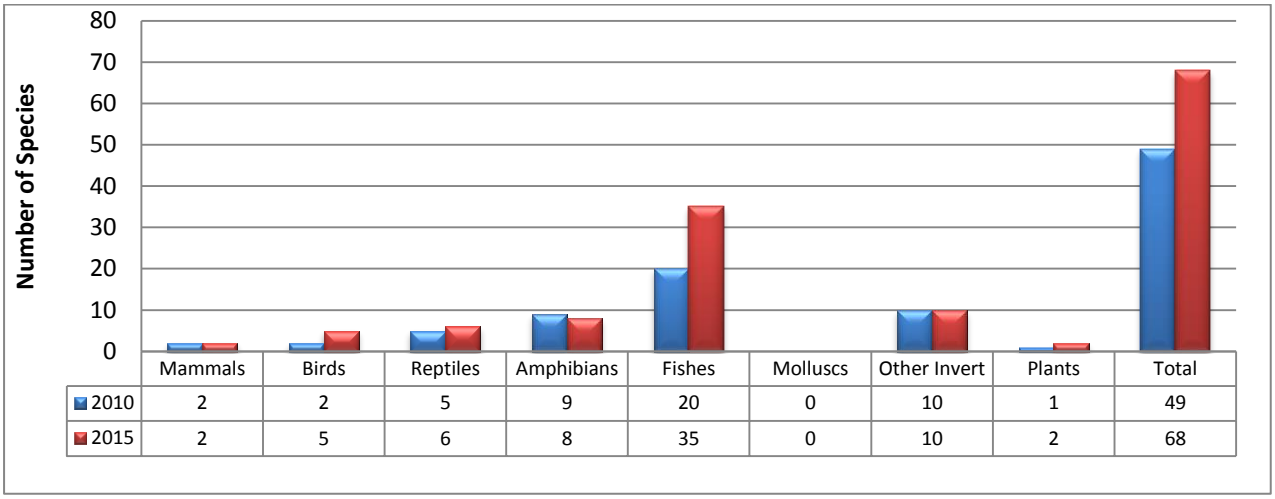
Major Categories of Plant and Animal Species	Number of Species	Number of Endemics	Source
Echinodermata (marine)	55 echinoderms	Not available	
Porifera (marine)	56 sponges	Not available	Hubbard, 1990
Arthropoda (terrestrial)	212 chelicerata 43 crustacea (freshwater and terrestrial) 11 myriapoda 4,154 insecta 296 spiders	6 endemic scorpions and 5 endemic butterflies - Wasp- *Mischocyttarus baconi* - Butterflies- *Nymphidium trinidadi* the Trinidad Metalmark, and *Calospila urichi* - Ant- *Pheidole aripoensis* - Longhorned beetle- *Piruapsis antennatus* - Tortoise beetles- *Cephaloleia rubra* and *Cephaloleia brunnea* - Stonefly- *Anacroneuria isleta* - Katydid- *Cocconotus unicolor* - Tarantulas- *Psalmopoeus cambridgei* and *Lasiodora trinitatis* - Wall crab spider- *Selenops willinki* - Goblin spider- *Scaphiella simla* - Scorpions- *Microtityus rickyi* and *Tityus trinitatis* - Velvet worm- *Macroperipatus torquatus* - Freshwater crab- *Microthelphusa odaelkae* - Ghost shrimp- *Pseudobiffarius caesari*	Rostant, 2005; Barcant, 1970; Sewlal, 2011
Cnidaria	41 corals	Not available	Kenny, 1988; Laydoo, 1990; Juman, 2010

2.4.2 Threatened species

According to the IUCN Red List (2015a), there were a total of 68 threatened species in all categories in T&T in 2015 (Figure 21). This represents an increase of 19 species over what was reported in 2010. Of all the taxonomic categories, fishes are the group with the largest number of threatened species, followed by invertebrates and amphibians. Data on the levels of threat amongst the 66 animal species in the IUCN database, indicate that 8 species are critically endangered, 12 are endangered and 46 are vulnerable (Figure 22 - IUCN 2015b; 2015c). The recently published annotated checklist of vascular plants in T&T (Baksh-Comeau *et. al.* 2016) indicates that there may be some inaccuracies in the 2015 IUCN Red List, as well as with previously published accounts of T&T's threatened plant species. According to the new data, there may be more species of vascular plants in the Endangered (EN), Vulnerable (VU) and Near Threatened (NT) categories than previously reported (Figure 23).

T&T has its own system of designating threatened species for management. Under the Environmental Management Act Chapter 35:05, the Environmentally Sensitive Species Rules (2001) has named 10 species for protection - an increase of seven (7) species since the 4th National Report in 2010. The Environmentally Sensitive Species (ESS) are – the Pawi (*Pipile piplie*; 2005); Manatee (*Trichechus manatus manatus*; 2005); White-tail Sabrewing Hummingbird (*Campylopterus ensipennis*; 2005); Golden Tree Frog (*Phyllodytes auratus*; 2013); Ocelot (*Leopardus pardalis*; 2013); Leatherback Turtle (*Dermochelys coriacea*; 2014);

Loggerhead Turtle (*Caretta caretta*; 2014); Green Turtle (*Chelonia mydas*; 2014); Hawksbill Turtle (*Eretmochelys imbricata*; 2014); and the Olive Ridley Turtle (*Lepidochelys olivacea*; 2014)[10]



	Mammals	Birds	Reptiles	Amphibians	Fishes	Molluscs	Other Invert	Plants	Total
2010	2	2	5	9	20	0	10	1	49
2015	2	5	6	8	35	0	10	2	68

Figure 21: Number of Species Considered Threatened in Each Taxonomic Group in Trinidad and Tobago (2015)
Source: IUCN (2015a)
Note: This figure does not distinguish between the different levels of threat used in the IUCN classification system

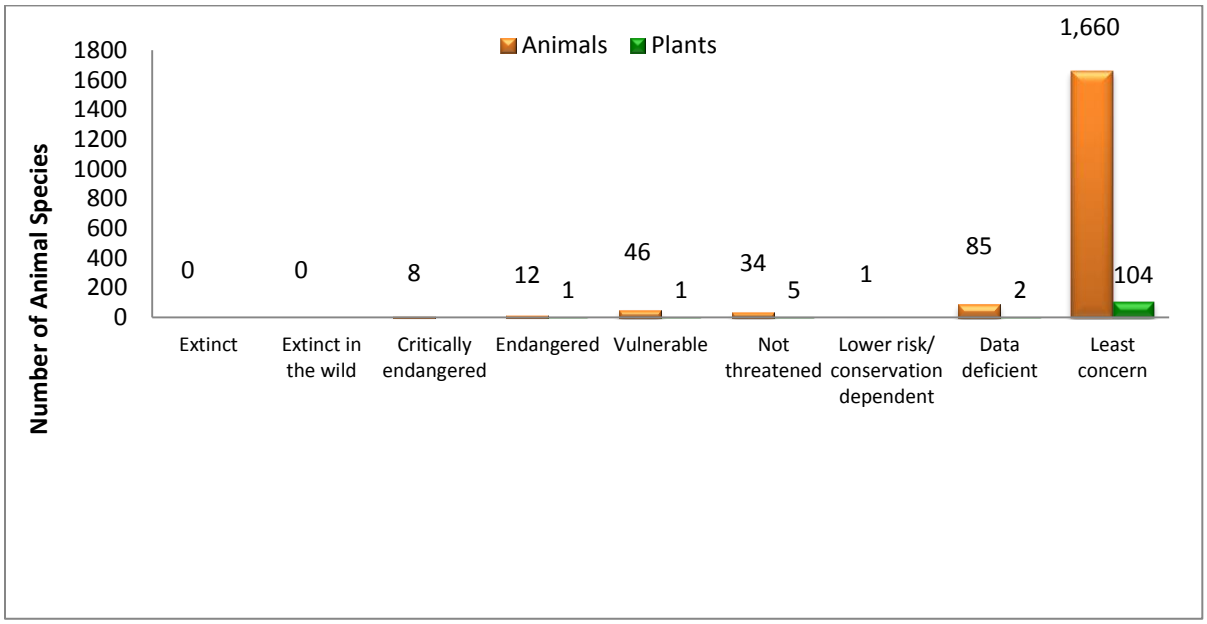


Figure 22: Levels of Threat to Species in Trinidad and Tobago Based on the IUCN Red List Categories (2015)
Source: IUCN (2015b; 2015c)

[10] Photos taken from http://www.ema.co.tt/new/index.php/sensitive-species

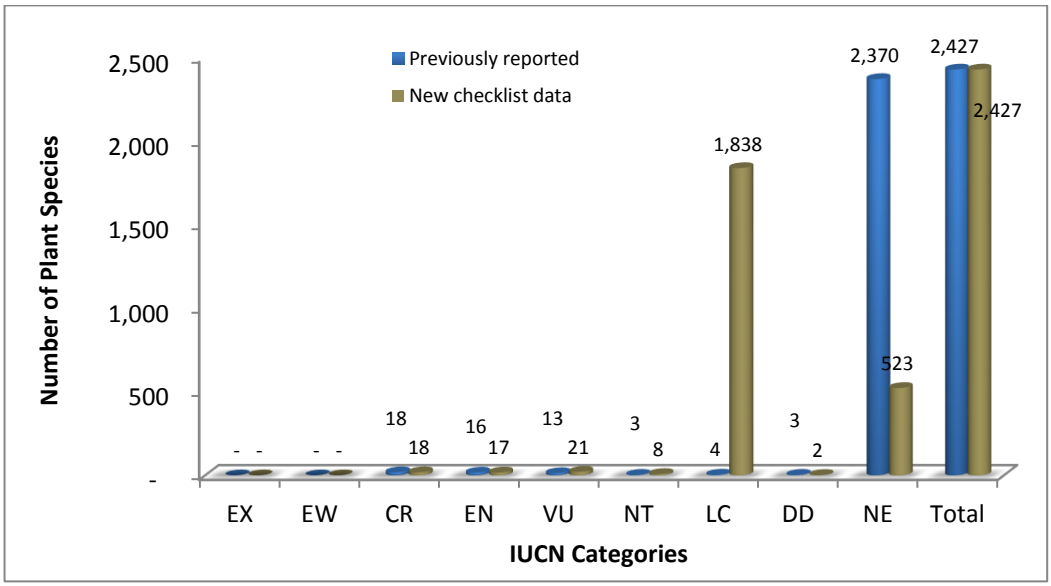


Figure 23: Previous and Proposed Levels of Threat to Vascular Plants in T&T
Source: Baksh-Comeau *et. al.* (2016)

The Convention on International Trade of Endangered Species (CITES) lists a total number of 165 species that are under threat from trade in Trinidad and Tobago – 82 birds; 37 invertebrates; 22 mammals; 16 reptiles, and 8 fish (UNEP-WCMC, 2016)[11].

2.4.3 Species of economic importance

Wildlife Species: There are a number of terrestrial species that are hunted in T&T, and concerns of overhunting led to a two-year moratorium being placed on hunting beginning October 2013. In order to determine the impact of harvesting on wildlife species, a three-year wildlife survey was initiated in 2014. It focuses on the five (5) most popular game species in Trinidad and Tobago - the Lappe *(Agouti paca),* the Red-Rumped Agouti *(Dasyprocta leporine),* the Tatoo *(Dasypus novemcinctus),* the Red-Brocket Deer (*Mazama americana trinitatis)* and the Wild-hog or Quenk *(Pecari tajacu).* Up until June 2015, 271 Agouti, three (3) Quenk, three (3) Lappe**,** 67 Deer and five (5) Tatoo were sighted. Though preliminary, the results of the survey might indicate that the Agouti populations are faring well under the pressure of hunting, but other species may not be. Further results will be required to draw more conclusive results (EMA and GFEU, 2016).

Commercial Fish Species: There are a number of fish species that are of commercial importance in Trinidad and Tobago. The current status of selected commercial species is shown in Table 8. The data indicate that most species are fully exploited to overexploited, most fish species found in T&T are thus under threat.

Table 8: Status of Selected Commercial Fish Species in Trinidad and Tobago
Source: Fisheries Division (2016)

[11] Data accessed from: http://www.unep-wcmc.org/#?country=TT&dashboard=show (Accessed April 2016).

Fish Species	Data sources	Description of stock status	Ranking of stock status*[12]
Carite or Spanish Mackerel (*Scomberomorus brasiliensis*)	1972-2002 (Trinidad); 1977- 2002 (Southern Caribbean & nearby Atlantic)	Fully exploited to overexploited	2/3 (Poor)
	1991-1992 (Trinidad: artisanal gillnet & line)	Fully exploited	3 (Poor)
Kingfish or King Mackerel (*Scomberomorus cavalla*)	2006-2007 (Trinidad: a la vive, troll, switchering & banking)	There has not been a significant change in fishing mortality in the last 10 years	5 (Fair)
	1996-1998; 2004 (Trinidad: artisanal a-la-vive, banking, switchering, troll)	Overexploited	2 (Poor)
	1995-2003 (Trinidad: artisanal troll & a-la-vive); 1950-2003 (Gulf of Mexico to Guianas)	Fully exploited to overexploited	2/3 (Poor)
	1987 (Trinidad: artisanal gillnet & line)	Fully exploited	3 (Poor)
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	5 (Fair)
Shark (*Carcharinus porosus*)	1992 (Trinidad)	Underexploited	6 (Good)
Four-winged flyingfish (*Hirundichthys affinis*)	1989/90 – 1990/91 (Tobago)	Heavily exploited	4 (Fair)
	1988 to 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.	5 (Fair)
All shrimp species: Brown (*Farfantepenaeus subtilis*); White (*Litopenaeus schmiti*); Pink (*F. notialis*); Honey or Seabob (*Xiphopenaeus kroyeri*); Red-spotted (*F. brasiliensis*).	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, Apr-Oct 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.	5 – 7 (Fair to Good ?)
All shrimp species: Brown (*Farfantepenaeus subtilis*); White (*Litopenaeus schmiti*); Pink (*F. notialis*); Honey or Seabob	1975, 1988-2004 (Trinidad & Venezuela: trawl)	Overexploited. Stock biomass is declining.	2 (Poor)

[12] 0 = Unknown; The lower the number, the higher the level of threat to the species (see key at the end of the table).

Fish Species	Data sources	Description of stock status	Ranking of stock status*[12]
(*Xiphopenaeus kroyeri*); Red-spotted (*F. brasiliensis*).			
Pink shrimp (*F. notialis*); Honey or seabob (*X. kroyeri*)	1992-2002 (Trinidad: trawl)	Fully exploited to overexploited	2/3 (Poor)
Brown shrimp (*F. subtilis*)	1988-2001 (Trinidad: trawl); 1973-2001 (Venezuela: trawl)	Severely overfished, with overfishing taking place since the 1970s.	1 (Poor)
	1988-1996 (Trinidad: trawl); 1973-1996 (Venezuela: trawl)	Overfished	2 (Poor)
Shrimp fishery	1995-1996 (Trinidad: trawl); 1995-1998 (Venezuela: trawl)	Fully exploited to overfished, over-capitalised	2/3 (Poor)
Cro-cro or Croaker (*Micropogonias furnieri*)	1987, 1989-1997 (Trinidad: artisanal trawl, gillnet & line; Venezuela: trawl) 1995-2006 (Trinidad: artisanal gillnets & lines; artisanal, semi-industrial & industrial trawl)	Fully exploited to overfished	2/3 (Poor)
Salmon or Weakfish (*Cynoscion jamaicensis*)	1989-1997 (Trinidad: artisanal trawl, gillnet & line)	Fully exploited to overfished	2/3 (Poor)
Lane Snapper (*Lutjanus synagris*)	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.	5 (Fair)
Groundfish fishery	1989-1997 (Trinidad artisanal trawl & gillnet)	Fully exploited to overfished	2/3 (Poor)
Snapper Plumhead (*Rhomboplites aurorubens*)	1992 (Trinidad: artisanal fishpot on North & East coast)	Fully exploited	3 (Poor)
Lane snapper (*Lutjanus synagris)*	1980-1981 (Trinidad: artisanal fishpot on North & East coast)	Underutilized but the species may be currently fully exploited to overexploited	2/3 (Poor)
Redfish (*L. purpureus*)	1992 (Trinidad: artisanal fishpot on North & East coast)	Fully exploited	3 (Poor)
Yellowedge Grouper (*Epinephelus flavolimbatus*) Sweetlip (*Mycteroperca interstitialis*)	1992 (Trinidad: artisanal fishpot on North & East coast)	Fully exploited or overexploited	2/3 (Poor)
*Yellowfin tuna (*Thunnus albacares*)	ICCAT database – annual submissions from countries and entities exploiting the resources	Fully exploited.	3 (Poor)

Fish Species	Data sources	Description of stock status	Ranking of stock status*[12]
	and findings of scientific research papers		
*Bigeye tuna (*Thunnus obesus*)	ICCAT database – annual submissions from countries and entities exploiting the resources and findings of scientific research papers	Fully exploited.	3 (Poor)
*Skipjack tuna (*Katsuwanus pelamis*)		Indeterminate, however there may be overexploitation within the FAD fisheries	0
*Albacore (North Atlantic stock) (*Thunnus alalunga)*		Fully exploited to overexploited	2/3 (Poor)
*Albacore (South Atlantic stock) (*Thunnus alalunga)*		Fully exploited to overexploited	2/3 (Poor)
*Marlin: Atlantic blue marlin (*Makaira nigricans*) Atlantic white marlin (*Tetrapturus albidus*) Roundscale Spearfish (*Tetrapturus georgii*) Longbill Spearfish (*Tetrapturis pfluegeri*)		Atlantic blue marlin overfished. Atlantic white marlin overfished.	2 (Poor)
*Swordfish (North Atlantic stock) (*Xiphias gladius)*		The stock is considered rebuilt, consistent with the 2009 evaluation.	5 (Fair)
*Swordfish (South Atlantic stock) (*Xiphias gladius)*		The stock is not believed to be overfished.	5 (Fair)
*Atlantic sailfish (West Atlantic stock) (*Istiophorus albicans*)		Indeterminate. Production models suggest a possibility that West Atlantic stocks are overfished.	0
*Atlantic sailfish (East Atlantic stock) (*Istiophorus albicans*)		Fully exploited and overfished.	2/3 (Poor)
*Small Tunas: Blackfin Tuna (*Thunnus atlanticus*) Bullet Tuna (*Auxis rochei*) Atlantic Bonito (*Sarda sarda*) Frigate Tuna (*Auxis thazard*) Little Tunny (*Euthynnus alletteratus*)		Indeterminate	0

Fish Species	Data sources	Description of stock status	Ranking of stock status*[12]
Wahoo (*Acanthocybium solandri*) Dolphinfish (*Coryphaena hippurus*)			
Sharks: *Blue shark *(Prionace glauca)*		North and South Atlantic stocks suggest stability but results are uncertain.	5 (Fair - ?)
Sharks: *Shortfin mako *(Isurus oxyrinchus)*		Catch levels in both North and South Atlantic stocks considered sustainable.	5 (Fair)
Sharks: *Longfin mako *(Isurus paucus)*	2006 (IUCN Red List Assessment)	Fully exploited to overfished	2/3 (Poor)
Sharks: *Oceanic Whitetip (*Carcharhinus longimanus*)	2006 (IUCN Red List Assessment)	Fully exploited and overfished.	2/3 (Poor)
Sharks: *Blacktip Shark *(Carcharhinus limbatus)*	2009 (IUCN Red List Assessment)	Overfished.	2 (Poor)
Sharks: *Tiger shark *(Galeocerdo cuvier)*	2009 (IUCN Red List Assessment)	Overfished.	2 (Poor)
Sharks: *Sharks:Silky shark *(Carcharhinus falciformis)*	ICCAT database – annual submissions from countries and entities exploiting the resources and findings of scientific research papers	Fully exploited and overfished.	2/3 (Poor)
Sharks: *Bigeye Thresher (*Alopias superciliosus*)	ICCAT database – annual submissions from countries and entities exploiting the resources and findings of scientific research papers	Fully exploited and overfished.	2/3 (Poor)
Sharks: Hammerheads *Scalloped Hammerhead (*Sphyrna lewini*) *Great Hammerhead (*Sphyrna mokarran*) *Smooth Hammerhead (*Sphyrna zygaena*)	ICCAT database – annual submissions from countries and entities exploiting the resources and findings of scientific research papers	Fully exploited and overfished	2/3 (Poor)

*Key

Rank	Status description	Summary Status
0	Unknown	Unknown
1	Severely overfished	Poor
2	Overexploited/ overfished	
3	Fully exploited	
4	Heavily exploited	Fair
5	No change/ stable stock	
6	Underexploited	Good
7	Increasing stock	

2.5 Threats to Biodiversity

2.5.1 Land use and land cover changes

Changes in land use and land cover continue to be an important threat to biodiversity in Trinidad and Tobago. Figure 24 shows the change in land use over the period, 1991 to 2010, and indicates significant expansion of built up and industrial areas especially along the west coast and the north-western section of the Northern Range. In Tobago, there has been expansion of built development in the southwestern tip of the island.

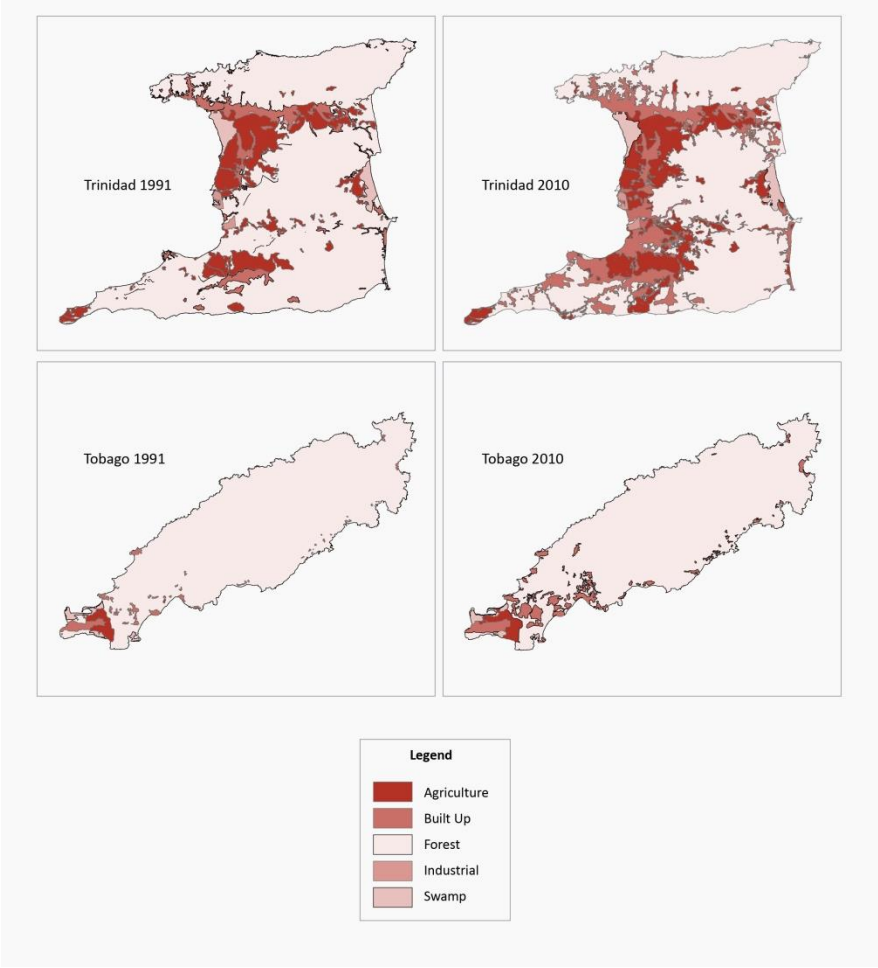


Figure 24: Changes in Land Use Between 1991 and 2010
Source: GoRTT (2012a)

2.5.2 Urban and Build Development

Figure 25 shows the changes in the expanse of urban areas between 1991 and 2010. Urban areas grew rapidly over the period, and extended into portions of the island that were not classified as suitable for this type of development (GoRTT, 2012b).

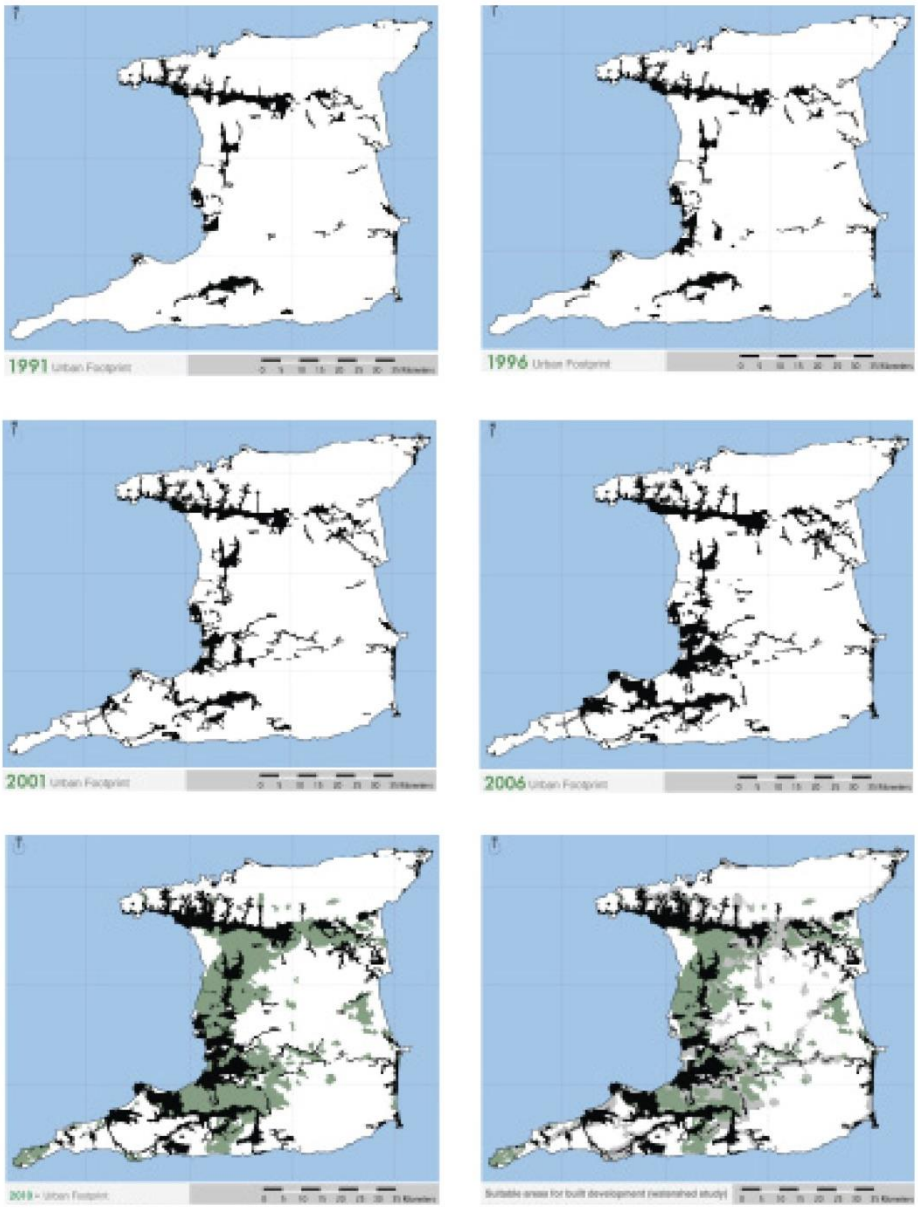


Figure 25: Evolution of Trinidad and Tobago's Urban Footprint (1991 – 2010)
Source: GoRTT (2012b)
Note: the Figure at the bottom right shows the suitable areas for built development based on a watershed study.

2.5.3 Agriculture

It is reported (GoRTT 2013) that farmland accounts for 25% of the land area of Trinidad and Tobago (or 131, 572 Ha) – with the majority (62.1%) under cultivated cropland. However, based on another account, in 2010, agricultural land covered 830 km^2 in Trinidad and 5km^2 in Tobago – a total of 835 km^2 across both islands (GoRTT 2012 – Figure 26). These two accounts

of area under agriculture in T&T are significantly different and likely do not represent the increase in agricultural land over the 2010/ 2013 period.

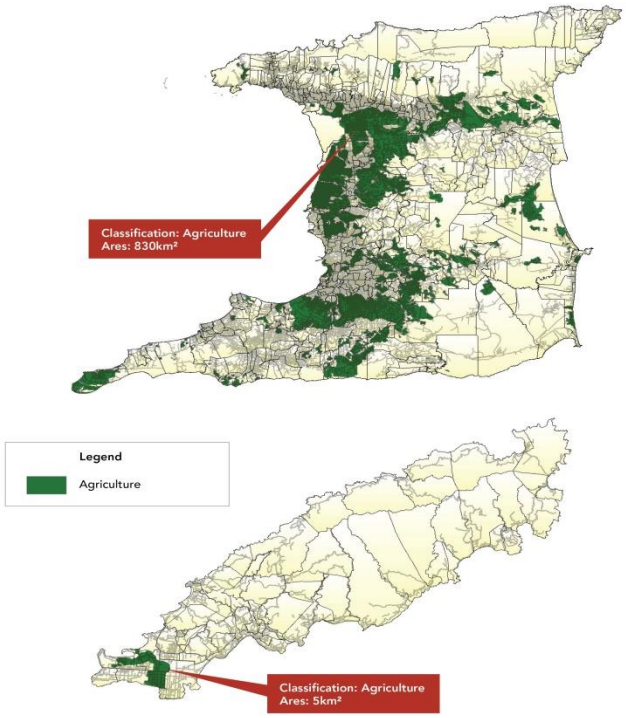


Figure 26: Agricultural Land Area in Trinidad and Tobago (2010)
Source: GoRTT (2012a)

2.5.4 Fires

The 4th National Report (2010) included data on the areas affected by fire in T&T (1998 – 2008) by land use type (natural forests; shrub and secondary forest; Teak plantations; Pine plantations; Savannah and grasslands; and agricultural lands). The National Biodiversity Assessment (NBATT, 2012) included data for 2010. This type of data was important because it provided a clear indication of the extent to which different ecosystems/ habitat types across the country were being affected by human-induced fires (Figure 27).

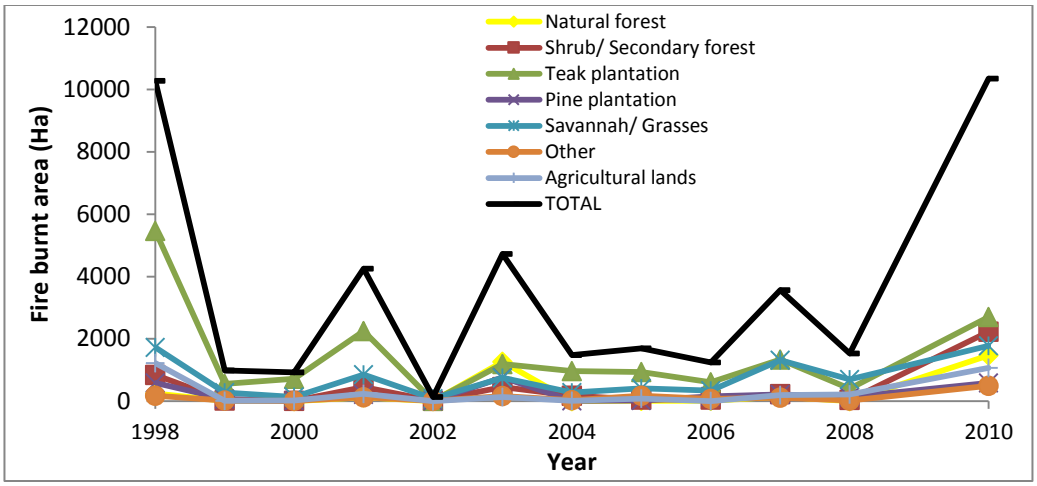


Figure 27: Fire Affected Habitats/ Ecosystems in Trinidad and Tobago (1998 – 2010)
Data sources: GoRTT (2010) and NBATT (2012)

However, since 2010, the aggregation of data by habitat types is not available, and fire data is now aggregated by geographical distribution only (conservancy). The newest data do not therefore provide an indication of the change in the area of fire-degraded habitats by habitat type; and it is difficult to accurately assess the impact of fires on biodiversity and its associated services. What Figure 28 indicates however is that a cumulative total of over 50,000 Ha of terrestrial ecosystems (in all categories – forests, plantations, savannahs and agricultural lands) was burnt between 1998 and 2015.

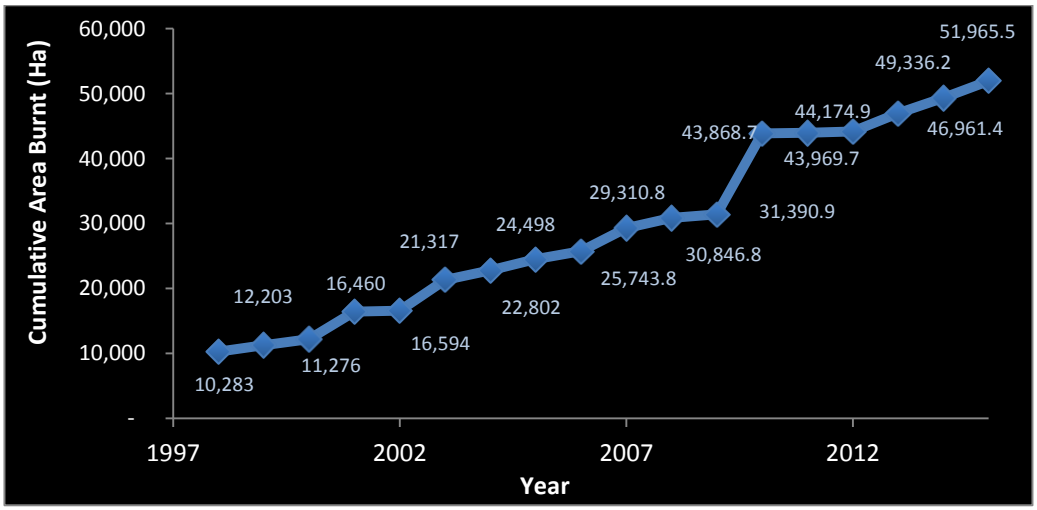


Figure 28: Cumulative Area Burnt in Trinidad and Tobago (1998 – 2015)
Data sources: GoRTT (2010); NBATT (2012) and Forestry Division (2016)
Notes: The cumulative area burnt is calculated by adding the total area affected by fires on an annual basis. It does not take into account whether the same area (geographical space) was burnt in different fires in different years
There is a slight discrepancy with 2010 data; Forestry (2016) data is used as the source in the Figure

What current annual data also indicate is that there is no long-term discernable annual trend in fires – the numbers and size of fires are largely determined by rainfall, topography and vegetation; and thus fire impacted areas vary from year to year (Figure 29).

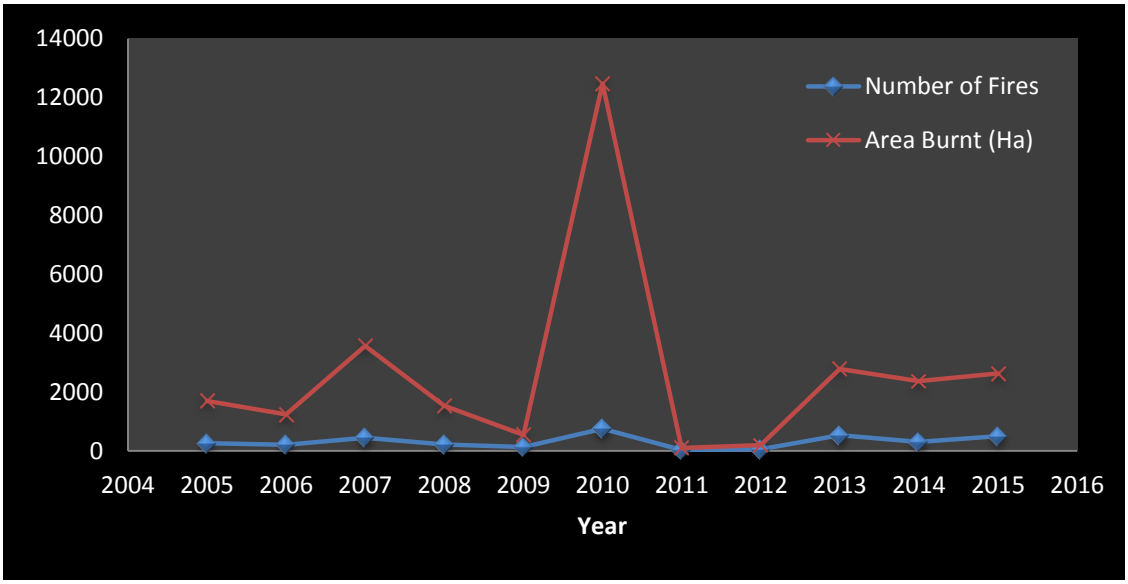
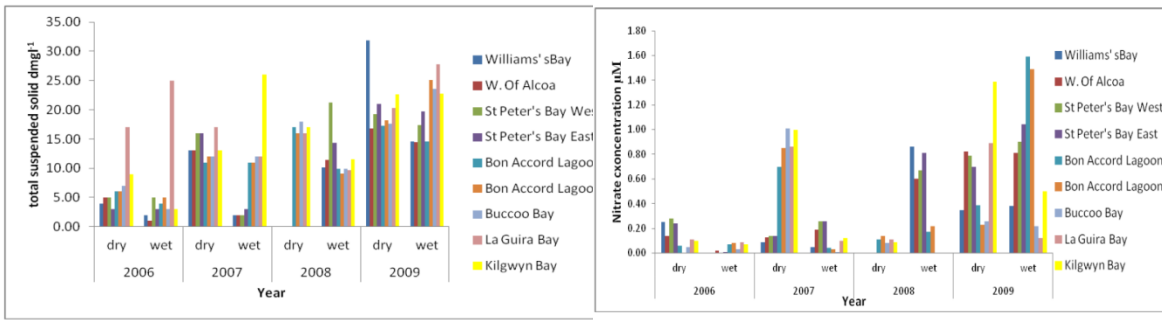


Figure 29: Number of Fires and Area Burnt in Trinidad (2005 – 2015)
Source: Forestry Division (2016b)

2.5.5 Chemical and Solid Waste Pollution

There is an increasing threat to T&T's coastal waters from land-based sources of pollution (LBS) as outlined in the Draft Integrated Coastal Zone Management Policy Framework document (2014. Research in seagrass monitoring sites has shown that there has been an increase in the coastal concentrations of pollutants such as suspended solids and nitrates (Figure 30). Pollution (nutrient enrichment) has also been shown to affect mangrove communities around Trinidad and Tobago in areas such as the Godineau Swamp, Buccoo Bay and the Bon Accord Lagoon, Sea Lots, and the Moruga River (Juman and Ramsewak, 2013).



Total Suspended Solids Nitrates

Figure 30: Water Quality Parameters at Selected Seagrass Monitoring Stations (2006 – 2009)
Source: Juman (2011)

Another threat to the coastal/ marine environment in Trinidad and Tobago is offshore oil and gas operations. As demonstrated in Figure 31, there are many areas where exploration and production areas are occurring. Oil pollution is known to affect coastal ecosystems such as the mangrove communities in the Godineau Swamp, Irois Bay, and Scotland Bay (Juman and Ramsewak, 2013).

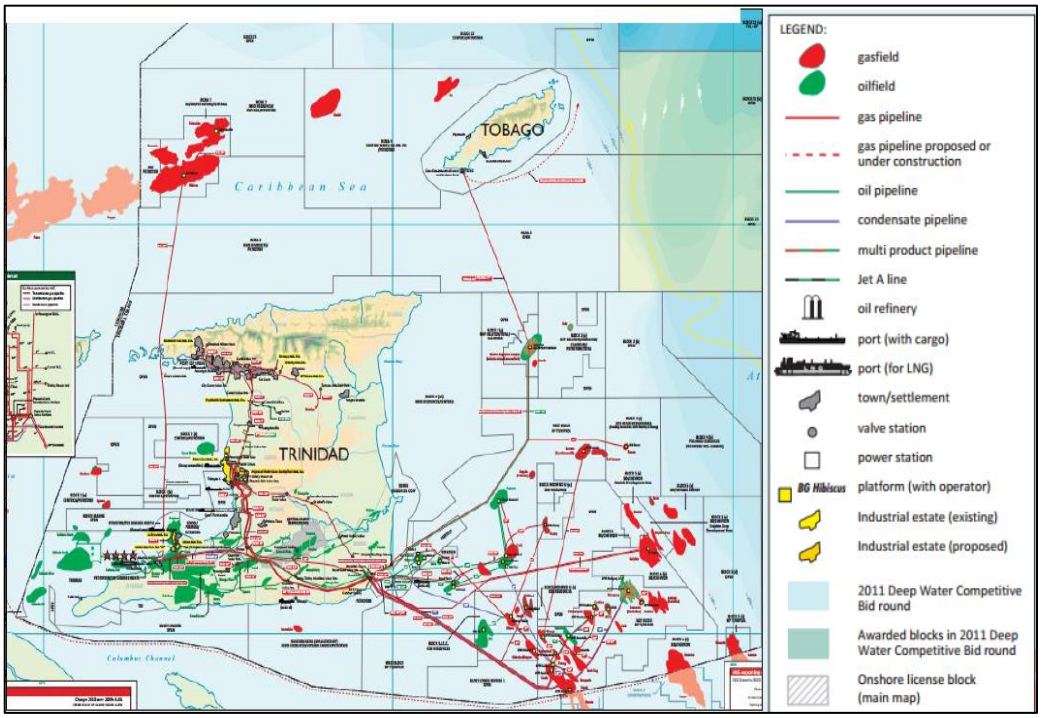
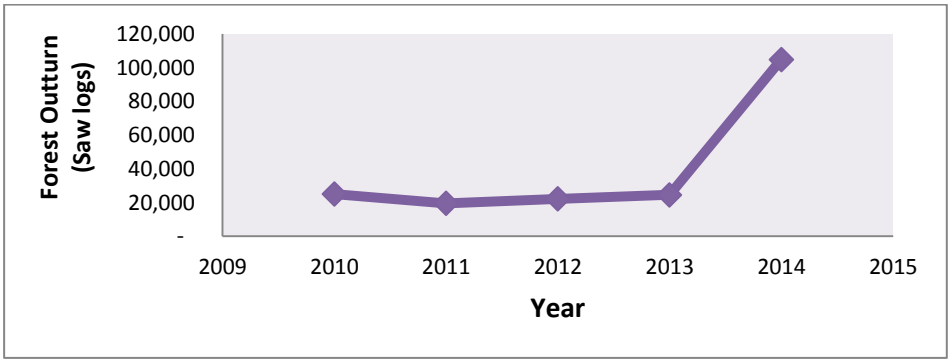


Figure 31: Trinidad and Tobago Offshore Concession Map (2.20)
Source: Ministry of Energy and Energy Industries (2012) in NBATT (2012)

2.5.6 Harvest and Resource Consumption

Timber removal: T&T's forests continue to be impacted by logging activities, and special attention needs to be paid to primary forests. Figure 32 shows the forest outturn from natural forests (on state lands) over the period 2010 – 2014, and indicates that there was a significant increase in the removal of timber from natural forests in 2014. It is important for T&T to ensure that its timber harvesting is sustainable, especially in natural forests, to guard against impacts to BES.



Data source: Forestry Division (2016a)
Figure 32: Forest Outturn From Natural Forests (2010 – 2014)

Freshwater extraction: There has been increasing pressure on the freshwater resources in T&T for human consumption. Data show that per capita water withdrawal in T&T increased by approximately 20% over the period 1997 to 2011 (Figure 33).

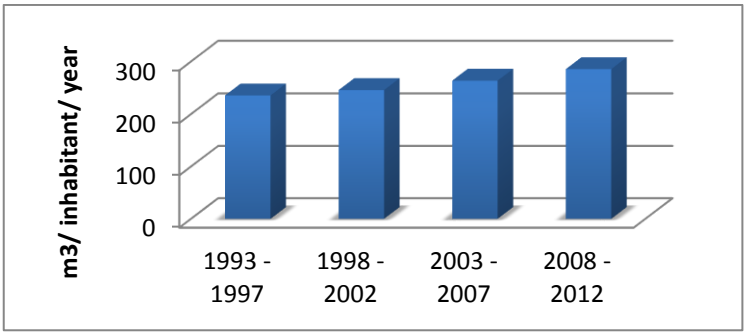
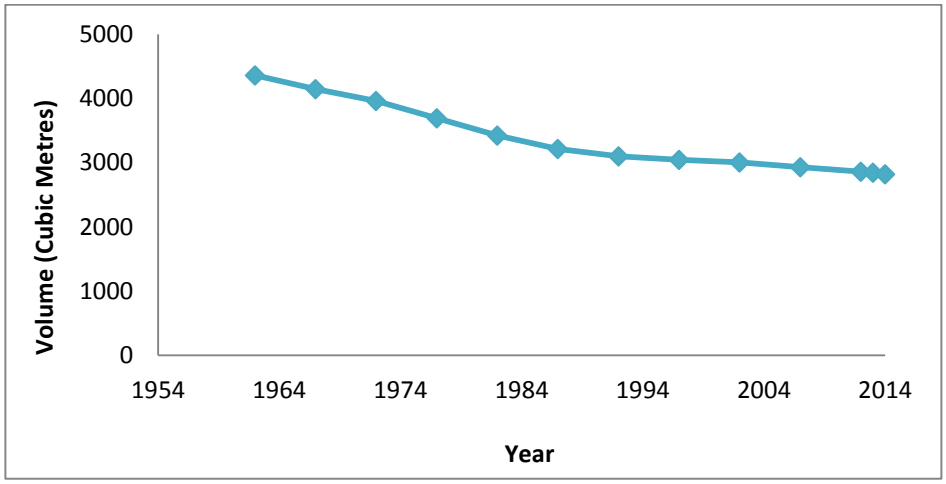


Figure 33: Trinidad and Tobago's Water Withdrawal Per Capita

Source: FAO AQUASTAT[13] (Accessed February 2016)

As a result, renewable internal freshwater resources per capita have been decreasing (Figure 34).

(1962 – 2014)

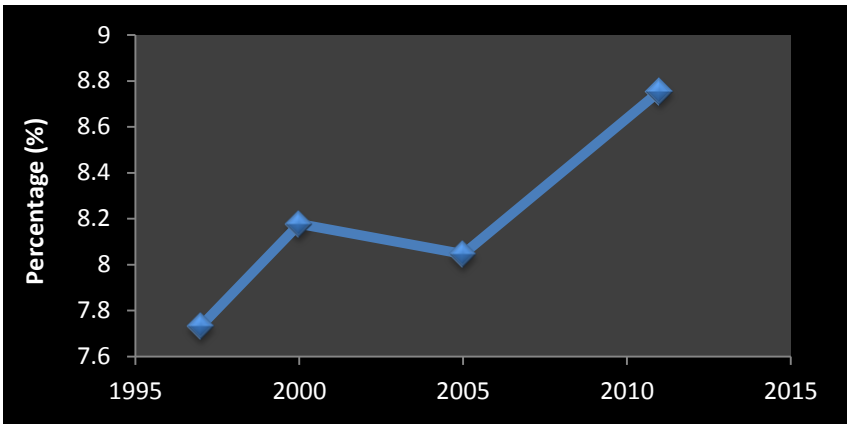


Compiled from various sources: World Bank (1982 – 2014 data) and Index Mundi (1962 – 1977 data)

Figure 34: Renewable Internal Freshwater Resources Per Capita in Trinidad and Tobago

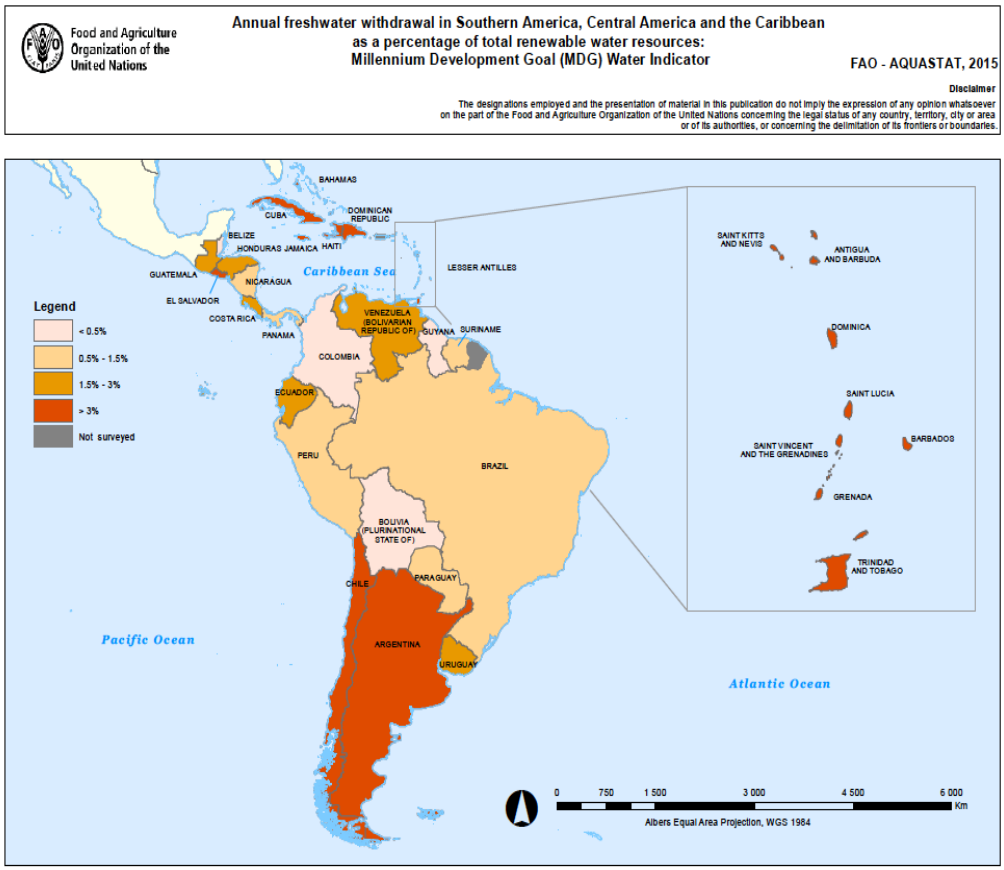
T&T is now one of the countries in Latin America and the Caribbean with the highest freshwater withdrawals as a percentage of total renewable water resources, and this indicates that extraction levels may be approaching unsustainable limits (Figures 35 and 36).

13 http://www.fao.org/nr/water/aquastat/data/query/results.html?regionQuery=false&showCodes=true&yearRange.fromYear=1960&yearRange.toYear=2015&varGrpIds=4250,4251,4252,4253,4254,4255,4256,4257,4260,4261,4262,4263,4264,4265,4269,4270,4275,4451,4475,4490,4491,4493,4510,4512,4515,4516,4517,4535&cntIds=220&newestOnly=false&showValueYears=true&categoryIds=-1&XAxis=YEAR&query_type=CP&YAxis=VARIABLE&hideEmptyRowsColoumns=true



Source: FAO AQUASTAT (2016). Available at http://www.fao.org/nr/water/aquastat/data/query/results.html (Accessed April 2016)

Figure 35: Freshwater Withdrawal as a Percentage of Total Renewable Freshwater Resources (1997 – 2011)

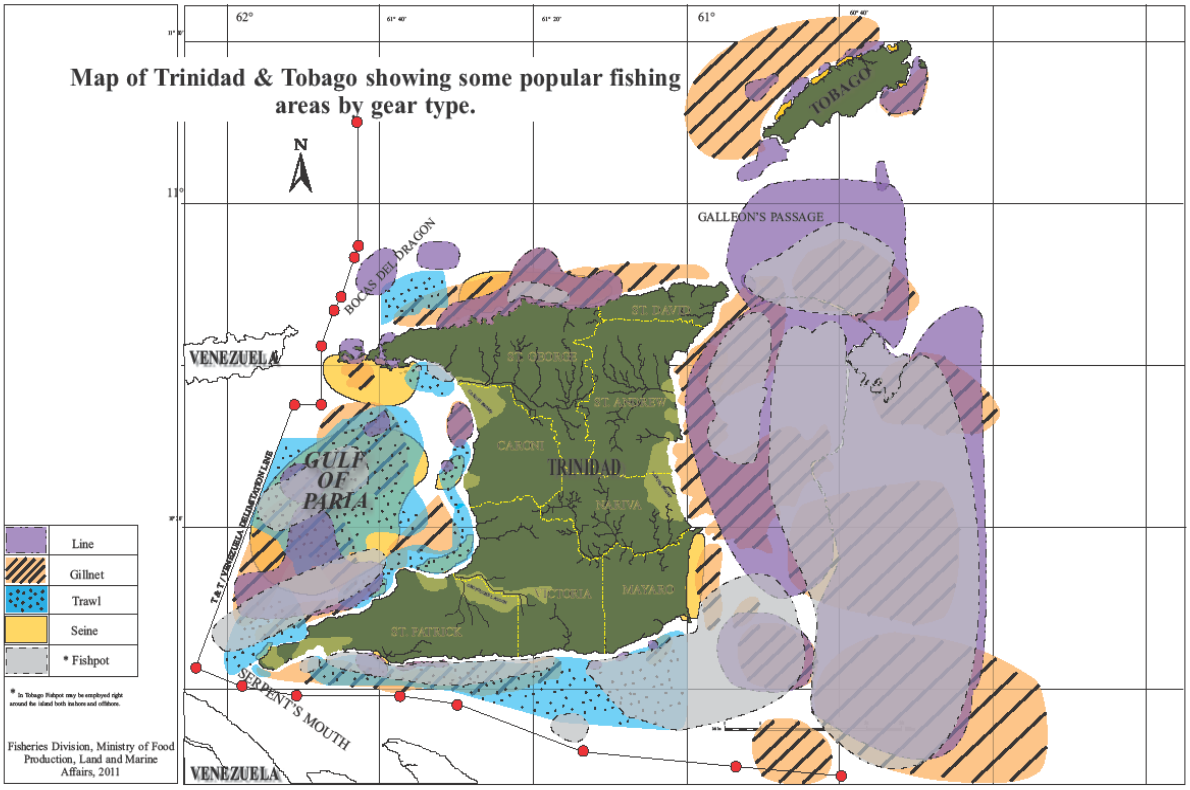


Source: FAO AQUASTAT (2015) in UNEP (2016)[14]

Figure 36: Annual Freshwater Withdrawal in LAC as a Percentage of Total Renewable Water Resources (2015)

[14] Taken from the GEO-6 Regional Report for Latin America and the Caribbean.

Fisheries: As indicated in Table 8, many commercial fish species are being overexploited locally. Figure 37 shows the distribution of fishing grounds in the coastal and marine waters around Trinidad and Tobago, and indicates the areas exploited for fisheries are extensive.

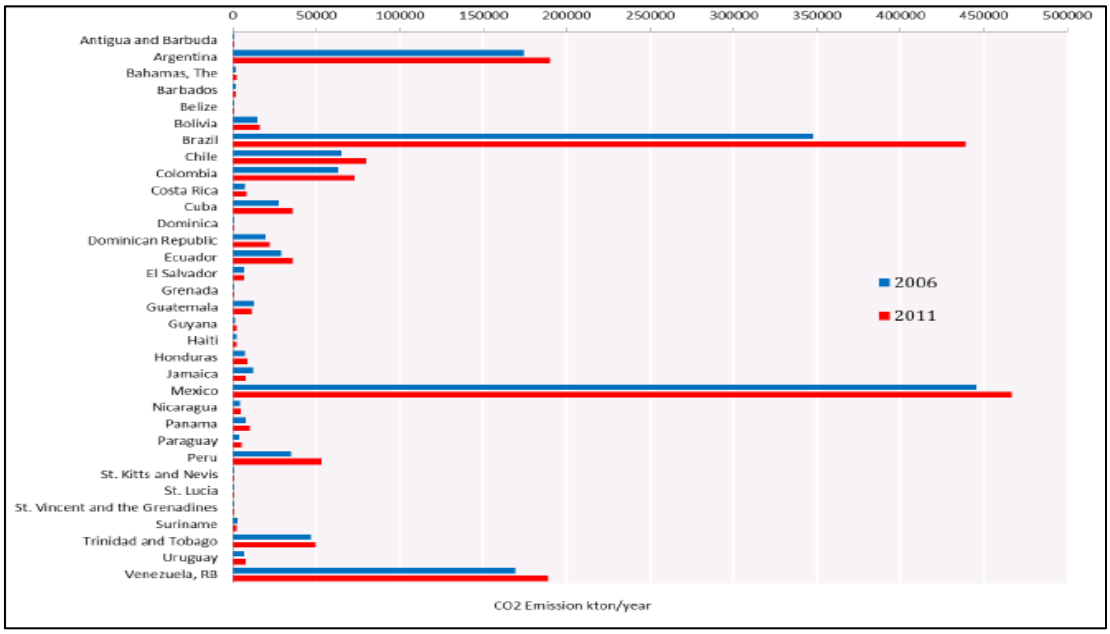


Source: Fisheries Division (2011)

Figure 37: Map of Trinidad and Tobago Showing Popular Fishing Areas by Gear Type

2.5.7 Climate Variability, Change and Associated Effects

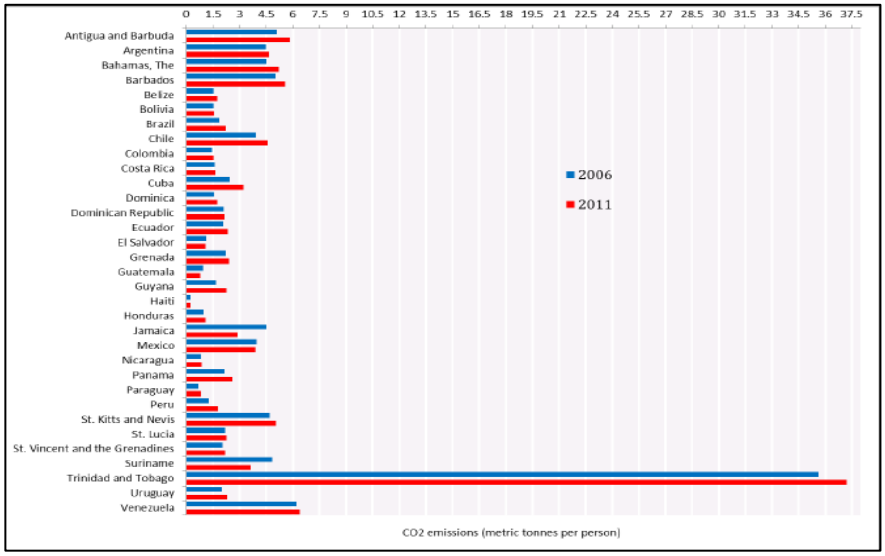
Trinidad and Tobago's heavy reliance on an energy-based economy, coupled with growing unsustainability in patterns of production and consumption locally, continue to render T&T as one of the highest emitters of carbon dioxide in the Latin America and Caribbean (LAC) region; and the highest CO_2 emitter in the eastern Caribbean (Figure 38). From a global perspective however, in 2013, T&T was ranked 62nd out of all countries in terms of its greenhouse gas (GHG) emissions (GoRTT 2015), and T&T is therefore not considered to contribute significantly to worldwide GHG emissions.



Source: World Bank 2015

Figure 38: Total Carbon Dioxide Emissions for Countries of Latin America and the Caribbean (2006 and 2011)

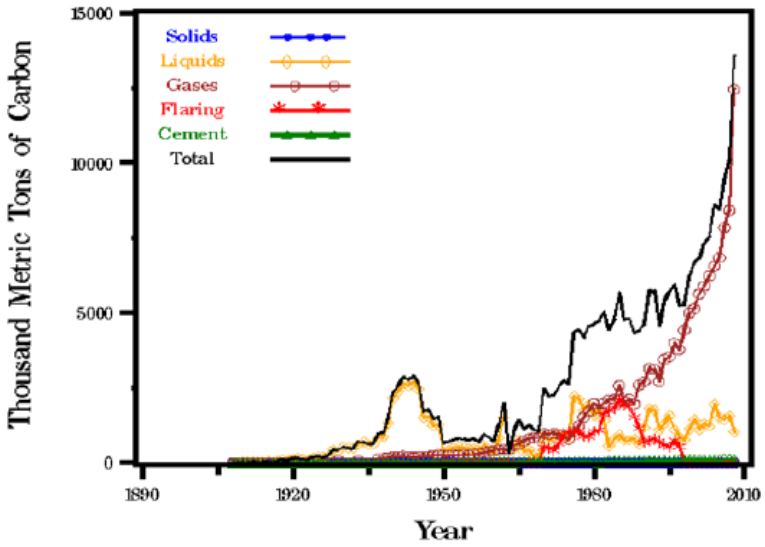
When Trinidad and Tobago's CO_2 emissions are considered in a per capita context however, the overall picture becomes quite alarming (Figure 39), and T&T stands out from every other country in the Latin America and Caribbean (LAC) region.



Source: World Bank 2015

Figure 39: Carbon Dioxide Emissions Per Capita for Countries of Latin America and the Caribbean
(2006 and 2011)

The World Bank (2015) reports that CO_2 emissions in Trinidad and Tobago, on account of fossil fuel burning and cement manufacturing, rose by 6.77% (measured in kilo tonnes of CO_2) over the period 2006 to 2011. Further, the GoRTT (2015) reported that total anthropogenic GHG emissions increased more rapidly over the 10-year period 2000 to 2010, than it had done in the three previous decades (Figure 40).

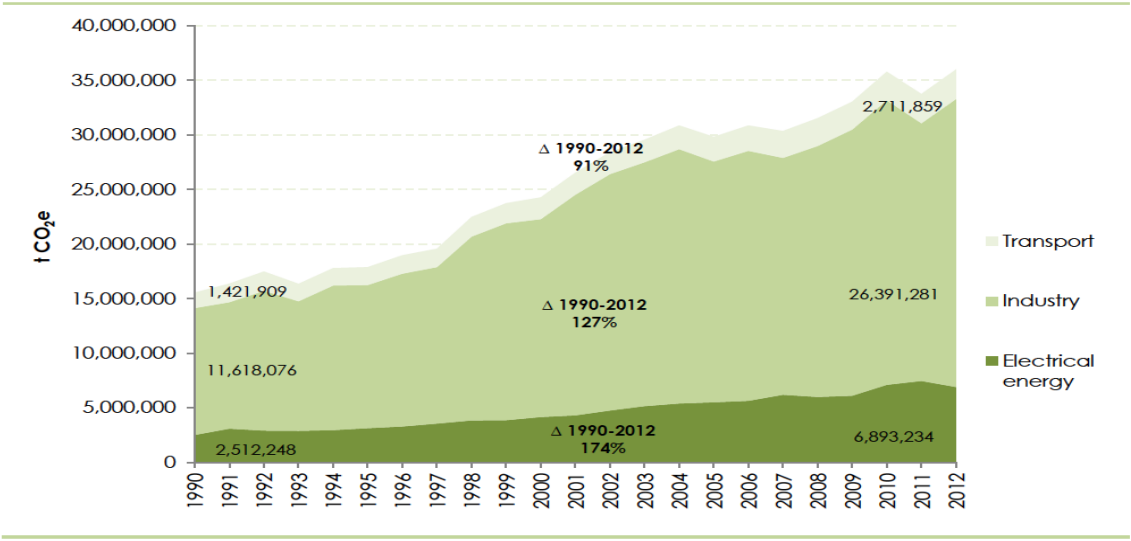


Source: Carbon Dioxide Information Analysis Centre – CDIAC (2011)

Figure 40: Trinidad and Tobago's Carbon Dioxide Emissions Based on Global Monitoring Data
(1900 – 2010)

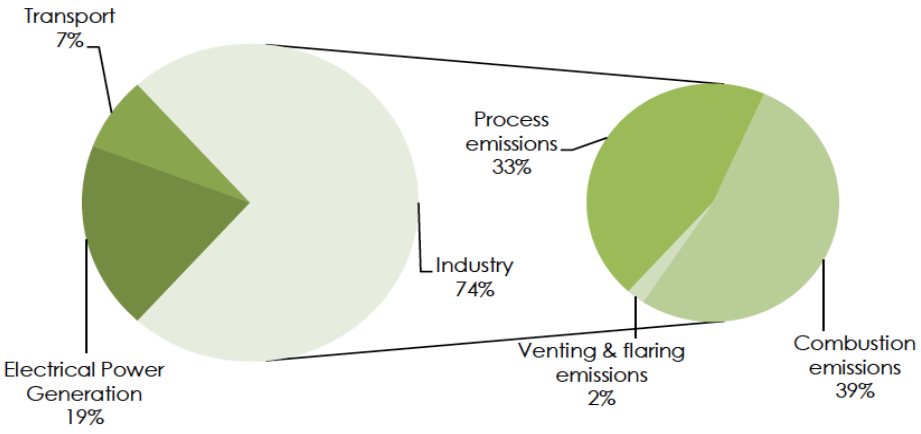
Greenhouse Gas emissions in T&T have, and continue to be largely on account of industrial activity (Figures 41 and 42), but there are also significant contributions from electrical power generation and from the transportation sector. There was a small, observed decrease in the overall share of emissions from the industry sector between 1990 and 2012 (from 75% to 73%), which means that there was a concurrent increase in the combined share from electricity generation and transportation. It is worth noting that in 2013, it is estimated that the number of land vehicles per 1,000 persons in T&T was 561[15].

[15] This figure is calculated using data from GoRTT (2015), and population data from the Central Statistical Office.



Source: GoRTT 2015

Figure 41: Historical Reconstruction of GHG Emissions in T&T (1990 – 2012)



Source: GoRTT 2015

Figure 42: Sectoral GHG Emissions in Trinidad and Tobago (2012)

There is evidence to suggest that there have been changes in T&T's climate, with an overall upward trend in temperatures over the last four decades. Between 1975 and 2015, the mean annual temperature increased by 1.64 ^{0}C, at a rate of 0.4 ^{0}C per decade, which is statistically significant at the 1% level (Figure 43). Additionally, there was an increase in 30-year averages: 26.6 ^{0}C for the 1961-1990 baseline period, compared to an average of 27.4 ^{0}C for the 1981-2010 period.

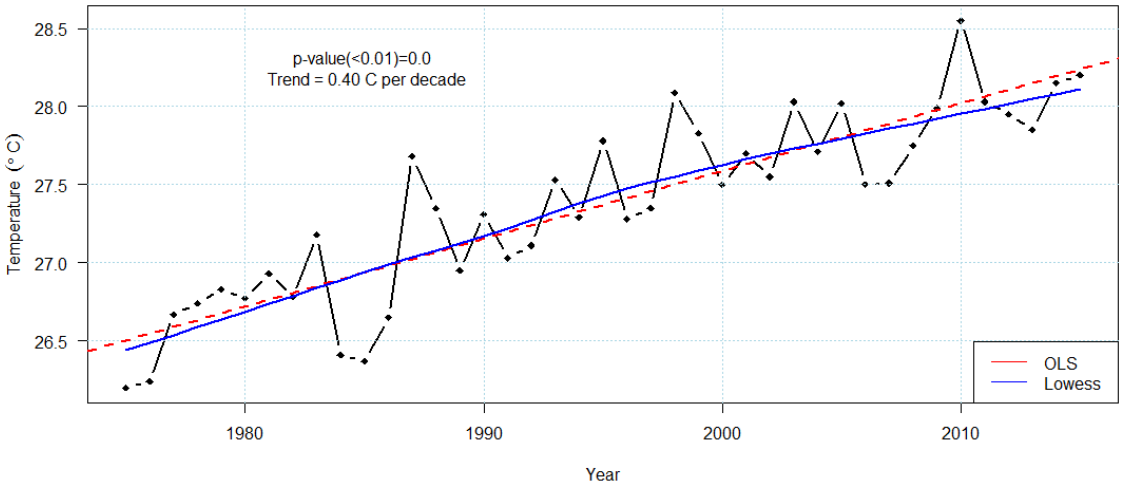
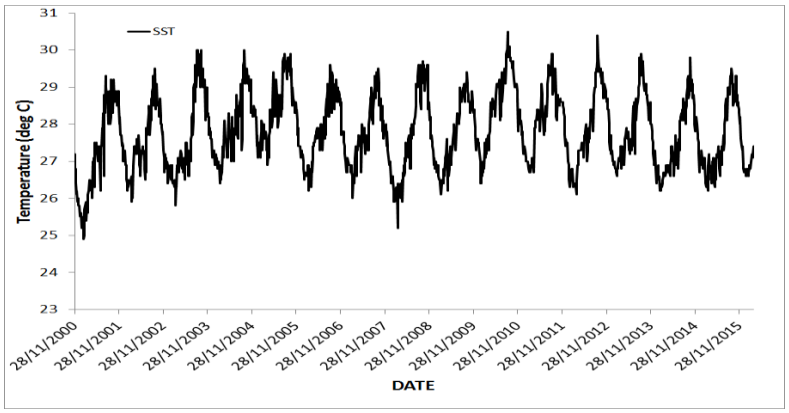


Figure 43: Mean Long-term Annual Temperature at Piarco, Trinidad (1975 – 2015)
Source: Trinidad and Tobago Meteorological Services 2016
Note: The black line indicates the time series of mean annual temperatures. Red and blue lines indicate ordinary least squares linear regression and non-parametric lowess trends, respectively.

Increasing ambient temperatures have been driving changes in sea-surface temperatures. Although there is significant seasonal variation, there has been an increase in the maximum temperatures observed at monitoring stations in Trinidad and Tobago (Aleumu and Clement, 2014) – Figure 44.



Data Source: NOAA Coral Reef Watch. 2000, updated twice-weekly. NOAA Coral Reef Watch 50-km Satellite Virtual Station Time Series Data for Buccoo Reef, Tobago
Figure 44: Sea Surface Temperatures in Trinidad and Tobago (2000 – 2015)

Rainfall patterns in T&T are also showing worrying signs especially in the wet season, where rainfall appears to be in decline at a measured rate of 67.0 mm per decade, which is statistically significant at the 5% level (Figure 45). This trend has been steady since 2003; and if it continues can lead to droughts and severe water shortages in T&T.

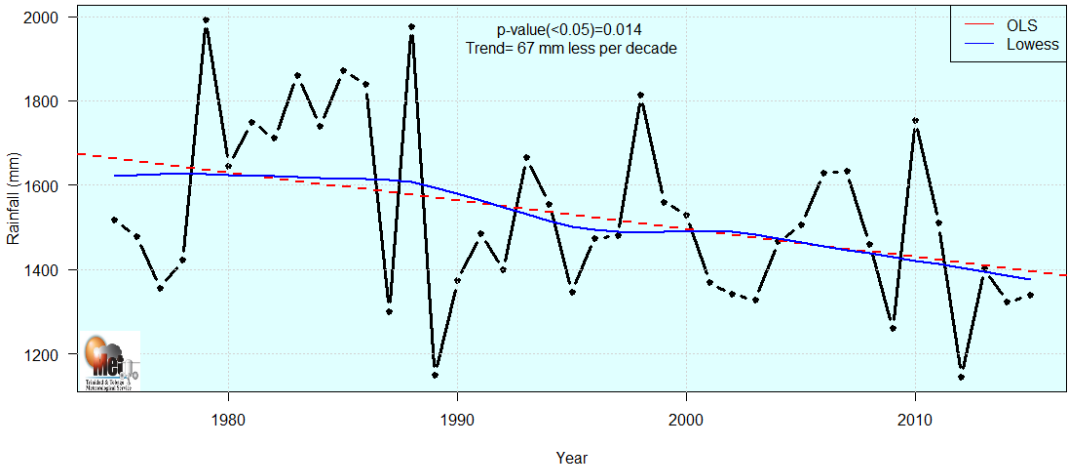


Figure 45: Annual Wet Season Rainfall Totals in Piarco, Trinidad (1975 – 2015)
Source: Trinidad and Tobago Meteorological Services (2016)
Note: Trends in Wet Season (June to December) rainfall totals (Piarco) 1975-2015. Black line indicates time series of wet season rainfall totals. The red and blue lines indicate ordinary least squares linear regression and non-parametric lowess trends, respectively.

In the dry season, there has been an increasing linear trend of 15.0 mm per decade, but this is not statistically significant at the 5% level. This trend has been steady since 1992 (Figure 46).

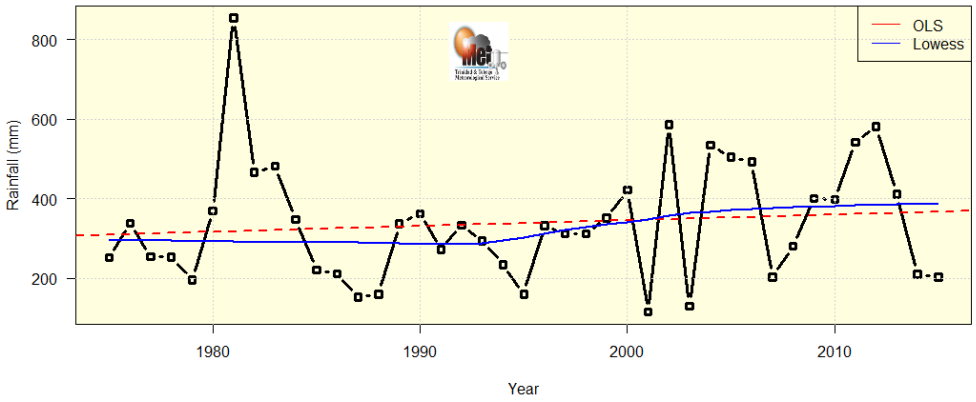
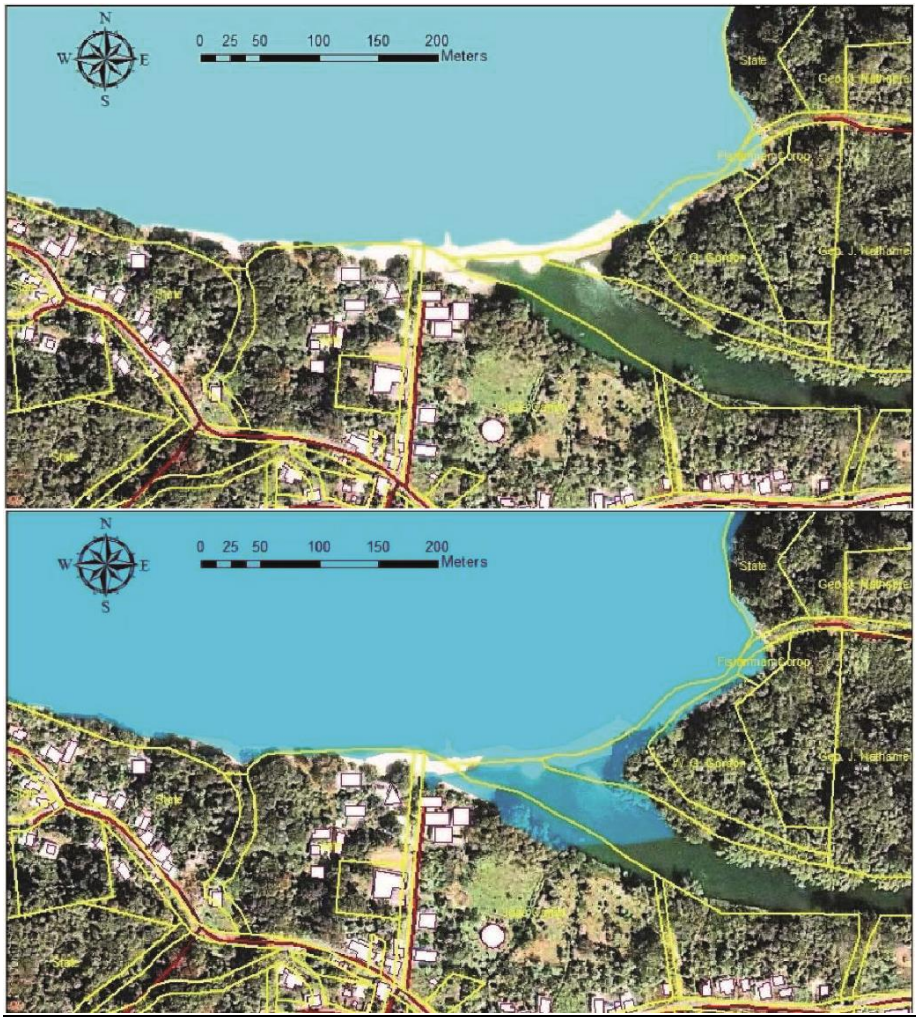


Figure 46: Annual Dry Season Rainfall Totals in Piarco, Trinidad (1975 – 2015)
Source: Trinidad and Tobago Meteorological Services (2016)
Note: The black line indicates time series of dry season rainfall totals. Red and blue lines indicate ordinary least squares linear regression and non-parametric lowess trends, respectively.

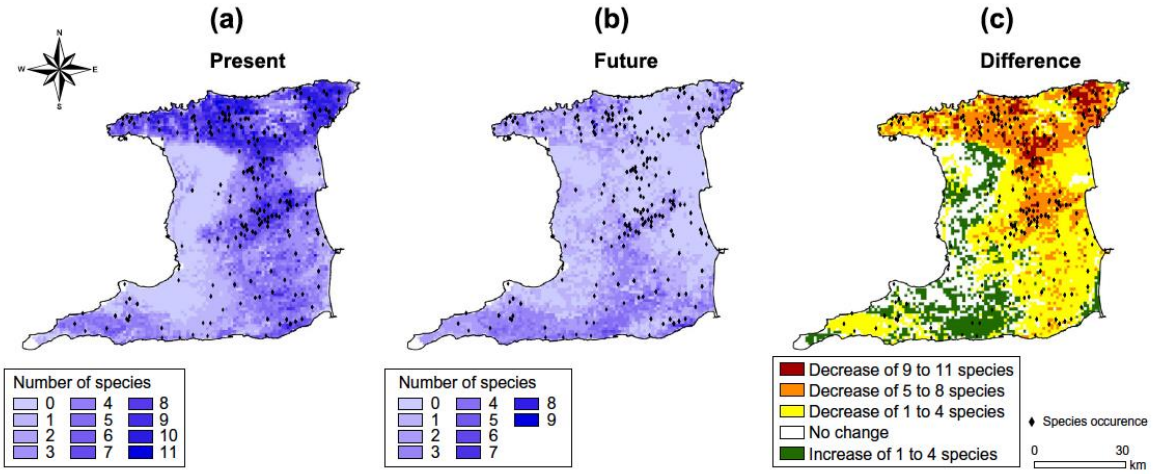
Sea level rise continues to be an important consideration for T&T as a small island state. There are several anticipated impacts of sea level rise on the islands' biodiversity, especially in the coastal zones (Jeppesen et al, 2015; GoRTT, 2013). A case study on the effects of sea level rise on the Grande Riviere beach in northeastern Trinidad, which serves as a popular nesting site for leatherback turtles, indicates that almost the entire beach can be lost in the future (Figure 47; Griffith-Charles and Sutherland, 2011). This will likely result in a number of socio-economic impacts on the local community, which depends heavily on turtle watching to provide a source of livelihoods (Sookram and Sutherland, 2011).



Simluated MSL (above) and Simulated 0.8m above MSL (below)
Source: Griffith-Charles and Sutherland (2011)

Figure 47: Anticipated Sea Level Rise on Grande Riviere Beach in Northeastern Trinidad

Research so far indicates that changes in climate will affect Trinidad and Tobago's biodiversity in a number of ways. Modelling of the effects of climate change on vascular plants in Trinidad (Maharaj and New, 2013) indicates that significant decreases in species diversity and range can occur especially in the northern and central areas of the island of Trinidad (Figure 48). Trinidad's Northern Range, a very important ecosystem and watershed area, is expected to be the most heavily impacted area, with losses and shifts expected in a number of floral species, especially endemic species at the higher altitudes.



Source: Maharaj and New (2013)
Note: These maps use timescales: Present (2000 – 2010) and Future (2035 – 2065) and are based on 11 species of vascular plants.

Figure 48: Potential Changes in Distribution and Diversity of Vascular Plants in Trinidad Based on Climate Change Modelling

2.5.8 Invasive Alien Species

According to the Global Invasive Species Database (2016) there are 57 recorded invasive alien species (IAS) in Trinidad and Tobago. This figure is significantly higher than the 36 invasive species that were reported in both the 4th National Report (2010) and the National Biodiversity Assessment of Trinidad and Tobago (2012). Another account from the T&T Biodiversity Clearinghouse produced as a part of the GEF funded Caribbean IAS project (http://www.ciasnet.org/) indicates that the number of IAS in T&T may be as high as 173 species (Figure 49). The Invasive Species Compendium developed by the Centre for Agriculture and Bioscience International (CABI) lists 431 Invasive Species for Trinidad and Tobago. This latter list contains species that are present but whose invasive status is not known for Trinidad but are reported as invasive in other regions; including some native species and some that are commercial species in agriculture, forestry and livestock production.

The large discrepancies in the various IAS lists for T&T, as well as the absence of relatively new and important IAS such as the Lion fish in the databases, indicate that further work is required in order to establish a single baseline figure for IAS of immediate threat, and to track and report on changes in the numbers and status of IAS over time.

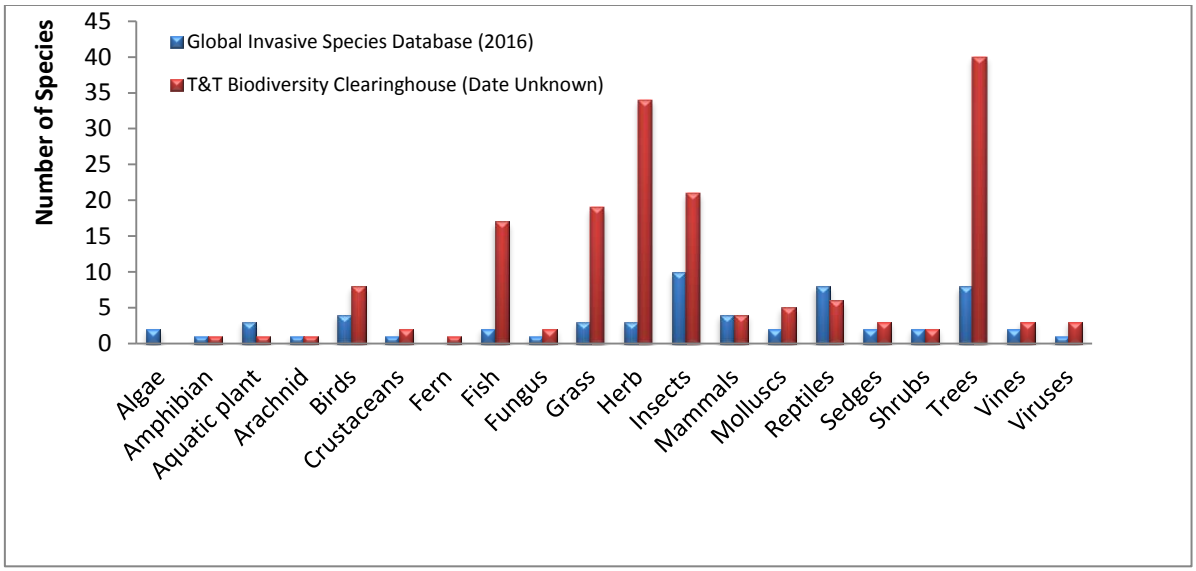


Figure 49: Numbers of Invasive Alien Species in Trinidad and Tobago
Data sources: Global Invasive Species Database (Accessed 2016)
Trinidad and Tobago Biodiversity Clearinghouse - http://www.biodiversity.gov.tt/home/trinidad-a-tobago-biodiversity/invasive-alien-species.html (Accessed 2016)

One of the newest IAS threats in Trinidad and Tobago is the lionfish, and it has caused disruptions on the reefs, especially in Tobago.

The control of Invasive Alien Species can be very costly, as was evident in the case of the eradication programme for the Giant African Snail (GAS) in Trinidad between 2009 and 2012. However, cost benefit analyses for IAS management plans in T&T highlighted that investment into the design of effective management plans can help to improve the control of the negative impacts of IAS.

It is worth noting that the classical biological control of the Pink Hibiscus Mealy bug implemented prior to 2010 is still providing control; the Green Mussel is now naturalised with declining populations and is no longer threatening biodiversity or commercial water cooling plants; the national control plan for the Giant African snail has contained this IAS to two areas in the country to date; and a National Emergency Action Plan was developed in 2014 to prevent the introduction of Frost Pod Rot in cocoa.

Although not described as an IAS, the large influxes of Sargassum on T&T's beaches have had a number of effects locally, not the least of which has been economic.

2.5.9 Economic factors

The economy of Trinidad and Tobago continues to be heavily dependent on the energy sector (Figure 50); and this renders T&T as one of the most buoyant economies in the Caribbean (Central Intelligence Agency, 2016[16]) (see Figures 51 and 52 for GDP statistics). Of particular interest is the fact that approximately 70% of the population and 80% of the economic activities in Trinidad and Tobago are

Platform in Trinidad and Tobago's Offshore Environment
Source: GoRTT (2012b)

[16] https://www.cia.gov/library/publications/the-world-factbook/geos/td.html

concentrated on the coastline (Juman and Hassanali, 2013), indicating the importance of coastal areas to the economy and livelihood base of the country.

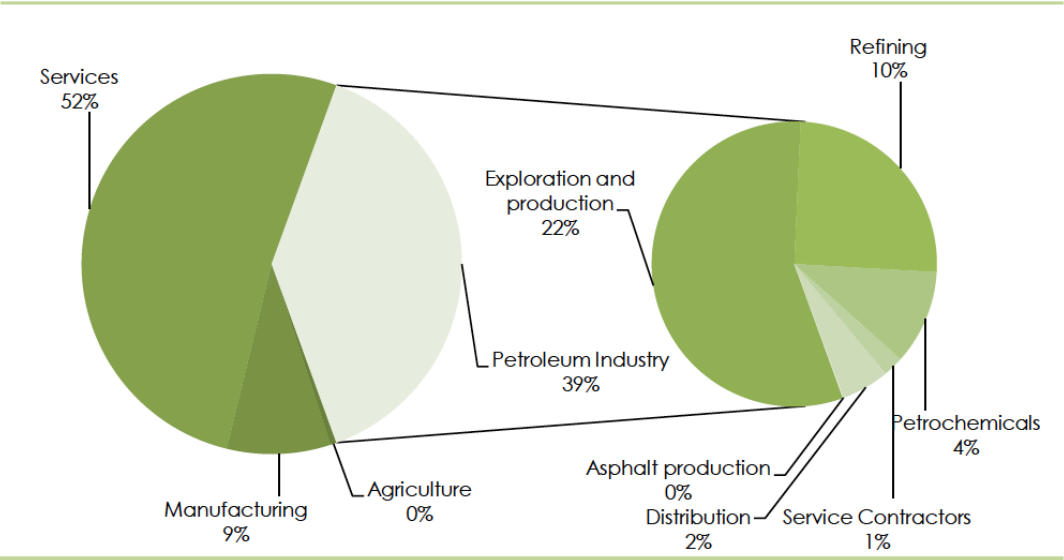


Figure 50: Sectoral Distribution of GDP in Trinidad and Tobago (2013)
Source: GoRTT (2015)

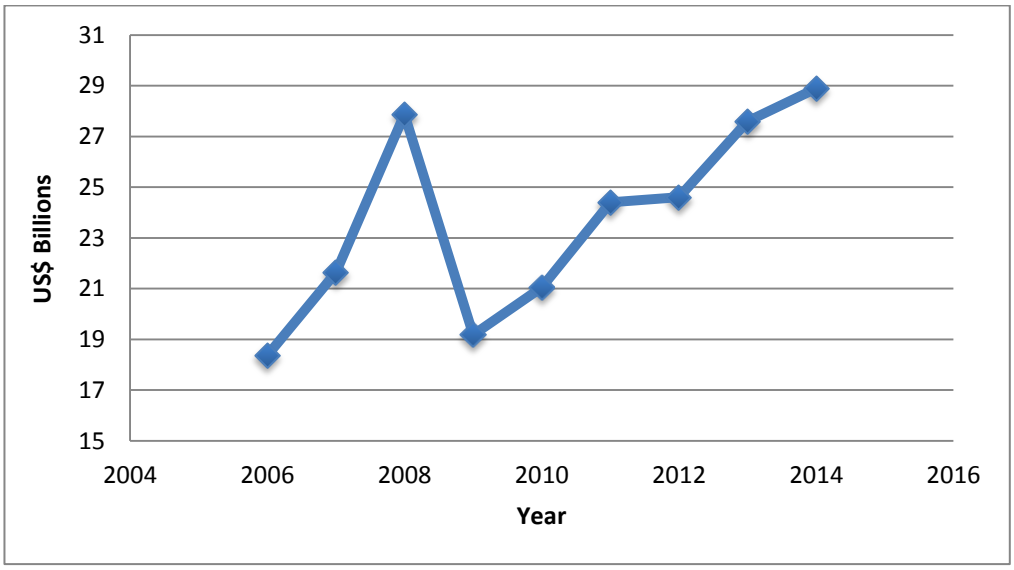


Figure 51: Trinidad and Tobago's Gross Domestic Product (2006 – 2014)
Data Source: World Bank (2016)
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries/TT?display=defaul

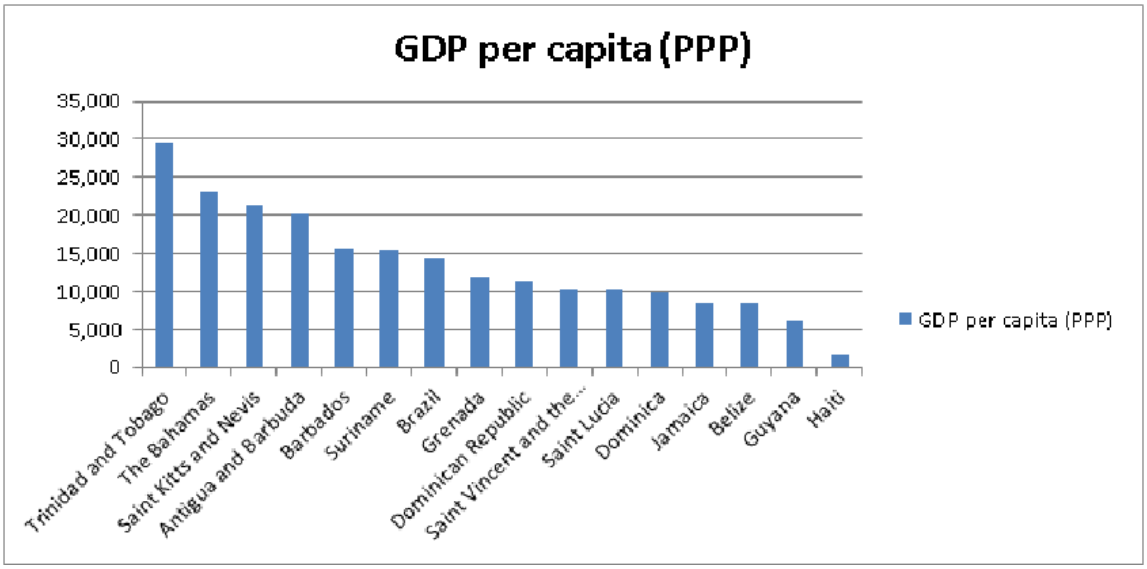
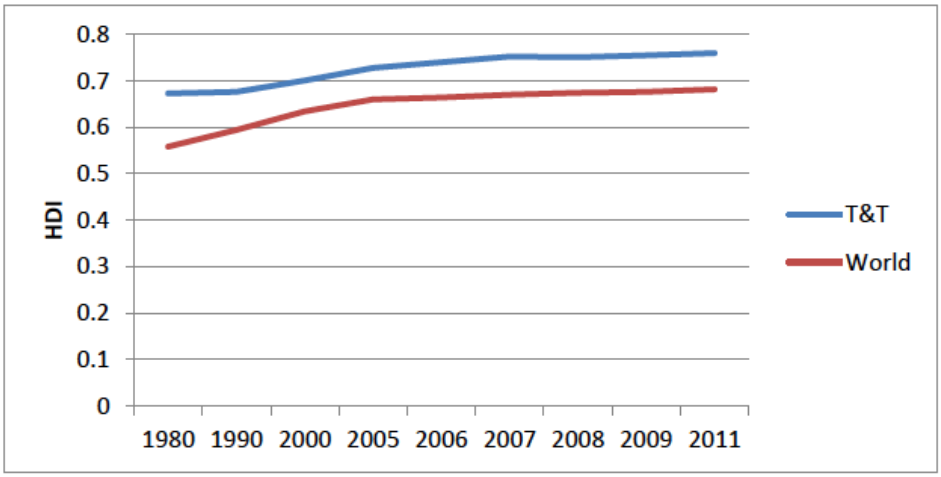


Figure 52: GDP per Capita of Caribbean Countries

Source: Key factors around ocean-based power in the Caribbean Region, via Trinidad and Tobago. - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/275464354_fig4_Figure-4-This-plot-of-Caribbean-countries'-GDP-per-capita-places-Trinidad-and-Tobago-at [accessed 1 Apr, 2016]

Although a strong economy has allowed T&T to maintain a high human development index (Figure 53), the patterns of production and consumption that are associated with this sustained economic growth continue to have a range of implications for biodiversity and ecosystem services; and consequently human well-being, as reported in previous sections of this report.

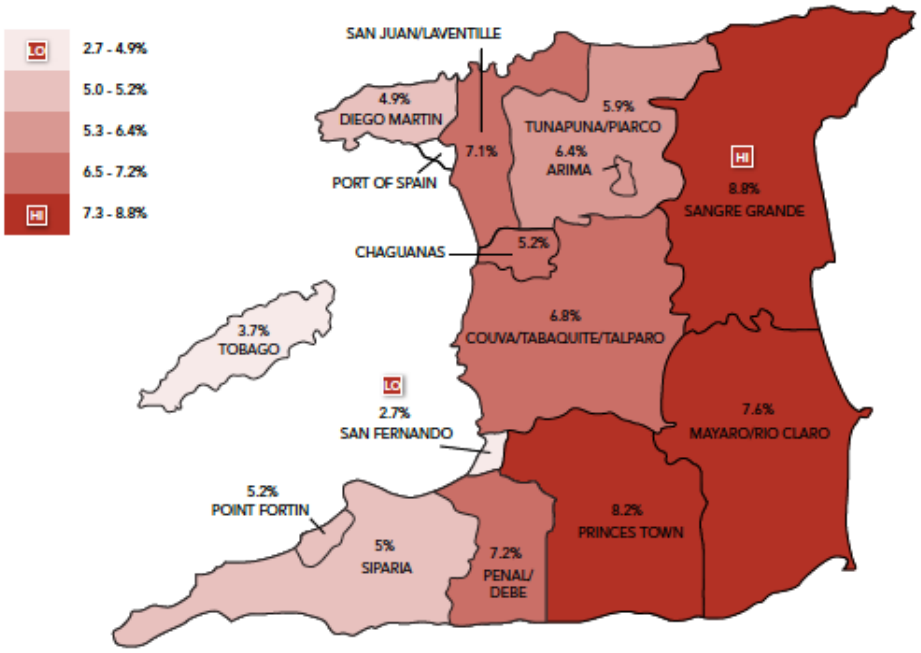


Source: United Nations Development Fund- Human Development Index Report, 2011

Figure 53: Trinidad and Tobago's Human Development Index Compared to the Rest of the World (1980 – 2011)

Extracted from NBATT (2012)

Economic wealth is not evenly distributed around the country however. As shown in Figure 54, higher levels of poverty are seen along the east and southeast portion of Trinidad, most of which is considered rural. In many of these areas, there is a higher dependence on ecosystem services to support livelihoods. One area in eastern Trinidad where the link between an ecosystem and human well-being is well established is the Nariva Swamp. Over 50 small-scale farmers operate in the swamp (Dempewolf, 2015), and many inhabitants derive income from subsistence fishing and tourism-related activities (Carbonell *et al*, 2007; Bynoe 2014 – Figure 6). Along the northeastern coast of Trinidad, many local communities are also involved in providing turtle-watching tours and associated services; and these activities provide livelihoods for many inhabitants of the rural areas.

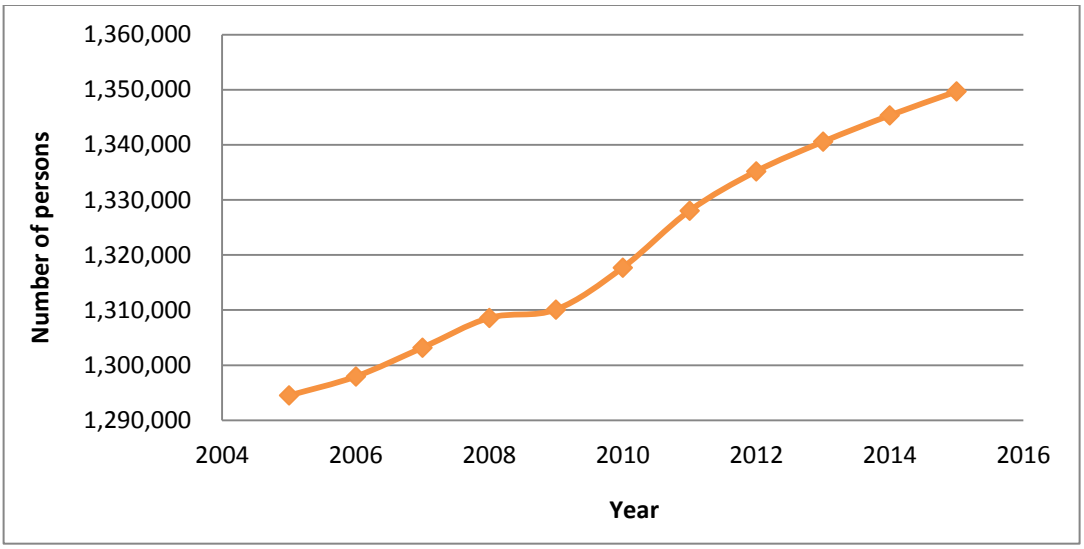


Source: GoRTT (2012a)

Figure 54: Multidimensional Poverty in Trinidad and Tobago by Administrative Area (2006)

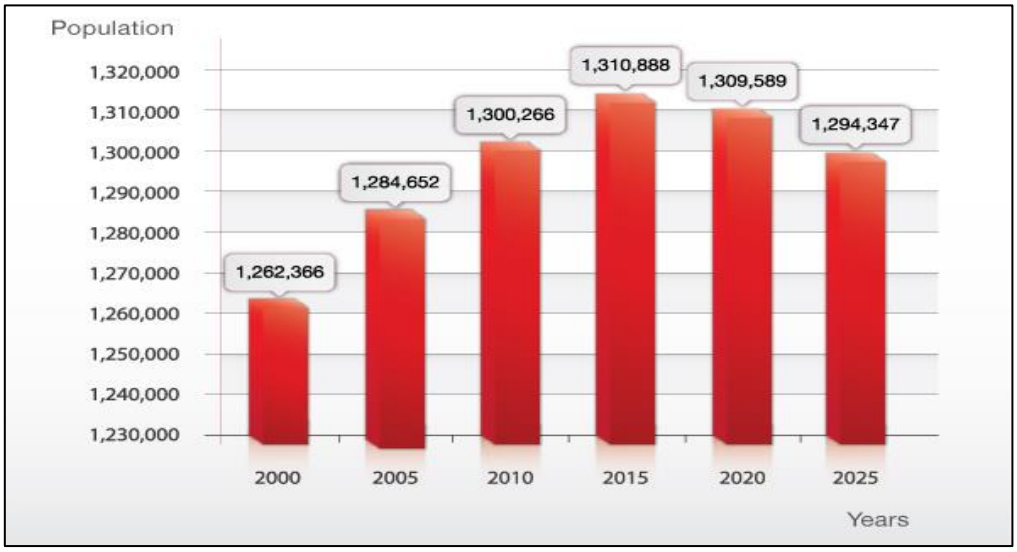
2.5.10 Demographics

The population of Trinidad and Tobago has been growing (Figure 55), although this growth is expected to reverse after 2015 (Figure 56).



Source: CSO (2016)

Figure 55: Population of Trinidad and Tobago (2005 – 2015)



Source: Central Statistical Office (2016) Available at: http://cso.planning.gov.tt/tt-today/Trinidad-Tobago-Population-Projections-2000-2025.html. Accessed March 2016.

Figure 56: Trinidad and Tobago Population Projections (2000 – 2025)

Population growth can likely be correlated with increased consumption of goods such as freshwater, given that the majority of T&T's water is used by the municipal sector (Figure 57).

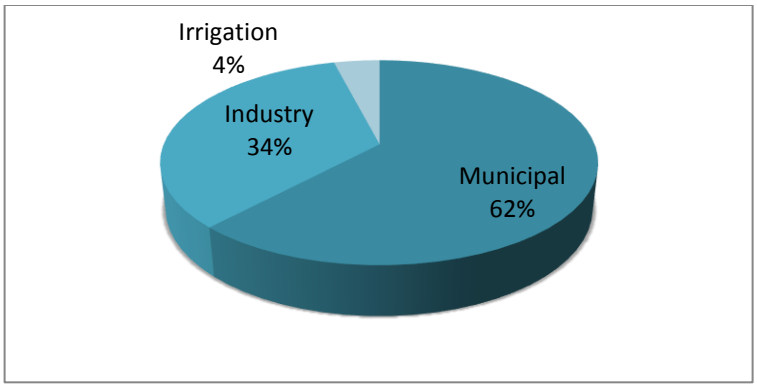


Figure 57: Water Use by Main Sectors in Trinidad and Tobago as a Percentage of Total Water Used (2011)
Source: FAO AQUASTAT http://www.fao.org/nr/water/aquastat/countries_regions/tto/index.stm Accessed March 2016.

The distribution of the population across Trinidad and Tobago (Figure 58) can also be correlated with changes in important ecosystems such as watersheds and coastal ecosystems. High concentrations of T&T's populations coincide with the areas where coastal ecosystems have been shown to be important (such as the Buccoo Reef in Tobago, and the Caroni Swamp in Trinidad); and the watersheds of northwestern Trinidad. Issues such as these have already been recognised as crucial considerations for spatial/ development planning and are reflected in the draft National Spatial Development Strategy for Trinidad and Tobago (GoRTT, 2012 a&b).

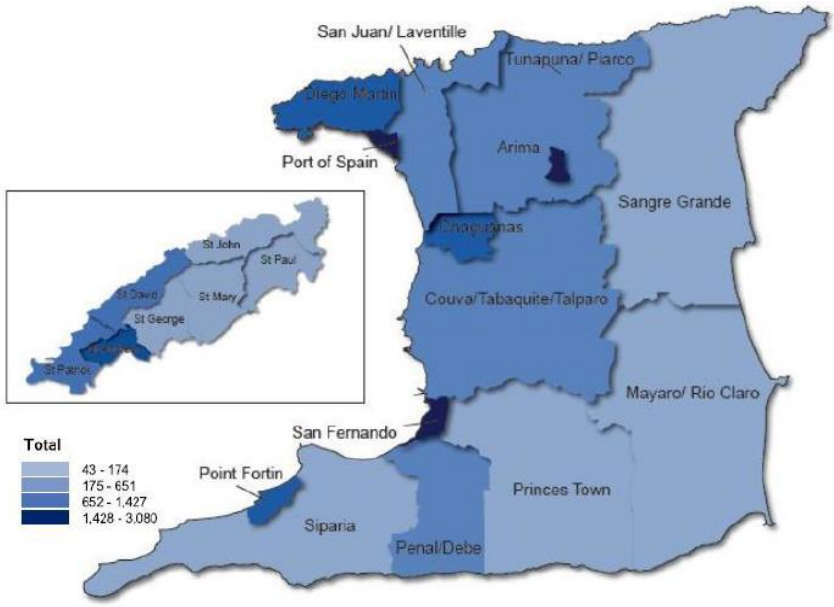


Figure 58: Population Distribution in Trinidad (2011)
Source: T&T Population and Housing Census (2011) in NBATT (2012)

2.6 National and international legal/policy context

Trinidad and Tobago ratified the Convention on Biological Diversity (CBD) on August 01, 1996 thereby indicating its commitment to the implementation of the Decisions of the CBD

Conference of Parties (COP). Pursuant to these commitments, the Government of the Republic of Trinidad and Tobago is required to:

- Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned.
- Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies including but not limited to national development plans.[17]

Under Article 6 of the Convention, each Contracting Party is requested to:

- Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt, for this purpose, existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and
- Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectorial or cross-sectorial plans, programmes and policies.

Article 26 and Article 10 (a) of the CBD calls for Parties to present, through their national reports, information on measures which have been taken for the implementation of the provisions of the Convention and their effectiveness in meeting its objectives and encourages Parties to integrate consideration of the conservation and sustainable use of biological resources into national decision-making.

An assessment of the policy and legal framework for the management of biodiversity in T&T, undertaken as a part of the current report preparation, has highlighted the following issues:

- **Several gaps exist in the legal framework that undermine the government's capacity to effectively manage biodiversity**. Much of the legislation in place to address natural resource extraction, the management of biodiversity and habitats, and pollution is outdated and therefore fails to integrate a modern approach to sustainable development and sustainable management of biodiversity. The existing legislative structure in many cases approaches the management of natural systems from a purely economic or anthropocentric perspective. While these considerations are important, such provisions meanwhile sideline environmental considerations once overarching economic priorities have been addressed. This not only undermines efforts for biodiversity protection, but also fails to capitalise on synergies between sustainable management and community livelihood opportunities which are today considered necessary and effective to balance both needs and achieve sustainable development. Further, despite being one of the greatest threats to small island developing states, climate change considerations are rarely integrated into management strategies.

- **Yet, the existing legislative foundation provides a sound basis upon which several critical gaps can be filled.** While new legislation can comprehensively address many of the threats to biodiversity and integrate models of sustainable management (such as in the case of the relatively new Planning and Facilitation of Development Act No. 10/2014 – See Box 6), existing legislation already establishes several mechanisms for the enactment

[17] Article 6 of the Convention on Biological Diversity, available at https://www.cbd.int/doc/legal/cbd-en.pdf.

and revision of relevant laws. Most legislation governing biodiversity-related issues provides for the development of subsidiary legislation, or Rules and Regulations, to deal with related concerns under the Acts. The scope of issues for which such subsidiary legislation can be made is usually quite broad, and can be enacted by the Minster by negative resolution. This means that they are not required to go through as rigorous a process as an Act of Parliament, and therefore can be used to enact provisions to address concerns that require urgent attention.

- **Mechanisms to guarantee public participation in environmental decision-making or rule-making could be made stronger.** Though an established process is provided for under the law in respect of major development activities, legislation is not specific in some cases on the manner and timing of consultation, leaving some of these determinations up to the discretion of the authorities. The strength and extensiveness of provisions which include the public on environmental decision-making and provide access to information varies vastly by sector.

- **There are limited mechanisms for the integration of research and scientific knowledge into decision-making.** This has posed challenges to effect adaptive techniques for biodiversity management. The sharing of data among relevant or related sectors is also not contemplated under the laws, overlooking a vital function that could significantly improve efficiency and accuracy in existing work. There also exists a need for the standardisation of data collection to allow for easier analysis and usability of the data across different platforms.

- **Expansion of economic instruments to strengthen compliance.** Currently there exists a range of economic instruments to support biodiversity management, these range from the sale of removal permits for the transport of timber from private lands to pollution charges and other stringent penalties for breaches of the relevant laws. These and other mechanisms includingthe Honorary Game Warden Proggramme can be further enhanced to address environmental compliance.

There is no mechanism for the implementation of access and benefit sharing (ABS) over genetic resources. Though the need for this is raised in recent policies, there is no legislative framework currently in place to enable the necessary mechanisms for implementation. However, there are general provisions for access and benefit sharing derived from our local biodiversity and environment in the country's policy and legislative framework.

Very few efforts has been directed toward examining the possible modalities under the current legal framework for the granting of Prior Informed Consent (PIC) to external parties wishing to exploit genetic resources in Trinidad and Tobago as well as the development of contracts to stipulate Mutually Agreed Terms (MAT) for the sharing of benefits that may arise out of the exploitation of genetic resources. There is also some uncertainty when NGO/CBO entities occupy State Lands or utilise genetic base stock provided by the State as to the disbursements of possible benefits arising out of collaboration with external third parties.

- **Recent policies propose necessary measures to fill gaps in legislation and adopt modern approaches to biodiversity management**. The implementation of such policies could modernise and enhance the regulation of biodiversity, address conflicts and

establish more comprehensive and coherent management approaches, thereby addressing several problems created by existing outdated legislation.

A significant issue overshadowing many of the above concerns is the general lack of enforcement of existing laws governing biodiversity and the environment in Trinidad and Tobago. This is due in large part to the lack of human, technical and financial resources to ensure that sufficient capacity exists to undertake enforcement. Limited public awareness for environmental issues, and well as the lack of appreciation for the value of biodiversity and ecosystem services through all levels of society generally exacerbate these concerns. The subject of enforcement needs to be addressed with priority, since revised laws will effect little change if enforcement is not adequately addressed.

The following recommendations have been developed following a thorough analysis of the laws and policies impacting biodiversity in Trinidad and Tobago. They have been formulated to respond to the challenges outlined in the key findings in each thematic area, and are summarised below:

- Review and revise the existing legislation impacting all aspects of biodiversity management. This includes repealing outdated laws in part or in whole, and/or the enactment of comprehensive laws which address the drivers of biodiversity destruction and degradation and establish measures to overcome these challenges. The enactment of Rules or Regulations by the relevant Minister on a wide range of issues as outlined under the respective parent Acts should be considered where appropriate. Particular urgency should be placed on outdated laws that today directly contribute to biodiversity loss or are in conflict with modern approaches to biodiversity management.

  Additionally, areas in biodiversity management which are currently lack governance framework should receive urgent attention. Several laws have already been developed to address this and are in draft form and are pending enactment. Such draft laws should be reviewed and brought into force.

  All laws should be in line with up-to-date national policies relating to the environment, biodiversity and climate change.

- Ensure that in the development of legislation, decision-making processes are guided by sound science and local knowledge.

- Develop and implement up-to-date national policies relating to biodiversity through the establishment and execution of implementation plans where necessary.

- Review and gaps in the technical, financial and human capacity at key regulatory institutions to improve enforcement of existing laws.

- Improve public involvement in in environmental decision-making, fully integrating the stakeholder consultation process and enhancing transparency in the decision-making process, particularly in the extractive industries. This can be achieved through the review and revision of Regulations governing the sector.

- Adopt the use of economic instruments in existing legislation to incentivise compliance and deter violations. Develop mechanisms within the law to ensure that the economic value of ecosystem services is properly taken into account when making management decisions.

2.7 Lessons learned from the earlier NBSAP(s) and the process of developing the updated NBSAP

2.7.1 NBSAP Implementation

The first NBSAP approved in 2001 prioritised twenty-three (23) strategies across five thematic areas for addressing biodiversity conservation in a holistic manner. Table 9 below provides a summary of the achievements and challenges faced in implementing these strategies across the thematic areas. The full description of the strategies is available in the Executive Summary (p. ix to xiv) of the NBSAP (2001).

Table 9: Summary of NBSAP (2001) Implementation Assessment

STRATEGY	ACHIEVEMENTS	CHALLENGES	OPPORTUNITIES
Education and Awareness: Strategies 1-9	All agencies (government and civil society) involved in biodiversity conservation have actively carried out education and awareness initiatives, or have established regular awareness activities. Environmental and biodiversity conservation concepts are entrenched in the formal education system at primary, secondary and tertiary levels. Corporate entities and religious organisations have also been involved in biodiversity conservation activities.	Weak coordination and collaboration amongst agencies in delivering a unified education and awareness programme. Limited access to financial resources. Accessible finance finite due to being associated with projects.	Improve coordination and collaboration to maximise human and financial resources; presentation of a coordinated effort will likely increase impact on public

STRATEGY	ACHIEVEMENTS	CHALLENGES	OPPORTUNITIES
Legislation and Enforcement: Strategies 10 & 11	The following laws have been drafted and enacted: Water Pollution Rules No. 12/2007; Planning and Facilitation of Development Act No. 10/2014; Air Pollution Rules, No. 12/2015; Litter Act 30:52, 1973 (rev. 2014) (revised to increase fines for violations); Waste Management (Hazardous Waste) Rules (Draft), 2014. The following policies have come into force: the Climate Change Policy (2011), Protected Areas Policy (2011), Wildlife Policy (2013), and Forest Policy (2011). The Environmental Commission has been established since 2001	Legislative gaps still exist with respect to the control of alien invasive species, marine pollution, sustainable extraction of natural resources and the mainstreaming of climate change among others. Lack of integration of modern biodiversity management methods e.g. science-based decision-making, co-management mechanisms, ecosystem-based approaches into existing laws. Ineffective law enforcement due to lack of human, technical and financial capacity to monitor and respond to environmental violations. Jurisdiction of Environmental Commission is limited to violations of the Environmental Management Act 2000.	Build capacity with non-specialised court system to effectively address environmental violations. Integrate modern biodiversity management methods in existing laws.
Capacity: Strategies 12 – 14	Agencies involved in biodiversity conservation are known to each other and interact at coordinated events. They all have tools (e.g. website, Facebook page, periodic newsletter) they use to disseminate information on their activities. The civil society within T&T has grown and some are actively engaging in regional and international initiatives to build their capacity for more effective national	Limited, coordinated interaction amongst agencies. No formal environment for networking and sharing of information and experiences. Lack of enabling environment to facilitate development of and utilisation of advocacy tools. Absence of formal framework to facilitate NGO and CBO involvement in biodiversity management.	Increase networking opportunities and interactions amongst biodiversity conservation agencies and organisations. Integrate modern methods of co-management into existing legislation and policies.

STRATEGY	ACHIEVEMENTS	CHALLENGES	OPPORTUNITIES
	engagement. NGOs and CBOs have also been actively building their internal capacity to support management of biodiversity.		
Information and Research: Strategies 15 - 19	A biodiversity clearinghouse was established by the EPPD. Academic and research institutions, e.g. National Herbarium, the UWI, actively engage in projects with the Forestry Division, EMA and IMA and NGOs to improve the flora and fauna inventories of Trinidad and Tobago.	Absence of a national agenda to guide and coordinate biodiversity research and data gathering. No defined procedure for the government sectors to include biodiversity related activities in their work programmes. No financial resources allocated to research and information management. Limited willingness by some responsible entities to share data	Establish a national framework to guide research, and build on and expand collaborations amongst agencies
Policy and Commitment: Strategies 20 - 23	Ministries with responsibility for Environment, Agriculture, Tourism, Transport, Planning, Public Utilities, Energy and Local Government have been incorporating biodiversity considerations into their policies and programmes. There has also been increased public participation in the development of government policies for conservation and management of biodiversity	Absence of an overarching national framework for integration of biodiversity conservation across sectors. Limited collaboration and coordination within and amongst public (government) agencies related to biodiversity conservation actions. Poor articulation of public views and opinions in national planning and policy development	Utilise the revised NBSAP and the national framework for implementation of the 2030 Sustainable Development Agenda

Special mention should be made of the Green Fund which was established under the Finance Act in 2000 as the Green Fund Levy. The Green Fund Levy was started in January 2001 and the funds collected are meant to provide financial assistance to organisations and community groups for implementing activities related to remediation, reforestation of the environment and conservation[18]. The Green Fund became accessible in 2008, however many relevant bodies could not access the fund because of the meaning given to 'community groups' and 'organisations' under Regulation 2, Green Fund Regulations 2007[19]. The Green Fund legislation was amended in 2011 to ensure full access to the fund by all relevant organisations. Several projects have benefited from the Green Fund including: the Fondes Amandes Community's "Sustainable Community Forestry (Reforestation) Initiative", Phases I & II; Greenlight Network's "Plastikeep Projects", Phases I & II; Environmental Management Authority's "Nariva Swamp Restoration, Carbon Sequestration and Livelihoods Project"; Toco Foundation's "Water Harvesting in the Northeastern Region of Trinidad"; Nature Seekers "Matura Development Initiative of Awareness, Management and Eco-tourism for Natural Resource Conservation"; and Realize Road Environmental Club's "Greening the Plastic planet recycling Project"[20].

There have been obvious successes that have supported the implementation of the 2001 NBSAP and by extension biodiversity conservation in Trinidad and Tobago, despite the limitations in human resources and access to financial resources, the absence of integration within and across responsible agencies and inconsistent coordination amongst agencies. There are also opportunities for improving the biodiversity conservation situation in Trinidad and Tobago. As such, the revision of the NBSAP is an opportunity for the biodiversity conservation community and the country to build on these successes, address the barriers to success, and incorporate the changes and developments that have taken place and continue to take place in the country.

2.7.2 NBSAP Revision

The Government of the Republic of Trinidad and Tobago (GoRTT) engaged the consulting team in November 2015 to revise the NBSAP and produce the 5th National Report to the CBD. The process officially began in January 2016 with the establishment of a National Oversight Committee (NOC) to provide technical advice, guidance and quality assurance throughout the revision process. The NOC comprised representatives from the EMA, the EPPD, the Institute of Marine Affairs (IMA), the Fisheries Division, the Forestry Division, the Council of Presidents of the Environment (COPE), The Trust for Sustainable Livelihoods (SusTrust) and Environment TOBAGO (ET). The Tobago House of Assembly (THA) was invited to be part of the NOC but was unable to engage in the process at this level.

Given the short time frame (9 months) provided for completing the revision the consulting team conducted a rapid stocktaking and assessment exercise in the key sectors of biodiversity, agriculture, legislation and policy, and economics. These assessments were ably supported by individual interviews with a range of stakeholders from across all sectors. A presentation was made to the NOC who assessed the findings and provided guidance on additional information

[18] http://www.ema.co.tt/docs/wed/green_fund.pdf; accessed September 10, 2016
[19] http://www.trinidadexpress.com/news/Green_Fund_back_in_Parliament-110920164.html; accessed September 10, 2016
[20] http://chamber.org.tt/articles/a-look-at-the-green-fund/; accessed September 10, 2016

sources for gap filling. The first of two national consultations followed, one in Trinidad and one in Tobago, and brought together key stakeholders from various Ministries, academic and research organisations, and non-governmental organisations across T&T. Robust discussion around the findings was had in both consultations and resulted in validation of existing data, identification of additional and/or more accurate data sources, current challenges and constraints to implementation, and an overall continued interest by stakeholders to see improvements to biodiversity conservation in the country.

The team followed up on these consultations with the stakeholders to complete the various assessments. Focus also shifted to defining the national targets and principles and priorities of NBSAP. National Biodiversity Targets and Indicators for T&T were developed in 2014, through a series of national consultations coordinated and facilitated by the Multilateral Environmental Agreement Unit (MEAU) of the EPPD. Stakeholders were sensitised to the CBD's 2011-2020 Strategic Plan for Biodiversity and the Aichi Biodiversity Targets, the framework used to develop the proposed National Biodiversity Targets and Indicators. The development process included a review and refinement of the Aichi Targets to reflect the national context; indicators were defined with a view to capitalise on data and information already being collected by the relevant agencies. The opportunity was also taken to define within these national biodiversity targets, the agencies and organisations that would be responsible for contributing to the achievement of the targets.

Table 10 presents the proposed National Biodiversity Targets, Indicators and responsible agencies/organisations. These targets are pending Cabinet approval and were used by the consulting team as a starting point for defining the priority targets for the revised NBSAP.

Table 10: Proposed National Biodiversity Targets, Indicators and Responsible Agencies/Organisations

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
1a. By 2020, at the latest, at least 50% of people are aware of the values and understanding of biodiversity. 1b. By 2020, at the latest, at least 30% of people are aware of the steps they can take to conserve and use biodiversity sustainably.	i. Access to local biodiversity information ii. Number of different information documents produced iii. Number of activities to promote awareness on values of biodiversity. iv. Number of activities to promote steps to conserve and sustainably use biodiversity. v. Number of people aware of biodiversity and its importance	i. EPPD, EMA, IMA, FD, Trade, Industry and Communications ii. As (i) iii. As (i) iv. As (i) v. As (i), CSO vi. As (i), CSO

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
	vi. Change in the level of awareness on the values of biodiversity (%)	
2a. By 2020, at the latest, biodiversity valuation has been integrated into at least 50% of national and local development and poverty reduction strategies, and planning processes and reporting systems. 2b. By 2020 at the latest, biodiversity values are integrated into national and local plans.	i. Number of national initiatives that incorporate biodiversity valuation. ii. Number of local (regional corporation, THA) development plans that incorporate biodiversity valuation. iii. Number of national reports that incorporate biodiversity values and valuation. iv. Level of financial support for biological collecting, monitoring and evaluation. v. Number of policy and legislative documents that target biodiversity valuation and management.	i. Min. of Planning/TCPD ii. ? iii. ? iv. EPPD, research institutions v. EPPD
3a. By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are reformed in order to minimize or avoid negative impacts. 3b. Positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations.	i. Change in the number of incentives harmful to biodiversity. ii. Change in the number of incentives reformed to minimize or avoid negative impacts on biodiversity. iii. Number of positive incentives for conservation or sustainable use of biodiversity. iv. Change in the value of incentives for conservation or sustainable use of biodiversity. v. Change in the value of harmful incentives	i. Finance, Food Production, Energy, Tourism, Housing, Local Gov't, DNRE/DAMME ii. As (i) iii. As (i) iv. As (i) v. As (i) vi. As (i)

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
	vi. Value of incentives reformed to minimize or avoid negative impacts on biodiversity.	
4. By 2020, at the latest, the Government, business and stakeholders has taken steps to achieve or have implemented plans to keep the impacts of use of natural resources within safe ecological limits.	i. Number of plans prepared to reduce negative impacts of use of natural resources. ii. Number of plans implemented to reduce negative impacts of use of natural resources. iii. New technologies implemented to reduce negative impacts of use of natural resources.	i. WASA, Energy, Food Prod'n, Local Gov't, EMA, TCPD ii. As (i) iii. Energy, WASA,
5. By 2020, the rate of loss of all natural habitats, including marine habitats, is at least halved and degradation and fragmentation is significantly reduced.	i. Change in area of natural forest, by types of forest. ii. Change in area of plantation forest. iii. Change in area of wetlands by type of wetlands iv. Change in area, rugosity and diversity of coral reefs v. Change in area of seagrass beds vi. Change in area of fire degraded habitats vii. Change in area of natural habitats degraded or lost through conversion.	i. FD, State Lands, Housing, Land and Marine Affairs, THA ii. FD iii. FD, IMA iv. IMA v. IMA vi. FD vii. FD, State Lands
6. By 2020 at least 30% of the major commercially important fish, invertebrate stocks and aquatic plants are managed and harvested sustainably.	i. Number of site, species or fishery specific management plans prepared. ii. Number of site, species or fishery management plans implemented. iii. Number of commercial fish species and invertebrates	i. Fisheries, EMA (For aquaculture CEC applications), IMA ii. Fisheries, IMA iii. Fisheries, EMA, IMA iv. IMA v. Fisheries, Forestry, National Security vi. Fisheries, Forestry, National Security

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
	harvested in accordance with management plans. iv. Number of aquatic plants and depleted species under threat from harvesting. v. Number of illegal fishing activities reported. vi. Number of illegal fishing activities leading to conviction. vii. Change in status of key species of commercial fish and invertebrate stocks. viii. Change in no of fisher folk who use or adopt sustainable fishing techniques. ix. Change in awareness and knowledge of sustainable fishing techniques.	vii. Fisheries viii. Fisheries ix. Fisheries
7a. By 2020 at least 30% of areas under agriculture are managed sustainably, ensuring conservation of biodiversity. 7b. By 2020 aquaculture activities are managed sustainably, ensuring conservation of biodiversity. 7c. By 2020 at least 50% of areas under forestry are managed sustainably, ensuring conservation of biodiversity.	i. Area under agriculture. ii. Area under agriculture sustainably managed. iii. Number of aquaculture projects. iv. Number of aquaculture projects that contribute to conserving local biodiversity. v. Number of native species cultivated. vi. Number of non- native species cultivated vii. Acreage of non-native species. viii. Acreage of native species.	i. and ii. Food Prod'n iii. and iv. Fisheries, EMA v. to viii FD ix. Fisheries x and xi. FD

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
	ix. Number of aquaculture projects managed in accordance with global standards and best practices. x. Area under forest management. xi. Area under sustainably managed forests.	
8. By 2020, pollution, including from excess nutrients, at key sites has been brought to levels that are not detrimental to ecosystem function and biodiversity.	i. Change in the Level of all types of pollution at key sites. ii. Number of measures in place to control pollution. iii. Change in biodiversity at key sites affected by pollution. iv. Number of occurrences in non-compliance with pollution rules.	i. EMA, WRA, IMA, UWI ii. EMA iii. IMA, DNRE, FD iv. EMA
9a. By 2020, invasive alien species and pathways are identified and prioritized for action. 9b. By 2020, at least 40% of priority terrestrial IAS species present are controlled or eradicated at priority sites. 9c. By 2020, at least 50% of priority marine IAS species present are controlled or eradicated at priority sites. 9b. By 2020, measures are in place to manage pathways to prevent their introduction and establishment.	i. Number of IAS identified that are immediate threats. ii. Number of pathways identified as immediate threats. iii. Number of IAS controlled or eradicated. iv. Number of measures in place to prevent introduction of IAS. v. Number of new IAS identified in T&T annually.	i. FD, Food Prod'n, IMA, EMA ii. Food Prod'n, EMA, IMA iii. FD, Food Prod'n, IMA, EMA iv. FD, Food Prod'n (plant and animal quarantine), IMA, EMA v. FD, Food Prod'n , IMA,

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
10. By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable coastal ecosystems impacted by climate change are minimized, so as to maintain their integrity and functioning.	i. Number of management plans approved ii. Number of management plans implemented to reduce anthropogenic impacts on coral reefs and other vulnerable ecosystems. iii. Change in anthropogenic impacts on coral reefs and other vulnerable coastal ecosystems.	i – iii. IMA, Fisheries , THA, Buccoo Reef Trust, EMA
11. By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are managed consistent with approved plans.	i. Percentage of terrestrial area including inland waters protected. ii. Percentage of coastal and marine areas protected. iii. Number of management plans implemented for these areas.	i. FD, State Lands, THA ii. IMA, THA, Fisheries, CDA, EMA iii. CDA, IMA, THA, Fisheries, EMA
12. By 2020 the extinction of at least 60% of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	i. Number of threatened species. ii. Number of management plans for threatened species and habitats implemented. iii. Change in population/status of threatened species.	i. FD, IMA, EMA, THA ii. FD, Fisheries iii. FD, Fisheries, IMA, THA
13. By 2020, the genetic diversity of priority, native socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for safeguarding their genetic diversity.	i. Number of native socio-economically and culturally valuable species utilized. ii. Number of strategies developed for safeguarding native socio-economically and culturally valuable species. iii. Number of strategies implemented for safeguarding	i. – iii. FD, Fisheries, CARDI, CABI iv. Research institutions, orchid society, CARDI, CABI

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
	native socio-economically and culturally valuable species. iv. Measures in place to protect erosion of genetic resources	
14. By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are rehabilitated and managed, taking into account the needs of local communities, and the poor and vulnerable.	i. Number and acreage of degraded ecosystems ii. Number and acreage of degraded ecosystems rehabilitated and managed. iii. Number of people employed or gaining a livelihood from rehabilitated ecosystems	i. EMA, FD, Energy, WRA, Food Production, UWI (Geoinfomatics) ii. EMA, FD, Energy, WRA, Food Production iii. CSO*, ENGOs*, Green Fund, EMA, GEF SGP
15. By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through conservation and rehabilitation, including rehabilitation of at least 15 per cent of degraded ecosystems.	i. Percentage of degraded ecosystems rehabilitated. ii. Contribution of natural forest to carbon stocks. iii. Contribution of plantation forests to carbon stocks. iv. Number of carbon sinks created annually.	i. FD, NRWRP, EMA, Energy ii. FD, NRWRP, THA iii. FD, NRWRP, THA iv. FD, NRWRP, eNGOs, THA
16. By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is ratified by the Government.	i. Number of work programmes that incorporate some of the provisions of the Nagoya Protocol. ii. Number of legal instruments supporting implementation of the Nagoya Protocol.	i. EPPD, Food Prod'n, Legal Affairs, Trade ii. Legal Affairs, AG Office iii. EPPD, Food Prod'n, Legal Affairs, Trade

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
	iii. Number of PA and education events to promote info on ABS	
17. By 2015 the Government has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	i. Number of consultations held in preparing the updated NBSAP. ii. Level of participation in consultations held in preparing the updated NBSAP. iii. Approval of the revised NBSAP by the Government. iv. Number of work programmes that incorporate elements of the updated NBSAP.	i. – iii. EMA, EPPD iv. All applicable agencies
18. By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, are integrated and reflected in the implementation of the Convention in a participatory manner.	i. Number of documented traditional knowledge, innovations and practices of indigenous and local communities. ii. Number of biodiversity related activities implemented that incorporates traditional knowledge, innovations and practices of indigenous and local communities. iii. Level of participation by local communities in management of biodiversity. iv. Number of research projects utilizing indigenous and local knowledge.	i. Research institutions e.g. UWI, FD, Food Prod'n, NGOs ii. FD, Food Prod'n, NGOs iii. FD, NGOs iv. Research institutions
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,	i. Number of scientific studies on local biodiversity published annually. ii. Number of skilled persons by disciplines, managing biodiversity.	i. Research institutions e.g. UWI, CABI, UTT; FD, IMA, ii. EPPD iii. EMA, EPPD, IMA, FD, iv. Research institutions e.g. UWI, CABI, UTT; FD, IMA,

NATIONAL TARGETS	INDICATORS	PROPOSED LEAD AGENCY
widely shared and transferred, and applied at key sites.	iii. Change in access and use of biodiversity information. iv. Number of biodiversity research projects undertaken. v. Number of records per year to citizen science websites.	v. NGOs, Research institutions
20. By 2020, at the latest, the mobilization of and access to financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 including the updated NBSAP, from all sources, increased substantially from the current levels.	i. Total funds allocated annually by government for management of biodiversity. ii. Total funds derived from donors (e.g. GEF) for management of biodiversity. iii. Total funds from other sources e.g. Green Fund, for management of biodiversity. iv. Total funds from the private sector for management of biodiversity v. Total dollar value of projects implemented annually for management of biodiversity.	i. EPPD ii. EMA, EPPD iii. EPPD iv. Commerce Chambers v. EPPD

During the consultations to define priority national targets, stakeholders provided feedback on the full list of targets and indicators. It should be noted that prior to the presentation of the proposed priority targets, the team presented and reviewed the national biodiversity targets with the stakeholders. Many acknowledged that the proposed percentage changes for some of the targets were high and potentially unachievable by 2020, for example as in Target 6. However, those from responsible agencies indicated they are continuing to work towards achieving improvements. Recommendations were also made to edit some indicators due to the fact that they were not part of the existing monitoring protocol, did not provide an effective measure of the target, or would be too difficult to measure. For example, it was noted that "change in rugosity", indicator iv. in Target 5 was not part of the monitoring protocol of the IMA, which has been monitoring coral reefs for decades. Other recommended edits to the national targets were to include the THA as a responsible agency for all targets given their legal responsibility for implementation of national policy across all sectors in Tobago; and to use generic terms e.g. "Ministry responsible for…", to identify the responsible government departments due to the frequent movements that occur for departments when government administrations change and restructure ministerial portfolios.

Selection of the national targets for prioritisation was driven in part by the limited time remaining (3 years) to effectively implement, monitor and report on actions related to the implementation of 20 national targets under the Conventions' 10 year Strategic Plan. Other

driving factors behind target prioritization included an understanding of the desired changes in T&T's biodiversity and ecosystem services and associated human wellbeing by 2020, an understanding of the threats to biodiversity and the changes required in these, and the enabling environment to implement actions necessary to respond to these targets (Figure 59).

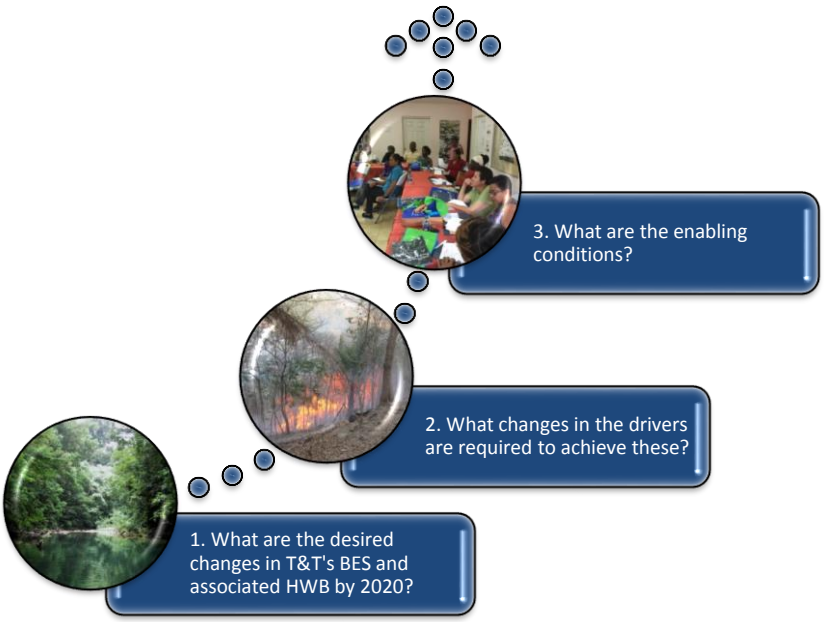


Figure 59: Concept Map Used to Guide the Determination of Strategies and Actions in the Revised NBSAP

A total of seven targets were selected for prioritisation in the implementation of the revised NBSAP (Table 11). They are as follows:

Table 11: Prioritised National Biodiversity Targets

Target	Description
1	a. By 2020, at the latest, at least 50% of people are aware of the values and understanding of biodiversity. b. By 2020, at the latest, at least 30% of people are aware of the steps they can take to conserve and use biodiversity sustainably.
5	By 2020, the rate of loss of all natural habitats, including marine habitats, is at least halved and degradation and fragmentation is significantly reduced
6	By 2020 at least 30% of the major commercially important fish, invertebrate stocks and aquatic plants are managed and harvested sustainably.
7	a. By 2020 at least 30% of areas under agriculture are managed sustainably, ensuring conservation of biodiversity. c. By 2020 at least 50% of areas under forestry are managed sustainably, ensuring conservation of biodiversity.

Target	Description
9	a. By 2020, invasive alien species and pathways are identified and prioritized for action. b. By 2020, at least 40% of priority terrestrial IAS species present are controlled or eradicated at priority sites c. By 2020, at least 50% of priority marine IAS species present are controlled or eradicated at priority sites. d. By 2020, measures are in place to manage pathways to prevent their introduction and establishment
11	By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are managed consistent with approved plans.
12	By 2020 the extinction of at least 60% of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Discussions around the implementation of non-prioritised targets also took place. The general consensus was that while focus will be placed on the 7 national targets identified, the remaining 13 targets will still be implemented directly or indirectly through actions aimed towards achieving the 7 targets or through existing national or regional projects under implementation of which T&T is a part. For example, implementation of actions to achieve Target 5 and 7 will support achievements in Target 14. Efforts towards accomplishing Target 16 will be supported by the GEF funded project, "*Advancing the Nagoya Protocol in Countries in the Caribbean Region"*, in which T&T is participating.

Once consensus was reached on the 7 targets, the process for defining the strategies and actions took place. The Results Chain tool, which describes how a strategy will lead to conservation success, was employed. Results Chains are tools that show the linkages between three main components: actions, expected outcomes and desired impact. Figure 59 describes the components of the results chains used for the 7 targets.

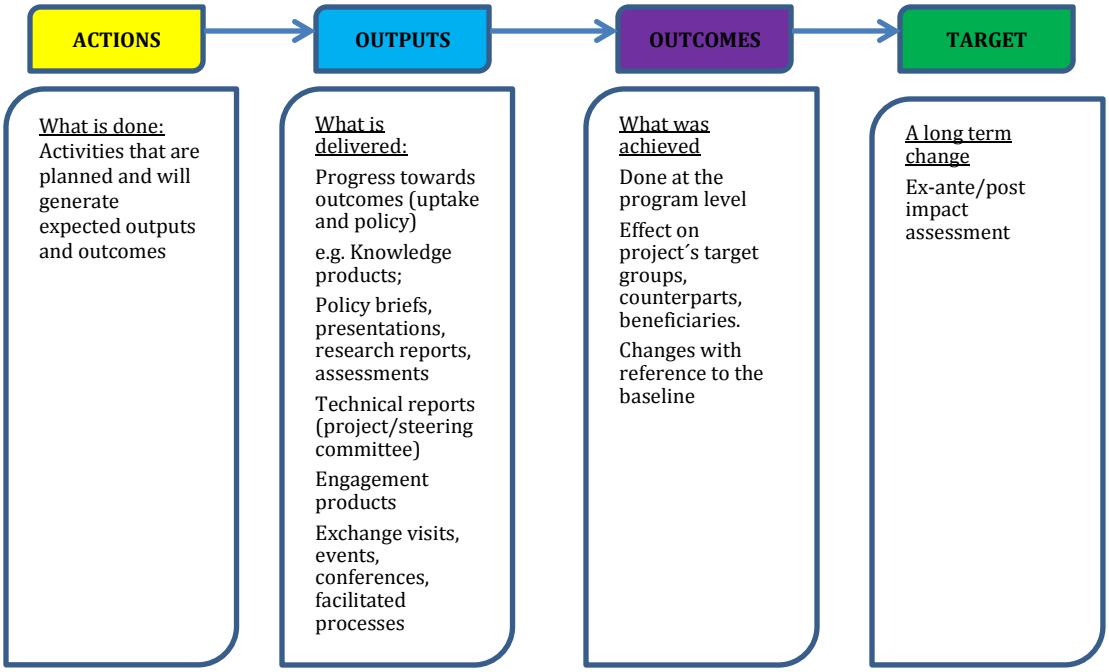


Figure 59: Description of results chains components

Results chains were developed for each of the 7 targets for refinement by the stakeholders. Due to the low turnout of stakeholders at the 2nd round of consultations, the results chains for the 7 targets were circulated more widely to all stakeholders via email. Feedback received from these reviews resulted in the development of the final strategies and actions for the revised NBSAP which are presented in Section 3.

3 NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

3.1 Vision and Goal

The GoRTT acknowledges that the environment is a key element of social and economic development. It believes that conservation of landscapes and seascapes, wildlife and marine species, green public spaces and their rich biodiversity is important to human well-being both now and in the future; and therefore aims to put environmental considerations at the heart of development to help safeguard the environment. Therefore the long term vision and goal is that **biodiversity and ecosystem services are mainstreamed into all areas of national development**.

3.2 Guiding principles

The guiding principles for the revised NBSAP are those articulated under Article 6 of the Convention which states that each Contracting Party shall, in accordance with its particular conditions and capabilities:

I. Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned.

II. Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies including but not limited to national development plans.

In support of this are Articles 26 and 10 (a) of the Convention which call for Parties to present, through their national reports, information on measures which have been taken for the implementation of the provisions of the Convention and their effectiveness in meeting the objectives of the Convention.

The revision of the NBSAP was also guided by the national obligations to implement the Sustainable Development Goals that define the Global Sustainability Agenda. A
A comparative review of the targets established for achieving the individual SDGs and the national biodiversity targets shows that achievement of all the national targets contributes directly and indirectly to achieving all the SDGs (Table 12).

Table 12: Relationship Between Sustainable Development Goals and National Biodiversity Targets

SDGs	National Biodiversity Target	How National Targets support SDG
1 - No Poverty	1, 5, 7	Addresses SDG target that seeks to reduce vulnerability and exposure to climate-related extreme events and environmental shocks and disasters
2 - Zero Hunger	7, 13, 16, 19, 20	Addresses SDG targets that *inter alia* seek to implement resilient agricultural practices that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought,

SDGs	National Biodiversity Target	How National Targets support SDG
		flooding and other disasters and that progressively improve land and soil quality; maintain genetic diversity, promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge; increase investment in agricultural research, technology development, etc.
3 - Good Health and Well-Being	8	Supports SDG target that seeks to reduce number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
4 - Quality Education	1, 17, 18,	Supports SDG target that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles
5 - Gender Equality	16, 17, 18	Indirectly supports SDG targets that promote women's full and effective participation and equal opportunities for leadership at all levels of decisionmaking in political, economic and public life; require reformation to give women *inter alia* control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws
6 - Clean Water and Sanitation	7, 8, 14, 15, 17, 18, 19	Supports SDG targets that seek to improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials; protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
7 - Affordable and Clean Energy	3, 4, 19	Indirectly supports achievement of all targets for this SDG
8 - Decent Work and Economic Growth	2, 3	Indirectly supports achievement of target that seeks to decouple economic growth from environmental degradation, in

SDGs	National Biodiversity Target	How National Targets support SDG
		accordance with the 10-year framework of programmes on sustainable consumption and production
9 - Industry, Innovation and Infrastructure	2, 3, 19	Indirectly supports SDG target that promotes domestic technology development, research and innovation
10 - Reduced Inequalities	18	Indirectly supports SDG target to empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status
11 - Sustainable Cities and Communities	8, 14	Supports SDG targets that aim to strengthen efforts to protect and safeguard the world's cultural and natural heritage and reduce the adverse per capita environmental impact of cities
12 - Responsible Consumption and Production	1, 3, 4, 5, 6, 7, 8, 19	Supports SDG targets that seek to achieve the environmentally sound management of chemicals and all wastes throughout their life cycle; substantially reduce waste generation; ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
13-Climate Action	1, 5, 7, 10, 15	Supports SDG targets that aim to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation,
14 - Life Below Water	6, 7, 8, 10, 11, 19	Directly supports SDG targets that aim to sustainably manage and protect marine and coastal ecosystems; effectively regulate harvesting and end unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks; conserve at least

SDGs	National Biodiversity Target	How National Targets support SDG
		10 per cent of coastal and marine areas
15 - Life on Land	2, 3, 4, 5, 7, 9, 16, 20	Directly supports all SDG targets
16 - Peace, Justice and Strong Institutions	18	Indirectly supports this SDG
17 - Partnerships for the Goals	19, 20	Indirectly supports targets related to finance, technology and capacity

3.3 National Biodiversity Targets

As indicated in the previous section, the National Biodiversity Targets (Table 10) were developed under a series of national consultations led by the MEAU of the EPPD. The National Biodiversity Targets are aligned with the Aichi Biodiversity Targets and the overall goals of the Strategic Plan 2011-2020. Effective implementation of this revised NBSAP will be for 5 years, with the end of year 3 coinciding with the end of the Strategic Plan i.e. 2020. As such, the strategies and actions for implementation will focus on seven priority targets where meaningful change in biodiversity conservation and management can occur with the existing capacities, funding and time. Table 13 identifies the desired outcome for the 7 prioritised national targets.

Table 13: Outcomes and Outputs of prioritised national biodiversity targets

TARGET	OUTCOMES	OUTPUTS
1a. By 2020, at the latest, at least 50% of people are aware of the values and understanding of biodiversity. 1b. By 2020, at the latest, at least 30% of people are aware of the steps they can take to conserve and use biodiversity sustainably	Biodiversity conservation, biodiversity innovation and sustainable use become more evident in Trinidad and Tobago The mind-set of part of the population in T&T becomes more favourable to biodiversity conservation and sustainable use.	Schools, media are active participants in campaigns to improve and promote knowledge on biodiversity conservation and sustainable use. Periodic and diversified information on biodiversity conservation and sustainable use is available. Annual progress reporting from government agencies is available. EPPD, EMA, IMA, Forestry Division and others engage chambers of commerce and other private sector organizations in

TARGET	OUTCOMES	OUTPUTS
		propagating sustainable use of biodiversity. Government policies in all sectors make progress to create an enabling environment for biodiversity conservation Regulatory agencies responsible for monitoring private sector activities such as mining, forestry, and agriculture collect data on the impact of these activities on biodiversity
5. By 2020, the rate of loss of all natural habitats, including marine habitats, is at least halved and degradation and fragmentation is significantly reduced	There is no further loss of primary natural habitats in T&T At least 30% of degraded natural habitats are recovering and their functionality is being restored. Fragmented ecosystems are actively reconnected via suitable bio-corridors.	Comprehensive land use policies and plans are developed and implemented at the national and local levels A national climate change adaptation strategy, which includes specific considerations for vulnerable natural habitats, is developed and implemented Robust monitoring and evaluation programmes are established in collaboration with the Universities and local communities to continuously track changes in the extent and integrity of natural habitats The PA instruments are harmonised and are strictly implemented/ enforced Sustainable funding sources for the protection of natural habitats,

TARGET	OUTCOMES	OUTPUTS
		including the Green Fund, are identified and mobilized against a clear management workplan
6. By 2020 at least 30% of the major commercially important fish, invertebrate stocks and aquatic plants are managed and harvested sustainably	Available statistics on commercial fish species and invertebrates harvested in accordance with management plans The Spatial Monitoring and Reporting Tool (SMART) is in place for monitoring and reporting illegal activities	TT national data collected and updated on implemented management plans (considering aquatic plants, illegal fishing stats, etc.) A national on-site audit program is elaborated Web based and mobile App is created to record findings and monitoring data Task force is created to assess and implement the SMART system for TT 30 landing sites in Trinidad with approved management plans 15 landing sites in Tobago with approved management plans Sustainable fishing material is completed (media, prints, video, outreach, environmental education) Fishing component is included into national awareness campaign
7a. By 2020 at least 30% of areas under agriculture are managed sustainably, ensuring conservation of biodiversity.	Sustainable management practices in T&T's agriculture sector have increased Harvesting of natural forests is prohibited	Land use policy is updated to support sustainable agriculture and forestry practices and implemented Education and outreach strategies are developed

TARGET	OUTCOMES	OUTPUTS
7c. By 2020 at least 50% of areas under forestry are managed sustainably, ensuring conservation of biodiversity.	Sustainable harvesting of timber has increased Illegal bush fires and quarrying have decreased T&T population are more favourable to sustainable agricultural practices and forestry conservation	and implemented for agricultural and forestry sectors Monitoring and evaluation are established to track % of areas under agriculture that are managed sustainably
9a. By 2020, Invasive Alien Species (IAS), and Pathways are identified and prioritized for action 9b. By 2020, at least 40% of priority terrestrial IAS species present are controlled or eradicated at priority sites. 9c. By 2020, at least 50% of priority marine IAS species present are controlled or eradicated at priority sites. 9d. By 2020, measures are in place to manage pathways to prevent their introduction and establishment.	Targeted surveillance at all air and sea ports in place to effectively screen cargo, passengers and their luggage for detecting and eliminating any possible IAS threats National and International passengers informed of IAS risks, procedures of moving plants and animals and their products across borders, and penalties for violation	Existing laws and regulations, plans and policies governing the management and control of IAS are harmonised Draft National Invasive Species Policy approved and National Invasive Species Multi-Sectoral Coordinating Committee in place Specific IAS threats identified and updated at least annually for main trading and tourist markets by managers and policy makers in agriculture, tourism, environment and health sectors Regulations in place to manage IAS threats from ballast water, imported cargo (e.g. cars, tractors, machinery), ship hulls
11. By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance	All terrestrial and coastal marine areas important for biodiversity, ES, livelihoods and poverty alleviation are protected	Current status of biodiversity areas (protected areas) and their importance for ES, livelihoods and poverty

TARGET	OUTCOMES	OUTPUTS
for biodiversity and ecosystem services, are managed consistent with approved plans.	Protected areas are managed effectively and according to their plans	alleviation is documented and clear. Protected areas management effectiveness is documented and under implementation Sound management plans of protected areas are completed.
12. By 2020 the extinction of at least 60% of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained	Threats to threatened species are reduced and conservation status of such species improved.	Legislative framework to address challenges and threats and improve protection is established Current status of threatened species and their habitats are documented. Threats to threatened species are documented and understood. Challenges to improving protection of threatened species and opportunities are highlighted. A participatory strategy to improve protection of and rehabilitate threatened species is developed, addressing challenges and capitalizing on opportunities.

3.4 Action Plan

Table 14: Action Plan for the revised NBSAP

Target	Action	Y1	Y2	Y3	Y4	Y5	Implementing Agency
1a. By 2020, at the latest, at least 50% of people are aware of the values and understanding of biodiversity. 1b. By 2020, at the latest, at least 30% of people are aware of the steps they can take to conserve and use biodiversity sustainably.	Design a public awareness/publicity campaign focused on biodiversity conservation and sustainable use in T&T.						EPPD, EMA, IMA, FD, THA, Trade andIndustry, Public Administration and Communications and Education
	Engage the Ministry of Education to continue incorporating courses and projects related to biodiversity conservation and sustainable use in primary and secondary school programs and curricula.						
	Engage the Ministry of Education to promote innovative teaching methods e.g. values teaching in the delivery of biodiversity conservation information as part of teacher professional development						
	Organize annual trainings on biodiversity conservation and sustainable use for a selected set of journalists from TV, radio and print outlets.						
	Incentivize the drafting of articles on the subject.						
	EPPD/EMA to organize national campaigns to inform and mobilize people about biodiversity conservation and sustainable use in TT (day of biodiversity race; environmental fair; recycling drive).						

5. By 2020, the rate of loss of all natural habitats, including marine habitats, is at least halved and degradation and fragmentation is significantly reduced	Identify all natural habitats/ ecosystems that are of ecological, socio-economic and cultural importance in T&T						FD, State Lands, Housing, Land and Marine Affairs, THA, IMA
	Establish a baseline measure for the rate of loss of each of these natural habitats						
	Determine, and where possible, quantify the drivers that are leading to loss/ degradation of these natural habitats						
	Ensure that natural ecosystem management considerations are effectively mainstreamed into key development and planning sectors						
	Establish strict in-situ and ex-situ regulatory and enforcement measures to ensure that human activities affecting natural habitats are controlled/ prohibited as relevant						
	Establish, where relevant, corridors between habitats to improve connectivity						
6. By 2020 at least 30% of the major commercially important fish, invertebrate stocks and aquatic plants are managed and harvested sustainably.	Fisheries Policy and regulations are in place						Fisheries, EMA (For aquaculture CEC applications), IMA, Forestry, National Security
	Update GIS maps positioning landing sites, and critical fish habitats including fishing areas, spawning and nursery areas and make them available via web						
	Collect and analyse data to determine status of fisheries stocks. Revise and update Management Plans, in consultation with stakeholders. Conduct public awareness campaigns.						

	Implement management plans (monitoring and enforcement)						
	Include within annual operative plans the on-site audit calendar						
	Prepare TOR for a web based app or use open source SMART App.						
	Initiate implementation of the App.						
7a. By 2020 at least 30% of areas under agriculture are managed sustainably, ensuring conservation of biodiversity. 7c. By 2020 at least 50% of areas under forestry are managed sustainably, ensuring conservation of biodiversity.	Forest policy updated and implemented						Food Production, Fisheries, EMA, FD
	All forested areas management plans are documented and under implementation						
	Education and outreach strategies are developed and implemented to support forest management plans						
	Monitoring and evaluation are established to track % of areas under forestry that are managed sustainably						
	Research and Extension organizations develop and circulate Good Agricultural Practices (GAP) Manuals for ALL crops on the National Agricultural Marketing Information System (NAMIS) database						
	The National Agricultural Marketing and Development Corporation (NAMDEVCO) test produce at both wholesale and retail markets for adherence to GAP standards.						
	Ensure agriculture takes place on lands zoned for agriculture by type of agricultural activity e.g. agroforestry, livestock husbandry, aquaculture and crop farming						

	Map/overlay the location of current agricultural practices in relation to where they should occur and in relation to protected and environmentally sensitive areas to support the updating of the land use policy						
	Monitor and evaluate the sustainable management of agricultural areas in close proximity to protected and environmentally sensitive areas						
	Livestock Research Division updates standards for managing livestock waste and livestock farms monitored for adherence to standards.						
9a. By 2020, invasive alien species and pathways are identified and prioritized for action. 9b. By 2020, at least 40% of priority terrestrial IAS species present are controlled or eradicated at priority sites. 9c. By 2020, at least 50% of priority marine IAS species present are controlled or eradicated at priority sites. 9d. By 2020,	Stakeholders from health, agriculture, tourism, environmental sectors meet on a regular basis, to discuss threats posed by IAS and the management and control of existing IAS.						IMA, FD, Food Production, EMA
	Communicate updated IAS information from multi-sectoral committee to the general public frequently						
	Mount national campaign to sensitize travelling public and traders to the risk IAS pose to biodiversity						
	Sensitize resource managers and visitors to National Parks on the risks posed by IAS and their impact on biodiversity						
	Identify and document IAS present in sensitive/protected areas						

measures are in place to manage pathways to prevent their introduction and establishment	Establish an electronic platform to share information, data and policies on IAS in Trinidad and Tobago among all stakeholders						
	Establish proper signage at international ports of entry and put procedures in place to allow passengers to self-declare and dispose of material that are in non-compliance with laws and regulations governing IAS						
	Update and enforce the penalties for illegal entry of material that pose a risk to bio-security						
	Promote citizen science to support monitoring and reporting of IAS						
11. By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are managed consistent with approved plans.	Determine % of terrestrial and coastal marine areas protected, and under which categories.						FD, State Lands, THA, IMA, Fisheries, CDA, EMA
	Assess the protected areas based on importance for ES, livelihoods and poverty alleviation and biodiversity value.						
	Draft a strategy to address the gap to reach 10% coastal marine.						
	Determine in which areas management effectiveness has been implemented.						
	Develop Management Plans for the six (6) Pilot Protected Areas of the IFPAM Project						
	Determine amount of protected areas without management plans.						
	Draft a strategy to complete the missing management plans.						

	Determine the extent of illegal activities occurring in protected areas						
	Develop strategy for addressing illegal activities occurring in protected areas						
12. By 2020 the extinction of at least 60% of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	Identify which species are threatened in Trinidad and Tobago (consider criteria developed for determining threatened species within priority listing).						FD, IMA, EMA, THA, Fisheries
	Identify where the threatened species are located.						
	Identify the threats posed to these threatened species.						
	Identify the challenges (and opportunities) related to protecting species at sustainable levels.						
	Designate protected status to threatened species and review laws which contribute to or undermine efforts to protect threatened species						
	Where relevant, develop in-situ or ex-situ rehabilitation programmes for threatened species						
	Develop and implement public awareness, education and outreach activities to sensitise the public						
	Establish response units within management authorities to address reports from citizens						

	Monitor and evaluate status of threatened species and their threats						

The implementation of these actions to achieve the targets is not without risk. Table 15 below identifies these risks.

Table 15: Risks associated with NBSAP implementation

TARGET	RISKS
1a. By 2020, at the latest, at least 50% of people are aware of the values and understanding of biodiversity. 1b. By 2020, at the latest, at least 30% of people are aware of the steps they can take to conserve and use biodiversity sustainably	• Schools not open to change • Lack of innovation in developing approaches to educational awareness • Inappropriate tools used to engage target audience • Inappropriate use of tools to relay messages to target audiences especially related to verification/ vetting/ accuracy of information • Lack of political will • Nonchalance on the part of the implementing agencies • Lack of buy-in at the "top" in implementing agencies which are also part of target audience • Lack of capacity within implementing agencies • Lack of interest among journalists and the companies they work for
5. By 2020, the rate of loss of all natural habitats, including marine habitats, is at least halved and degradation and fragmentation is significantly reduced	• Poor public participation and responsibility • Environmental risks: effects of climate change and variability including rainfall and temperature • Lack of political will • Lack of or limited funding • Lack of capacity within implementing agencies to monitor and manage • Lack of coordination and collaboration between agencies responsible for biodiversity management • Conflicting mandates of agencies responsible for biodiversity management • Risk to personnel security
6. By 2020 at least 30% of the major commercially important fish, invertebrate	• Inadequate or outdated fisheries legislation

TARGET	RISKS
stocks and aquatic plants are managed and harvested sustainably	• No or inadequate baseline data/information on fish landings and efforts for assessment at some sites • No or inadequate baseline data and information on fish landings and effort for assessment. • Lack of capacity (human, technological, financial) to collect necessary data, undertake fisheries assessments, and develop, monitor and enforce management plans. • Several management plan methodologies with no standard • Lack of political will or resistance to include the proposed actions within the operative plans • Lack of capacity (human, technological, funding) to undertake an IT project • Inadequate participation in regional and global partnerships for managing shared migratory fishing resources • Climate change, environmental events, Invasive Alien Species
7a. By 2020 at least 30% of areas under agriculture are managed sustainably, ensuring conservation of biodiversity. 7c. By 2020 at least 50% of areas under forestry are managed sustainably, ensuring conservation of biodiversity.	• Lack of funding and/or incentives • Lack of collaboration and coordination between agencies • Lack of enforcement of sustainable agriculture practices by regulatory agencies • Education and outreach strategies are ineffective • Lack of capacity within responsible or regulatory agencies to support implementation of sustainable practices • Lack of continuous monitoring and evaluation • Risk to personnel security
9a. By 2020, Invasive Alien Species (IAS), and Pathways are identified and prioritized for action 9b. By 2020, at least 40% of priority terrestrial IAS species present are controlled or eradicated at priority sites.	• Lack of political will • Poor coordination among state agencies • Management pathways are resource intensive • Unwillingness of public to comply with laws • Lack of public awareness

TARGET	RISKS
9c. By 2020, at least 50% of priority marine IAS species present are controlled or eradicated at priority sites. 9d. By 2020, measures are in place to manage pathways to prevent their introduction and establishment.	
11. By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are managed consistent with approved plans.	• Unplanned and unregulated development in the country presents a threat to key biodiversity areas for ES, livelihoods and poverty alleviation. • Lack of enforcement • Lack of political will • Lack of collaboration and coordination between agencies • Low public appreciation for value of protected area • Risk to personnel security
12. By 2020 the extinction of at least 60% of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained	• Low buy-in and/or non-compliance by public with laws and regulations governing species • Lack of resources to monitor and evaluate status of species • Lack of capacity to effectively manage, monitor, evaluate species • Environmental factors: climate change, diseases

4 IMPLEMENTATION and MONITORING AND EVALUATION

4.1 National Coordination Structures

Successful implementation of the revised NBSAP will require a National Steering Committee to coordinate and oversee the strategies and actions outlined in Section 3. There are several government agencies and divisions, research institutions, and NGOs that have been playing an important role in biodiversity management and conservation in T&T. These agencies and entities listed in the 2001 NBSAP (Table 3, p. 17) are essentially the same. Only a few have changed either in name or ministerial location i.e. the THA Fisheries Department is now called the Department of Marine Resources and Fisheries, the Eastern Caribbean Institute of Agriculture and Forestry (ECIAF) is now within the University of Trinidad and Tobago (UTT), the Caribbean Epidemiological Centre (CAREC) has been incorporated into the Caribbean Public Health Agency (CARPHA) and CARINET no longer exists.

It is recommended that the following agencies (state, research and NGO) constitute the National Steering Committee for the implementation of the revised NBSAP.

EPPD, Ministry of Planning and Development

The Ministry of Planning and Development (MPD) is the Ministry with responsibility for the environment and as such is the national focal point for the Convention on Biological Diversity. The Environmental Policy and Planning Division (EPPD) is within the MPD and aims to ensure that the pattern of development pursued by Trinidad and Tobago is sustainable, taking into account social, economic and environmental considerations in order to secure continuous improvements in the state of our natural environment. The EPPD is responsible for coordinating the multilateral environmental agreements (MEA) to which T&T is a signatory. As such, it will have oversight of the revised NBSAP.

Environmental Management Authority (EMA)

The EMA established in the Environmental Management Act, works to ensure the protection, wise use and enhancement of the environment in T&T. This is facilitated through active partnerships with all sectors, public awareness and education, cooperation with public entities engaged in environmental management programmes, development and enforcement of environmental laws, and being proactive and responsive to environmental concern. The EMA was responsible for overseeing the coordination and implementation of the 2001 NBSAP and will continue to do so with the revised NBSAP.

The following agencies will be members of the National Steering Committee for the implementation of the revised NBSAP.

Institute of Marine Affairs (IMA)

The IMA is a multi-disciplinary marine and environmental research organisation established by Act of Parliament (Chap. 37:01 of the Revised Laws of the Republic of Trinidad and Tobago, as amended by Act No. 13 of 1990) to advise the GoRTT on marine affairs. The IMA also provides support to the wider Caribbean in coastal and marine areas.

Forestry Division (FD)
The FD is in charge of 192,000 hectares of forest, distributed within 35 forest reserves, 11 game sanctuaries and other State Lands. Forest management is guided by a National Forest Policy with legal mandate drawn from the Forests, Sawmill and Conservation of Wild Life Acts. The role of the Division is to sustainably manage the forest estate so as to optimize the use of the resources, to encourage and monitor the development of forests industries, to conserve important and fragile ecosystems, to preserve biodiversity and to educate the public on the wise use of the country's natural heritage.

Fisheries Division
Fisheries Division advises on fisheries development policy; provides fisheries extension services and training to fishermen, marketers and aquaculturists on fishing gear, equipment and method and fish handling and processing; conservation; assists in the management of the living marine resources of the Exclusive Economic Zone and administers and contributes to the enforcement of fisheries regulations in accordance with the governing legislation.

Ministry with the responsibility for Agriculture
The Division of Agriculture contributes to the development of overall national and sectoral policies and plans; coordinates and oversees the determination of a consistent set of goals and objectives for agricultural development and the formulation, evaluation and implementation of concomitant sectoral policies, plans, programmes and projects.

Division of Agriculture, Marine Affairs, Marketing & the Environment (DAMME), Tobago House of Assembly (THA)
The Division of Agriculture, Marine Affairs, Marketing & the Environment (DAMME) is responsible for effecting the sustainable management of Tobago's natural resources, the skilled development of Tobago's human resources and increased use of relevant technology to facilitate trade and a dynamic agro-business sector. The Department of Natural Resources and the Environment (DNRE) is responsible for forestry and wildlife management. The Department of Marine Affairs and Fisheries (DMAF) is responsible for the sustainable Management of Tobago's Marine Resources from the coastline to a distance of 6 nautical miles off shore. The Department is subdivided into the Fisheries and Aquaculture Unit and the Marine Area Unit.

The University of the West Indies (UWI)
The Office of Research Development and Knowledge Transfer (ORDKT) supports all research and knowledge transfer activities at the University of the West Indies. In collaboration with the Office of Research of the University of the West Indies, the ORDKT provides intelligence and early information on new initiatives, national, regional and international developments and on the updated priorities of major funding bodies. ORDKT links UWI experts to national and international corporations, multinational organizations, governments, NGO's and funding agencies. Projects secured and managed by the ORDKT have led to considerable returns for all parties.

University of Trinidad and Tobago (UTT)
The UTT's primary focus is on the development of Trinidad and Tobago. With its genesis in the Trinidad and Tobago Institute of Technology (TTIT), UTT initially focused on programmes in engineering and technology. Today's programmes, however, go far beyond engineering and technology to a fuller spectrum of educational opportunities where experiential learning programmes are incorporated into the traditional learning environment. Alternative avenues

are also provided for persons to enter, exit and re-enter tertiary education. This kind of flexibility and integration within programmes; together with UTT's leadership position in sector-driven research and innovative teaching methodologies, is a direct response to twenty-first century global trends.

The vision of UTT is to be the National Institution of higher learning and research for socioeconomic and technological development that:
(a) Inculcates in the graduates a set of overarching skills - metaskills - that help them navigate the new and emerging technologies in the national and global contexts, and
(b) Through its Research & Development activities, brings and keeps Trinidad and Tobago in the vanguard of engineering and technology in niche areas of key importance.

Council of Presidents of the Environment (COPE)
The Council of Presidents of the Environment (COPE) is a grouping of autonomous, not-for-profit, non-government organizations and community-based organizations representing specialist interests in Environmental Concerns. Its mission is to act as an advocate for environmental conservation and the sustainable use of natural resources by supporting the coordination of efforts of local environmental NGOs and CBOs in the promotion of public awareness.

Environment Tobago (ET)
Environment Tobago **(ET)** is a national, environmental, non-governmental, volunteer and membership organization. Established in 1996 and registered under the Companies Act 1995 ET remains a pro-active advocacy group that rallies against negative environmental activities. ET conserves Tobago's natural and living resources and advances the knowledge and understanding of such resources, their wise and sustainable use, and their essential relationship to human health and the quality of life through environmental education, community outreach and awareness programmes, advocacy of local government for greater protection and sustainable use of our natural resources and research programmes.

In addition to these biodiversity focused agencies and institutions, the National Steering Committee should include representation from other sectors to facilitate the mainstreaming process that is critical for the successful implementation of the NBSAP. Other relevant entities that should be represented include the Ministries of Finance, Tourism, Education, T&T Chamber of Industry and Commerce, Tourism Development Corporation. The MPD also houses divisions relevant to facilitating and enabling environment for the mainstreaming of and implementation of the NBSAP, e.g. Town and Country Planning Division, Socio-economic Policy and Planning Division, and the Central Statistical Office and should therefore seek to engage these via internal mechanisms throughout the implementation process.

As implementation of the NBSAP proceeds, the National Steering Committee should consider establishing sub-committees to address specific issues associated with implementation e.g. capacity development committee to oversee implementation of the capacity development plan or a IAS Management Committee to oversee implementation of aspects of Target 9. In such instances, membership can be expanded to include representation from all relevant sectors (both biodiversity and non-biodiversity related).

4.2 Plan for Capacity Development

The long term vision for the future of biodiversity conservation, articulated in the 2001 NBSAP, identified the need to build national capacity to manage and conserve biodiversity

resources through increased awareness of biodiversity in all sectors, integration of biodiversity concerns into national policies and planning, increased participation by a broad cross section of the national community in the accomplishment of the vision and building up the information base to support the preceding activities. Limitations in human resources, the absence of integration within and across responsible agencies and inconsistent coordination amongst agencies were identified as some of the reasons for the non-implementation of the NBSAP in its entirety. These elements need to be addressed if the revised NBSAP is to be implemented effectively.

All the agencies and institutions involved in biodiversity conservation have highly skilled human capacity with specialisations to ably support effective biodiversity conservation and management. However, across agencies the overall numbers of persons are relatively low in relation to the magnitude of work required. There are also work areas that are the same across all agencies, e.g. public education and awareness, resulting in duplication of effort. Table 16 shows the main steps that should be taken to begin addressing capacity development towards NBSAP implementation.

Table 16: Capacity Development Plan

Capacity Development Action	Timeframe for completion	Responsible Party
Human and technical resource assessment	1 month after start of NBSAP implementation	All implementing agencies
Develop resource map to highlight agencies and their competencies	1 month after completion of assessment	EPPD and EMA
Establish formal framework to facilitate inter-agency/ institution resource sharing	3 months after start of NBSAP	EPPD and EMA
Prioritise capacity deficiencies	1 month after completion of resource map	National Steering Committee
Compile an inventory of training programmes and resources that can be used to address capacity deficiencies	2 months after completion of prioritisation exercise	National Steering Committee
Identify and apply specific CBD training modules to fill training needs identified	2 months after completion of prioritisation exercise	National Steering Committee
Develop a training schedule to address priority capacity deficiencies	1.5 months after compilation of inventory	National Steering Committee
Fund raise to support training programme	Ongoing once training schedule is complete	National Steering Committee

The capacity of agencies/institutions to carry out the following areas should be considered in the resource assessment: communications and outreach, legal and policy development, research and analysis (data collection, analysis, interpretation, and representation), stakeholder/community engagement, web/systems development, data storage.

With respect to the inventory of training programmes and resources, the National Steering Committee should consider its member agencies with high competency in the deficient area(s)

as potential trainers/resources for building capacity. Emphasis should also be placed on identifying locally based subject matter specialists and trainers to support this process. Regarding the target audience for training, consideration should be given to building human capacity at the community level to develop this constituency's capacity to support biodiversity and ecosystem management.

The training schedule should be developed in such a way that all required training to address deficiencies are completed by 2020. This of course will be dependent on the financial resources available to support implementation of each training programme.

4.3 Communication strategy

The NBSAP is designed to provide a) indicators on how Trinidad & Tobago will move forward in the implementation of the Aichi Biodiversity Targets, and b) the action plan to be adopted in order to achieve them. Part of this action plan includes an overarching communication strategy specifically created for the NBSAP. Upon review through stakeholder consultations and gathering existing data, it was noted that many issues highlighted in the 2001 NBSAP were still occurring. With regard to implementing an effective strategy, the main issues previously faced were:

1. Communication and cooperation within and among agencies, and their stakeholders
2. Political commitment

As noted in the 2001 NBSAP, these issues are all interrelated. The NBSAP communication strategy depends on research and data collected from a wide range of stakeholders, agencies included, which would inform the strategy content. Without cooperation from all stakeholders, the strategy would not be as effective. To add to this, there needs to be political commitment to implement the proposed strategy. Without a sustainable driver, a focal point in this case, the strategy cannot be delivered to identified target audiences.

Based on stakeholder consultations during data collection for the NBSAP and 5th National Report, it was agreed that there is a lack of appreciation by individuals and the national community of the need for biodiversity conservation, and in turn its contribution to the quality of life in Trinidad & Tobago. There is also a disconnect between human activities and their impacts on biological diversity. When looking at these two issues, the government would need to effect positive social and behaviour change. In order to do so, they would have to implement a communication strategy with short term as well as long term goals.

<u>Implementation</u>

In order to implement an effective communication strategy, both short term and long term, the following steps would have to be taken:

1. Create a steering committee with a representative from each agency and represented organisation. This steering committee should be coordinated by the focal point to the CBD. Each person on this committee should be dedicated to creating and implementing the strategy. They would each have a vote for proposed programmes. This committee would improve collaboration between conservation and education agencies as well as other key stakeholders, which would assist in the development of a formal action plan to implement the strategy.
2. A baseline assessment on existing initiatives as well as gaps should be conducted and all information gathered should be integrated into the strategy. There should also be a holistic approach to the development of informal awareness programmes, as stated in the 2001 NBSAP.

3. Ideally, a full time communications team should be hired by the government to assist the steering committee with creating materials and products in line with this strategy. Considering the limited resources, this team could be hired on an ad hoc basis under consultant conditions.
4. The steering committee would meet at least once a month with the communications team to discuss the strategy and its implementation.

Key Components of Creating a Strategy

1. Defining the Problem
   - Baseline Assessment

2. Planning and Programming
   - Desired outcomes (impact versus implementation)
   - Target Audiences

3. Implementing Communication Strategy
   - Timelines, Staffing, Budgets

4. Monitoring & Evaluation Framework

Short Term Recommendations (1-5 years)

- The National Biodiversity Clearing-House Mechanism (CHM) should be significantly expanded, so as to provide more effective information services to facilitate the implementation of the revised NBSAP.

- Hire a communications officer to promote biodiversity conservation initiatives through all forms of media, including all social media platforms. Content for all media streams must be acquired by hiring one graphic designer/web developer and one photographer/videographer that both have the ability to capture footage from various types of stakeholders, for example, short underwater videos for a marine conservation organisation to capturing wildlife photographs at night for a nature centre. This would also keep the quality of all material consistent.
- Utilise acquired material for all forms of media – television, newspapers and social media. Increase Search Engine Optimisation (SEO), where you increase the visibility of the main website by directing viewers to the site organically. This can be done by advertising the site on social media where messages will direct you back to the main source of information, ideally the CHM.

Budget (TTD)

Service	Unit Cost (Monthly)	Max (Persons)	Timeframe (Years)	Total Cost
Communications Officer (Full Time)	$15,000	1	5	$900,000
Graphic Designer & Web Developer	$15,000	1	5	$900,000

Service	Unit Cost (Monthly)	Max (Persons)	Timeframe (Years)	Total Cost
Photographer & Videographer	$15,000	1	5	$900,000

Total Cost over 1 year: $540,000
Total Cost over 5 years: $2,700,000
Note that these costs do not include printing and dissemination of material created.

Long Term Recommendations (5+ years)

- Hire a communications team and/or consultants on specific products and deliverables to promote biodiversity conservation initiatives through all forms of media. Content for all media streams must be acquired by using full time photographer and videographer from the communications team that have the ability to capture footage from various types of stakeholders.
- Create effective educational programs on environmental topics and use these as a source of information to Trinidad and Tobago nationals. An example of this would be a nationwide media campaign on the value of biodiversity in Trinidad & Tobago. This can take shape through the creation of a video series that focuses on biodiversity; advertisements (print and electronic) - having the same message on all forms of media throughout the country. This, coupled with legislation, would create a biodiversity image and eventually behaviour/attitude change.
- Create a national campaign on the importance of biodiversity conservation – ensure that it addresses initial problems (lack of appreciation of biodiversity and disconnect of how nationals affect the environment), and further addresses long term sustainable projects.

Budget (TTD)

Service	Unit Cost (Monthly)	Max (Persons)	Timeframe (Years)	Total Cost
Communications Officer (Full Time)	$15,000	1	5	$900,000
Graphic Designer & Web Developer	$15,000	1	5	$900,000
Photographer & Videographer	$15,000	1	5	$900,000

In addition to aforementioned costs for short term recommendations, there are additional costs such as:

Service	Unit Cost	Amount	Timeframe	Total Cost
Video Series	$70,000	5	Annually	$600,000

Service	Unit Cost	Amount	Timeframe	Total Cost
Print Media & Dissemination (Finalised by the Steering Committee)	$20,000	52	Annually	$900,000

Total Cost for 5 short documentaries on the environment in a Trinidad & Tobago context: $350,000
Total Cost for printing full page advertisements once a week for a year in a local newspaper: $1,040,000
Total Cost over 1 year: 1,390,000
Note that these costs are optional and are determined by the final communications strategy.

Monitoring & Evaluation (M&E)
The same methods used to conduct a baseline assessment will be used for M&E. To measure success of this strategy, you must determine if identified issues were alleviated in the allocated timeframes.

- Has the percentage of nationals who are aware of the importance of biodiversity conservation increased?
- Is there an increase in the connection between nationals and how they affect the environment?
- Have these questions been dealt with through the short term recommendations?
- Will these questions be dealt with through the long term recommendations?

It is important to note the difference between implementation and impact. When measuring implementation, you record the number of messages and activities that were disseminated, and number of persons who were recipients of those messages and activities. When measuring impact, you record the number of persons who understood the content and remained the same, and the number of persons who changed their attitudes or opinions, and underwent a social and behavioural change.
In order to have an effective communication strategy, there must be mandates to coordinate among agencies and stakeholders, once this is driven by the focal point. There must be a champion for this cause, stemming from the focal point in order to sustain these initiatives. Since the 2001 NBSAP, there has been evidence that education and awareness programs have been occurring, but not on a national level. In order to implement the NBSAP successfully, the communication strategy must become priority so that citizens of Trinidad & Tobago can have a holistic understanding of the importance of conserving the environment.

4.4 Resource mobilisation plan

The financial resources to effectively implement the NBSAP through participatory planning, knowledge management and capacity building, from all sources, including budgetary allocations to responsible state agencies needs to increase substantially from the current levels in order to ensure the Strategic Plan for Biodiversity 2011–2020 and its Aichi Biodiversity Targets are achieved.

It is therefore very relevant to develop a plan or strategy for resource mobilization which can lead to creative efforts in using own local assets to reach the planned strategic goals and

targets and reduce reliance on external (or foreign) funding. The primary source of local funding to support the NBSAP implementation should be the National Environmental Fund – the Green Fund. The Green Fund has been mobilized and has supported several initiatives as mentioned earlier in the document. Processes need to be in place to ensure that it can be fully utilized to support the implementation of all aspects of the NBSAP.

Implementation can also capitalize on projects that are already being executed at the national and regional levels to support improvements biodiversity and ecosystem management, namely *Improving Forest and Protected Area Management in Trinidad and Tobago* executed by the Food and Agriculture Organisation (FAO), and *Integrating Land Water and Ecosystem Management (IWECHO) in Caribbean Small Island Developing States* being co-implemented by the United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP) and co-executed by UNEP's Caribbean Environment Programme (CEP) and the Caribbean Public Health Agency (CARPHA).
Parallel to accessing potential internal sources of funding, it is necessary to map and capitalize on accessing funding from external sources such as the Green Climate Fund and the GEF.

Finally, a critical element to the successful mobilization of financial resources is strong political willingness to ensure the enabling framework is in place to facilitate easy access to existing funds and support the access to external funding.

4.5 Monitoring and Evaluation

In 2014, during the process to develop the National Biodiversity Targets, T&T developed a draft list of local indicators, which provide a national framework for systematically monitoring and measuring changes in biodiversity and its management (See Table 10). It should be noted however that these indicators have not yet been approved by T&T's Cabinet, and are therefore not yet fully adopted and operationalised by the GoRTT and other stakeholders.

In keeping with the Action Plan (Table 17), the following table summarises the indicators that can be used to monitor and evaluate the NBSAP and the frequency by which they should be assessed.

Table 17: Indicators for Monitoring and Evaluation of the NBSAP

Indicators	Description	Targets
Amount of campaigns implemented at the national level by schools to improve and promote knowledge on biodiversity conservation and sustainable use.	With the goal of increasing people awareness of the values and understanding of biodiversity, schools at the national level are going to be encouraged to embark in new, innovating campaigns that will contribute to this end. This indicator will be measured annually.	1
Number of journalism articles published in national media (electronic, TV, radio, newspaper).	As a result of focused training to a selected set of journalists on topics related to biodiversity conservation and sustainable use, media monitoring will help identify number and type of articles in the different media (electronic, TV,	1

Indicators	Description	Targets
	radio, newspaper) related to the topics addressed in the trainings. This indicator will be measured for 3 months after the trainings are delivered.	
Percent of annual coverage of loss of primary natural habitats in T&T.	The country is committed to stop the loss of primary natural habitats. This indicator will help document if the commitment is met. This indicator will be measured annually.	5
Coverage of degraded natural habitats that are recovering in the country.	This indicator will help document the recovery of degraded natural habitats. This indicator will be measured annually.	5
Number of fragmented ecosystems that are actively reconnected via suitable bio-corridors.	This indicator will document the progress in the establishment of corridors created to reconnect fragmented ecosystems. This indicator will be measured annually.	5
Number of fish species harvested in accordance with management plans that have statistics on capture, commercial use are completed and available	This indicator will help account for the species of fish species that are being harvested according to their management plans and that have useful statistics completed and available. This indicator will be measured annually.	6
Number of government agencies that are using the Spatial Monitoring and Reporting Tool (SMART) for monitoring and reporting illegal activities	With this indicator the documentation of agencies actively using the SMART is possible. This indicator will be measured annually.	6
Percentage of agriculture businesses implementing sustainable management practices in T&T's.	This indicator will help keep a register of agriculture businesses that are implementing sustainable management practices. This indicator will be measured quarterly.	7
Coverage of natural forests.	This indicator will help to keep track of the annual forest cover of T&T.	7

Indicators	Description	Targets
	This indicator will be measured annually.	
Percentage of timber harvested with sustainable practices.	This indicator will help to keep a register of the timber harvested with sustainable practices (and those that are not as well). This indicator will be measured bi-annually.	7
Number of illegal bush fires and quarrying.	This indicator will help to keep track of illegal bush fires and quarries. This indicator will be measured annually.	7
Number of national and international passengers informed of IAS risks, procedures of moving plants and animals and their products across borders, and penalties for violation.	This indicator will help to keep track of the number of passengers informed about IAS. This indicator will be measured quarterly.	9
Percentage of terrestrial and coastal marine areas important for biodiversity, ES, livelihoods and poverty alleviation that are protected.	This indicator will help to keep track the percentage of terrestrial and coastal marine areas important for biodiversity, ES, livelihoods and poverty alleviation that are being protected. This indicator will be measured annually.	11
Percentages of acceptable and optimal management effectiveness of protected areas.	This indicator will contribute to the implementation and reporting of management effectiveness of protected areas. This indicator will be measured annually.	11
Number of threatened species with reduced threats.	This indicator will document the efforts to reduce threats on threatened species. This indicator will be measured annually.	12
Number of threatened species with improved conservation status.	This indicator will document the improvements of threatened species conservation status. This indicator will be measured annually.	12

The data collected using the indicators identified will feed into an annual report on the status of implementation of the NBSAP. This report will be produced by the National Steering Committee and will be used to highlight progress, but more importantly identify lags and challenges in implementation and solutions for overcoming them.

5 REFERENCES

Albins, M. A., and Hixon, M. A. 2008. Invasive Indo-Pacific lionfish Pterois volitans reduce recruitment of Atlantic coral-reef fishes. Marine Ecology Progress Series, *367*: 233-238.

Alemu, J.B. 2016. The status and management of the lionfish, *Pterios spp.* in Trinidad and Tobago. Marine Pollution Bulletin, 109: 402-408.

Alemu, J. B., and Clement, Y. 2014. Mass coral bleaching in 2010 in the southern Caribbean. PLoS one, *9*(1): e83829.

Bachan, A. 2012, May 28. *Economic Value of Sea turtles and the Environment and as a catalyst for Developning Sustainable Communities.* Retrieved August 2012, from Enivronmental Mangement Authority: http://www.ema.co.tt/docs/events/economic_value.pdf. Accessed on 11 October 2016.

Baksh-Comeau et al. 2016. Annotated Checklist of the Vascular Plants of Trinidad and Tobago with Analysis of Vegetation Types and Botanical 'Hotspots', Phytotaxa (paper yet to be made publicly available)

Balfour, A., and Ali, N. 2014. An Economic Analysis of Three Management Options of the Giant African Snail (*Achatina fulica)* in Trinidad and Tobago. Retrieved from: http://www.cabi.org/Uploads/CABI/about-us/Scientists%20output/Economic_impact_in_the_Caribbean.pdf. Accessed on 10 October 2016.

Barson, N, J., Cable. J, and Van Oosterhout, C. 2009. Population genetic analysis of microsatellite variation of guppies (*Poecilia reticulata*) in Trinidad and Tobago: evidence for a dynamic source–sink metapopulation structure, founder events and population bottlenecks. *Journal of evolutionary biology*, *22*(3): 485-497.

Caribbean Natural Resources Institute. 2013. Case study on a pilot project on community action to build climate change resilience in Caura Valley. Trinidad.CANARI, GEF, SGP, UNDP. Trinidad and Tobago.

Cortes, J. 2003. Corals and coral reefs of the Pacific of Costa Rica: history, research and status. *Latin American coral reefs*, 361.

Fahrig, L. 1997. Relative effects of habitat loss and fragmentation on population extinction. *The Journal of Wildlife Management*, 61(3): 603-610.

FAO. 2015. Global Forest Resource Assessment. Retrieved from http://www.fao.org/3/a-i4808e.pdf. Accessed 10 October 2016.

FAO. 2014. Global Resources Assessment Country Report Trinidad and Tobago. Retried from http://www.fao.org/3/a-az356e.pdf. Accessed on 10 October 2016.

Ghermandi, A. 2015. Mapping ecosystem service values in Trinidad and Tobago. Report prepared as a contribution to the Project on Ecosystem Services (ProEcoServ). Port of Spain, Trinidad and Tobago. 25pp.

Global Invasive Species Database. 2016. http://www.issg.org/database/species/search.asp?sts=sss&st=sss&fr=1&x=23&y=10&sn=&rn=Trinidad+and+Tobago&hci=-1&ei=154&lang=EN. Accessed on October 5th 2016.

Girvan, A., and Teelucksingh, S. 2012. *Environmentally adjusted National Accounts for Trinidad and Tobago's sustainable future.* Prepared in satisfaction of the Project for Ecosystem Services, UWI ST. Augustine.

GoRTT – Government of the Republic of Trinidad and Tobago. 2012a. National Spatial Development Strategy Document: Core Strategy and Regional Guidance. Available at: http://www.planning.gov.tt/sites/default/files/content/documents/Draft_NSDS%20Strategy_Core%20Document.pdf. Accessed on 12 October 2016.

GoRTT – Government of the Republic of Trinidad and Tobago 2012b. National Spatial Development Strategy Document – Surveying the Scene: Background Information and Key Issues. Available at http://www.planning.gov.tt/OurTnTOurFuture/documents/Surveying_the_Scene_web.pdf. Accessed 5 October 2016.

GoRTT – Government of the Republic of Trinidad and Tobago. 2013. Second National Communication of the Republic of Trinidad and Tobago Under the United Nations Framework Convention on Climate Change. Port-of-Spain, Trinidad and Tobago. 104pp.

Griffith-Charles, C., and Sutherland, M. 2011. Cadastral records and the impact of sea level rise. Unpublished

Inter-American Development Bank. 2010. Indicators of Disaster Risk and Risk Management. Program for Latin American and the Caribbean, Trinidad and Tobago. IBD.

IUCN. 2012. IUCN red list categories and criteria: Version 3.1. Second edition. Gland, Switzerland and Cambridfe, UK. IUCN. iv + 33 pp.

IUCN. 2015, February 10. IUCN Presented the Project "Advancing the Nagoya Protocol in Countries of the Caribbean Region" at the COTED Ministerial Session. Retrieved from https://www.iucn.org/zh-hans/node/17375. Accesses on 10 October 2016.

IUCN. 2015. Red list of Endangered Species: Threatened species in each country (totals by taxonomic groups. Available at http://cmsdocs.s3.amazonaws.com/summarystats/2015-4_Summary_Stats_Page_Documents/2015_4_RL_Stats_Table_5.pdf. Accessed October on 3ed 2016.

Johnson, E. S., Bekele, F. L., Brown, S. J., Song, Q., Zhang, D., Meinhardt, L. W., and Schnell, R. J. 2009. Population Structure and Genetic Diversity of the Trinitario Cacao (L.) from Trinidad and Tobago. *Crop Science*, *49*(2): 564-572.

Juman, R. A. 2004. The characterisation and ecology of the Bon Accord Lagoon, Tobago, West Indies Ph.D Thesis. University of the West Indies, St Augustine, Trinidad; 261pp.

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

Juman, R.A., and Hassanali, K. 2013. Mangrove conservation in Trinidad and Tobago, West Indies. In: Mangrove Ecosystems (Chapter 2). Editors G. Gleason and T.R. Victor. Nova Science Publishers Inc. pp 3–63.

Juman, R.A., and Ramsewak, D. 2013a. Land cover changes in the Caroni Swamp Ramsar Site, Trinidad (1942 and 2007): implications for management. Journal of Coastal Conservation, 17: 133–141.

Juman, R., and Ramsewak, D. 2013b. Status of Mangrove Forests in Trinidad and Tobago, West Indies. *Caribbean Journal of Science*, *47*(2-3): 291-304.

Kelly, A. E., and Goulden, M. L. 2008. Rapid shifts in plant distribution with recent climate change. *Proceedings of the National Academy of Sciences*, *105*(33): 11823-11826.
Maharaj, S.S., and New, M. 2013. Modelling individual and collective species responses to climate change within Small Island States. Biological Conservation, 167: 283–291.

Mallela, J., Parkinson, R., and Day, O. 2010. An assessment of coral reefs in Tobago. *Caribbean Journal of Science*, *46*(1): 83-87.

Messiner, H., Lemay, A., Bertone, C. Schwartzbury F., and Mewton L. 2009. Evaluation of Pathway for Exotic Plant Pest into and within the Greater Caribbean Region. Caribbean Invasive Species Working Group (CISWIG).

Ministry of the Environment and Water Resources. 2014. Trinidad and Tobago Draft Integrated Coastal Zone Management Policy Framework (2014). Available at http://www.ima.gov.tt/home/images/docs/Ingrated_Coastal_Zone_Mment_Policy_Framework1_Minister_April_2014.pdf. Accessed on 6 October 2016.

NOAA. 2016. What is coral bleaching? Retried from http://oceanservice.noaa.gov/facts/coral_bleach.html. Accessed on 10 October 2016.

Riebeek, H. 2006, May 9. Paleoclimatology: Explaining the Evidence. The Earth Observatory. Retrieved from http://earthobservatory.nasa.gov/Features/Paleoclimatology_Evidence/. Accessed on 5 October 2016.

UNEP. 2015. Success stories in mainstreaming ecosystem services into macro-economic policy and land use planning: evidence from Chile, Trinidad and Tobago, South Africa and Viet Nam. UNON Publishing Service Section. Nairobi, Kenya.

UNEP-WCMC (UNEP- World Conservation Monitoring Centre). 2016. Conservation dashboard for Trinidad and Tobago. Available at: https://www.unep-wcmc.org/#?country=TT&dashboard=show. Accessed 3 October 2016.

Wilkinson, C. 2008. Status of coral reefs of the world: 2008. Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, Townsville, Australia, 296 pp.

World Travel and Tourism Council. 2015. Travel and Tourism Economic Impact 2015: Trinidad and Tobago. London, United Kingdom. 20pp.

2016. Climate. Trinidad and Tobago Metrological Service. Retrieved from http://www.metoffice.gov.tt/Climate. Accessed on 12 October 2016.

Richard Laydoo, THE ROLE OF THE GREEN FUND IN SUSTAINABLE DEVELOPMENT IN TRINIDAD AND TOBAGO, http://www.ema.co.tt/docs/wed/green_fund.pdf; accessed September 10, 2016

2010. Daily Express online. Green Fund Back in Parliament, http://www.trinidadexpress.com/news/Green_Fund_back_in_Parliament-110920164.html; accessed September 10, 2016

6 APPENDICES

National Oversight Committee

- Environmental Management Authority
- Environmental Policy and Planning Department, Ministry of Planning and Development
- Trust for Sustainable Livelihoods (SusTrust)
- Council of Presidents of the Environment (COPE)
- Institute of Marine Affairs
- Fisheries Division
- Forestry Division