EMA
environmental
management
authority

2010 ANNUAL REPORT

Mission Statement

The Environmental Management Authority is committed to protecting and conserving the natural environment to enhance the quality of life by promoting:

- *Environmentally responsible behaviour*
- *Development and enforcement of environmental legislation*
- *Encouragement of voluntary compliance*
- *The use of economic and other incentives*

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

CHAIRMAN'S MESSAGE

Dr. Allan Bachan

Chairman

For the 2010 reporting period, the Board of Directors of the Environmental Management Authority (EMA) operated under the Chairmanship of Professor Julian Kenny. On behalf of the existing Board of Directors I am pleased to present the 2010 Annual Report.

Indeed this year has been productive for the EMA in terms of initiating and progressing towards attaining its targeted strategic goals and enabling strategies outlined in the 2010-2014 Strategic Plan.

Part A of this Annual Report focuses on examining the impacts of land cover and land use on key environmental components, including biodiversity. As our country's population increases so too does the need for basic amenities such as housing, education, healthcare, recreational activities and jobs. The challenge therein lies with understanding the dynamic nature and trends of our economic development, meeting the needs of our people and sustainably managing the use of our forest, agriculture and economic and urban land use.

The Plan defines the most relevant environmental and human health goals that will have the most profound impact on our population - clean air and water, healthy ecosystems, less noise and improved waste management. Environmental impacts of land cover and land use change have a significant impact on air and water quality. With respect to clean air, the EMA installed a new Ambient Air Quality Monitoring (AAQM) station at the port of Point Lisas and relocated the current AAQM station at Sea Lots. The EMA has also progressed in developing the proposed Air Pollution Rules (APR), that seek to set the limits for pollutants that may be released into the ambient air, in order to protect public health and the environment from the adverse effects of air pollution.

With the increase in industrial and economic development, the EMA also developed a National Non-point Source (NPS) Pollution Management Programme to protect the surface and ground water sources from non-direct or diffuse sources of water pollution and restore their quality to established criteria.

The EMA also remediated a lead contaminated site at Nurse Trace, Guayaguayare and the final report on the National Hazardous Waste Inventory Study was completed and submitted to key stakeholders.

Developing healthy ecosystems was critical to this year's goals as several initiatives got underway, firstly with the continuation of the Aripo Savannas Implementation Programme. Some activities included: completion of basic First Aid and Cardiopulmonary Resuscitation (CPR) training for 28 members of the community and Aripo Savannas Stakeholder Management Committee, several community engagement activities, as well as initiating the production of a 10-minute video documentary on the Aripo Savannas. The EMA also prepared the Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity which was approved by Cabinet on October 14, 2010.

The EMA in its Certificate of Environmental Clearance (CEC) application process, received 252 CEC applications in 2010, and this can be further separated into 66 energy related applications and 186 non-energy related applications. The EMA also received seven (7) Environmental Impact Assessments (EIA) and 22 Notices of Violation (NOVs) which were served against persons and companies for not complying with the CEC Rules.

In an effort to build efficiency within the CEC process, a revised CEC layout was implemented. Research was also done to assess the effectiveness of analysing CEC applications for poultry farms, and environmental and CEC databases were conceptualised and initiated. Compliance Assistance Programs were also being developed in various sectors such as agriculture, land distribution and biodiversity, and an EIA Frequently Asked Questions Booklet was also produced, as a guide for applicants to easily comply with the CEC Rules.

In the case of breaches of the Noise Pollution Control Rules (NPCR), five (5) NOVs were issued by the Authority to persons who failed to comply with the requirements outlined in the Noise Pollution Control Rules.

The management and staff at the EMA have continued to work diligently towards achieving the goals identified in the Strategic Plan. Staff at the EMA has also increased over the year in an effort to meet its environmental demands. Training of staff has always been a priority with the Authority, and this year was no different with almost every department receiving training in various areas in accordance with

regulatory standards and requirements. The implementing of a new performance management system was also critical to the development of staff and their abilities to perform their jobs effectively.
The EMA is steadfast in providing effective leadership in attaining an environmentally healthy Trinidad and Tobago, while conserving healthy ecosystems for present and future generations. While the EMA's success is predicated on several legislative and regulatory factors, we all are responsible for contributing positively towards the well-being of our environment. Therefore, developing an environmentally conscious culture and promoting sustainable activities, should be our focus looking forward to safeguard the future existence of our environment. The EMA's strategy for the past year was to impress upon the national community the vital link between the promotion of sustainable development and the maintenance of the country's unique biodiversity.

These activities were in support of the country's obligations under the Convention on Biological Diversity to promote the conservation of biological diversity, encourage the sustainable use of its components and encourage the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

The year 2010 was also declared the International Year of Biodiversity (IYB) by the United Nations. The intent was to draw attention to the importance of biodiversity including every plant, animal and micro-organism. In commemoration of the IYB, the Environmental Management Authority (EMA) made the critical decision to incorporate and inculcate the UN's slogan for its year-long activities, which was, "**Biodiversity is life. Biodiversity is our life!"**

The IYB brought with it its own public awareness strategies as several exhibitions and events were hosted by the EMA this year around this topic. Some of the events included: the EMA's schools' competitions, environmental commemorative day celebrations, the bi-annual Green Leaf Awards along with collaborative projects with other ministries, such as the EMA's first IYB stamp launch. To celebrate the occasion and raise public awareness of biodiversity's contribution to sustainable development, the EMA also launched an IYB-themed calendar and diary at its Annual Stakeholders Christmas Party in December 2009. The images and information shared, offered an opportunity to learn more about the rich tapestry of life that exists in Trinidad & Tobago and to discover the importance of having healthy eco-systems. Other public awareness programmes were also ongoing as the EMA's inaugural Green

Lifestyle Show was successfully executed along with several other joint initiatives such as the Clean and Beautify Trinidad and Tobago campaign.

The EMA plays a key role in protecting biodiversity and promoting sustainable development through: the designation of Environmentally Sensitive Species (ESS) and Environmentally Sensitive Areas (ESAs); the coordination and facilitation of capacity building with stakeholders; commissioning of studies for research and management planning; and enhancing public education and awareness. In this regard, I must mention that one of our major projects, the Nariva Swamp Restoration Project, was launched on April 20, 2010.

The EMA has accessed the financial support necessary to implement this project, whose overall objective is to restore and conserve the Nariva wetlands, through the recognition of the services it provides as a carbon sink and a biodiverse ecosystem. This will be accomplished through reforestation of 1339ha of forest previously destroyed by illegal farming. The restoration of the wetlands will result in additional environmental benefits, including carbon sequestration, conservation of endemic species in the area, and recovery of the protection and storm buffering character of the wetland. The implication of the reforestation for carbon sequestration was considered to be an important benefit of restoration, in the context of climate change. This project was seen as eligible for inclusion in the World Bank BioCarbon Fund (BioCF) Portfolio, of the Clean Development Mechanism (CDM) of the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC).

Dr. Allan Bachan

Chairman

February 2014

ABOUT THE EMA

The EMA of Trinidad and Tobago was established by the EM Act in 1995 on World Environment Day (June 05). The EMA is committed to protecting, restoring and conserving the environment to improve the quality of life by promoting:

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

This is to be achieved in an atmosphere of mutual respect, professionalism, accountability, transparency, collaboration and social responsibility. One of the main tasks of the EMA to date has been the development and implementation of a comprehensive and cohesive package of (subsidiary) environmental regulatory legislation in accordance with the requirements of the EM Act. It should be noted, however, that the role of the EMA goes beyond regulation.

The EMA has been investing resources in: improving environmental awareness and education; coordinating environmental management functions performed by persons in Trinidad and Tobago; working with partner agencies, organisations and institutions in the development and implementation of other relevant environmental policies and plans; and lending support to the fulfillment of the country's obligations to a number of regional and international conventions and treaties.

The EMA is also responsible for preparing an annual report containing an assessment of the state of the environment, which is intended to:

- Provide a foundation for improved decision-making at all levels;
- Increase awareness and understanding of environmental trends and conditions; and
- Facilitate the measurement of key indicators that monitor progress of the pace and direction towards enhancing positive, or mitigating negatively, observed conditions and trends.

The EMA is responsible for a wide range of activities, a responsibility which has become increasingly important over the last few years given the country's rapidly growing economy. To help guide the organisation's work, a three-year strategic plan, spanning the period 2009 to 2012 was developed, within which eight strategic goals and six enabling strategies were identified. They are:

THE EMA'S STRATEGIC GOALS – WHAT WE WOULD LIKE TO ACHIEVE

1. To protect and improve air quality to reduce and eliminate any risk to human health and ecosystems health.

2. To protect and restore the water quality of inland and near-shore coastal waters to safeguard human health and ecosystems health.
3. To protect communities and ecosystems from the health consequences of hazardous chemicals spills and the unsafe handling and disposal of solid and hazardous wastes.
4. To protect, conserve, and/or restore selected ecosystems and species to ensure the biodiversity of Trinidad and Tobago is sustained.
5. To balance environmental protection and economic development and facilitate the expeditious processing of CEC applications.
6. To protect human health and the environment from the effects of noise and maintenance of the fundamental rights of an individual to the enjoyment of property whilst still allowing reasonable social, cultural and economic activity.
7. To modify and/or develop legislation, policies, procedures and systems to facilitate the work of the EMA.
8. To protect human health and the natural environment through the timely enforcement of statutes, ensuring compliance with permit and license conditions and the promotion of environment stewardship.

THE EMA'S ENABLING STRATEGIES – HOW WE ACHIEVE THEM

1. Attract, retain and develop competent staff.
2. Develop appropriate legislation policies, procedures, and systems to facilitate the work of the EMA.
3. Cultivate positive attitudes to environmental protection and conservation through awareness building, education and effective communication.
4. Maximize self-funding of EMA operations.
5. Coordinate environmental management activities in Trinidad and Tobago.
6. Operate the EMA as a model for good environmental management practices.

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ACRONYMS

ASOE	Assessment of the State of the Environment report
BTEX	Benzene, toluene, ethyl benzene and xylene
C	Central Trinidad
°C	degree Centigrade
CDA	Chaguaramas Development Authority
CEC	Certificate of Environmental Clearance
CEPEP	Community-Based Environmental Protection and Enhancement Programme
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CSO	Central Statistical Office
DNRE	Department of Natural Resources and the Environment
EMA	Environmental Management Authority
EMBD	Estate Management Business Development Company Limited
ESA	Environmentally Sensitive Area
GDP	Gross Domestic Product
GoRTT	Government of the Republic of Trinidad and Tobago
ICT	Information and Communication Technology
km^2	Square kilometres
LNG	Liquefied Natural Gas
MTBE	Methyl tertiary butyl ether
NAP	National Action Programme to Combat Land Degradation in Trinidad and Tobago

NBSAP	National Biodiversity Strategy and Action Plan
NEP	National Environmental Policy
NE	North East Trinidad
NH_3	Ammonia
N_2O	Nitrous oxide
NISS	National Invasive Alien Species Strategy
IAS	Invasive Alien Species
NO_x	Nitrogen oxides
NRWRP	National Reforestation and Watershed Rehabilitation Programme
NW	North West Trinidad
ppb	Parts per billion
%	Percent
RGB	Red, green, blue
SC	South Central Trinidad
SE	South East Trinidad
SIDS	Small Island Developing States
SW	South West Trinidad
TCPD	Town and Country Planning Division
THA	Tobago House of Assembly
UDeCott	Urban Development Company Limited of Trinidad and Tobago
UNCCD	United Nations Convention to Combat Desertification
URP	Unemployment Relief Programme
UWI	The University of the West Indies

VSEP	Voluntary separation of employment programme
WASA	Water and Sewerage Authority

EXECUTIVE SUMMARY

Trinidad and Tobago faces the challenge of managing approximately 5,128 square kilometres (km^2) of land within its boundaries to balance the trade-offs between meeting immediate human needs for resources such as food, fibre, timber and space, and maintaining the capacity of these limited land resources to provide goods and services in the long term.

This report has provided quantitative data from 1991 to 2010 which has been used to examine changes in the natural and built environment in Trinidad and Tobago. The change analysis was conducted using Landsat imagery to extract specific categories of land cover and land use for each of the five (5) years used to record data – 1991, 1996, 2001, 2005 and 2010. The accuracy of these land coverage extractions is approximately 70%. This accuracy level was derived from overlays done with the Town and Country Planning Division 2008 Satellite Imagery, and the Lands and Surveys 1998 Ortho-rectified Aerial Photography. Ground truthing of data did not form part of the scope of this study. The related negative environmental impacts being experienced as a result of land cover and land use changes, as well as the associated driving forces were also examined.

In reporting on land cover and land use change, land is considered a fixed and finite resource which has limits for adequately sustaining a continually expanding population. The key results from the data showed that:

1. In 2010, land cover in Trinidad consisted of approximately 3076 km^2 of forest, 830 km^2 of agriculture, 829 km^2 of built development, 99 km^2 of swamp and 30 km^2 of industrial type development. All regions in Trinidad are dominated by forest, with agriculture and built development the next largest land cover categories.

2. The 2010 land cover map for Tobago shows that forest was the predominant land cover type for the island. There were 276 km^2 of forest, 20 km^2 of built development, 5 km^2 of agriculture and 3 km^2 of swamp.

3. Over the period of analysis, there was an increase in the loss of forest land cover, and a corresponding increase in land use change to built development and agriculture. Because of incompatibilities in the functioning of these activities, there is the risk of disturbance of the living conditions in housing communities.

4. There were differences in the extent and rate of change in the different regions in Trinidad – generally a slowing down in the already highly developed North-West and acceleration in Central and South-Central and, to a lesser extent, South-West. This pattern of built development can be described as “sub-urbanisation” – growth is occurring in bands outwards from, and remaining dependent on, the core urban centers, but not necessarily guided by planning.

5. Industrial land use did not increase significantly in extent; however it is known that there have been and will continue to be efforts to expand industry, especially heavy industry, by changing the use of forest and agricultural lands.

Population growth has been one of the most significant drivers of land cover and land use changes, as increases in population generate a demand for shelter, education, health and recreational facilities, jobs, and transportation infrastructure. Other major drivers of change include political forces/governance and economic growth.

Competing demands have led to unsustainable utilisation, overuse and degradation of the country's land resources. Measures to address the negative consequences of land use and land cover changes on the environment include:

1. Identifying and quantifying the full range of environmental consequences (to the extent possible) in order to make informed and sound decisions, which must ultimately balance competing societal objectives for the use of land resources.

2. No further loss of forested land to other land uses; this is included in the NEP.

3. Areas of natural vegetation should be protected by measures appropriate to the particular characteristics of the areas. These areas include rivers and watersheds, wildlife habitats, wetlands, coastal zones, archaeological and heritage sites, and areas of high amenity value.

4. Rigid zoning of agricultural land and measures to prevent change to others land uses, mainly housing and industry (outside of the agricultural sector).

5. The patterns of housing development should be changed in order to conserve land and maximise the use of existing infrastructure; preferred patterns are high density, infilling, re-development, rehabilitation and re-planning of 'brown land' rather than consuming 'green-fields'.

6. Adoption of land use policies aimed at achieving a better balance in the distribution of settlements, and social and economic activities over the national land space to satisfy the needs of the population while minimising the need for travel especially for work and schooling.

7. The need to rationalise the legislative and policy framework for dealing with all aspects of land management in Trinidad and Tobago. A more comprehensive and robust legislative and policy package is needed to deal with the challenges of managing Trinidad and Tobago's land resources sustainably.

8. Greater collaboration among partners in land use planning and management – there needs to be formal mechanisms of collaboration to ensure effective collaboration among the critical agencies with overlapping responsibilities, as well as various stakeholder organisations/institutions.

PART A: ASSESSMENT OF THE STATE OF THE ENVIRONMENT REPORT 2010

1.0 INTRODUCTION

Trinidad and Tobago faces the challenge of managing approximately 5,128 square kilometres (km^2) of land within its boundaries to balance the trade-offs between meeting immediate human needs for resources such as food, fibre, timber and space, and maintaining the capacity of these limited land resources to provide goods and services in the long term. How we use our land resources is a key component of environmental management, and in recognition of this important link, the 2010 Assessment on the State of the Environment report (ASOE) focuses on the types of land cover and land use changes occurring in Trinidad and Tobago. The report also examines several fundamental questions about the state of the nation's land:

- Are land-use activities degrading the environment in ways that may ultimately undermine ecosystem services, human welfare and the long-term sustainability of our land resources?
- What are the trends in land cover and land use, and their effects on human health and the environment?
- What are the likely driving forces of land cover and land use changes, and how do these relate to the environment?

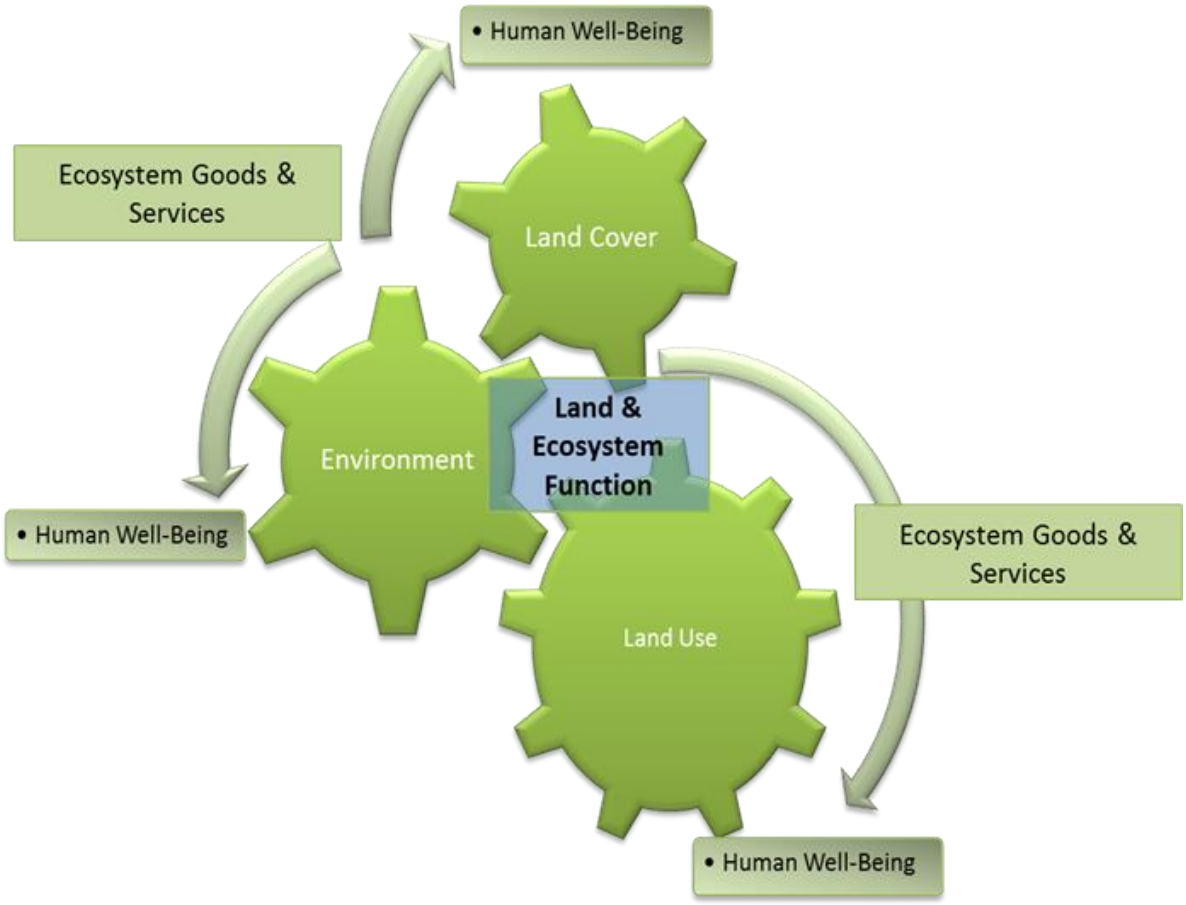
Land, and the manner in which it is used, provide a key link between human activities and the environment. Land-use activities – whether converting natural landscapes for human use or changing management practices on human-dominated lands – have transformed a large proportion of the planet's land surface. By clearing tropical forests, practicing subsistence agriculture, intensifying farmland production, or expanding urban centers, human actions have changed and continue to change the world's landscapes in pervasive ways[1].

At global scales, the conversion of ecosystems by human activities has adversely impacted not only the planet's biodiversity, which has resulted in a loss of species, but also a range of ecosystem services that include the regulation of climate, air and water quality, soil formation and the regulation of flooding and other natural hazards [2]. Land use therefore presents us with a dilemma – many land-use practices that are essential for the provision of food, water, fibre and shelter for immediate human needs are often done at the expense of degrading the environment.

[1] Foley, J.A., DeFries, R., Asner, G.P., Barford, C., Bonan, G., Carpenter, S.R., Chapin, F.S., Coe, M.T., Daily, G.C., Gibbs, H.K., Helkowski, J.H., Holloway, T., Howard, E.A., Kucharik, C.J., Monfreda, C., Patz, J.A., Prentice, I.C., Ramankutty, N. and Snyder, P.K. 2005. Global consequences of land use. Science 309:570-574.

[2] Millennium Ecosystem Assessment. 2003. Ecosystems and Human well-being: A Framework for Assessment. Washington, DC: Island Press

The mutual interdependencies between land cover, land use and the environment are demonstrated in Figure 1.1. These relationships are often two-way, so that simple relationships between cause and effect can be difficult to identify. In some places, specific land uses or land management practices may be important in sustaining particular patterns of biodiversity and environments. Elsewhere, the uses to which land can be put are highly dependent on the biodiversity resources and environments present[3].



[Figure adapted from Haines-Young 2009[4]]

Figure 1.1. The relationship between land cover, land use, the environment and the output of ecosystem services.

[3] Haines-Young, R. 2009. Land use and biodiversity relationships. Land Use Policy 26:178-186.

[4] Haines-Young, R. 2009. Land use and biodiversity relationships. Land Use Policy 26:178-186.

1.1 CONTEXT FOR ANALYSIS

To ensure a common understanding of terminology, the following terms are defined:

Land cover is the physical coverage of land, usually expressed in terms of vegetative cover or lack of it. This study focuses on broad categories of natural vegetation such as forest, scrubland, wetland and other natural features of the earth's crust. Thus, land cover in any area can be assessed in terms of the biophysical state of the earth's surface and sub-surface directly below. Land cover change is significant when natural vegetation in an area is removed or depleted to the point where it cannot regenerate. This can occur naturally, can be caused by weather events or be human-induced (e.g. when the land is developed for another use).

Land use is the human utilisation of a piece of land for certain purposes. Land use inevitably involves two factors, the manipulation of the biophysical attributes of land or the development of land, and the human intent underlying the act of manipulation or development. Land use is the physical manifestation of decisions taken by people to use land in satisfying a wide range of needs and purposes and development consists of a set of actions as defined in legislation.

Land cover and land use are strongly interconnected but not synonymous. However, it is possible that in the course of this report the terms may be used interchangeably. There is also some difficulty in distinguishing between land cover and land use on maps, where activities that can be defined as land use such as agriculture, plantation forest and tree crop cultivation will appear as vegetative cover.

Driving forces are the overarching social and economic factors which reflect people's needs and create demands for development and the policies and strategic directives of government administrations and political directorates.

Environment is all **land**, area beneath the land surface, atmosphere, climate, surface, surface water, groundwater, sea, marine and coastal waters, seabed, wetlands and natural resources within the jurisdiction of Trinidad and Tobago.[5]

Land includes the combined physical and biological features of the earth's surface; that is, topography, terrain, physiography and natural resources such as soils, minerals and a wide range of ecosystems.[6]

Ecosystem Services are the benefits that people obtain from ecosystems. These include provisioning service such as food and water; regulating services such as flood and disease control; cultural services

[5] Environmental Management Act, Chapter 35:05

[6] Environmental Management Authority. State of the Environment 1996 Report. GoRTT. 93 pp.

such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.[7]

The data and information used in this ASOE were obtained primarily from the report prepared by GISCAD Limited for the EMA[8]. To examine the changes in land cover and land use, Trinidad has been divided into six (6) geographic regions based on Municipal Corporations, with Tobago considered as a single region (Table 1.1, Figure 1.2).

Table 1.1. Regions for data recording and analysis

REGIONS	**RELATED MUNICIPAL CORPORATIONS (best fit)**
TRINIDAD	
North West	City of Port of Spain, Diego Martin, San Juan Laventille, Borough of Arima, Tunapuna Piarco
North East	Sangre Grande
Central	Borough of Chaguanas, Couva Tabaquite Talparo
South East	Mayaro, Rio Claro
South Central	City of San Fernando, Princes Town
South West	Borough of Point Fortin, Siparia, Penal Debe
TOBAGO	Under a separate jurisdiction; defined as a 'region' for this study.

A fundamental assumption of the analyses conducted for this report is that development activities result in changes in land cover and land use. In turn, these changes have the potential to adversely affect the natural environment and those aspects of the quality of life of human-beings which are directly related to it. Furthermore, the principles underlying the environmental management system are that these changes should be properly examined so that appropriate and timely measures can be taken to protect, conserve and enhance the environment and remediate in circumstances where harm to the environment has occurred.

[7] Millennium Ecosystem Assessment. 2003. Ecosystems and Human well-being: A Framework for Assessment. Washington, DC: Island Press.

[8] GISCAD. 2011. Land cover and land use changes in Trinidad and Tobago: 1991 – 2010. Environmental Management Authority. 65 pp.

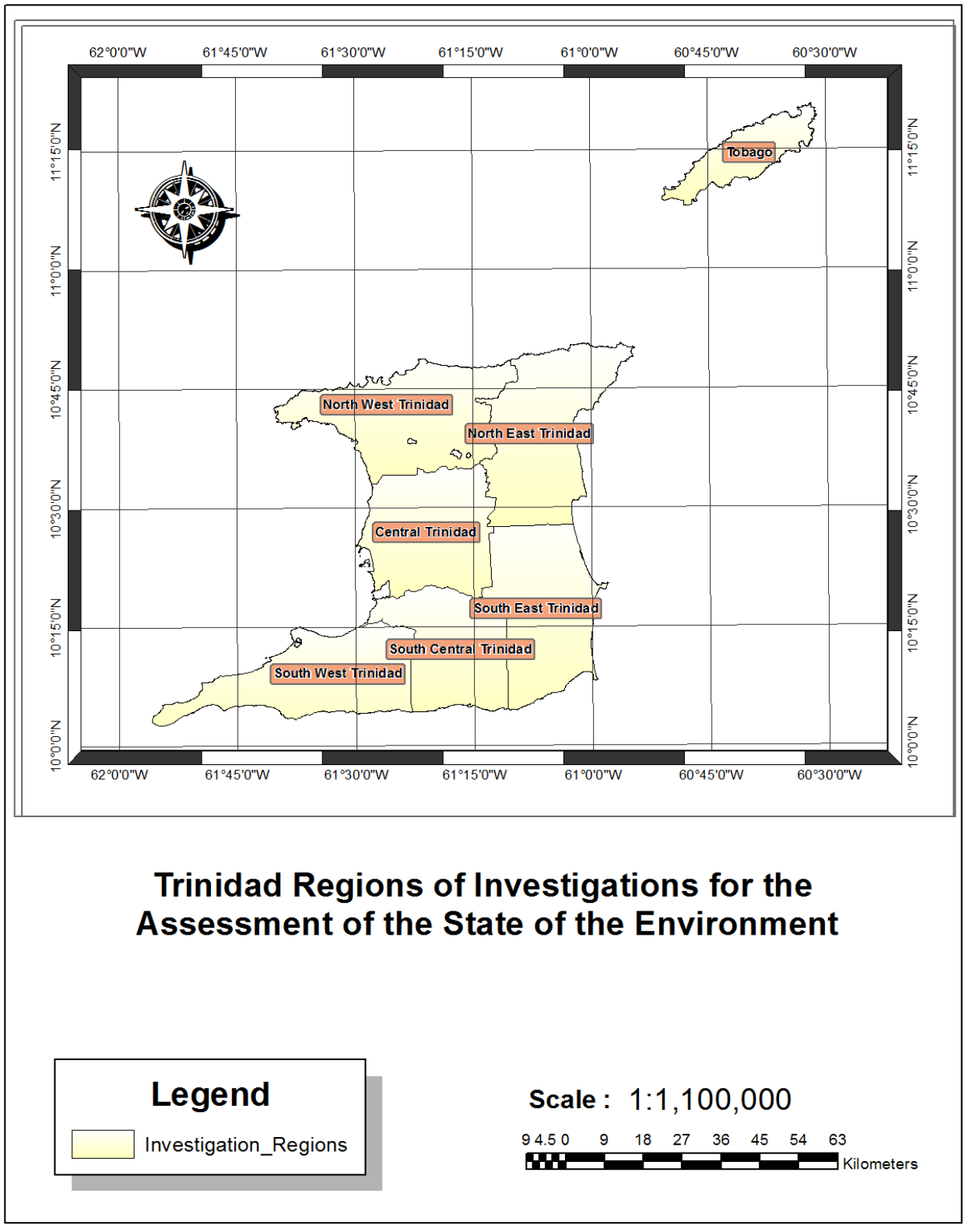
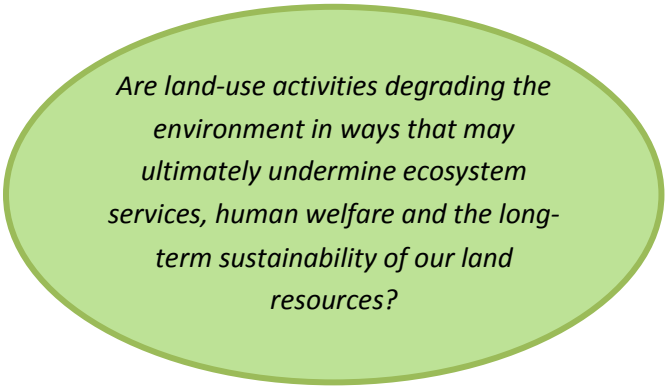


Figure 1.2. Regions of investigation for land cover and land use changes in Trinidad and Tobago

2.0 ENVIRONMENTAL CONSEQUENCES OF LAND COVER AND LAND USE CHANGES



The environmental impacts of land cover and land use change have concerned the global community for several decades. Research on the dynamics of land cover and land use as a coupled human-environment system has shown that human-driven changes in the terrestrial surface of the earth hold wide-ranging significance for the structure and function of ecosystems, with equally far-reaching consequences for human well-being[9].

Today, as much as 50% of the earth's ice-free land surface has been transformed[10]. Much of this change is a direct consequence of land uses, and the environmental impacts range from changes in atmospheric composition to the extensive modification of ecosystems, significant consequences for biodiversity, nutrient cycling, soil structure, soil biology, and climate [11]. Understanding land-use and land-cover changes is important because they have a direct relationship to many of the planet's fundamental characteristics and processes, including the productivity of the land, the diversity of plant and animal species, and the biochemical and hydrological cycles[12].

For terrestrial ecosystems, land cover and land use changes have been the main direct drivers of change in ecosystem services in the last 50 years[13]. Human activities now appropriate nearly one-third to one half of global ecosystem production[14], and as development and population pressures continue to grow,

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[9] Turner II, B.L., Lambin, E.F. and Reenberg, A. 2007. The emergence of land science for global environmental change and sustainability. Proc. Natl. Acad. Sci. USA 104:20666-20671.

[10] Haberl, H., Heinz Erb, K., Krausmann, F., Gaube, V., Bondeau, A., Plutzar, C., Gingrich, S., Lucht, W. and Fischer-Kowalski, M. 2007. Quantifying and mapping the human appropriation of net primary production in earth's terrestrial ecosystems. Proc. Natl. Acad. Sci. USA. 104:12942-12947.

[11] Wackernagel, M., Schulz, N.B., Deumling, D., Callejas Linares, A., Jenkins, M., Kapos, V., Monfreda, C., Loh, J., Myers, N., Norgaard, R. and Randers, J. 2002. Tracking the ecological overshoot of the human economy. Proc. Natl. Acad. Sci. USA. 99:9266-9271.

[12] de Sherbinin, A. 2002. "Land-Use and Land-Cover Change," A CIESIN Thematic Guide, Palisades, NY: Center for International Earth Science Information Network of Columbia University. Available on-line at http://sedac.ciesin.columbia.edu/tg/guide_main.jsp

[13] Millennium Ecosystem Assessment. 2005. Current State and Trends Assessment. Washington, DC: Island Press.

[14] Foley, J. *et al.* 2005. Global Consequences of Land Use. Science 309:570-574.

there are increasing concerns about the condition of global ecosystems and ecosystem services, and how these may be altered by land use changes (Table 2.1).

Table 2.1. Some ecosystem functions altered by land use change

Ecosystem Function	Role of landscape in providing function	Example of altered function with specific types of land use change
Provision of ecosystem goods (food, fibre, fuelwood, shelter, fresh water)	Provides natural resources for immediate human needs	Conversion to cropland increases fraction of primary production appropriated for human consumption but decreases the share available for other ecosystem functions (e.g. provisioning of freshwater, climate regulation or habitat for biological diversity)
	Regulates flow of water to streams	Conversion to urbanised areas increases tendency of flash flooding from storm runoff
	Maintains water quality	Runoff from agricultural lands increases nutrient loads in streams
Climate regulation	Sequesters greenhouse gases through biogeochemical cycling	Deforestation releases carbon dioxide to the atmosphere resulting in global warming
	Exchanges water, energy and momentum with atmosphere	Tropical forest removal increases surface temperatures, creating a warmer, drier climate
		Urbanisation creates heat islands
Disease regulation	Restricts habitat for disease vectors	Deforestation increases human-primate contacts and spreads zoonotic diseases
Biological diversity (genetic resources, biogeochemicals, cultural benefits)	Provides habitat for plant and animal species	Forest conversion increases habitat fragmentation causing declines in the size and persistence of wildlife populations
Soil fertility	Replenishes soil nutrients	Increased soil erosion from clearing depletes fertility

Table adapted from De Fries *et al*. 2004[15]

[15] De Fries, R.S., Foley, J.A. and Asner, J.P. 2004. Land-use choices: Balancing human needs and ecosystem functions. Frontiers in Ecology and the Environment, 2(5):249-257.

Deforestation

Throughout history, the fate of the world's forests has strongly reflected the pattern and intensity of land use by societies[16]. Demand for agricultural land, timber, and other forest products, as well as technological changes in agriculture, significantly impact the mode and rate of transformation of forested areas. Deforestation has a number of repercussions which include:

- Soil erosion or impoverishment, especially in tropical areas where soils tend to be thin and nutrient-poor.
- Habitat loss, which is a leading cause of species endangerment and biodiversity loss, particularly in humid tropical forests.
- Impacts to the hydrological cycle through changes in evapo-transpiration and run-off.
- Contributions to green-house gas emissions that bring about climate change, particularly forest burning.

Land use activities that can lead to deforestation include:

- Agricultural expansion
- Timber extraction
- Squatting and residential development
- Commercial and industrial development
- Many land use practices (e.g. fuelwood collection, forest grazing and road expansion) can degrade forest ecosystem conditions – in terms of productivity, biomass, stand structure and species composition – even without changing forest area.
- Certain land use practices can also degrade forest conditions indirectly by introducing pests and pathogens, changing fire-fuel loads, changing patterns and frequency of ignition sources, and changing local meteorological conditions.

Land Degradation

Over the last two (2) centuries the impact of human agricultural, waste disposal, industrial and extractive activities, when coupled with natural and human-induced climate variation, has led to land degradation on an unprecedented scale[17]. Land degradation can occur anywhere, and is particularly

[16] ibid

[17] de Sherbinin, A. 2002. "Land-Use and Land-Cover Change," A CIESIN Thematic Guide, Palisades, NY: Center for International Earth Science Information Network of Columbia University. Available on-line at http://sedac.ciesin.columbia.edu/tg/guide_main.jsp

prevalent in areas of subsistence agriculture and mountainous environments impacted by human activities.

The National Action Programme to Combat Land Degradation in Trinidad and Tobago (NAP)[18] defines land degradation as "*the reduction or loss of bio-physical or economic productivity of land resulting from land uses or from a process or combination of processes arising from natural phenomena, human activities and habitation patterns*." This report identifies land degradation as one of the factors responsible for lowering the actual and productive potential of the country's land resources, reducing vegetative cover, increasing erosion, runoff and flooding, and has adversely affecting soils, water quality and availability, biodiversity and the coastal and marine environments. If left unchecked, land degradation can lead to irreversible loss of the land resources on which the socio-economic development of the country depends.

Several concepts are important in studying land degradation: *sustainability* or the ability of the land to remain productive over long time periods; *resilience* or that quality of a resource that makes it sustainable or resistant to degradation; *vulnerability* or the risk of specific adverse outcomes for people or ecosystems in the face of different stresses; and *carrying capacity* or the number of people and animals the land can normally support without being significantly stressed.

> Mining has modified the landform in large areas of Wallerfield, Valencia and Longdenville through the clearing of land and open pit mining. Additionally, washing of aggregate has led to the silting of several rivers close to the locations of these quarries, many of which are in the Northern Range of Trinidad.[19]

Biodiversity Loss

Human transformations of the earth's surface affects biodiversity in almost every corner of the world and changes are occurring rapidly enough so that the result is a net loss of species[20]. The greatest human impact on biodiversity is the alteration and destruction of habitats, which occurs mainly through changes in land use: draining of wetlands, clearing of land for agriculture, felling of forests for timber, and pollution of the environment and fragmentation. The conversion of land from natural states to other uses can lead to habitat fragmentation which may result in reductions in total genetic variation, dispersal barriers and, for plants, the potential loss of key biotic interactions with pollinators and dispersal agents.

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[18] Government of the Republic of Trinidad and Tobago. 2006. Draft National Action Programme to combat land degradation in Trinidad and Tobago: 2006-2020.

[19] Environmental Management Authority. In press. Assessment of the State of the Environment 2005.

[20] De Sherbinin, A. 2002. "Land-Use and Land-Cover Change," A CIESIN Thematic Guide, Palisades, NY: Center for International Earth Science Information Network of Columbia University. Available on-line at http://sedac.ciesin.columbia.edu/tg/guide_main.jsp

The Pawi or Trinidad Piping Guan (*Pipile pipile*), the only locally endemic bird species in Trinidad and Tobago, has been categorized as critically endangered by the International Union for the Conservation of Nature (IUCN) as its numbers in the wild continue to decline because of habitat destruction and overhunting (Hayes et al, 2009).[21] The Pawi was designated as an Environmentally Sensitive Species in 2005 under the Environmentally Sensitive Species Rules, 2001.

The Caroni Swamp has been impacted by reclamation for highways, roads, landfill, sewage plants and agriculture. The hydrology of this system was altered in the early 1920's to facilitate rice cultivation, and later on for flood mitigation. Currently, there are built developments encroaching on the wetland boundary.[22]

Wetlands provide important services include provisioning (food, water and fuel), regulating (erosion, flood control, climate regulation), cultural and supporting (tourism and recreation) services.[23] They also provide habitats and breeding areas for many fish and bird species.

Southwest Tobago has experienced rapid growth and development in the tourism and related service sectors. Mangroves were cleared in the 1990's for the extension of the Crown Point Airport and for hotel development. In 2007, mangroves were cleared in the Bon Accord Lagoon for proposed resort development and in 2008 for housing.[24]

An overall assessment of the status and trends in key biodiversity-related ecosystem services in Trinidad and Tobago (based on ecosystem and species data and information) based on an analysis of available, empirical data, as well as expert judgments, indicates that most services are in fair condition but are in decline. The decline is especially evident in the flooding which is growing in frequency and intensity throughout the country. The ability of forests and coastal systems to help regulate surface runoff and soil erosion, and thereby assist in minimizing the effects

[21] Hayes, F. E., Sanasie, B., and Samad, I. 2009. Status and conservation of the critically endangered Trinidad piping-guan *Aburria pipile*. Endangered Species Research. vol. 7:77-84 (citied in the Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. Government of the Republic of Trinidad and Tobago. 2010. 130pp.)

[22] Juman, R. and Ramsewak, D. 2010. Status of mangrove forests in Trinidad and Tobago. Institute of Marine Affairs. 137 pp.

[23] Millennium Ecosystem Assessment. 2005. Current State and Trends Assessment. Washington, DC: Island Press.

[24] Ibid

of flooding in low-lying areas around the country has been significantly impaired by reductions in the extent and integrity of vegetation cover. Flooding effects are coupled with reductions in infiltration surfaces because of increasing infrastructural development (as well as improper/inadequate drainage systems). The result has been greater occurrence and severity of flooding throughout the country in areas that coincide with greatest degradation – such as in western Trinidad.[25]

Land Cover, Land Use and the Water Cycle

There are many connections between land surface characteristics and the water cycle:

1. Land cover can affect both the degree of infiltration and runoff following precipitation events. There are two (2) paths of escape for surplus water – through infiltration into underground aquifers, and as surface water flows.

   Natural land cover has various properties that help to regulate water flows, both above and below ground. For example, forest canopy and leaf litter help to attenuate the impact of raindrops on the earth's surface, thereby reducing soil erosion. Roots hold the soil in place, especially on steeper slopes, and also absorb water. Openings in leaf litter and soil pores permit the infiltration of water, which is carried through the soil into the ground water.

   Streams eventually carry excess surface water to the ocean, though they may feed intermediate destinations such as lakes and wetlands. In their natural states, the network of streams in a catchment will slow down water flows so that there is a significant lag time between a period of peak precipitation and peak runoff further downstream.

   Wetlands are natural parts of the landscape where water collects. Wetlands act like sponges, absorbing water during periods of high runoff, and gradually releasing it. Wetlands also serve as natural water filters, removing impurities and sediments. Historically, the function of these ecosystems was relatively undervalued, and many wetlands were drained for agriculture and other forms of development. Today, however, there is increasing recognition of the valuable ecosystem services provided by wetlands, from flood control and storm surge protection to fisheries nursery function.

   Land cover change can affect runoff from mountains and uplands to lower elevation areas; deforestation, for example, can contribute to flash flooding at lower elevations. Urbanisation is associated with a proliferation of impervious surfaces, such as paved roads, parking lots, and

[25] Government of the Republic of Trinidad and Tobago. 2010. Fourth National Report of Trinidad and Tobago to the Convention on Biological Diversity. 130pp.

rooftops. In built-up environments the impervious surfaces may exceed 80% of land cover[26]. The effect of such surfaces is two-fold. First, it increases the speed of runoff, with rain water being channelled to streams much more rapidly than under conditions of natural vegetation cover. Secondly, infiltration is reduced, which reduces the groundwater levels and therefore the base flow of streams. In urban areas, streams are also frequently "channelized" using cement bottoms and embankments. Under such conditions, streams have been stripped of their natural character, and flood runoff peaks dramatically after rainfall events.

2. The degree of vegetation cover and the albedo (fraction of solar radiation reflected by a surface or object, often expressed as a percentage degree of absorption/reflection of sun's rays[27]) of the surface can affect rates of evaporation, humidity levels and cloud formation.

   Land surface characteristics can, in turn, affect temperature and humidity levels in the lower atmosphere, and vegetation patterns and soil moisture levels can affect cloud formation and precipitation through convection (the spontaneous rise of air). Certain land cover types, such as bare ground, heat more rapidly and transmit radiant heat to the overlying air. As air rises it also cools, and the moisture in the air condenses and eventually forms clouds, leading in some cases to precipitation.

3. Urbanisation and increased population densities also increases demand for potable water, which may impact groundwater reserves.

Climate Change

While global warming and associated climate change[28] is not a new phenomenon and has been occurring naturally for millions of years, there is now building evidence that there is a current accelerated rate of warming and climate change as a result of human activity, primarily the increases in concentration of greenhouse gases in the atmosphere as a result of fossil fuel combustion, industrial processes and waste management.[29] Global climate change has become an urgent environmental issue that could lead to significant changes in resource use, production, and economic activity. These changes

[26] Ibid.

[27] Intergovernmental Panel on Climate Change (IPCC), 2001: Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Houghton*, et al.* (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 881 pp.

[28] Climate change in the Intergovernmental Panel on Climate Change (IPCC) usage refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change, where climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.

[29] Ibid.

have implications for both human and natural systems, making climate change one of the greatest challenges facing us for the coming decades.

For its heat-trapping potential and its significance in global biogeochemical cycles, carbon dioxide (CO_2) is one of the most important greenhouse gases, and fossil fuel use and land use changes have been identified as the primary causes of global increases in atmospheric CO_2 levels[30].

The World Resources Institute 2005[31] report ranked Trinidad and Tobago as the 10th highest per capita emitter of greenhouse gas emissions. These emission figures exclude CO_2 from international bunker fuels and land use change and forestry.

Land use changes can result in emissions of other greenhouse gases as well. Aber and Mellilo[32] list 10 additional greenhouse gases that are released by terrestrial ecosystems, many of which have much greater heat-trapping capacity that carbon. Among others, these include:

- methane (CH_4), which is emitted by wetlands, rice paddies, and animals (i.e., an indirect contribution from pasture lands)
- nitrous oxide (N_20) and other oxides of nitrogen (NO_x) which are emitted by fertilized agriculture and biomass burning
- ammonia (NH_3), which is emitted by animals, fertilized agriculture, and biomass burning
- carbon monoxide (CO) from biomass burning
- sulphur gases from wetlands, wet tropical forests, oceans, fertilized agriculture, biomass burning
- water vapour from forests

The effects of climate change can alter land cover and land use especially in coastal zones, mountains and forested areas due to sea level rise, storm surges and excessive and unseasonable rainfall. Agriculture, human health and settlements, coastal zones and water resources are the most vulnerable and most likely to be impacted by climate change.

As one (1) of the small island developing states (SIDS), Trinidad and Tobago is vulnerable to the adverse impacts of climate change related to temperature increases, changes in precipitation and sea level rise[33].

[30] IPCC. 2007. Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[31] Baumert, K.A., Herzog, T. and Pershing, J. 2005. Navigating the numbers: Greenhouse gas data and international climate policy. World Resources Institute. 132 pp.

[32] Aber, J. D. and Melillo, J. M. 1991. Terrestrial Ecosystems. Philadelphia: Saunders College Publishing.

[33] Government of the Republic of Trinidad and Tobago. 2009. Draft Climate Change Policy.

The mean annual temperature is projected to increase by between 0.7 and 2.6 degrees centigrade (°C) by the 2060s, and between 1.1 and 4.3 °C by the 2090s; the range of projections by the 2090s under any scenario is around 1 – 2 °C.

Projections of mean annual rainfall indicate decreases in rainfall for Trinidad and Tobago.

By the 2090s, the sea level for this region is projected to rise between 0.13 to 0.56 m above the 1980 – 1999 levels.

A study done by Mahabir and Nurse in 2007[34] suggests that global sea level rise has contributed to the trend of coastal erosion which has occurred over the last decade or so along some stretches of the Cocal area of Trinidad. Resources that may be at risk from erosion and sea level rise include 64.4% of swamp, 34.9% of coconut plantation and 0.6% of agricultural lands. The road that runs parallel to the coast is also at risk. Sea level rise may cause salt water intrusion, which could result in contamination of groundwater and soil salinisation.

The value of the land which may be affected or lost was calculated at approximately TT$13.5 million. This value would increase substantially if the amount of money that could be earned from other uses of these resources (e.g. agriculture, tourism, transportation) was also calculated.

Urbanisation

Though the extent of urban areas is not that large when compared with other land uses such as agriculture or forestry, their environmental impact is significant. This is due not only to the large concentrations of population that are found in cities, but because they are centers of political, cultural and economic influence, and are often the location of significant industrial activity.

In terms of urban impacts on the environment and land-cover change, there are direct and indirect impacts. The direct impacts include human settlements, industrial and infrastructural land uses, and the expansion of these land uses into areas of natural or agricultural lands.

[34] Mahabir, D. and Nurse, L. 2007. An assessment of the vulnerability of the Cocal area, Manzanilla, Trinidad, to coastal erosion and projected sea level rise and some implications for land use. Center for Resource Management and Environmental Studies (CERMES) Technical Report No. 4. University of the West Indies, Cave Hill Campus. 49 pp.

Urban built up areas have direct impacts on the hydrological cycle, and because urban paved and built-up land surfaces tend to absorb heat and to re-radiate it at night, they can also create heat islands that affect plant physiology as well as the health and welfare of urban dwellers.

The indirect impacts of urban areas on land use and land cover can be even more important. For example, cities may expropriate water from large distances, and in some cases this may have the effect of conserving large areas of land that might otherwise be developed, while in others the expropriation may have a negative impact on the ecology of natural water bodies. A significant indirect impact of urban areas is the need for sinks or dumping sites for the great volumes of waste they produce. Urban wastes can be solid, liquid or gaseous. Problems of solid waste disposal have become increasingly problematic as landfills have reached their maximum capacities, as well as the treatment and disposal of sewage.

Methyl tertiary butyl ether (MTBE) and BTEX (benzene, toluene, ethylbenzene and xylene) have been found in the groundwater in areas of North Trinidad that are relatively close to gas stations – there was a variability in MTBE concentrations ranging from 6.33 parts per billion (ppb) to less than 1.55 ppb at a Water and Sewerage Authority production well in Four Roads Diego Martin and MTBE concentrations ranges from 4.3 ppb to less than 1.5 ppb at the Curepe production well in the Valsayn Production Field.

MTBE is a carcinogenic substance that is soluble in water and not easily absorbed into the soil; it does not biodegrade and will, therefore, persist in groundwater. BTEX is made up of all components of gasoline; it is carcinogenic and its presence in groundwater indicates the possibility of leaking gasoline storage tanks[35].

The illicit dumping of lead-contaminated wastes at Demerara Road, Wallerfield in east Trinidad has resulted in contaminated soils[36]. Lead contaminated fill was used to repair roads in the area and villagers also mined the fill in search of lead pellets for use as fishing sinkers.

Over the past two (2) centuries, both the human population and the economic wealth of the world have grown rapidly. These two (2) factors have increased resource consumption significantly, as can be seen in agriculture and food production, forestry, industrial development, transport and international commerce, energy production, urbanisation and even recreational activities[37]:

[35] Environmental Management Authority. 2008. EMA Case Study Series: A Methodological Assessment of Groundwater Quality in Selected Areas of Trinidad and Tobago, November 2004 – April 2005. 8 pp.

[36] Environmental Management Authority. 2008. EMA Case Study Series: Lead Contamination and Clean-up at Demarara Road,Wallerfield. 9 pp.

[37] Steffen, W., Sanderson, A., Tyson, P.D., Jäger, J., Matson, P.A., Moore III, B., Oldfield, F., Richardson, K., Schellnhuber, H.J., Turner II, B.L., Wasson, R.J. 2004. Global change and the earth system: A planet under pressure. Springer, Berlin.

- In the last 150 years, humankind has exhausted 40% of the known oil reserves that took several hundred million years to generate
- More nitrogen is now fixed synthetically for fertilisers and through fossil fuel combustion, than is fixed naturally in all terrestrial ecosystems
- More than half of all accessible freshwater is appropriated for human purposes, and under-ground water resources are being depleted rapidly in many areas
- The concentrations of several climatically important greenhouse gases, in addition to CO_2 and CH_4, have substantially increased in the atmosphere
- Coastal and marine habitats are being dramatically altered; 50% of mangroves have been removed and wetlands have shrunk by one-half
- Extinction rates are increasing sharply in terrestrial ecosystems around the world. It is estimated that approximately 800 plant and animal species are now extinct in the wild, and half of the global flora is now threatened. The local extirpation of species, which affect local ecosystem dynamics and services, may be twice as prevalent as global extinctions[38]

Conversion of land to feed and shelter a growing human population has been one of the main reasons for human modification of the global environment. Over the coming decades, expansion and intensification of agriculture, growth of urban areas, and extraction of timber and other natural resources will likely accelerate to satisfy the demands of increasing numbers of people at higher standards of living[39].

Large areas with good agricultural soils at the foothills of the Northern Range, Trinidad, have been converted to built development. In Tobago, some of the best agricultural lands are located in and around the urban center of Scarborough and much of south west Tobago and are subjected to significant built development when compared to the rest of the island[40].

The transport and manufacturing sectors, as well as power generation have been identified as major contributors of air pollution in Trinidad and Tobago.[41] Air pollutants generated from these activities may cause harm to human, plant or animal life; damage man-made materials and structures; bring about changes in weather or climate; or interfere with the enjoyment of life or property.

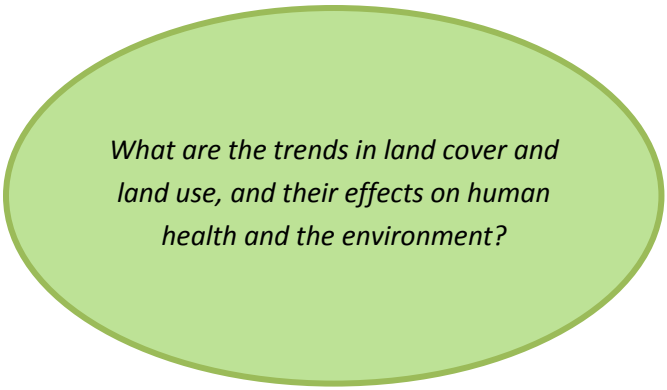
[38] Foley, J. *et al*. 2005. Global Consequences of Land Use. Science 309:570-574.

[39] DeFries, R. and Eshleman, K. 2004. Land use change and hydrologic processes: A major focus for the future. *Hydrological Process,* 18:2183–2186.

[40] Government of the Republic of Trinidad and Tobago. 2007. First Compendium of Environmental Statistics, Trinidad and Tobago. Chapter 4: Land Use. Ministry of Planning and Development.

[41] Environmental Management Authority. 2001. State of the Environment Report 2000. 74 pp.

3.0 STATE AND TRENDS OF LAND COVER AND LAND USE



Land cover is critical in understanding the condition of the environment, including the availability of habitats and changes in habitat. Unlike land cover, land use (the purpose of human activity on the land) may not always be visible. For example, a unit of land designated for use as timberland may appear identical to an adjacent unit of protected forestland, or if recently harvested, may appear not to be forested land cover at all.

In reporting on land cover and land use change, land is considered a fixed and finite resource which has limits for adequately sustaining a continually expanding population. The change analysis was conducted for the period 1991 – 2010, using Landsat imagery to extract specific categories of land cover and land use for each of the five (5) years used to record data – 1991, 1996, 2001, 2005 and 2010. For this report, land cover and land use are described in terms of five (5) major categories: forest, agriculture, swamp (wetlands), built-up and industry to permit meaningful analysis (see Box 3.1 for further information).

Table 3.1 shows the significant features of terrain and land cover, together with generalised land use for each region in Trinidad, and for Tobago.

BOX 3.1. ANALYSIS OF LAND COVER AND LAND USE CATEGORIES

Thematic Mapper (TM) images from Landsat 5 (L5) and Enhanced Thematic Mapper Plus (ETM+) images from Landsat 7 (L7) were selected for the land cover assessment study. These images have a spatial resolution of 30 metres, which dictates the level of detail discernable for features present in the images. Other limitations of the Landsat images relate to the cloud cover, which can impede image interpretation and missing scan lines on images acquired since mid-2003. Multiple images were employed in an effort to reduce the impact of these two factors.

The land cover types were delineated from the Landsat images, mainly via visual interpretation. Various red, green and blue (RGB) composites were used to enhance interpretation:

- Bands 3,2,1 (RGB) > True-colour (natural) image
- Bands 4,5,7 (RGB) > False-colour (infrared) image
- Bands 5,4,3 (RGB) > False-colour (near-natural) image

Image interpretation was also guided by classified images based on the outputs of supervised classifications using the Maximum Likelihood algorithm.

The accuracy of these land coverage extractions is approximately 70%. This accuracy level was derived from overlays done with the Town and Country Planning Division 2008 Satellite Imagery, and the Lands and Surveys 1998 Ortho-rectified Aerial Photography. Ground truthing of data did not form part of the scope of this study.

Delineation of land cover and land use categories from the imagery:

- **Forest** – Vegetation such as terrestrial forests and grass/shrubs.
- **Swamp** – Large areas of the Caroni and Nariva swamps were extracted based on visual interpretation using spectral bands that showed mangrove swamps as clearly visible outlined areas. Vegetation such as terrestrial forests, mangrove forests and grass/shrubs were delineated as “Forest”, except in the case of "Swamps" where the false colour infrared was used, to determine digitisable extent.
- **Agriculture** – Areas where agricultural fields and cultivation were visible or could be inferred from visual interpretation.
- **Built-up areas** – Based on visual inspection of the images and included residential, commercial, etc.
- **Industry** – Derived from image interpretation, using visual aids such as pipelines, industrial tanks, general topography and prior on-the-ground knowledge of given areas.

Within the broad categories, specialised uses such as sports stadia, entertainment centers, large-scale housing subdivisions and quarries, may be highlighted because of their location, size or the nature of the impacts on the environment. In some instances, specific activities may be listed to provide a deeper appreciation of a category. For example, the built-up area or urban development category embraces a large number of activities, including residential, commercial, social, institutional, and related infrastructure; agriculture includes different types of cultivated areas.

Table 3.1. Regions, terrain, land cover and land use for Trinidad and Tobago

REGIONS / ZONES	SIGNIFICANT FEATURES OF TERRAIN & LAND COVER	LAND USE CATEGORIES & ACTIVITIES (1991 – 2010)
TRINIDAD		
North-West Region		
Northern Range Valleys/Watersheds /Uplands	Valley floor and coastal zone	Agriculture, shoreline & marine recreation, entertainment, fishing, marine industry, ports and marinas
1. Chaguaramas	Upland forest	Recreation and conservation
2. Diego Martin 3. Maraval 4. Santa Cruz 5. St. Joseph / Maracas	Valley floor & lower hillsides <100 m	Urban development including housing subdivisions; industry, commercial, main roads/highways, airport; quarries; education; health, other institutional uses
	Uplands>100m and steep sloping land >1:6	Recreation and conservation
North Coastal Zone	Coastal zones	Beach recreation; fishing
Caroni River Basin Mainly north of the river (East-West Corridor)	Generally flat and gently sloping land within the flood plain of the rivers; abandoned sugar plantations; other agriculture	Urban development including housing subdivisions; Industry, commercial, main roads/highways, quarries; social, community and other institutional uses; industry
Central Region		
Caroni River Basin South of the Caroni River	Central plains, generally flat and low-lying; within the flood plain of the rivers abandoned sugar plantations Wetlands (swamp and marshes)	Urban development; housing subdivisions, agriculture, rice, road corridor pattern of developed areas and small nucleated settlements; industry; main roads/highways; quarries; water reservoirs Mangroves
Caparo Valley Basin	Rolling land; river basins	Forest reserves/forested areas; road corridor pattern of developed areas and small nucleated settlements; main roads/highways; water catchments
Central Range	Low hills - broken topography; upper watersheds of rivers	Forested areas; tree crop agriculture (cocoa); road corridor pattern of developed areas and small nucleated settlements
North-East Region	Northern Range mountains coastal zones river basins & wetlands	Forested areas /production forest; road corridor pattern of developed areas; water reservoir; quarries; coastal recreation
South Central Region	Rolling land	Forested areas, forest and wildlife

REGIONS / ZONES	SIGNIFICANT FEATURES OF TERRAIN & LAND COVER	LAND USE CATEGORIES & ACTIVITIES (1991 – 2010)
	coastal zones river basins & wetlands	reserves; road corridor pattern of developed areas with small nucleated settlement; fishing
South-East Region	Rolling land coastal zones river basins & wetlands	Road corridor pattern of developed areas; oil and gas production, pipeline corridors; oil and gas industrial areas; fishing; beach recreation
South-West Region	Rolling land coastal zones river basins & wetlands	Forest/forest reserves, wildlife reserves; road corridors pattern of developed areas; unique mineral extraction (asphalt and oil sand); oil and gas production; pipeline corridors; industrial areas
TOBAGO		
Central Ridge	Forested uplands	Forest/forest reserve
Coastal Zones	Narrow valleys, coastal strips, lower hillsides	Urban development; road corridors pattern of developed areas with small nucleated settlements; hotels and tourist zones, beach recreation, golf courses; airport; industrial estate

3.1 TRINIDAD, 1991 – 2010

3.1.1 Land Cover in Trinidad in 2010

In 2010, land cover in Trinidad consisted of approximately 3076 km^2 of forest, 830 km^2 of agriculture, 829 km^2 of built development, 99 km^2 of swamp and 30 km^2 of industrial type development (Figure 3.1). Figures 3.2 – 3.7 show all regions in Trinidad being dominated by forest, with agriculture and built development the next largest land cover categories.

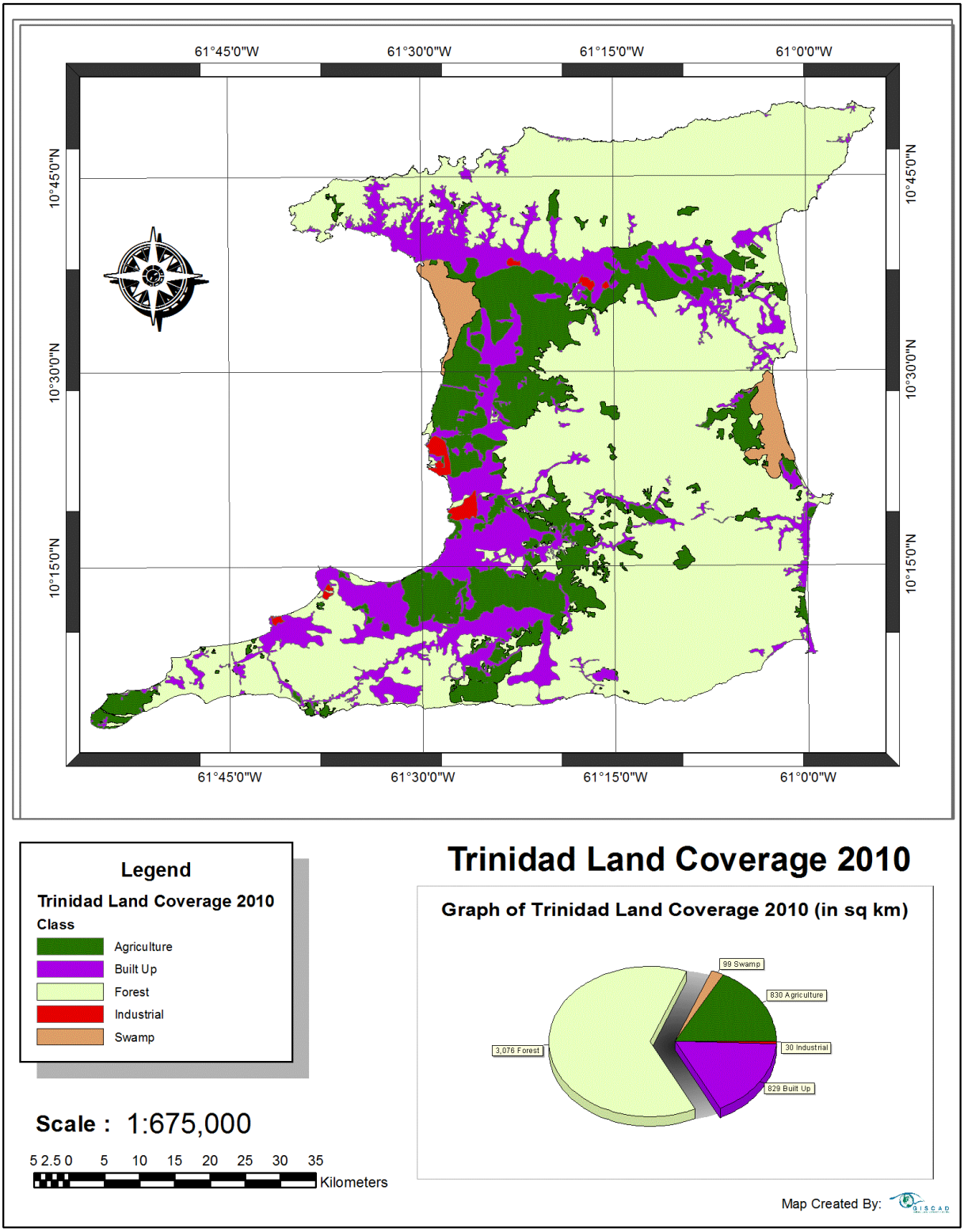


Figure 3.1. Trinidad land cover in 2010

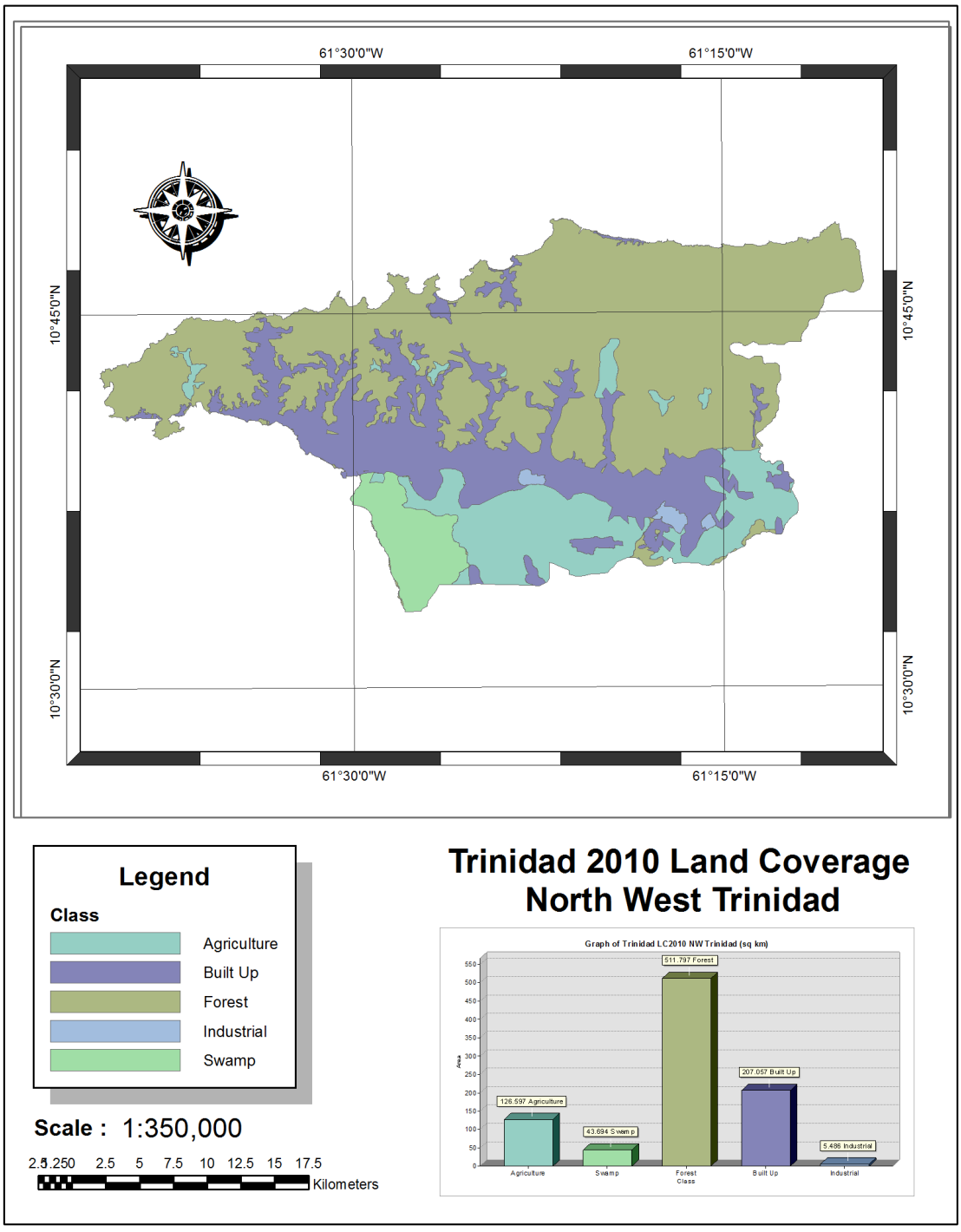


Figure 3.2. Land cover in North West Trinidad in 2010

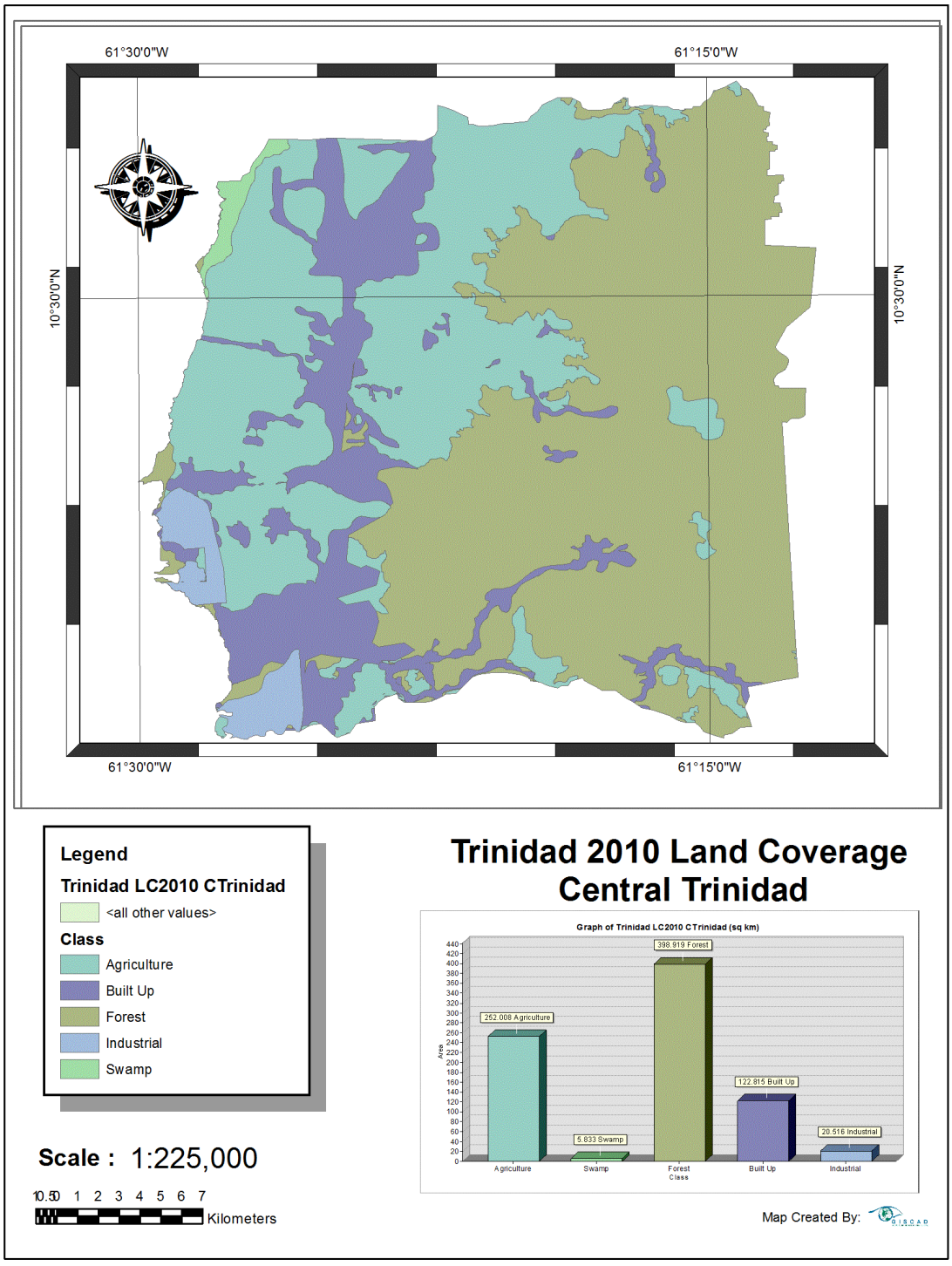


Figure 3.3. Land cover in Central Trinidad in 2010

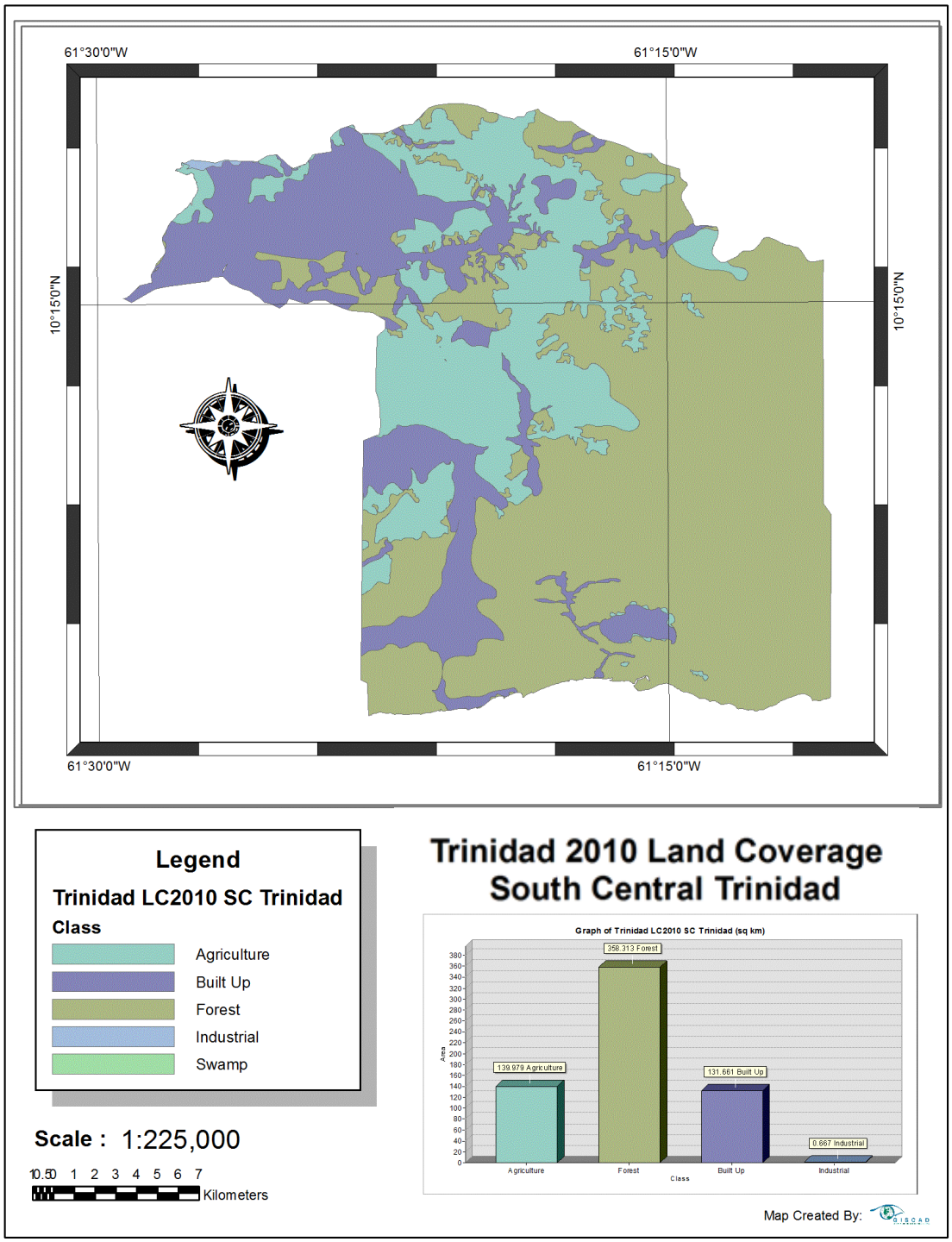


Figure 3.4. Land cover in South Central Trinidad in 2010

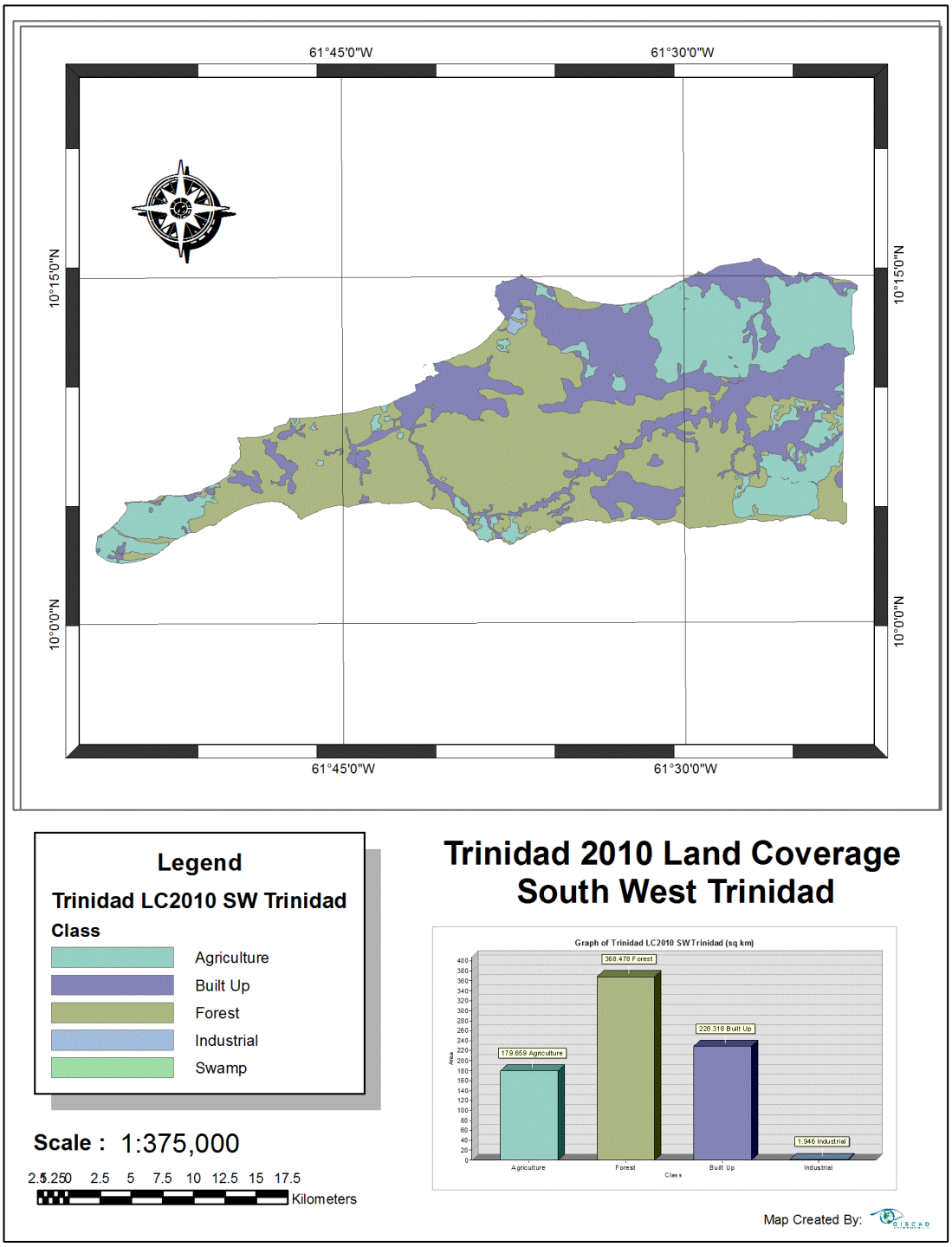


Figure 3.5. Land cover in South West Trinidad in 2010

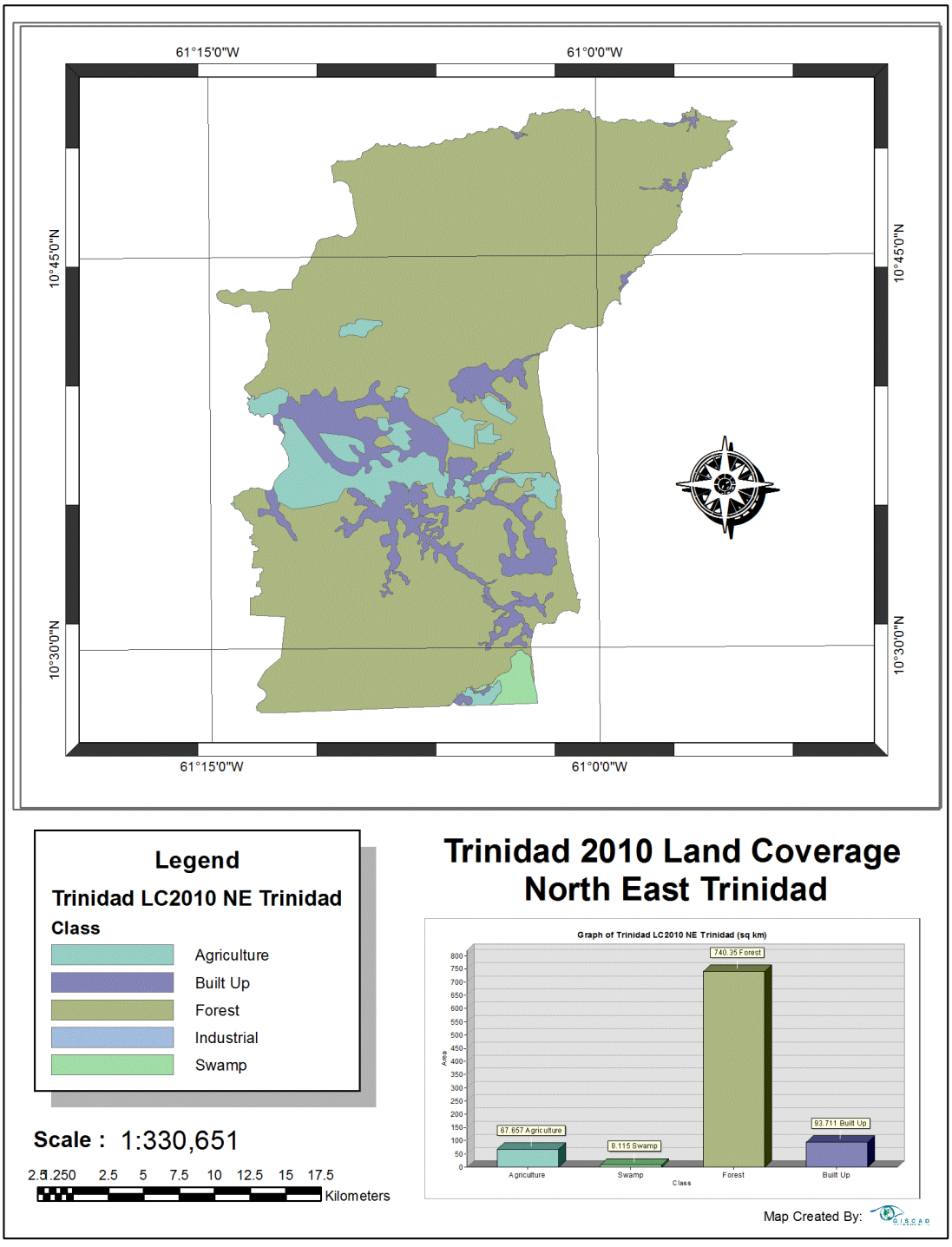


Figure 3.6. Land cover in North East Trinidad in 2010

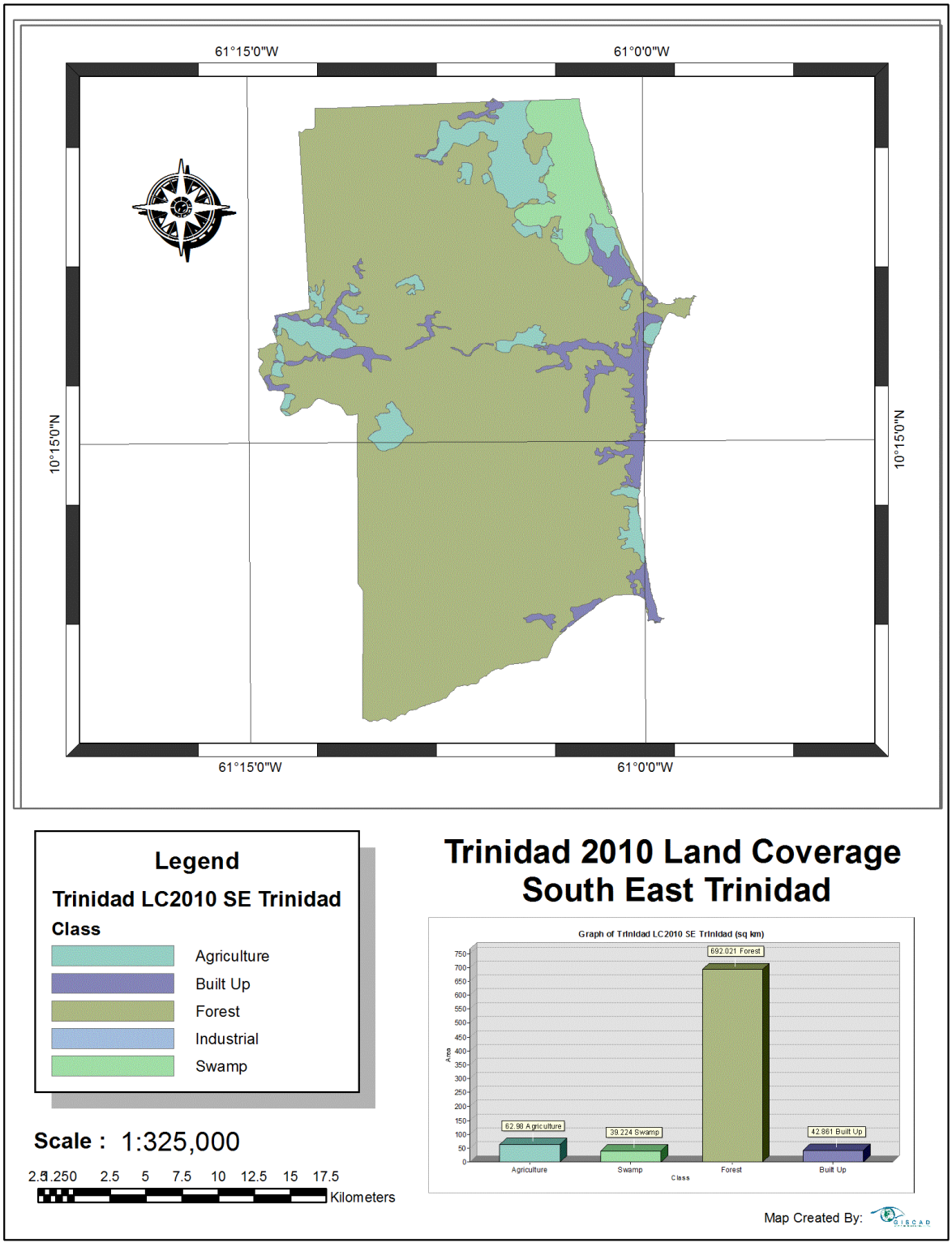


Figure 3.7. Land cover in South East Trinidad in 2010

3.1.2 Land Cover and Land Use Changes in Trinidad, 1991 – 2010

Table 3.2. Trinidad land cover and land use change for the period 1991 – 2010

	Trinidad land cover change (1991-2010)[42]										
Category of Land cover	1991	1996	'91-'96	2001	'96-'01	2006	'01-'06	2010	'06-'10	20 year period	
	km²	km²	Change	km²	Change	km²	Change	km²	Change	km²	Change
			%*		%*		%*		%*		%*
Forest	3771	3704	-2	3581	-3	3161	-12	3076	-3	-695	-18
Agriculture	610	608	-0[Ŧ]	637	5	819	29	830	1	220	36
Swamp	94	94	0	94	0	99	5	99	0	5	5
Built -up	357	432	21	525	22	734	40	829	13	472	132
Industry	24	27	13	27	0	27	0	30	11	6	25
Total Area	**4856**	**4865**		**4864**		**4840**		**4864**		**4858***	<(Mean)

*Values have been rounded to the nearest unit

[Ŧ]Value of 0.3% has been rounded to the nearest unit

Table 3.2, as well as the maps and graphs in Figures 3.1 and 3.8 – 3.11, illustrate the trends in land cover and land use changes over the period 1991 – 2010. The following conclusions may be drawn:

1. The loss of forest cover has been progressive, with the rate accelerating during the period 1991 to 2006, and declining between 2006 and 2010. This loss corresponds with the increase in land cover by agriculture and built development, in both absolute and percentage terms, in that the percentage loss in forest cover and percentage increases in agriculture and built-up land cover peak in the period 2001 – 2006.

2. The pattern of change seen in the amount of land under built development is similar to the change seen in the amount of land under forest cover. In both cases, the rates of change increased steadily for the period 1991 – 2006 and then decreased from 2006 to 2010.

3. There is a large increase in agricultural land cover in 2006 which may be linked to the closure of Caroni (1975) Limited and the policy of distributing lands to former employees as part of the Voluntary Separation of Employment (VSEP) settlement.

4. Industrial land cover, as depicted on the maps, consists primarily of heavy and light industrial estates; individual industrial establishments and small clusters are not discernable on the maps. It is noted that, notwithstanding the importance of industry and the nature and scale of its impacts, industrial land cover is relatively small and has not shown large increases.

[42] The data are taken from the maps produced for the island of Trinidad and show the absolute area of land covered in each category and the percentage change in cover in each 5-year period. The change for the entire 20-year period of the study is also shown. The total area for the years in the period is based on a summation of the category areas and varies within a range of 4840 km² and 4865 km². This is due to inaccuracies in delineating areas and does not materially affect the analysis. These figures are all higher than the official area of the island of Trinidad – 4828 km².

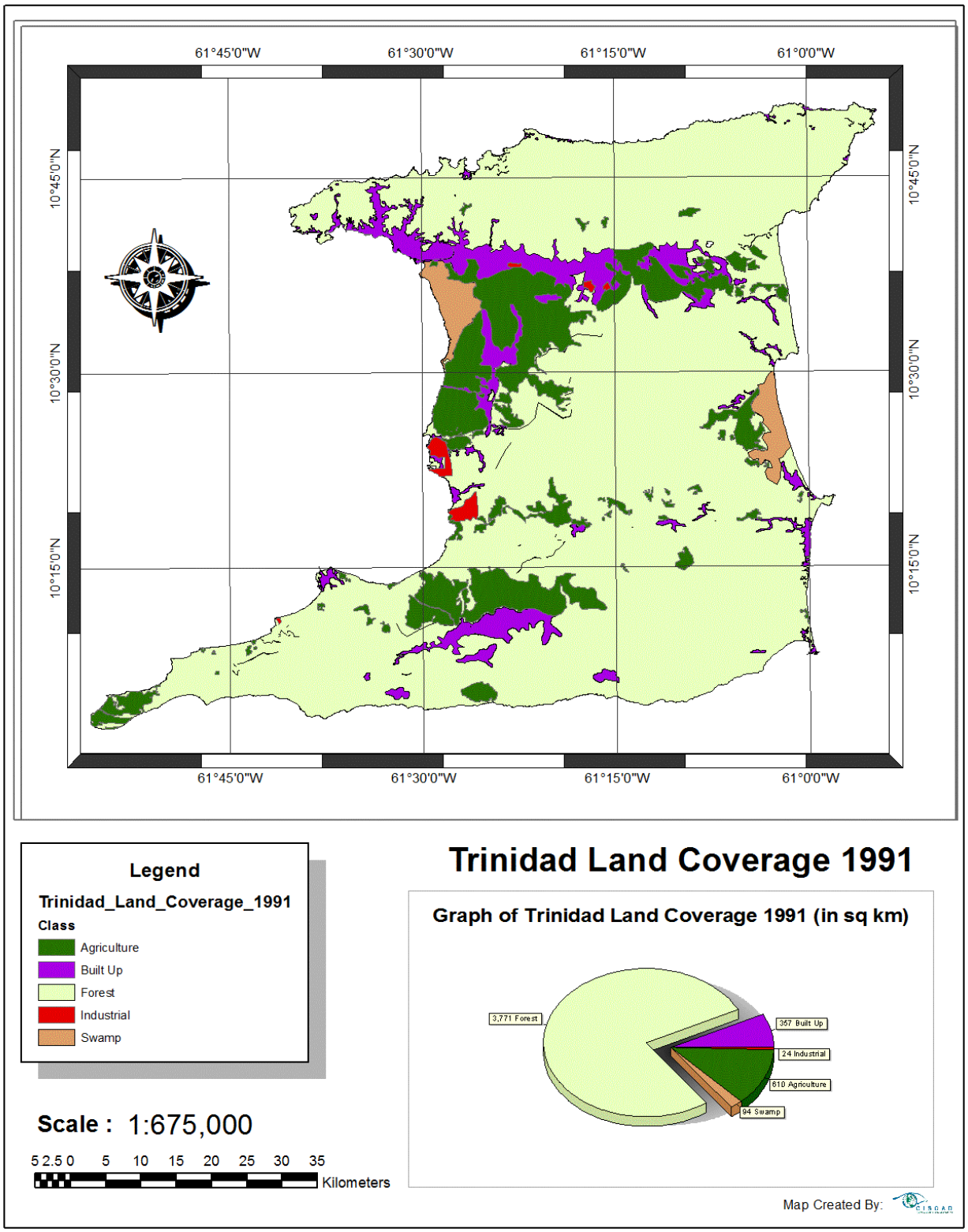


Figure 3.8. Trinidad land cover in 1991

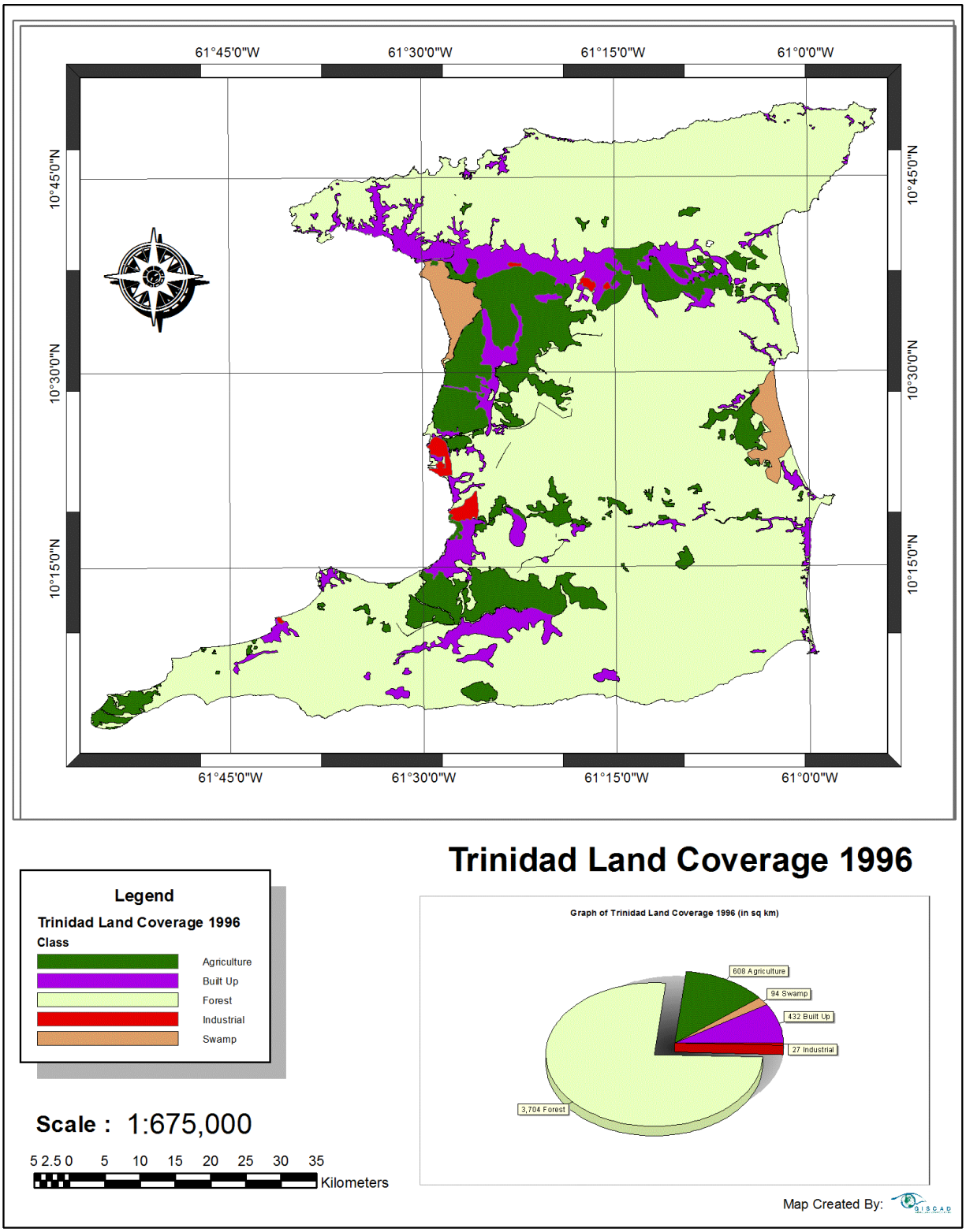


Figure 3.9. Trinidad land cover in 1996

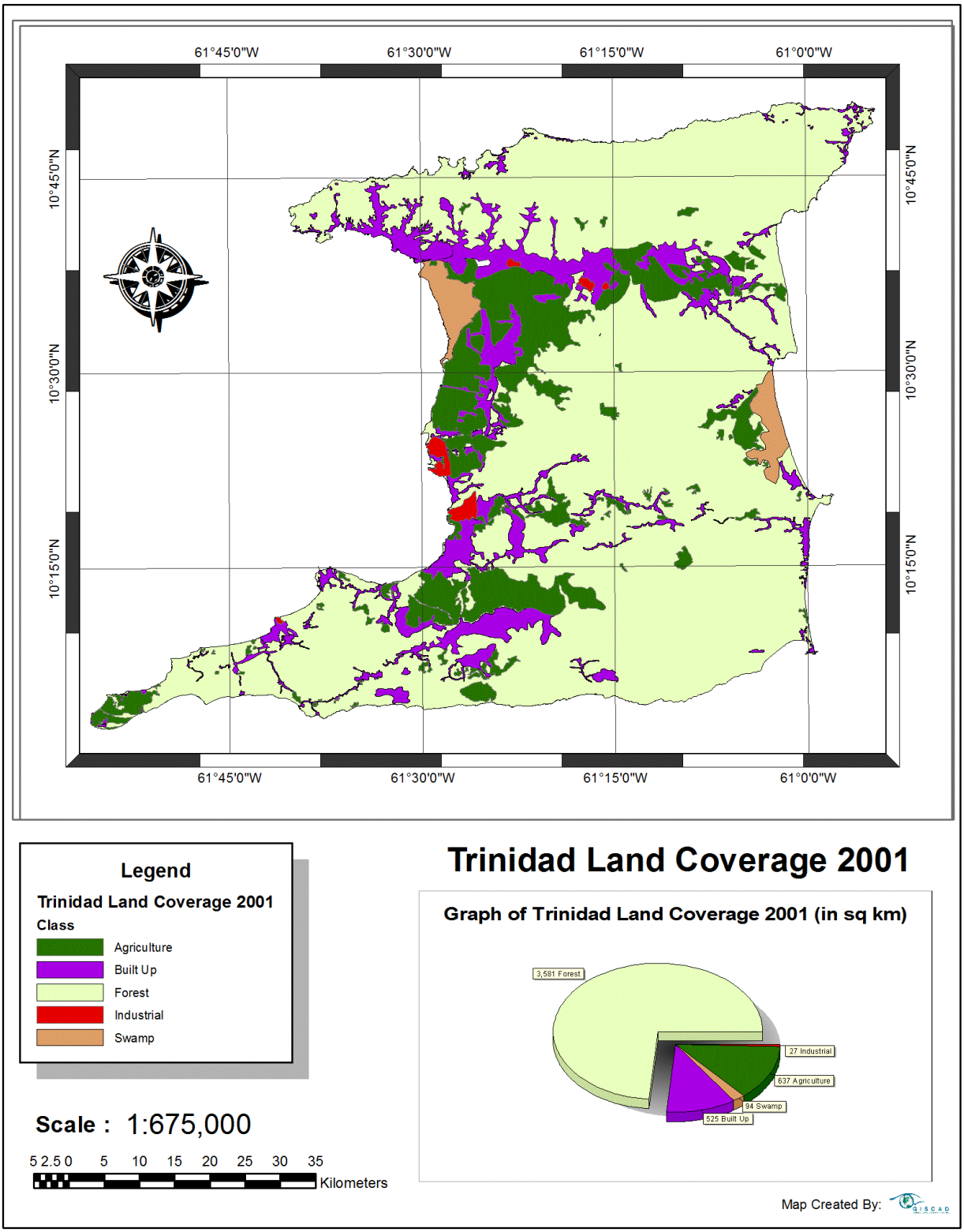


Figure 3.10. Trinidad land cover in 2001

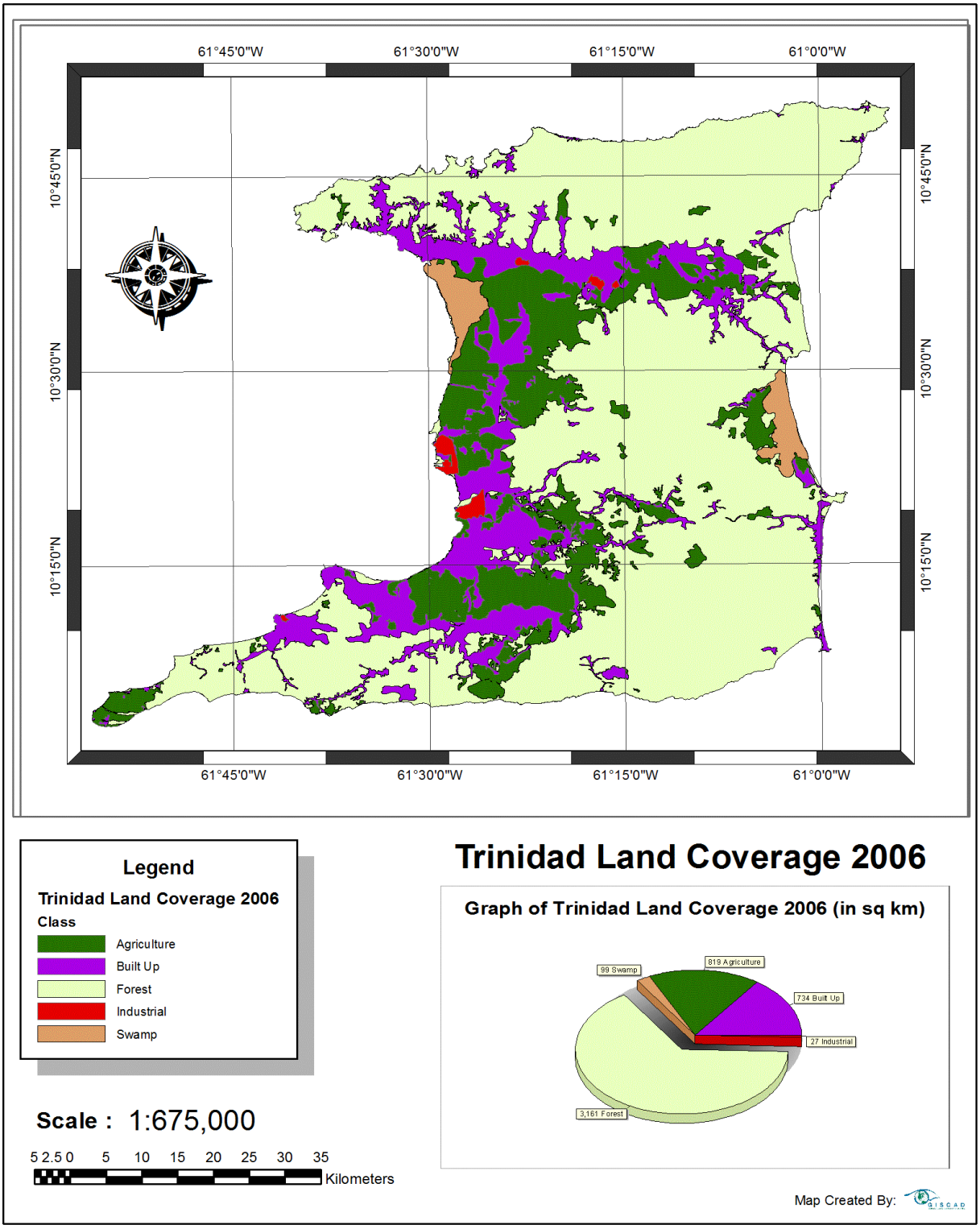


Figure 3.11. Trinidad land cover in 2006

3.1.3 Forest Land Cover in Trinidad, 1991 – 2010

1. All regions lost forest cover between 1991 and 2010 (Figure 3.12 and Table 3.3). This is matched by increases in other categories in all regions (Table 3.2).

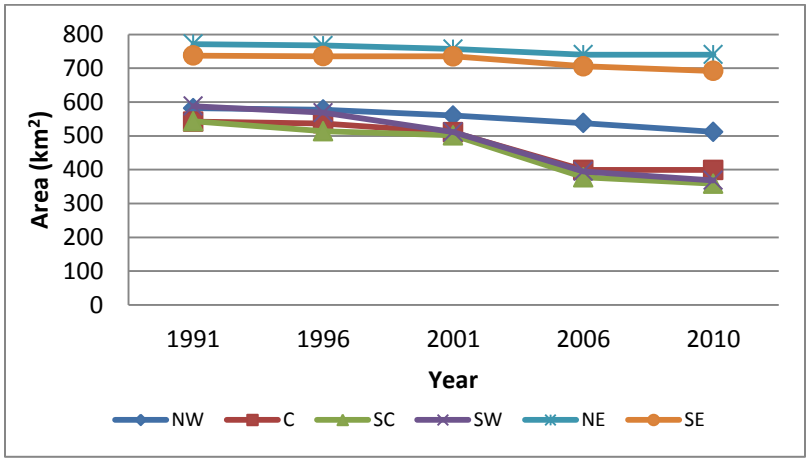


Figure 3.12. Area of forest cover (km^2) by region in Trinidad, 1991 – 2010

Table 3.3. Forest cover (km^2) by region for Trinidad, 1991 – 2010

Region	Year					Change (km^2) 1991 – 2010
	1991	1996	2001	2006	2010	
NW	582	577	560	538	512	-70
C	542	537	510	399	399	-143
SC	543	514	501	378	358	-185
SW	588	569	511	395	369	-219
NE	771	767	757	740	740	-31
SE	737	735	735	706	692	-45
Trinidad	**3763**	**3699**	**3574**	**3156**	**3070**	**-693**

2. The South West (SW) region (Figure 3.13) had the largest loss of forest cover (220 km^2), followed by 185 km^2 in the South Central (SC) and 143 km^2 in the Central (C) regions. The figures show that the loss in forest cover (695 km^2) is almost exactly matched by increases in built development (see Section 3.1.4.) and agriculture (see Section 3.1.6) combined (692 km^2).
3. The most rapid rate of change was between 2001 and 2006 in SC, SW and C Trinidad.
4. The SW region shows the largest loss between 2001 and 2006. Conversion of forested areas for the development of industrial estates at La Brea, Union and Point Fortin may be responsible for the loss of forest cover in this region.

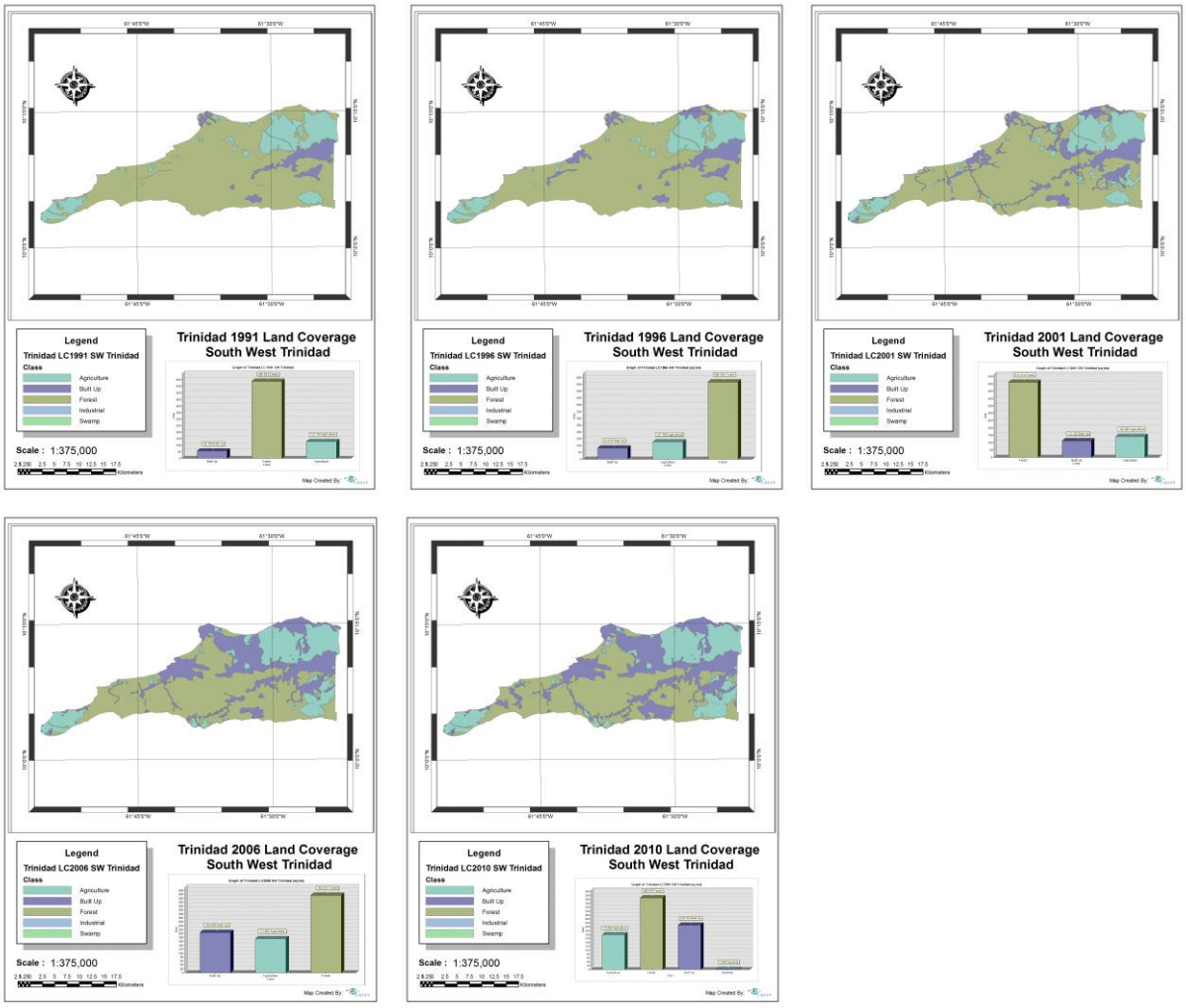


Figure 3.13. Changes in forest cover in South West Trinidad from 1991-2010

This declining trend in forest cover is supported by a study done by Opadeyi[43] on forest cover in Trinidad (only) for three years over a 31-year period (1976, 1994, 2007), which indicated an overall decrease of 1.8% in forest cover in Trinidad between 1976 and 2007 (although forest cover increased between 1976 and 1994).

[43] Opadeyi, J. 2010. Managing Our Land, Managing Our Future. Inaugural Professorial Lecture. University of West Indies. (presentation)

3.1.4 Built Land Cover in Trinidad, 1991 – 2010

1. Table 3.4 shows that for the period 1991 – 2010, the largest increase in built land cover was in SW (171 km^2) and SC (107 km^2) Trinidad.

Table 3.4. Built land cover (km^2) in Trinidad by region, 1991 – 2010

Region	Year					Change (km^2) 1991 – 2010
	1991	1996	2001	2006	2010	
NW	153	155	169	179	207	54
C	48	56	82	123	123	75
SC	25	62	66	112	132	107
SW	57	82	112	206	228	171
NE	48	51	66	76	94	46
SE	23	25	28	34	43	19
Trinidad	**354**	**431**	**523**	**730**	**827**	**473**

2. Between 2001 and 2006, a rapid rate of increase in the amount of built land cover took place in the SW region, resulting in that region overtaking the North West (NW) region in terms of the total amount of built land cover (Figure 3.14 and 3.15). This may seem surprising given (a) the large difference in population between the two (2) regions, (b) the greater amount of new housing (public and private) present in the NW region over the SW region during the period and (c) the attractiveness of the NW region over the SW region for built development of all types. However, land cover is generally more extensive in low-density areas where housing is spread out, as in the SW, than in high-density compact areas, as in the NW. It is possible that areas in NW Trinidad, especially those close to Port-of-Spain, are approaching the limits of their capacity. Consequently, new housing developments in the NW region may consist mostly of higher density units, with corresponding low land coverage, which can have positive environmental consequences. A more detailed investigation is required to fully explain these observations.

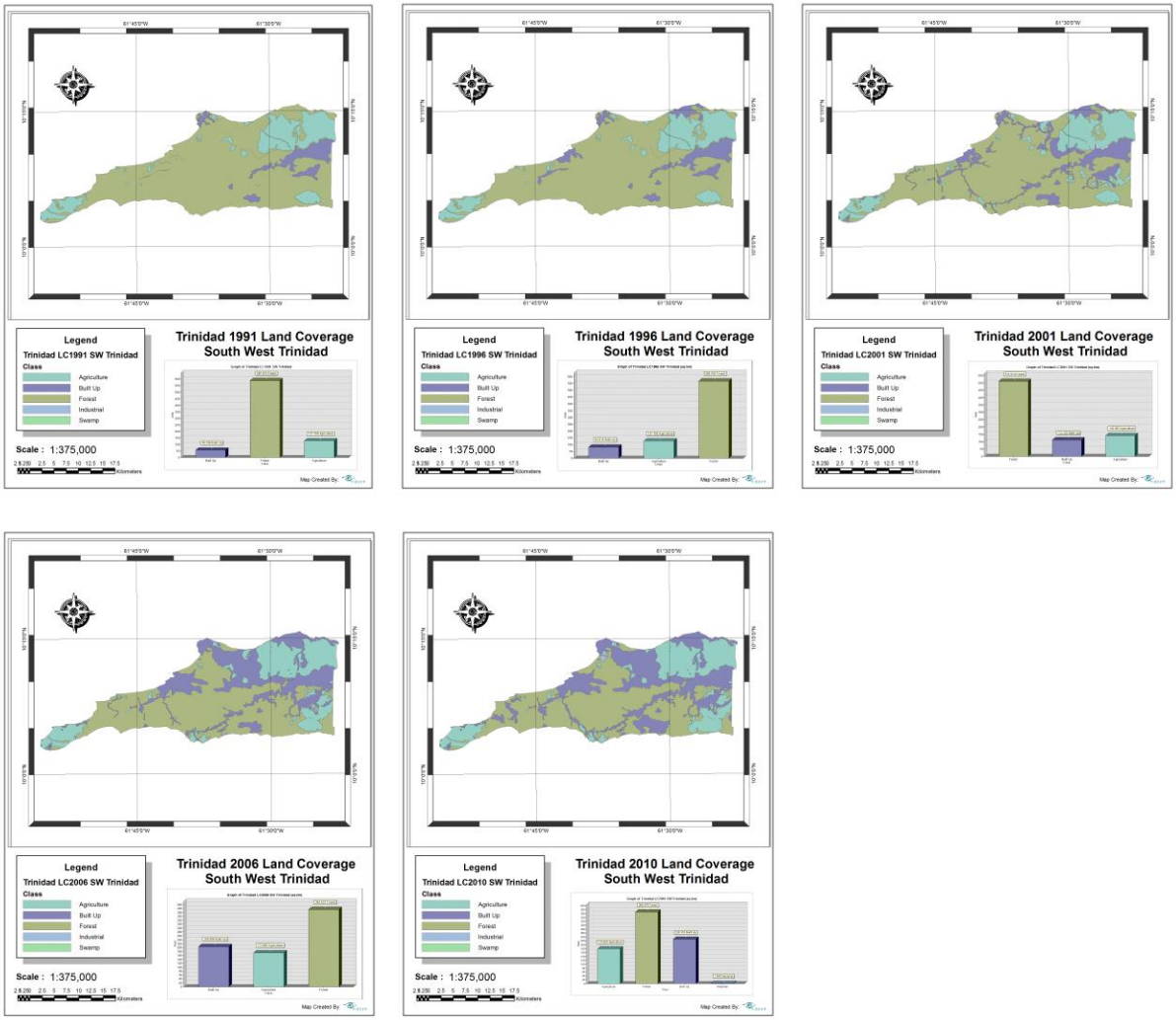


Figure 3.14. Changes in built land cover in South West Trinidad from 1991-2010

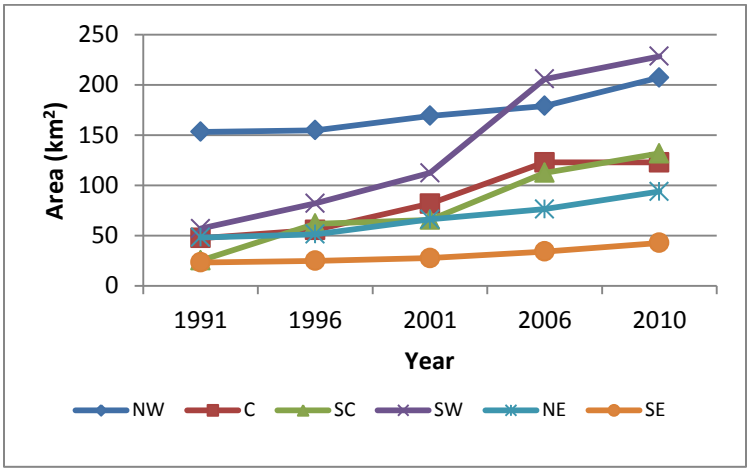


Figure 3.15. Area of built land cover (km^2) in Trinidad, 1991 – 2010

3. The smallest increase in the amount of land under built cover took place in the South East (SE) region; in this region, the population base is small, so even with a considerable population growth rate the resulting increase in built land cover would be small.
4. The highest rate of change in any one period was seen in the SC region, with an increase of 148% occurring from 1991 to 1996 (Table 3.5). The SC region recorded the largest overall percentage increase over the study period (428%) and overtook the C region in the amount of built-up land cover; this cannot be explained fully without more detailed investigation. However, the following may have had some effect – the rapid urbanisation on the outskirts of the two (2) main towns, San Fernando and Princes Town, possibly because of large-scale public housing projects and opportunities to satisfy demand for housing because of the availability of former Caroni (1975) Limited lands.

Table 3.5. Percentage change in built land cover in Trinidad, 1991 – 2010

Region	Year					% Change 1991 – 2010
	1991	1996	2001	2006	2010	
NW	0	1	9	6	16	35
C	0	17	46	50	0	156
SC	0	148	7	70	18	428
SW	0	44	37	84	11	300
NE	0	6	29	15	24	96
SE	0	9	12	21	27	83
Trinidad	**0**	**22**	**21**	**40**	**13**	**134**

Note: Values for %Change are rounded to the nearest unit

5. Spikes were recorded in the amount of built-up land cover between 2001 and 2006 in the SW, SC and C regions.
6. The NW region had the smallest percentage increase in land under built cover; this may be an indication of saturation or attainment of maximum carrying capacity. The trends suggest that there is a process of "suburbanization" in the pattern of built development over the study period – the pattern of population change (see Table 4.2 in Chapter 4.0) shows a decline or stagnation in numbers in the core cities of Port-of-Spain and San Fernando (original boundaries), while there have been steady increases in areas within the next band out from the cores, e.g. the sub-regions of Diego Martin and St. Ann's on the outskirts of Port of Spain. Within the sphere of Port-of-Spain, the percentage population growth in St. George was 17% (just below the average for Trinidad) and 36% in the C region. In the SC and SW regions, within the sphere of San Fernando, the growth rates were 15% and 19% respectively. These figures and the underlying pattern of development must be taken into account in the further investigations, as they may influence considerations on the national land use strategy.

3.1.5 Industrial Land Cover in Trinidad, 1991 – 2010

1. The largest increase in industrial land cover during a single period was seen in the SE region, which recorded a large jump in 2001 (Figure 3.16, Figure 3.17 and Table 3.6); industrial land cover was not shown, either before or after this period. This has to be investigated and explained, since the oil industry existed in this region prior to this study and other sector-related industries have been established more recently, especially at Galeota; additionally, any industry of that scale, once established, is more than likely to remain in place.

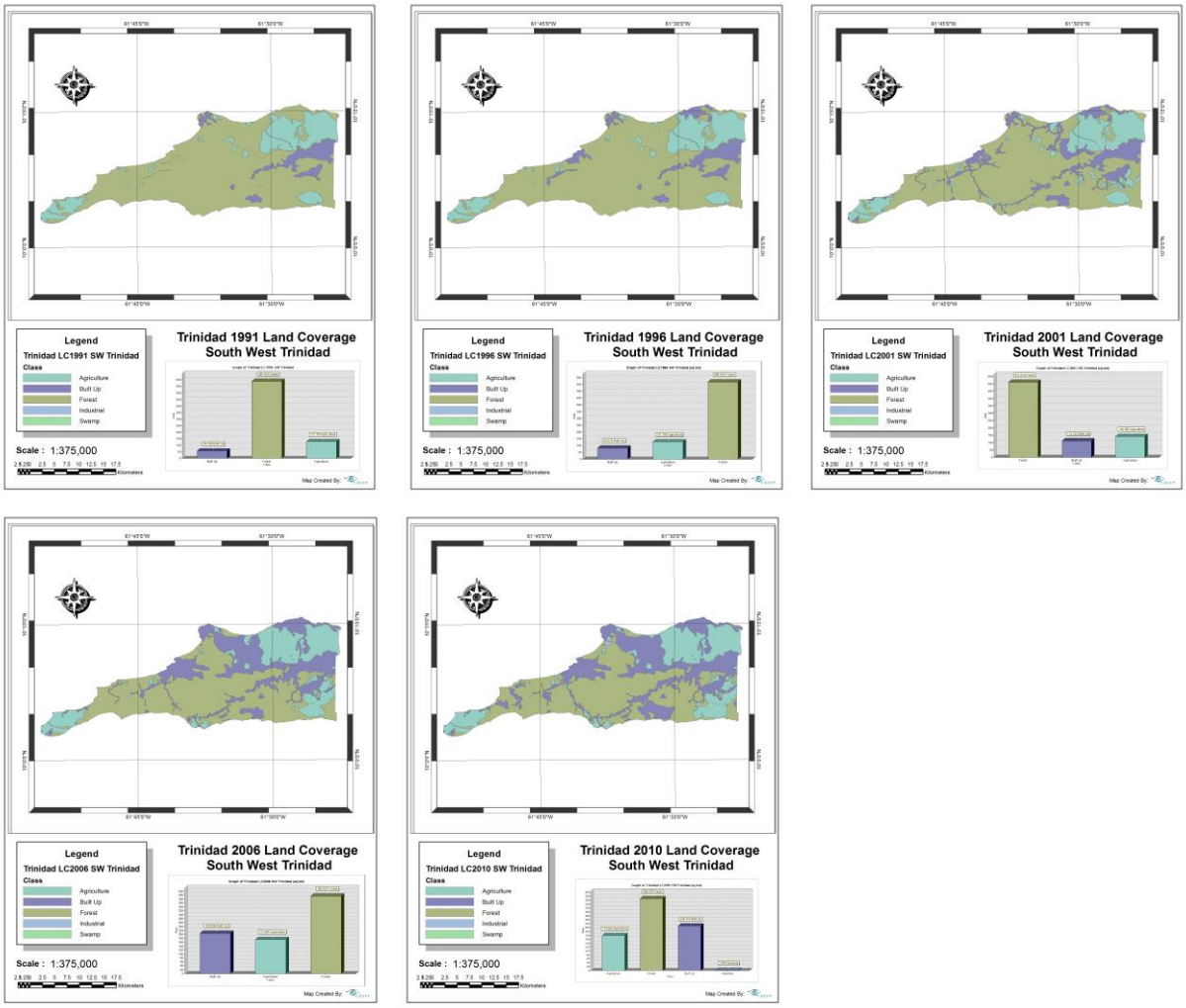


Figure 3.16. Changes in industrial land cover in South West Trinidad from 1991 – 2010

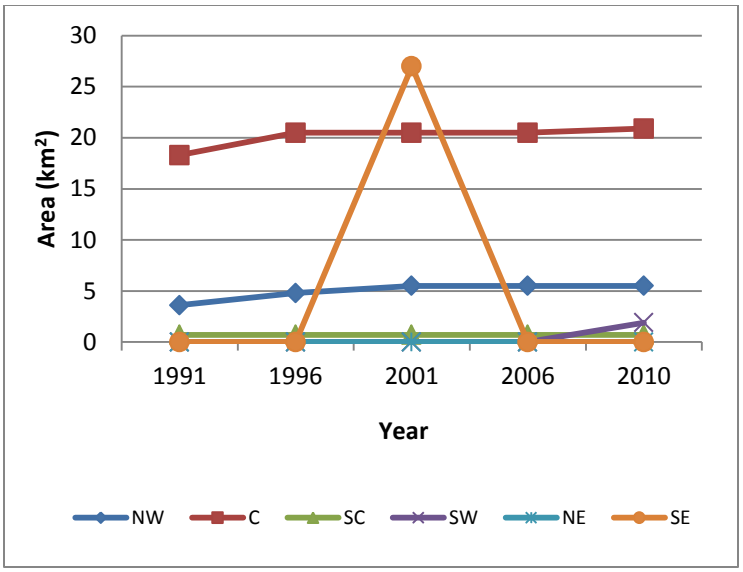


Figure 3.17. Industrial land cover (km^2) in Trinidad, 1991 – 2010

Table 3.6. Industrial land cover (km^2) in Trinidad by region, 1991 – 2010

Region	Year					Change (km^2) 1991 – 2010
	1991	1996	2001	2006	2010	
NW	4	5	6	6	6	2
C	18	21	21	21	21	3
SC	1	1	1	1	1	0
SW	0	0	0	0	2	2
NE	0	0	0	0	0	0
SE	0	0	27	0	0	0
Trinidad	**23**	**27**	**54**	**28**	**30**	**7**

2. Industrial land cover is recorded in the SW region for the first time during the period 2006 – 2010. While this accurately records the new industry at La Brea and the liquefied natural gas plant (LNG) at Point Fortin, the long established oil industrial land use has not been recorded.
3. The NW region recorded increases from 1991 – 2001, but shows no change after that. This may be indicative of a shortage of suitable land for this use in the region.
4. The trend in the C region is relatively flat, with no substantial change occurring between 1996 – 2001.
5. There is no industrial land cover recorded in the North East (NE), although it is known that quarrying for extraction of sand and gravel is extensive.
6. The amount of industrial land cover has remained unchanged in the SC region.

3.1.6 Agricultural Land Cover in Trinidad, 1991 – 2010

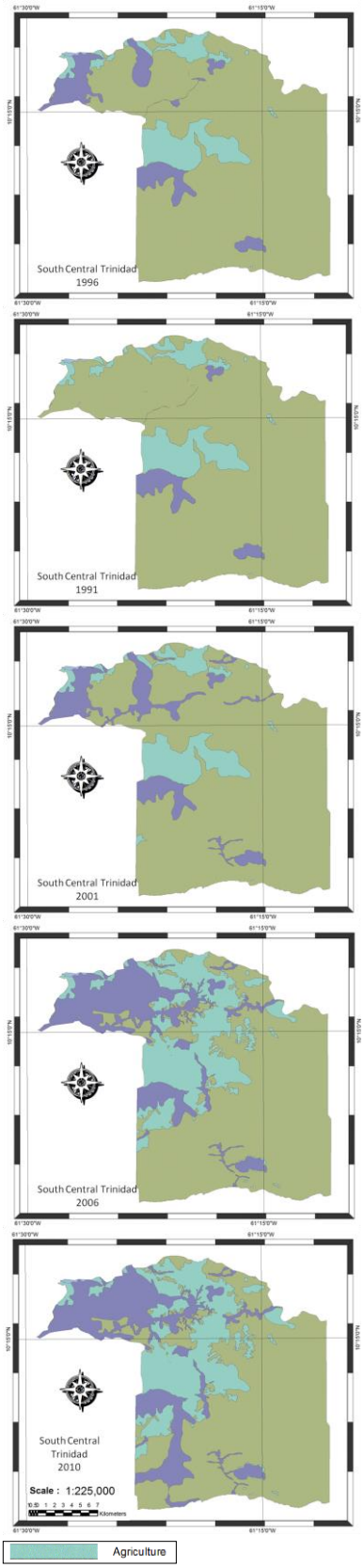


Figure 3.19. Changes in agriculture land cover in South Central Trinidad for 1991-2010.

1. The C region had the largest amount of agricultural land cover for the period 1991 – 2010 (Figure 3.18, Figure 3.19 and Table 3.7).

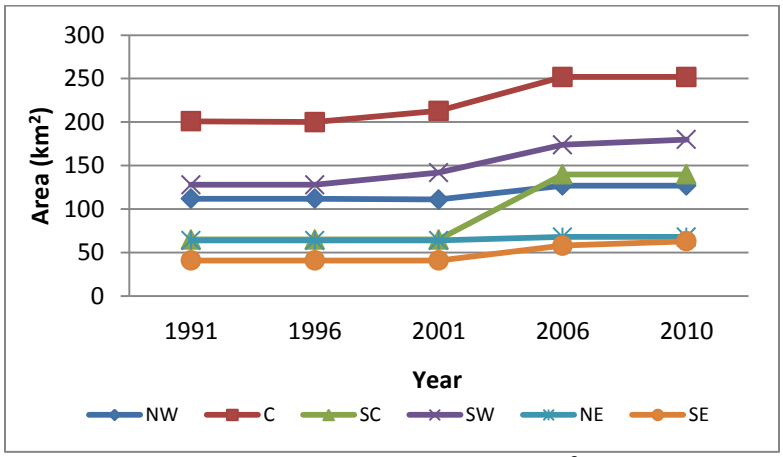


Figure 3.18. Area of agricultural land cover (km^2) in Trinidad by region, 1991 – 2010

Table 3.7. Agricultural land cover (km^2) by region for Trinidad, 1991 – 2010

Region	Year					Change (km^2) 1991 – 2010
	1991	1996	2001	2006	2010	
NW	112	112	111	127	127	15
C	201	200	213	252	252	51
SC	65	65	65	140	140	75
SW	128	128	142	174	180	52
NE	64	64	64	68	68	4
SE	41	41	41	58	63	22
Trinidad	**611**	**610**	**636**	**819**	**830**	**219**

2. South Central Trinidad had the largest increase in agricultural land cover from 1991 to 2010 (Figure 3.20). There was an approximately 115% increase in the amount of cover in 2006.

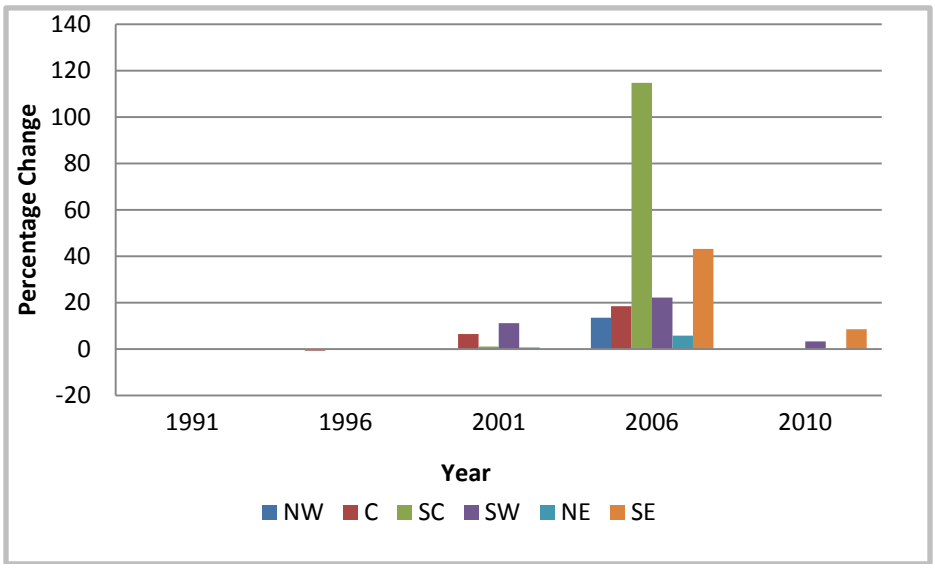


Figure 3.20. Percentage change in agricultural land cover in Trinidad by region, 1991 – 2010

3. The amount of land under agricultural cover in the SC region surpassed the amount in the NW region in 2006; this is indicative of the fact that agriculture has lost out to built development in the competition for land in the NW, whereas the SC seems to be gaining in agriculture from forest, having recorded the highest rate of increase for the study period (115%).
4. During the study period, the smallest change in agricultural land cover is in NE Trinidad (6%).
5. There was a slowing of the rate of growth in the latter part of the study period. This may be attributed to the general unattractiveness of agriculture as a means of sustainable livelihood, especially among young persons.

3.1.7 Swamp Land Cover in Trinidad, 1991 – 2010

1. In most regions, the amount of land covered by swamp generally remained unchanged during the period of review (Table 3.8). An increase in swamp cover was, however, seen in the SE region in 2006 (Figure 3.21 and Figure 3.22), which needs to be investigated and explained. It may be the result of the termination of rice cultivation and the rehabilitation and restoration of cover in the Nariva Swamp.

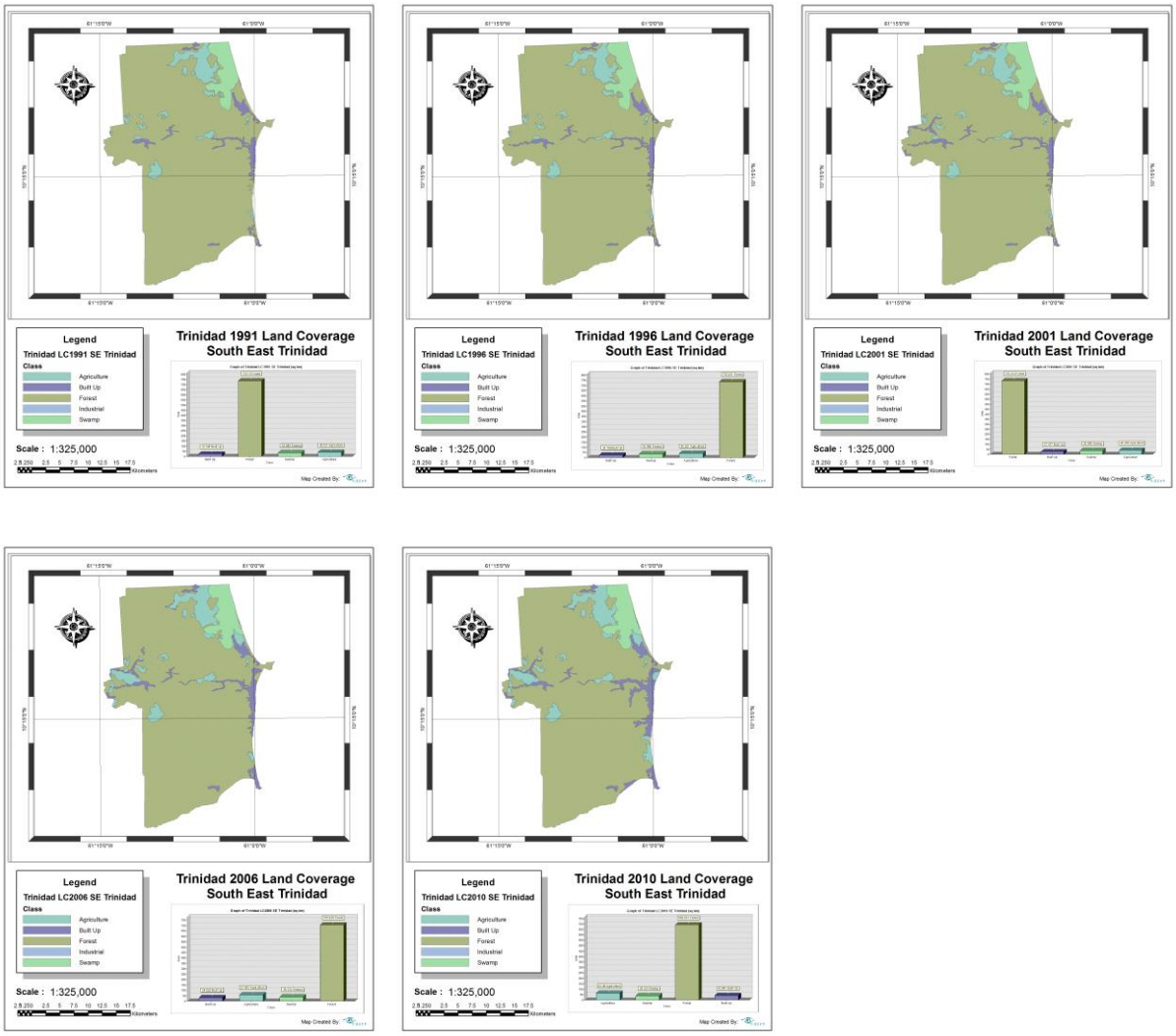


Figure 3.21. Changes in swamp land cover in South East Trinidad from 1991-2010

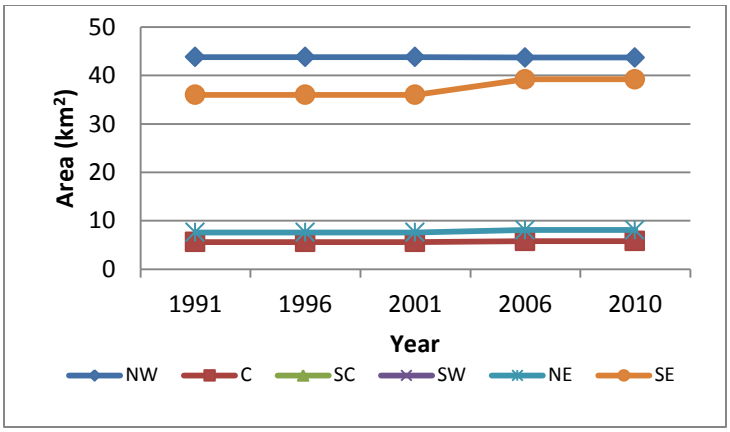


Figure 3.22. Area of agricultural land cover (km^2) in Trinidad by region, 1991 – 2010

Table 3.8. Swamp land cover (km^2) by region for Trinidad, 1991 – 2010

Region	Year					Change (km^2) 1991 – 2010
	1991	1996	2001	2006	2010	
NW	44	44	44	44	44	0
C	6	6	6	6	6	0
SC	0	0	0	0	0	0
SW	0	0	0	0	0	0
NE	8	8	8	8	8	0
SE	36	36	36	39	39	3
Trinidad	94	94	94	97	97	3

2. The amount of swamp in the NW region may appear to be larger than expected, especially when compared with that in the C region, and considering that there has been some loss of swamp land in the Mucurapo and Beetham areas; the reason for this is the fact that the Caroni Swamp is included in the NW region, since boundaries of the regional corporations were used.
3. In the SW region, there seems to be an oversight in recording no swamp cover, since swamps/wetlands are known to exist in this region; they are the Roussillac Swamp, east of La Brea, Los Blanquizales Lagoon, in Cedros and Godineau/Oropouche Swamp.

A study by Juman and Ramsewak[44] on the status of mangrove forests in Trinidad and Tobago, found a higher than anticipated mangrove coverage, perhaps because of inaccuracies in historical data and in some cases because of re-growth following past disturbances. In Trinidad, the majority of mangrove forests were found on the sheltered west coast (Gulf of Paria), an estimated 75 km^2, compared to 11 km^2 on the east coast, 5 km^2 on the south coast, and 0.003 km^2 on the north coast.

[44] Juman, R. and Ramsewak, D. 2010. Status of mangrove forests in Trinidad and Tobago. Research Report, Institute of Marine Affairs, Hilltop Lane, Chaguaramas. 124 pp.

3.2 TOBAGO, 1991 – 2010

3.2.1 Land Cover in Tobago in 2010

The 2010 Land Cover map for Tobago (Figure 3.23) indicates that forest was the predominant land cover type for the island. There were 276 km^2 of forest, 20 km^2 of built development, 5 km^2 of agriculture and 3 km^2 of swamp.

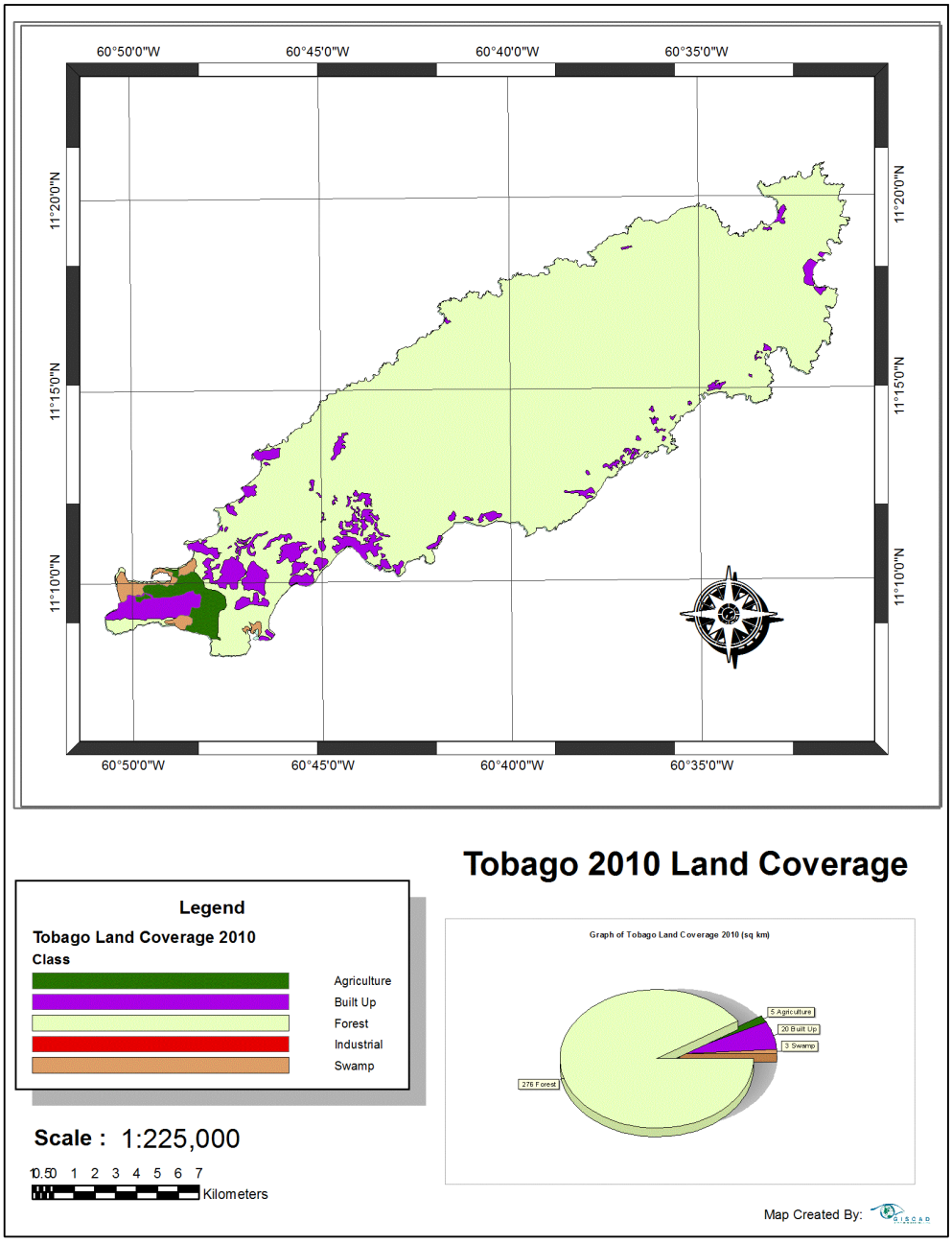


Figure 3.23. Tobago land cover in 2010

3.2.2 Land Cover and Land Use Changes in Tobago, 1991 – 2010

Table 3.9, as well as the maps and graphs in Figures 3.19 and 3.23 – 3.27, illustrate the trends in land cover and land use changes over the period 1991 – 2010. The following conclusions are noted:

1. Land cover changes in Tobago have been relatively small, except for built development, which shows an increase of almost 186%.
2. The amount of land covered by built development increased by 13 km^2 over the period 1991 – 2010. During that period, the amount of land under forest cover decreased by 13 km^2. However, it is unlikely that the locations can be precisely matched.
3. The amount of land under agricultural and swamp cover has been relatively unchanged.

Table 3.9. Tobago land cover and land use change for the period 1991 – 2010

	Tobago Coverage (1991-2010)[45]										
Category of Land cover	**1991**	**1996**	**'91-'96**	**2001**	**'96-'01**	**2006**	**'01-'06**	**2010**	**'06-'10**	**20 year period**	
	km^2	**km^2**	**Change**	**km^2**	**Change**	**km^2**	**Change**	**km^2**	**Change**	**km^2**	**Change**
			%*		%*		%*		%*		%*
Forest	289	290	0[Ŧ]	282	-3	279	-1	276	-1	-13	-4
Agriculture	4	2	-50	4	100	5	25	5	0	1	25
Swamp	3	3	0	3	0	2	-33	3	50	0	0.0
Built -up	7	7	0	14	100	17	21	20	18	13	186
Industry	0	0	0	0	0	0	0	0	0	0	
Total	**303**	**302**		**303**		**303**		**304**		**303**	<(Mean)

*Values have been rounded to the nearest unit
[Ŧ]Value of 0.3% has been rounded to the nearest unit

[45] The data are taken from the maps and show the absolute area of land covered in each category and the percentage change in cover over each 5-year period. The small differences in the total area from year to year are due to delineation variations. The official figure is 300 km^2.

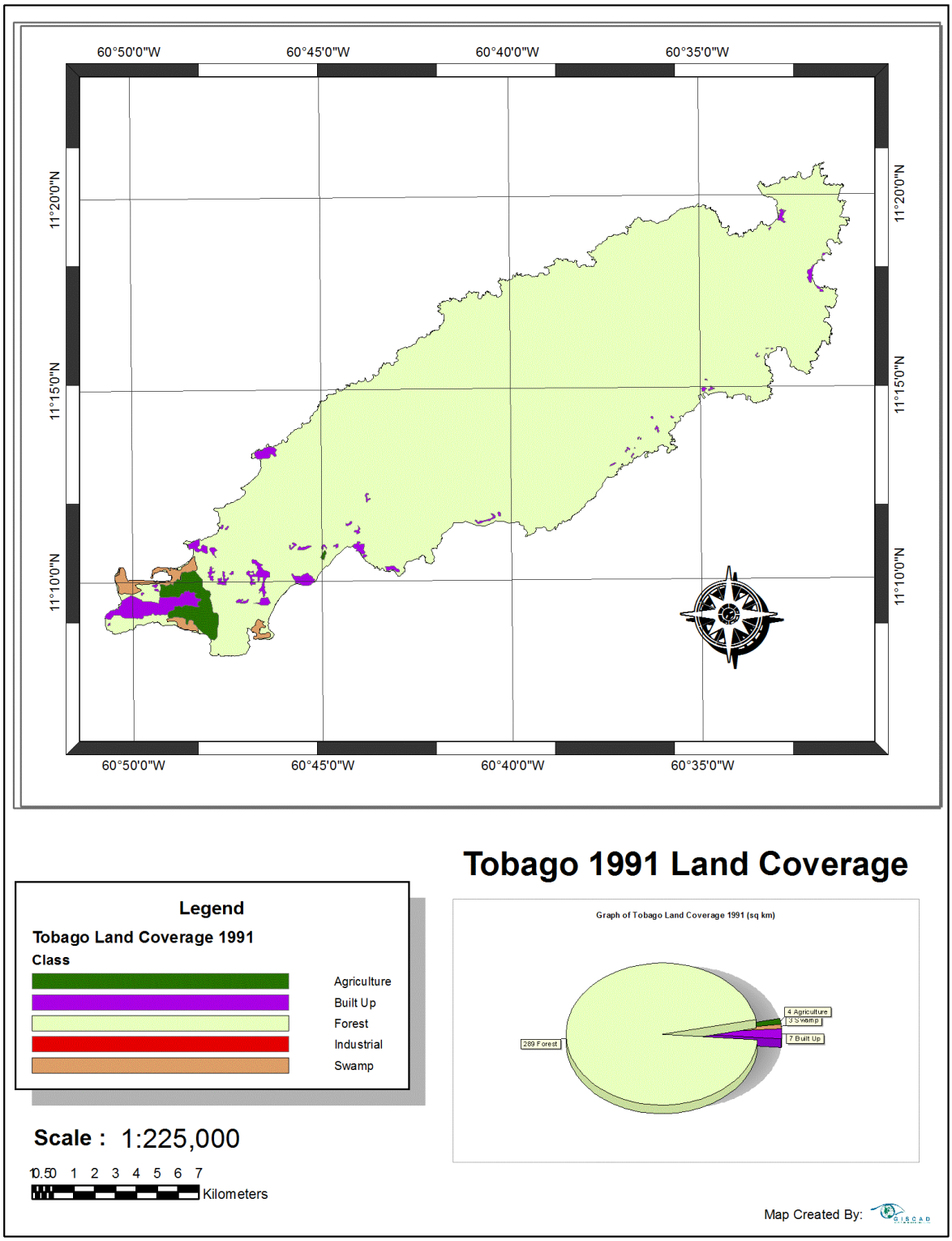


Figure 3.24. Tobago land cover in 1991

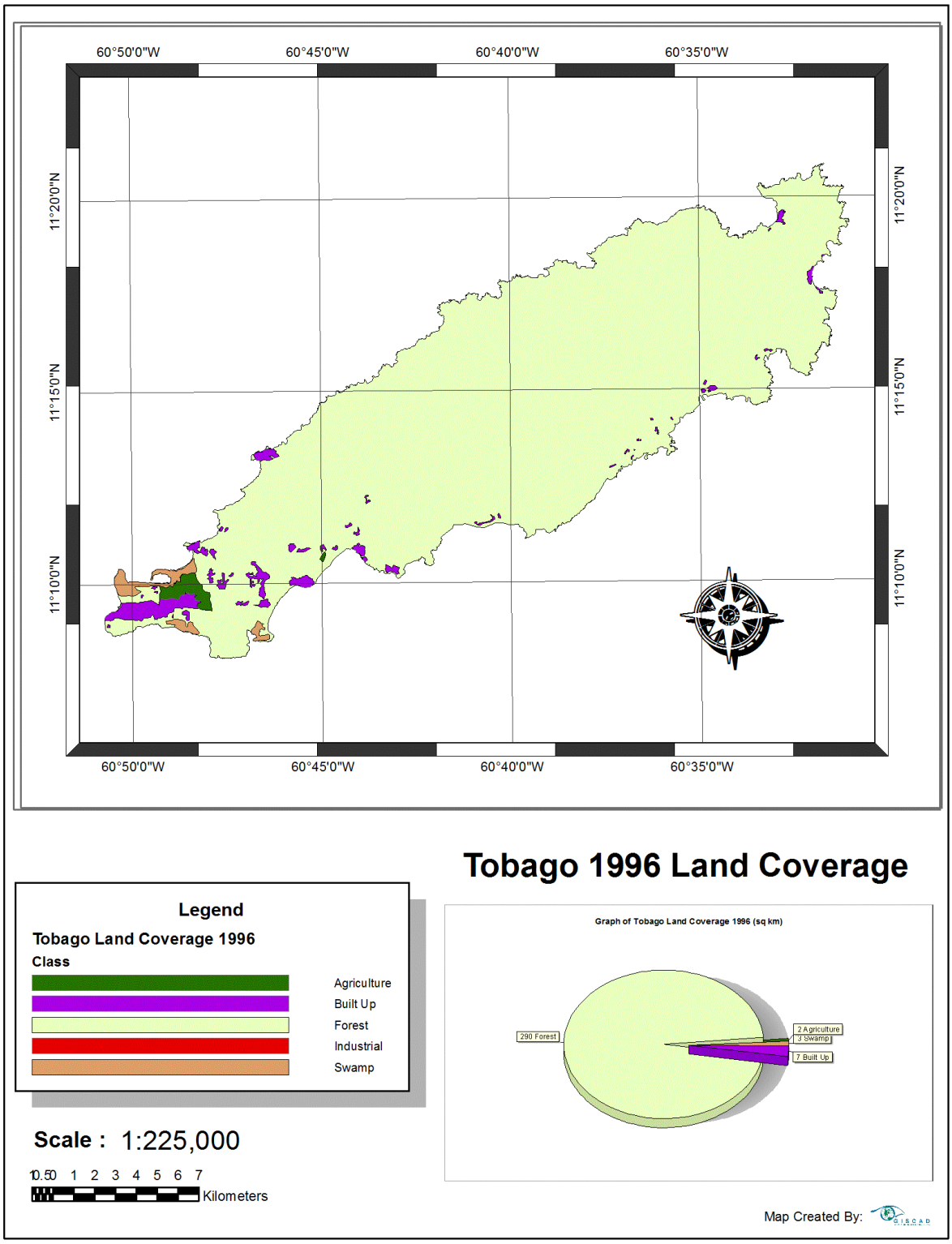


Figure 3.25. Tobago land cover in 1996

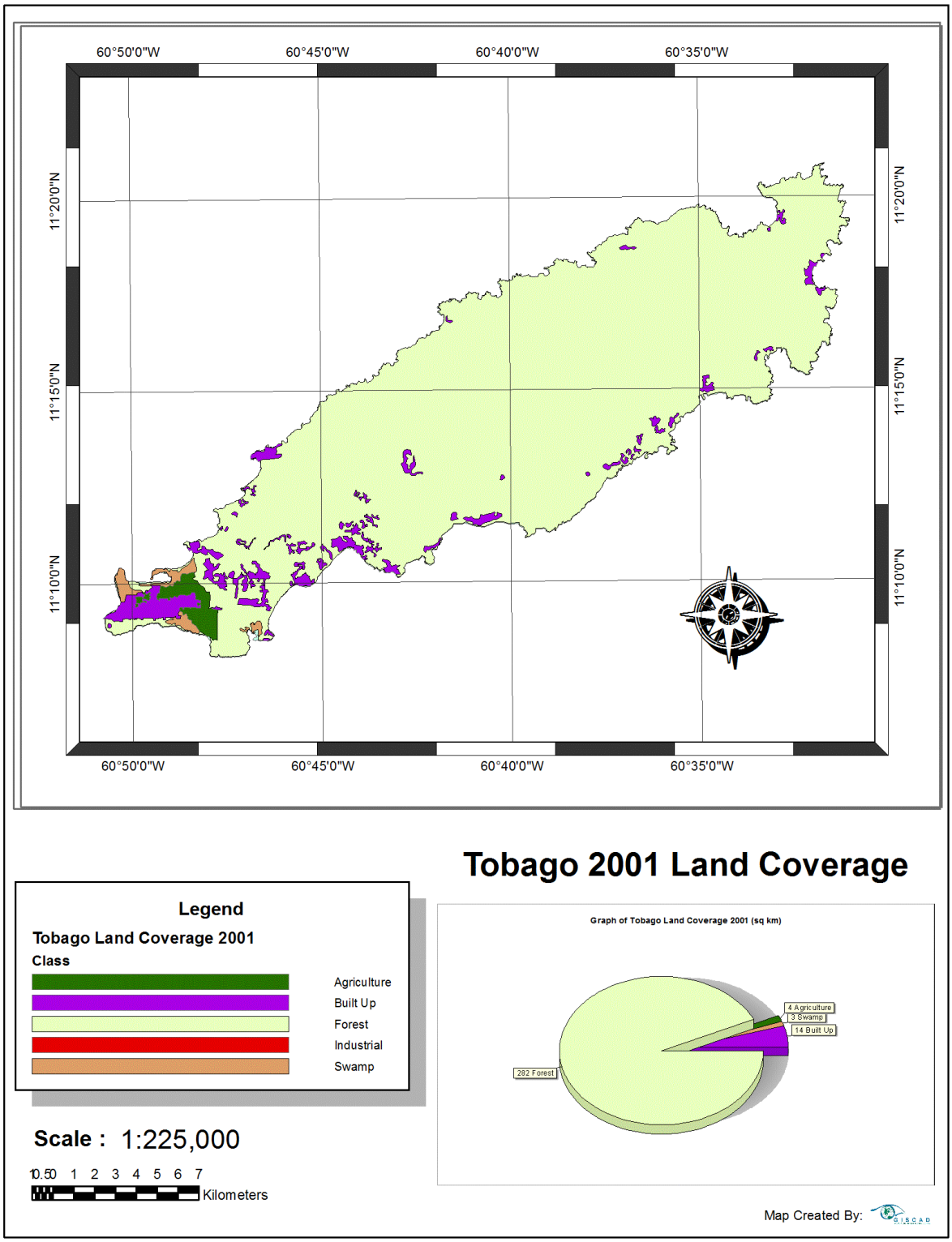


Figure 3.26. Tobago land cover in 2001

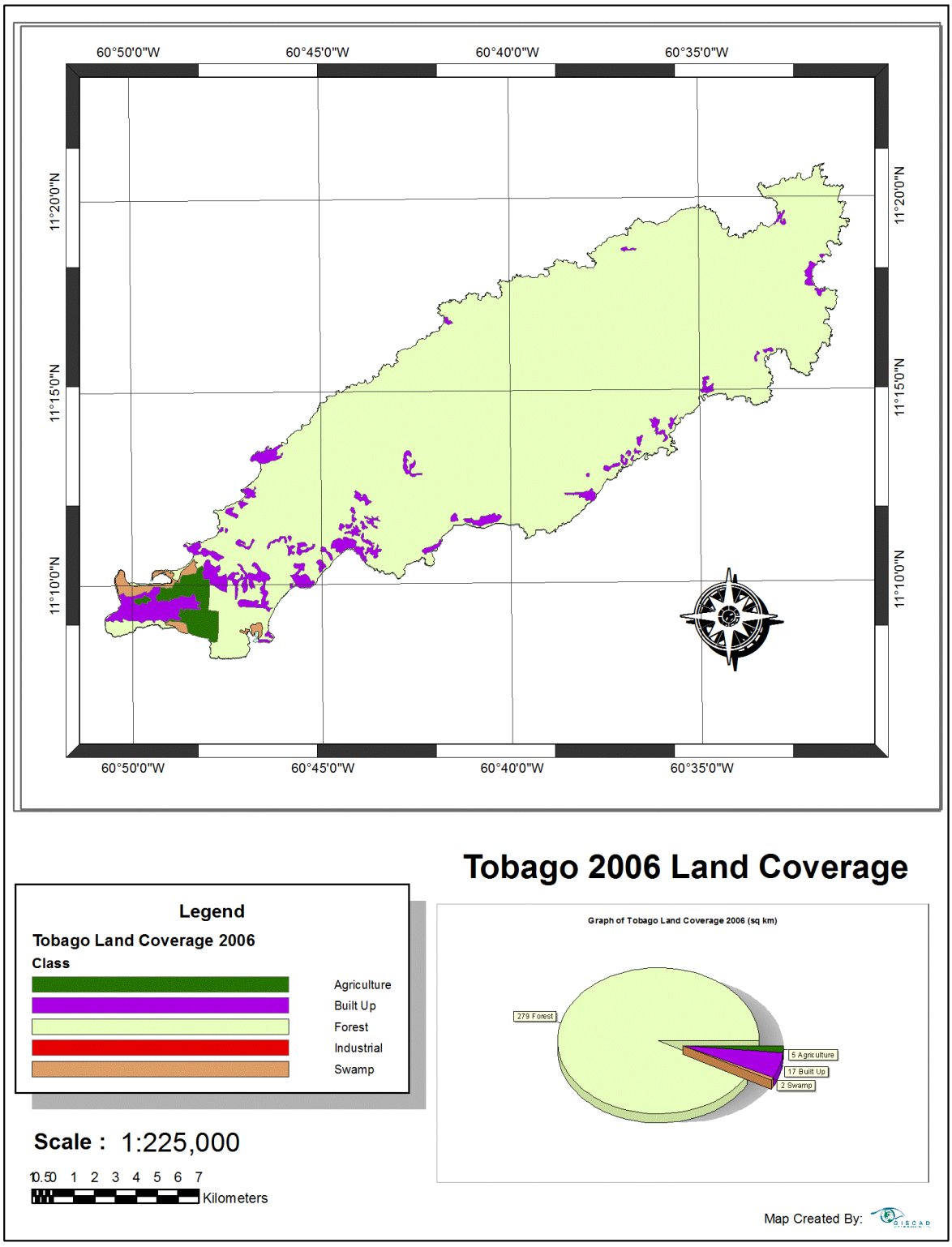
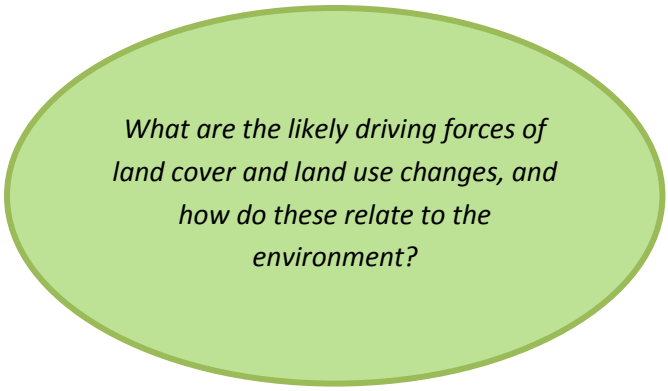


Figure 3.27. Tobago land cover in 2006

3.3 LIMITATIONS, CHALLENGES AND GAPS FOR THE STUDY

- The identification of forests and swamps needs to be further refined and investigated in order to provide a more accurate assessment of land cover trends for these categories.
- The small increase in swamp cover in Trinidad needs to be investigated further, given that swamp land was lost at Mucurapo. The evidence of increase in swamp cover suggests that there is successful subscription to the policy of 'no net loss' of wetlands.
- Cove Eco-industrial Park located near to Canoe Bay in Tobago should have been recorded in 2010. Although it is of significance to Tobago, it may not have been visible on the map at the standardised scale because of its small size (approximately 40 ha or 0.4 km^2), and was therefore not detected during the analysis.

4.0 THE PHYSICAL DEVELOPMENT PROCESS AND DRIVING FORCES OF LAND COVER AND LAND USE CHANGES



Driving forces may be considered the impetus for processes that culminate in physical development which, in turn, results in land cover and land use changes. As such, driving forces are development-inducing factors which initiate and trigger the process of development and can be collectively described as the overarching social and economic factors which reflect people's needs and create demands for development responses and the policies and strategic directives of government administrations and political directorates. The discussion on driving forces recognises both authorised and unauthorised action.

Some driving forces are the indirect product of population growth and socio-economic factors; others are responses to political (governance) imperatives and earmarked budgetary allocations, while others are inherent in development actions, involving biological and physical change in the features and characteristics of land. The 2004 ASOE report[46] defines a driver as "*…any natural, human, or institutional factor that directly or indirectly explains impacts on an ecosystem. Land use and land-cover change were collectively considered direct drivers of change.*" Driving forces may be grouped into categories as follows:

Social Forces

- Population growth which creates demands for: shelter; recreation; educational facilities; health facilities; entertainment; jobs and transport infrastructure and public utilities also included under economic forces.
- Inward migration which influences the location of demand for housing and other facilities.

[46] Environmental Management Authority. 2005. Report of an assessment of the Northern Range, Trinidad and Tobago: People and the Northern Range. 184 pp.

- Poverty which leads to a search for livelihoods (subsistence agriculture) and housing space (squatting) often resulting in inappropriate use of land.
- Cultural practices which have many positive, but also negative, behavioural implications, such as misuse of the environment; lack of understanding, care and sensitivity by users for the environment; and lack of knowledge of interconnectedness between land use, development actions and environment.
- Increasing prominence and direct contribution of non-governmental and community-based organisations in activities which embrace environmental restoration and conservation.

Economic Forces

- Opportunities for converting natural mineral resources such as oil, gas, stone, sand and asphalt to marketable products involving exploration, extraction, and production activities.
- Policies and programmes on the use of developable agricultural lands to satisfy the demand for food and to achieve the goal of food security.
- Growth in international trade, with liberalisation and globalisation generating increased demand for air and sea ports.
- Pursuit of business opportunities in both the traditional sectors (such as retail trade) and development of new green businesses involving recycling and reuse.
- Establishment of industrial estates and business parks to utilise oil and gas resources, and diversify economic production away from traditional energy activities into knowledge sectors such as Information and Communication Technology (ICT) and downstream energy products.
- Increased construction activities leading to more quarrying and production of construction materials.
- Demand for modern internal communication in the form of roads, highways and transport facilities for the movement of people and goods.
- Creation of key infrastructural elements including transportation and public utilities such as water mains and waste water facilities, electricity and telephone.

Governance/Political Forces

- Development policies as they relate to choice of industries and geographical locations.
- Development strategies such as alliances with foreign entities to pursue projects and the scale of development projects.

- Strategy of centralisation versus decentralisation of governmental activities which influences location of building facilities, leading to intensification in urban centers or dispersion.
- Political governance – policies to devolve authority to local levels.
- Policy approach to conservation of the natural environment and the built heritage.

The diagram in Figure 4.1 illustrates the steps involved in the physical development process and indicates the relationship between land cover and land use changes, the driving forces and actions that induce change and the environmental consequences.

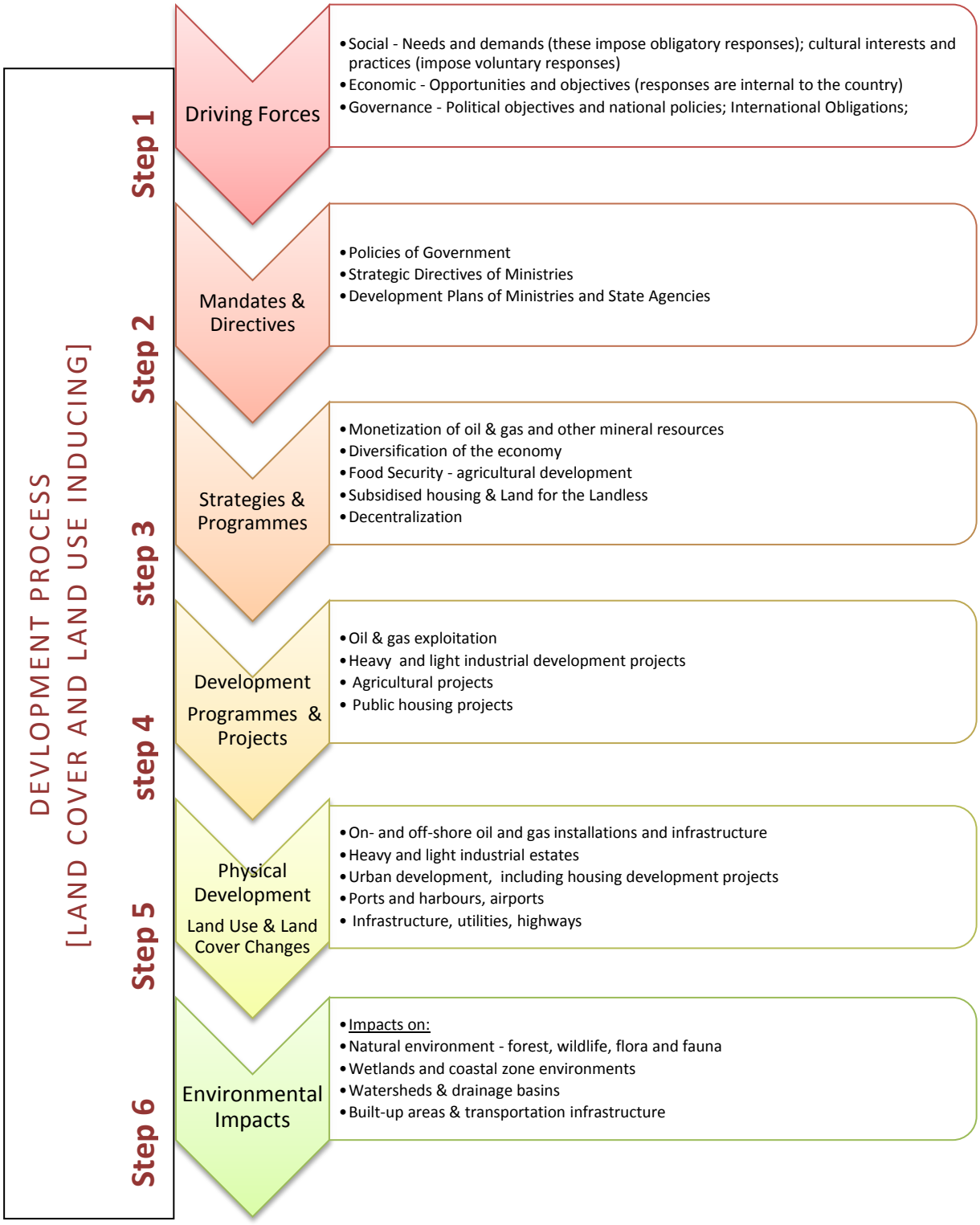


Figure 4.1. The physical development process and the relationship between land cover and land use, driving forces and environmental consequences

4.1 SOCIO-ECONOMIC DRIVING FORCES IN TRINIDAD AND TOBAGO

4.1.1 Population Growth

Population growth is one of the most significant drivers of land cover and land use changes because increases in population generate a demand for shelter, education, health and recreational facilities, jobs, and transportation infrastructure.

The official statistics on population growth in Trinidad and Tobago, as shown in Table 4.1, reveal a very low rate of growth averaging 0.5% over the 20 year period 1991 to 2010. The growth in the non-institutional population (defined as persons 15 years and over, excluding persons resident in prisons, hospitals and homes for the aged for more than six [6] months) does not, however, mirror the rate of growth of the general population. The non-institutional population increased by 4.7% in 1996 over 1991 and 8.3% in 2001 over 1996 but this rate dropped significantly to 4% in 2006 and dramatically to 2% in 2010 over 2006 (Figure 4.2).

Table 4.1. Trinidad and Tobago population and labour force (1991 – 2010)

Characteristic	1991	1996	2001	2006	2010
Total Population	1,213,733	1,219,801	1,262,366	1,294,494	1,317,714
Percentage (%) Change	0.0	0.5	0.5	0.3	0.6
Non Institutional Population – 15 yr+	837,200	876,700	949,900	978,500	997,100
Labour Force	492,200	530,400	576,500	625,300	608,400
Persons Employed	401,000	444,200	514,100	586,300	578,900
Persons Unemployed	91,200	86,100	62,400	39,000	29,500
Participation Rate (%)	58.7	60.5	60.7	63.9	61.0
Unemployment Rate (%)	18.5	16.2	10.8	6.2	4.8

Source: Central Statistical Office, Annual Digests and Labour Force Reports

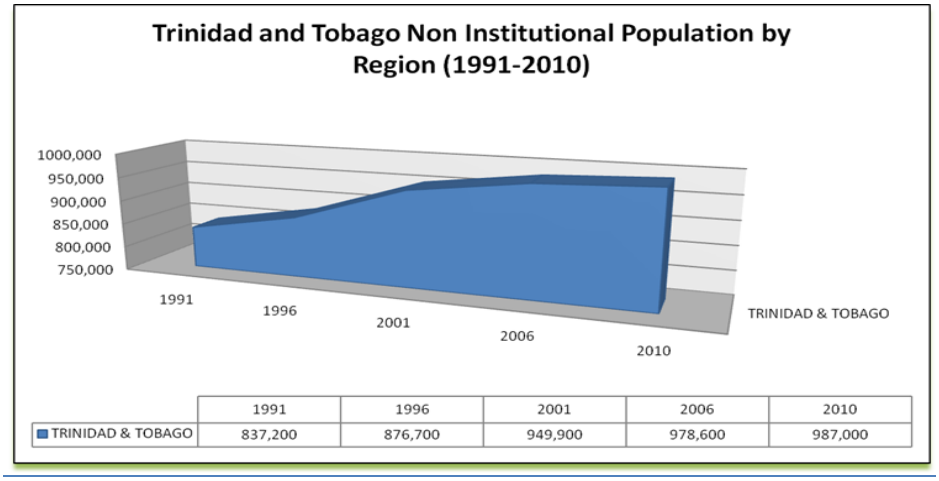


Figure 4.2. Non-institutional population in Trinidad and Tobago (1991-2010)

The main implication of the population growth statistics is that the impact of population as a driving force in land use change will be reduced as the population stagnates. But for the period under study, the effect of population as a driving force was demonstrated more through demand for shelter and other facilities as a result of increased incomes and prosperity of individuals and families, rather than mere population growth.

Non-Institutional Population 15 years of Age and Over by Region

The only data available to show the distribution of population by region are based on the statistics for non-institutional population 15 years of age and over. These statistics are relevant in that the non-institutional population is the major part of the productive population and represents those members likely to have the greatest impact on land use.

The data shown in Table 4.2 confirm a steady decline in the resident population in the capital city of Port-of-Spain of 28% in 2010 over 1991 (Figure 4.3). The capital city, however, remains the main center for business and governmental transactions which generates a large transient population in excess of 100,000 persons daily. This influx of persons does not impact the existing land use, but creates additional pollution from vehicle exhaust and disposal of refuse. The city of San Fernando displays a stagnant population situation. In north Trinidad, the significant sub-regions are Diego Martin and St. Ann's which show steady, if not dramatic, growth. For the Caroni region, significant growth was registered in 1996, but declined thereafter, reflecting the creation of the Chaguanas Borough previously recorded under the Caroni region. However, if the two (2) areas are combined to represent the Central Region, the continuing population is significant. It exceeds the two (2) cities and three (3) boroughs.

Tobago's non-institutional population 15 years of age and over is relatively stagnant at around 40,000 persons.

Labour Force

The labour force grew steadily over the period 1996 to 2006 when the participation rate registered 64%. However, a decline to 61% was observed for 2010, although the unemployment rate was 4.8%, the lowest on record (Table 4.1). The low unemployment statistic derives from the definition of unemployment used by the Central Statistical Office, which includes persons actively seeking work up to three months before a survey. Therefore, persons who are without jobs, but not looking for employment, whatever the reasons, are not counted as unemployed. Further, all persons who worked for pay for any length of time during the survey are counted as having jobs which means that persons employed in unemployment relief programmes will be considered employed. During the period being reviewed, there has been an expansion of unemployment relief programmes as well as educational and

training programmes which absorb significant numbers of persons who might be otherwise unemployed.

Table 4.2. Non-institutional population statistics by region for Trinidad and Tobago (1991-2010)

	1991	1996	2001	2006	2010
TRINIDAD & TOBAGO	837,200	876,700	949,900	978,600	987,000
North West:	356,200	369,000	401,000	396,600	394,200
Port of Spain	39,200	36,900	33,800	30,900	28,400
Arima Borough	22,100	21,100	23,000	24,100	21,800
St. George	294,900	311,000	344,200	341,600	344,000
Diego Martin	68,200	73,000	76,700	80,200	79,500
St. Ann's	107,600	111,800	119,800	106,200	109,500
Central: Caroni	121,400	136,300	152,400	161,200	164,500
Inc. Chaguanas Borough	0	0	(51,600)	(55,900)	(54,200)
South Central:	165,500	170,200	182,100	190,400	190,300
Inc. San Fernando	19,200	40,100	40,900	42,100	41,400
Victoria	146,300	130,100	141,200	148,300	148,900
South West:	96,400	97,100	103,200	113,900	114,400
Inc. St. Patrick	81,500	84,800	91,400	100,500	99,200
Point Fortin Borough	14,900	12,300	11,800	13,400	15,200
North East: St. Andrew/St. David	39,900	43,400	46,500	46,300	51,500
South East: Nariva/Mayaro	24,000	24,900	26,100	29,300	31,300
TOBAGO	33,800	35,600	38,400	40,800	40,900

Source: Central Statistical Office, Labour Force Reports.

Note: Statistics for 2010 unavailable so 2008 figures used. The increase in non-institutional population for 2010 over 2008 was 1 %.

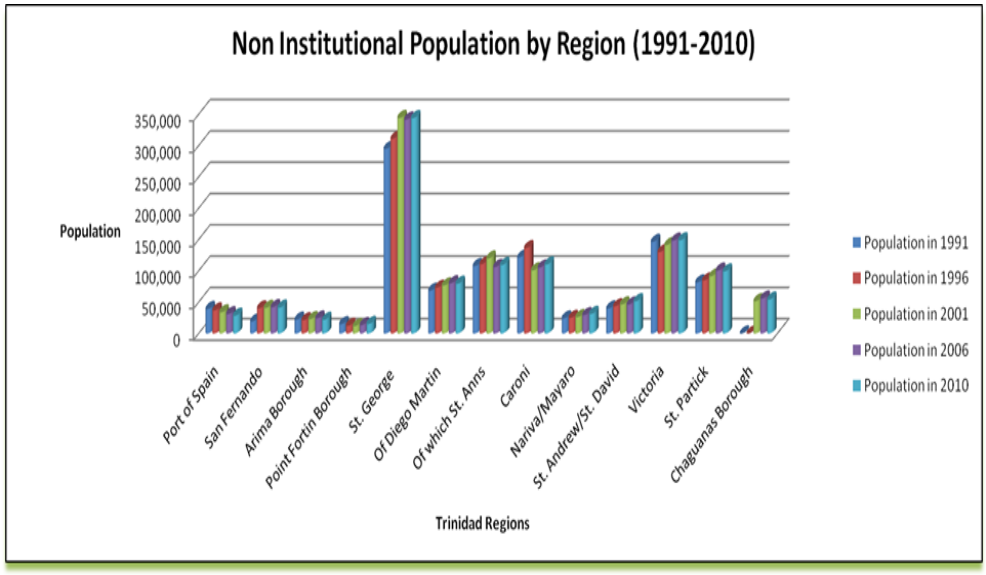
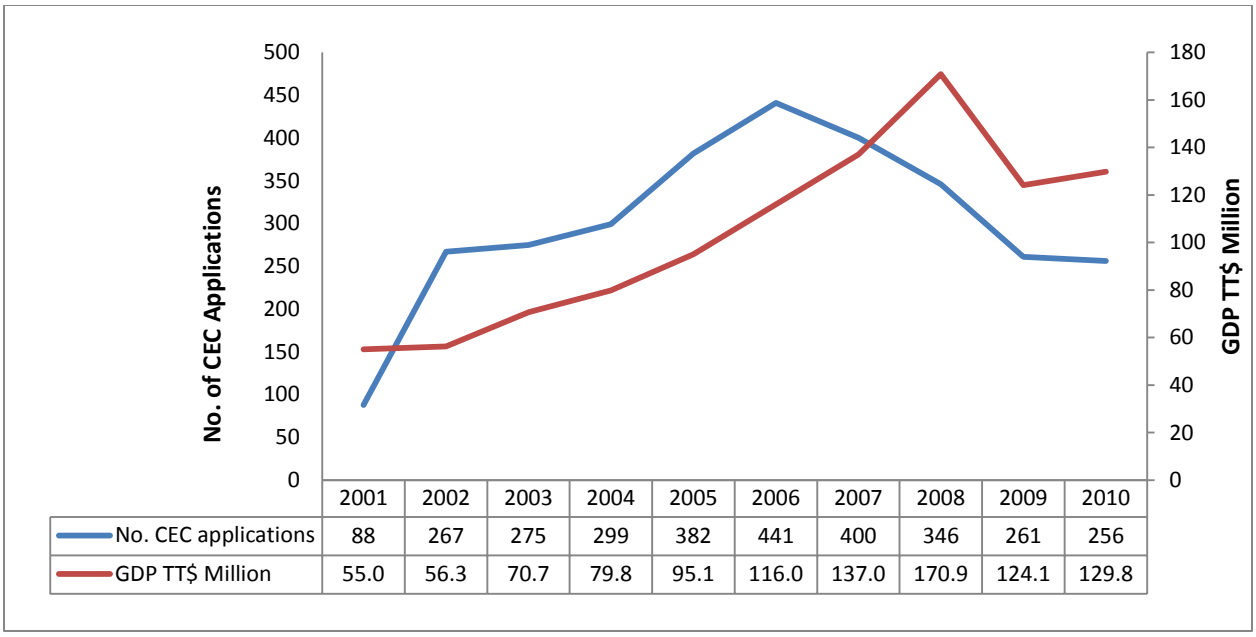


Figure 4.3. Non-institutional population by region for Trinidad (1991-2010)

4.1.2 Economic Driving Forces

Economic driving forces are the mandates and directives that result in physical development projects aimed at expanding the economy and the income generating capacity of the country. Data on these projects can be used as indicators of the operation of the economic driving forces.

An examination of annual Gross Domestic Product (GDP) for the country and Certificate of Environmental Clearance (CEC) applications received by the EMA for the period 2001 – 2010 show two (2) similar trend lines (Figure 4.4), except that CEC applications peaked two (2) years before GDP, which may reflect the fact that there is a time lag between applications for development projects and the realisation of contributions to the economy from the projects.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
No. CEC applications	88	267	275	299	382	441	400	346	261	256
GDP TT$ Million	55.0	56.3	70.7	79.8	95.1	116.0	137.0	170.9	124.1	129.8

Source for CEC application data: Environmental Management Authority
Source for GDP data: Central Bank of Trinidad and Tobago Economic Statistics

Figure 4.4. GDP and CEC applications in Trinidad and Tobago, 2001 – 2010

An analysis of the percentage of CEC applications for six (6) selected National Environmental Policy[47] (NEP) categories over the 10-year period (Figure 4.5) shows that applications for oil and gas activities has generally been the greatest while applications for land reclamation activities has been the lowest. Significant projects during the study period were those relating to the exploitation and processing of the mineral resources such as oil and gas, stone and sand, manufacturing and agriculture. From 2005 to 2010, the Oil and Gas Exploitation and Agriculture/Horticulture categories maintained a mirrored effect (red area).

[47] Government of the Republic of Trinidad and Tobago. 2006. National Environmental Policy. 50 pp.

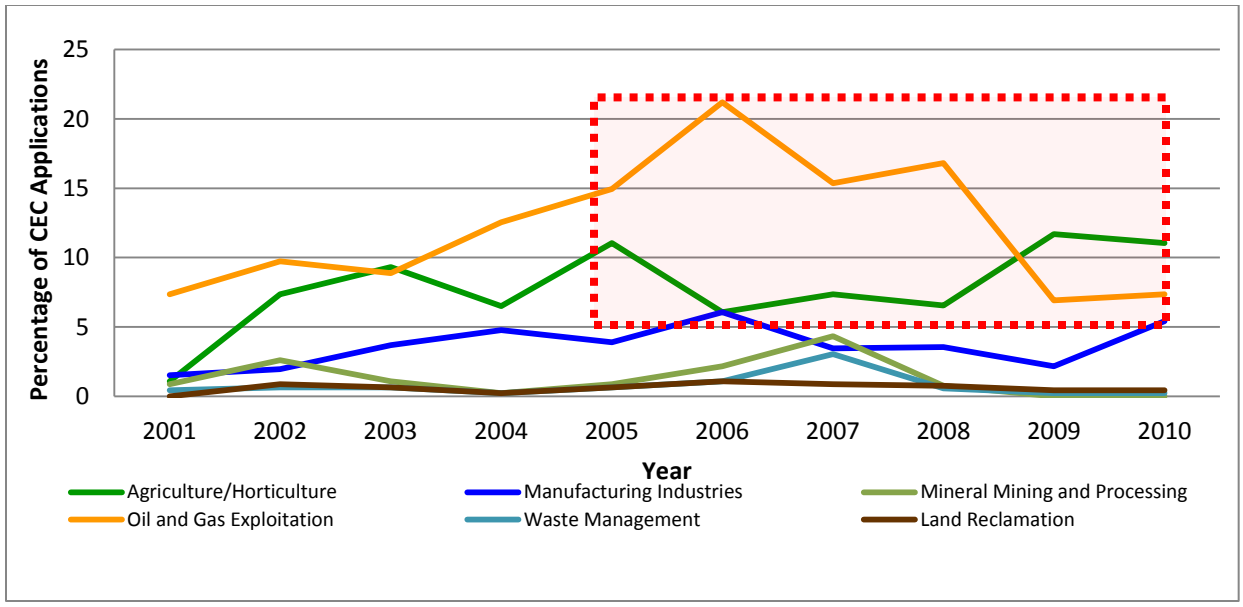
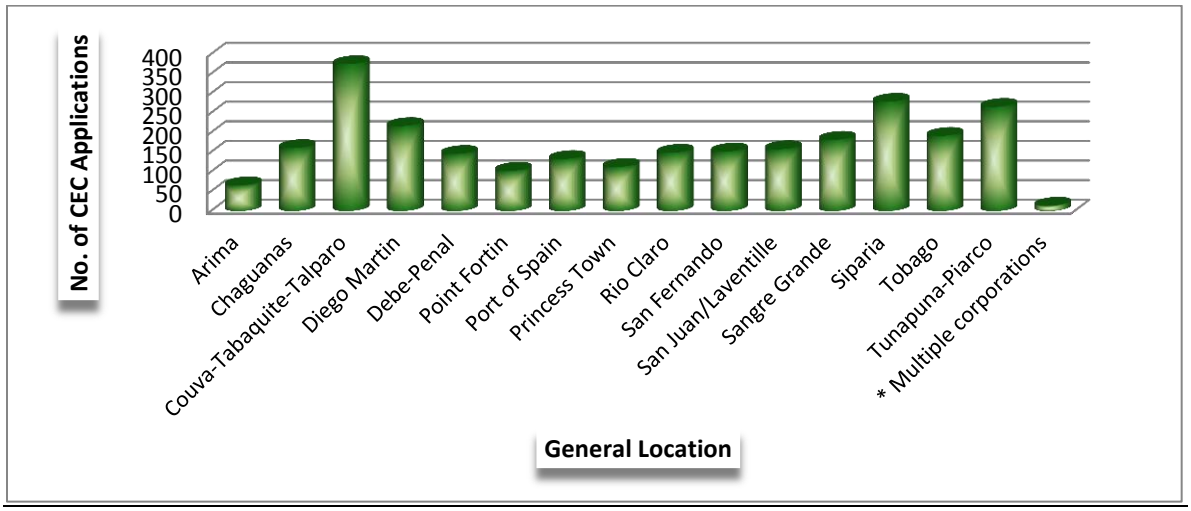


Figure 4.5. Percentage of Certificate of Environmental Clearance applications by selected National Environmental Policy category over the period 2001 – 2010

In considering individual general locations, Figure 4.6 shows that the greatest number of CEC applications were in the Couva-Tabaquite-Talparo Regional Corporation, while the least was derived from the Arima Borough Corporation. This type of analysis will indicate where development has been proposed and the land cover and land use changes that can be expected with implementation and the related environmental impacts.



**Note: "Multiple Corporations" represents CEC applications applicable to more than one regional corporation. For example, a highway construction may start in one regional corporation and end in another.*

Figure 4.6. Certificate of Environmental Clearance applications by general location in Trinidad and Tobago for the period 2001 – 2010

4.2 GOVERNANCE DRIVING FORCES IN TRINIDAD AND TOBAGO

There is a close relationship between land use and physical development and governance. For the period 1991 – 2010, this is demonstrated by tracking political events and related governance measures which translated into significant policy and strategic decisions of the different government administrations. These policies and decisions are interpreted and detailed by governmental agencies, formulated into programmes and projects for various types of development, which on being implemented result in land use and land cover changes.

Table 4.3 demonstrates how specific policies and projects by different administrations over the study period have resulted in development activities and consequences for land use changes, such as: public housing policies and projects; industrial development policy, strategy and projects; the shutdown of Caroni Limited and related agricultural and housing projects on Caroni lands; policies on centralization/decentralization, tourism, natural environment and heritage preservation. Some of the indicators include private sector property market performance, motor vehicle registration, road development, national and individual income growth.

Table 4.3. Relationship between governance policies and projects, and land use changes for the period 1991 – 2010 in Trinidad and Tobago

EPOCH	GOVERNANCE EVENT	DEVELOPMENT POLICY & PROJECTS	CONSEQUENCES
1991 – 1995	Changes in administration in 1991 and 1995 LOW INCOME PERIOD	1. Initiated a new phase of energy development projects. 2. Housing task force report and establishment of Urban Development Company Limited of Trinidad and Tobago (UDeCott). 3. Policy of land distribution instead of public housing construction. 4. Expanded car ownership through foreign-used policy.	Laid the groundwork for housing and energy development. Created demand for roads. Growth in construction; heavy industry projects.
1996 – 2000	LOW INCOME PERIOD	1. Farmland MissChem Limited constructed completed in 1998. 2. Atlantic Liquefied Natural Gas (LNG) Company of Trinidad and Tobago, Train 1 construction completed in 1999 3. Construction of Atlantic LNG Trains 2 and 3 began in 2000	Continued growth in construction and heavy industry projects.
2001 – 2004	Change in administration BOOM PERIOD –	1. Growth in income; expansion of re-distribution programmes – Community-Based Environmental Protection and	Increased availability of money – public and private-leading to acceleration of construction projects (land

EPOCH	GOVERNANCE EVENT	DEVELOPMENT POLICY & PROJECTS	CONSEQUENCES
	high commodity prices; high income flows continued to 2009	Enhancement Programme (CEPEP) and Unemployment Relief Programme (URP). 2. New energy development at La Brea. 3. Home ownership policy -public housing and projects, increase in lending (public and private). 4. Creation of social development programmes. 5. Infrastructure, buildings, highway & road construction projects. 6. Tobago housing projects and Cove Estate. 7. Caroni Ltd shutdown and subsequent Estate Management Business Development Company Limited (EMBD) activity.	use); car ownership; conspicuous consumption e.g. expensive homes.
2005 – 2010	Change in administration	1. Continuation of housing policy. 2. Apparent preference for housing over agriculture. 3. Land for the Landless policy. 4. New policy on agriculture promotion. 5. High-profile projects – highways and Invaders Bay. 6. Policy to decentralize government buildings and administrative services.	Competition for land; rapid increase in non-residential development in regions outside NW Trinidad.

There is a measure of overlap between socio-economic and governance driving forces which strengthens their effect on development and changes in land cover and land use. The analysis of the relationships between the identified driving forces and land cover and land use changes is instructive, since it suggests that the efficacy of land use and environmental management regulatory systems may be enhanced if measures are adopted and implemented to intervene and influence the strategic intent and design of driving forces at the early stages in the development process.

5.0 MANAGING TRINIDAD AND TOBAGO'S FINITE LAND RESOURCES IN AN ENVIRONMENTALLY SUSTAINABLE MANNER

Most aspects of environmental management in Trinidad and Tobago are directly dependent on, and influenced by, the planning and utilisation of its land resources. Competing demands and a lack of a comprehensive land use planning and development mechanism have led to unsustainable utilisation, overuse and degradation of the country's land resources. Moreover, extreme climatic events and other natural disasters particularly tropical storms and landslides, have impacted adversely on the land resources of certain regions of the country (for example, North Coast of Trinidad and Windward Tobago) to such an extent that corrective measures must be taken for recovery of the region's economies.

5.1 INSTITUTIONAL FRAMEWORK AND KEY LEGISLATION AND POLICY APPROACHES FOR LAND MANAGEMENT

There are several institutions in Trinidad and Tobago with responsibility for land management and protection based on their sectoral functions. The Town and Country Planning Division (TCPD) is the central government institution responsible for land use planning and development control. The EMA is the main focal point for environmental policy and management at the Central Government level, and is responsible for coordinating the environmental aspects of development activities, in collaboration with the municipal governments and other central government sectoral institutions. The Tobago House of Assembly (THA) is responsible for local governance on the island of Tobago, with several divisions having responsibilities corresponding to that of central government counterpart Ministries. In addition, the THA holds responsibility for certain aspects of environmental management and regulation, forest resources management, land development control and mining of quarrying materials. In Tobago, the Department of Natural Resources and the Environment (DNRE) of the THA acts on behalf of the EMA to enforce and monitor those laws related to development projects.

The table below (Table 5.1) identifies key law, policies, plans and programmes relevant to various aspects of land management in Trinidad and Tobago.

Table 5.1. Legislation, policies, plans, programmes and projects relevant to land management in Trinidad and Tobago

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
Environmental Management	Environmental Management Act, Chapter 35:05	It provides a comprehensive and contemporary approach to environmental management in Trinidad and Tobago, and is the principal framework legislation on environmental and natural resources management.	EMA
	CEC Rules	Defines the process for the application of a CEC for activities which require that the environmental impact which might arise out of any new or significantly modified construction, process, works or other activity be determined.	EMA
	CEC (Designated Activities) Order (as amended)	Lists 43 activities requiring a CEC, the grant of which signifies approval of the activity solely in terms of the environmental impact.	EMA
	Environmentally Sensitive Areas (ESA) Rules	Governs the designation of ESAs, which are intended to serve several objectives relating to biodiversity, species, ecosystem and livelihoods conservation, fulfilling international obligations and the promotion of scientific research. To date the following have been designated: - Matura National Park (2004) - Nariva Swamp Managed Resource Protected Area (2006) - Aripo Savannas Strict Nature Reserve (2007)	EMA
	NEP (2006)	It provides policy direction for the sustainable management of the country's environmental assets and provides a rational, practical and comprehensive framework for environmental management in Trinidad and Tobago. The NEP recognises that humans influence and are influenced by their environment, and that the natural and built environments affect their well-being. Specific objectives of the NEP relevant to land use and development are to: - Conserve the vitality and diversity of the natural environment through the conservation of ecological systems and the biodiversity within. - Develop within the carrying capacity (assimilative capacity of the environment) of the country through national physical development and	Ministry of Housing and the Environment

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
		planning, the sustainable use of renewable resources and the conservation of non-renewable resources. - Promote the integration of the principles of environmental sustainable development into all country policies and programmes.	
	Conservation of Wildlife Act, Chapter 67:01	Wildlife or Game Sanctuaries are designated under this Act; there are 13 in Trinidad and Tobago. They are intended to protect wild animal species by restricting hunting and collection of animals in and from such sanctuaries.	Ministry of Housing and the Environment
	Draft National Protected Areas Policy (2010)	This policy is aimed at producing a coherent management approach to protected areas and national parks by consolidating them under the auspices of one overarching Act and Authority. Specifically, the policy provides a course of action for programmes concerned with the protection of the country's natural heritage and the provision of outdoor recreation activities. It incorporates and integrates the intent of Government policy in a number of related areas including environment, conservation, forestry, tourism and recreation as it relates to the administration of national parks, heritage sites and protected areas.	Ministry of Housing and the Environment
	Trinidad and Tobago National Biodiversity Strategy and Action Plan (NBSAP)(2001)	The NBSAP addresses the issues affecting biodiversity locally in the context of sustainable use and conservation. It calls for the implementation of the necessary legal framework in order to protect the country's natural resources, recognizing the need for capacity building, research, conservation, wise-use of resources, education and public awareness. Priority actions identified in the NBSAP related to protected areas include: 1. Development and update legislation for conservation of protected areas, landscapes and species, consistent with current international trends 2. Building on existing law enforcement initiatives for protection of species and ecosystems	Ministry of Housing and the Environment
	Draft National	The policy will aim to provide policy guidance for the development of an	Ministry of Housing

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
	Climate Change Policy (2009)	appropriate administrative and legislative framework, in harmony with other sectoral policies, for the pursuance of a low-carbon development path for Trinidad and Tobago through suitable and relevant strategies and actions to address climate change, including sectoral and cross sectoral adaptation and mitigation measures. Actions to address the abatement or avoidance of greenhouse gas emissions will include the enhancement of natural carbon sinks by conserving forests and protecting natural systems that contribute to carbon sequestration.	and the Environment
	Nariva Swamp Restoration, Carbon Sequestration and Livelihood Project	Include the rehabilitation and reforestation of degraded lands as part of a larger project of management of the wetland. The Nariva Restoration Initiative aims at achieving the complete restoration of the landscape and ecological characteristics of Nariva through reforestation, hydrologic (hydrology and hydraulics) rehabilitation, fire management and improved agricultural practices. The implications of the Reforestation Scheme for carbon sequestration were considered to be an important benefit of restoration, in the context of climate change.	EMA, Forestry Division, and the University of the West Indies (UWI)
Forest Management	Forests Act, Chapter 66:01 (1915 amended 1922, 1925, 1933, 1955, 1999)	Provisions for regulation of the removal of timber and other forest products and definition of the responsibilities of Forestry Division. This Act omits to establish a comprehensive management framework for this critical resource on which is hinged the country's land and water resources. The Act merely focuses on the obtaining of permits for the removal of timber, prohibiting the extraction of balata gum and provisions regarding reforestation.	Forestry Division
	Forest (Prohibited Areas) Order, made under the Forests Act, Chapter 66:01	This Order provides for the designation of prohibited areas. Such designation restricts entry into the area and is supported by the penal mechanisms in place under the Forests Act. Several areas, including islands off the coast of Trinidad and Tobago have been designated as prohibited areas. Prohibited areas described in the order have been established in the following areas: - Aripo Savannas (previously designated as Long Stretch Reserve) - Caroni Swamp	Ministry of Housing and the Environment Forestry Division

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
		- Nariva Swamp - Matura Beach - Fishing Pond - Grand Riviere Beach - Northern Range Game Sanctuary - Trinity Hills Game Sanctuary - Central Range Game Sanctuary - Southern Watershed Game Sanctuary - Valencia Game Sanctuary - Little Tobago Game Sanctuary - Soldado Game Sanctuary - Kronstadt Game Sanctuary - Morne L'Enfer Game Sanctuary - St. Giles Game Sanctuary - Saut d'Eau Game Sanctuary	
	Draft National Forest Policy (1942 revised in 1998 and 2010)	This Policy recognises that forest, forest resources and forest uses contribute significantly to national development, livelihoods and human wellbeing. It builds on the existing policy framework for forest management and it supplements and enhances other public policies and plans, especially the NEP, the NBSAP and the National Action Programme to Combat Land Degradation in Trinidad and Tobago (NAP).	Ministry of Housing and the Environment
	National Reforestation and watershed Rehabilitation Programme (NRWRP)	The NRWRP has as its mandate the reforestation of 33,030 acres of denuded lands including 11,000 acres of watersheds. The NRWRP works through community groups to meet the needs to repair preserve and protect the Nation's forest, watersheds, wetlands, flora and fauna.	Ministry of Housing and the Environment
Coastal and Marine	Marine Areas (Preservation and	This Act deals with the marine areas of Trinidad and Tobago. It allows the Minister the power to designate any portion of the marine areas of Trinidad	Ministry of Agriculture, Land

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
	Enhancement) Act (1970 amended 1996), Chapter 37:02	and Tobago as a restricted area where the considered that special steps are necessary for: a. Preserving and enhancing the natural beauty of such areas b. The protection of the flora and fauna of such areas c. The promotion of the enjoyment by the public of such areas d. The promotion of scientific study and research in respect of such areas The Act also provides provisions whereby the Minister can acquire any private lands for the purpose of a restricted area. It has been used for the protection of only one area to date – the Buccoo Reef in Tobago.	and Marine Resources
	National Policy and Programmes on Wetland Conservation for Trinidad and Tobago, 2001	Wetlands of Trinidad and Tobago will be protected, managed and restored in order to sustain and enhance their ecological and socio-economic values and function for current and future generations. Objective 8 commits all levels of government to a goal of no net loss of wetlands and their values and function, on publicly owned lands and waters.	Ministry of Housing and the Environment
Land Use Planning and Development	Town and Country Planning Act (1960 amended 1974, 1977, 1980, 1985, 1990), Chapter 35:01	The Act contains provisions for the orderly and progressive development of land, both in urban and rural areas through comprehensive policies and plans for the use and development of all land, as well as the preservation and improvement of the amenities attached to land usage. The Act also contains provisions relating to the granting of permission to develop land and for other powers of control over land usage.	TCPD
	THA Act, Chapter 25:03	This Act affords the THA the power to formulate and implement policies with respect to land use and coverage as follows: 1. State lands 2. Land and marine parks 3. Museums, archives, historical sites and historical buildings 4. Forestry	THA

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
		5. Town and Country Planning 6. Infrastructure 7. Highways and roads 8. Housing	
	Municipal Corporations Act, Chapter 25:04	Makes provisions for regional planning and physical development and provides the foundation for devolution of authority to the municipal authorities. It sets responsibilities for certain aspects of public health and infrastructure within their boundary.	Ministry of Local Government
	State Lands Act, Chapter 57:01	Provides for the administration, management and protection of State lands by the Commissioner of State Lands. The Commissioner is responsible for the prevention of squatting and encroachment on state lands and of spoil and injury to the woods and forests of state lands. The Commissioner also has the added responsibility to superintend the settlement and allotment of State lands and any other directions from the President. The Commissioner can also prohibit the use of any road or portion thereof by vehicles of any class except under permit to be issued on his behalf by an authorised officer in the case of State Lands not included in a Forest Reserve[48] and by the Conservator of Forests in the case of State lands included in a Forest Reserve. The Act is supported by the Land Regulations, 1918 and the Crown Lands (State Lands) Forest Produce Rules, 1937 as amended.	Ministry of Food Production Commissioner of State Lands

[48] ***Forest Reserves*** designated under the Crown Lands Act, which is now the State Lands Act Ch 57:01 were established to manage timber resources by imposing fines, restrictions and the use of permits to extract high grade timber species. There are 36 such areas in Trinidad and Tobago.

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
	National Physical Development Plan for Trinidad and Tobago (1984)	Provides a strategic guide for all development in the country to the year 2000.	Ministry of Planning
	Draft Spatial Development Plans (2010 – 2020) for each Municipal Corporations in Trinidad	These plans are currently being developed and will set out the vision for each of the fourteen (14) Corporations, describe the ways in which land and buildings will be used, what type of development is to be encouraged and how regeneration will be sparked in the region to stimulate change over the next 10 years.	Ministry of Local Government Municipal Corporations
	Chaguaramas Development Authority (CDA) Act, Chapter 35:02	The CDA was established by this Act of Parliament in 1972 to administer and coordinate the development of the north-western peninsula of Trinidad and to ensure that such development is carried out in conformity with the requirements of the Town and Country Planning Act, Chapter 35:01 and national objectives. The CDA is vested with all the land of the north west peninsula of the island of Trinidad, including the offshore islands of Gaspar Grande, Monos, Huevos and Chacachacare.	CDA
	Minerals Act Chap. 61:03	This Act provides for the regulation of mining and the use of land for mining, where mining is defined as the excavating or quarrying in, on or, below the surface for the purpose of winning or obtaining minerals and includes any operations directly or indirectly necessary for or incidental to mining operations.	Ministry of Energy and Energy Affairs
	Water and Sewerage Act, Chapter 54:40	The Act provides for the establishment of the Water and Sewerage Authority. This Authority is given the power to acquire any private lands by means of a Compulsory Purchase Order, made by it and confirmed by the Minister, to purchase land or to acquire water rights compulsorily for the purpose of its water undertaking or proposed water undertaking or for any of its sewerage works or proposed sewerage works.	Water and Sewerage Authority

Area of Land Management	Legislation, Policies, Plans, Programmes and Projects	Summary	Entity Responsible for Implementation
	Highways Act Chapter 48:01	This Act allows the Minister to acquire either by agreement or compulsorily, any land required for the construction of a main road. Furthermore, any highway authority formed under this Act is given the same power for the construction of a highway which is to be a highway maintainable at the public expense, other than a main road. This is the same where the acquisition of lands is necessary for the improvement of an existing highway.	Ministry of Works
	NAP	The NAP is an integrated framework for mitigating the physical, biological and socio-economic impacts of land degradation. The NAP provides a comprehensive framework for implementing the country's obligations under the United Nations Convention to Combat Desertification (UNCCD) which it acceded to on August 06, 2000.	Ministry of Planning, Economic and Social Restructuring and Gender Affairs

5.2 RECOMMENDATIONS FOR ACTION

1. Land use decisions must ultimately balance competing societal objectives based on available information about the intended and unintended environmental consequences. The full range of consequences needs to be identified and quantified (to the extent possible) in order to make informed and sound decisions.

2. There should be no further loss of forested land to other land uses; this is included in the NEP.

3. Areas of natural vegetation should be protected by measures appropriate to the particular characteristics of the areas. These areas include rivers and watersheds, wildlife habitats, wetlands, coastal zones, archaeological and heritage sites, and areas of high amenity value.

4. There should be rigid zoning of agricultural land and measures to prevent change to others land uses, mainly housing and industry (outside of the agricultural sector).

5. The patterns of housing development should be changed in order to conserve land and maximise the use of existing infrastructure; preferred patterns are high density, infilling, re-development, rehabilitation and re-planning of 'brown land' rather than consuming 'green-fields'.

6. Adoption of land use policies aimed at achieving a better balance in the distribution of settlements, and social and economic activities over the national land space to satisfy the needs of the population while minimising the need for travel especially for work and schooling.

7. The need to rationalise the legislative and policy framework for dealing with all aspects of land management in Trinidad and Tobago. A more comprehensive and robust legislative and policy package is needed to deal with the challenges of managing Trinidad and Tobago's land resources sustainably.

8. Greater collaboration is needed among partners in land use planning and management – there needs to be formal mechanisms of collaboration to ensure effective collaboration among the critical agencies with overlapping responsibilities, as well as various stakeholder organisations/institutions.

PART B:
ACTIVITIES, ACCOMPLISHMENTS AND PLANS OF THE EMA

1.0 ORGANISATIONAL STRUCTURE

The Authority is governed by a Board of Directors comprising a Chairman and nine (9) other members, appointed by the President of the Republic of Trinidad and Tobago. The Managing Director, who is appointed by the Board, is an *ex-officio* member of the Board. The Board must appoint a Corporate Secretary who must be an employee of the EMA. The Manager of Corporate Services within the EMA currently serves as the Corporate Secretary.

The Chairman and the Board of Directors report to the Minister with responsibility for the Environment. The Members of the Board and Board Committees are detailed in Appendix 1.

The Authority itself is organised into five responsibility centers:

1.1 Managing Director's Office

The Office of the Managing Director (MD) is responsible for coordinating and managing all aspects of the work of the EMA. Some specific areas include:

- The fulfilment by the EMA of the objectives detailed in the NEP and the EM Act;
- The implementation and enforcement of the subsidiary legislation arising out of the EM Act, including monitoring conditions in permits and licenses granted pursuant to legislation;
- The development of environmental awareness among the citizenry of Trinidad and Tobago;
- The development of an organisational image that projects a strong, professional organisation and engenders confidence in the Authority by members of the public;
- Maintenance of the focus on sustainable development while engaging in environmental enhancement and preservation activity;
- To lead, guide, coach and inspire a team of managers towards the achievement of the highest level of performance;
- To promote a productive work atmosphere that would elicit high standards of performance from staff;
- Ensuring that the programmes and projects of the authority are implemented, consistent with budgetary allocations;
- Developing and delivering on EMA's overall strategic and operating plans;
- Advising the Board of Directors on all matters relating to the operations of the Authority;

- Advancing the work of the Authority through meaningful interaction with the political directorate, and other similar regional and international bodies;

- Developing mutually beneficial relationships with participating national agencies that perform various environmental management functions so that the coordination function is effectively achieved; and

- Ensuring that the day-to-day operations of the Authority are effectively managed.

The Environmental Police Unit (EPU) also falls under the MD's Office. Formed in 1999, the EPU comprises Special Reserve Police officers from the Trinidad and Tobago Police Service. Their responsibilities include patrolling highways, serving Notice of Violations and monitoring noise variations. They also police environmentally sensitive areas and monitor the protection of environmentally sensitive species designated under the EM Act. According to the EPU's 2010 statistics, 224 Fixed Penalty Notices were issued for offences ranging from excessive smoke, loud music and other traffic offences such as transporting garbage and goods without a secured cover, defective fittings (e.g. lights, wipers etc.) and unnecessary discharge of lubricant. The EPU made eight arrests, conducted 152 CEC investigations, served 66 Notices of Violation, investigated 219 noise complaints and monitored 333 events with respect to noise pollution control.

These officers are appointed as Environmental Inspectors under the EM Act and have the power to enforce legislation outside the EM Act (Motor Vehicles and Road Traffic Act, Minerals Act, Litter Act,) in addition to pollution monitoring and responding to environmental complaints. The Unit falls under the jurisdiction of the Commissioner of Police but, as facilitated by the EMA, they receive day-to-day work assignments from, and submit reports to the EMA.

The Human Resource Unit falls under the MD's office and is responsible for the following:

- Manpower Planning

- Succession Panning

- Recruitment / Selection

- Performance Management

- Training

- Industrial Relations

- Compensation and Benefits

- Employee Relations

1.2 Legal Services

A full range of legal services are provided to the Authority, these include, but are not restricted to, the following:

- Drafting and development of subsidiary legislation under the EM Act;
- Enforcement of the EM Act and its subsidiary legislation;
- Litigation/representation at the Environmental Commission, Court of Appeal, High Court and other Courts in this jurisdiction;
- Provision of timely and sound legal advice and opinions on the applicability of environmental law to issues affecting the Authority, other governmental entities and the general public;
- Formulation and review of internal policies to ensure that the Authority's activities and operations are consistent with its legislative mandate, national policies and programmes, international environmental law and best practices;
- Resolution of matters using non-litigious methods, e.g. Negotiations and Alternative Dispute Resolution (ADR)/ Mediation;
- Drafting, reviewing, negotiating, and providing advice on the implementation of all legal documents, agreements, contracts and other formal arrangements for operational activities of the Authority with other governmental and non-governmental entities; and
- Working in conjunction with Technical Services for the issuing of CECs and Noise Variations.

1.3 Corporate Relations and Public Education

The Corporate Relations and Public Education (CR/PE) Department is responsible for ensuring that the Authority establishes itself as a continuing presence and influences national consciousness. CR/PE has the responsibility within the EMA to "promote educational and public awareness programmes on the environment" as well as to assist with fulfilment of the mandate to "establish and co-ordinate institutional linkages locally, regionally and internationally.

One of the ways in which the EMA executes its mandate involves making the public more aware and concerned about environmental issues. In focusing on environmental improvement, the EMA develops special public education and outreach initiatives to change attitudes and behaviours towards a range of issues including Air Pollution, Water Pollution, Noise Pollution, Waste Disposal and Ecosystem conservation.

- Every year, in collaboration with the Ministry of Education, the EMA coordinates two school competitions namely, the Primary Schools' Hands-On Environmental Programme and the Secondary Schools' Eco-Song competition.

- The EMA delivers lectures, conducts workshops and develop programmes on environmental issues for the benefit of Government Agencies and Ministries, Community Groups and Non-Governmental Organisations, Corporate and Industrial Sector entities, Civic society groups, Faith Based organisations and Educational Institutions.

- The EMA also supports the creation of environmental clubs in primary and secondary schools, was well in communities.

- The Authority is also a clearing house for environmental information. Its in-house Information Center houses a specialized environmental reference collection that includes journals, environmental science texts, copies of legislation and newspaper clippings on environmental issues.

- The National Registers for the CEC and NPCR are also available at the Information Center.

- The EMA also collaborates with other governmental agencies, statutory bodies in the execution of their environmental education campaigns.

The Corporate Relations function remains critical as it is responsible for:

- Creating awareness of the EMA's mandates
- Generating a body of public opinion favourable to the EMA and its mandates.
- Building and maintaining a sound corporate image/identity
- Fostering good relationships with internal and external publics
- Creating a mutually beneficial relationship with the Media

1.4 Technical Services

The Technical Services Department is responsible for the implementation of the technical and administrative processes relating to the following:

- CEC
- Water Pollution Management
- Waste Management
- Management of Hazardous substances
- Emergency Incidents Response
- Complaints Investigation
- Site Remediation
- Biodiversity Protection and Conservation
- Market Based Instruments
- Environmental Monitoring and Research
- Inspection and Compliance Monitoring
- Noise Pollution Management
- Strategic Environmental Management

The EMA is charged with the responsibility of implementing subsidiary legislation under the EM Act, Chapter 35:05. This includes the NPCR, the ESSR, the ESAR, the CEC Rules and most recently the WPR (amendments to which were prepared on December 18, 2006 and submitted to Parliament for consideration). In addition to implementation of the foregoing, the EMA designs the framework and provides legal and technical instructions for proposed legislation.

1.5 Corporate Services

The Corporate Services Department is responsible for the following functions:

- Financial Accounting
- Fund/Treasury Management
- Procurement and Asset Maintenance
- Information Technology
- Secretarial Services to the Board
- General Administration
- Health, Safety and the Work Environment

Corporate Services serves to ensure the implementation of good governance and accountability. It has the primary responsibility for providing logistical support to the organisation and making available, timely, accurate and complete information on the financial performance and status of the Authority for sound decision making.

2.0 EMA'S ACTIVITIES AND ACCOMPLISHMENTS FOR 2010

Throughout 2010, the EMA continued to work towards sustainable development. The next section reveals the activities of the EMA and the goals achieved, based on the Strategic Goals and Enabling Strategies during the period January to December 2010.

2.1 STRATEGIC GOALS

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

Installation of the new Ambient Air Quality Monitoring (AAQM) station at the Port of Point Lisas and the relocation of the current AAQM Station at Sea Lots

Data gathering on air quality in Trinidad and Tobago was initiated via the establishment of an AAQM station at Point Lisas in 2004 to provide data on various air pollutants. In 2010, the EMA initiated this project with the aim to capture air quality data downwind of the Point Lisas Industrial Estate. As such, the new shelter will be installed on or near the Port of Point Lisas and the current shelter located at the Point Lisas Industrial Port Development Corporation Ltd (PLIPDECO) will be relocated to the Trinidad and Tobago National Petroleum Marketing Company Ltd (NP) at Sea Lots. The new shelter is best suited for installation at the Port of Point Lisas because it includes an attachment that is designed to measure hydrogen fluoride but can be used to measure other potential pollutants from the Estate.

Proposed Air Pollution Rules (APR)

In 2000, the EMA began the process of developing the APR in order to fulfil its mandate under Sections 49-51 of the EM Act to manage, permit and prohibit air pollution. The proposed APR seeks to introduce a registration and permitting system to authorize any process releasing air pollutants. It provides for a First and Second Schedule which lists the substances that are air pollutants and provides for the establishment of a Register of Air Pollutants by the EMA. The Rules also apply to new & existing facilities. The Rules seek to set the limits for pollutants that may be released into the ambient air by various sources in order to protect public health and the environment from the adverse effects of air pollution.

The EMA and the Chief Parliamentary Counsel's Department of the Ministry of the Attorney General finalized and submitted the draft of the APR in March 2009 to the then Ministry of Planning, Housing and the Environment. The APR 2009 was re-submitted to the Ministry of Housing and the Environment in June 2010 for review and further action. The development of Fees Regulations to support the APR is also being currently developed by the EMA.

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

Development of a National Non-point Source (NPS) Pollution Management Programme

This programme is aimed at complementing the work of the Water Pollution Rules, 2001. The primary objective of a NPSPMP is to protect the surface and ground water sources from non-direct or diffuse sources of water pollution and restore their quality to established water quality criteria. In 2010, the Draft NPSPMP was distributed to key external stakeholders for comments. The NPSPMP document will be revised based on the public comments in 2011.

The Water Pollution Rules

Continuing its focus on permitting, six notices were issued to facilities requiring them to apply for water pollution permits. Eight permit applications were received and four Water Pollution Permits (WPPs) were issued to: Waste Disposal Limited, National Petroleum, POWERGEN and Trinidad Juice Company Limited. During this period, 22 source registration applications were received and 56 source registration certificates were issued.

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

Remediation of Lead Contaminated Sites

The remediation of lead at Nurse Trace Guayaguayare commenced on December 14, 2009. This involved excavation of the contaminated soil, hauling off site for treatment and final disposal. Clean fill (soil) was used to backfill the excavated pits and works were completed in January 2010. Lead poisoning, even at low levels can be harmful to people's health. This silver-grey, metal that occurs naturally has long been known as a neurotoxin, a substance that adversely affects the central nervous system causing brain damage, diminished learning abilities of children, kidney damage, miscarriages and subtle abortions, and in extreme cases death.

National Hazardous Waste Inventory

The Government of the Republic of Trinidad and Tobago (GoRTT) acceded to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) in 1994. The conduct of the National Hazardous Waste Inventory Study (HWIS) for the period 2004 to 2008 was a project managed by the EMA for the Ministry of Housing and the Environment (MHE). The Final Report was submitted and approved February 04, 2010. Presentation of the findings to key stakeholders was completed on April 21, 2010.

Implementation of the Basel Convention

The table below highlights a summary of notifications under the Basel Convention for the period.

Month	Notifications (Other)	Material	Applicant	Country of Disposal
MAY	1 Notification (Export)	Scrap Lead Acid Batteries and Scrap Lead	Automotive Components Limited (ACL)	Venezuela
SEPT	1 Notification (Import)	Used Lead	Barry's Auto Solution Limited (Jamaica)	Trinidad and Tobago (as a collection point). The ULAB's will be sent to Venezuela for recovery.
OCT	1 Notification (Export)	Drained Lead Acid Batteries	International Recycle Group Limited	Israel

Beverage Container Bill

This Bill was initially developed and issued for public comment in November 2000. Since then, the Bill underwent a series of reviews with the most recent being continued in August 2010 by the EMA's Legal Services Department.

The proposed objects and purposes of the Beverage Container legislation are:

- To ensure that the polluter pays the external costs of the sale and consumption of beverages in beverage containers;
- To create incentives for the manufacturers, vendors and consumers of beverages to reuse or recycle beverage containers;
- To reduce the generation of solid wastes, waste disposal and recycling costs;
- To reduce litter and litter related costs and hazards;
- To conserve natural resources; and
- To preserve the amenity of the environment and enhance the quality of life.

The Bill seeks to regulate the sale of beverages in both returnable and non-returnable beverage containers; to provide for the payment and refund of a deposit on recyclable and reusable beverage containers; for other administrative and fiscal measures to encourage recycling and reuse of beverage containers and for matters incidental thereto.

Some proposed features of the Beverage Container legislation include the following:

- The EMA will be assigned responsibility for the administration of the Beverage Container legislation.

- Application of the ***polluter pays principle*** whereby bottlers, importers, vendors and consumers pay the external costs of the sale and consumption of beverages in beverage containers.

- The beverage containers covered by the proposed legislation include sealed bottles, can, jugs or carton composed of glass, metal, plastic, paper or any combination of those materials which contains 5 litres or less of beverage.

- The beverages subject to the proposed legislation include alcoholic, fermented and malt and distilled beverages, carbonated and noncarbonated water, soft drinks and fruit drinks, mineral, spring or purified water, flavoured water or milk, milk based and milk-substitute based drinks, coffee and tea drinks as well as vegetable juices. Milk based drinks and milk-substitute drinks specially formulated for children under 1 year old will be excluded.

- The Bill will contain registration requirements for bottlers and importers of beverages and prohibits sale of beverages in beverage containers by non-registered bottlers and importers.

- Create incentives for entrepreneurial endeavours through the advent of collection depots where consumers may return empty returnable beverage containers in exchange for a refund value.

- Creates a number of offences for failure to comply with various provisions of the Bill whereby penalties can be imposed if found liable.

The Bill is expected to be finalised and enacted in the very short future.

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

The Aripo Savannas Implementation Programme

Work on this project was initiated in 2006 and is guided by the management plans developed by CANARI. The Aripo Savannas Stakeholder Management Committee (ASSMC) in conjunction with the Forestry Division and the EMA overview the implementation process.

In April 2010, Basic First Aid and CPR training were completed for 28 members of the community and ASSMC. Also, the EMA embarked on the production of a 10-minute video documentary on the Aripo Savannas. The main purpose of the video documentary is to raise stakeholder awareness of the natural, cultural resources and the value of the ASESA.

In 2010, a total of 34 schools were visited and presented with copies of the popular version of the Management Plan. This included both primary and secondary schools from Arima to Mayaro, including Matura. Community meetings were held with residents from Kangalee and Damarie Hill. The major objectives of these meetings are to raise stakeholder awareness on the natural and cultural resources of the AS. Further, these meetings serve to facilitate the critical participatory approach to managing this resource.

The conceptualisation and design of a Visitor Center and associated facilities was initiated with the Office of the Chief Architect, Ministry of Works and Transport in 2010. Preliminary drawings have been prepared and presented to the ASSMC, the EMA and Forestry Division for review.

Forest Policy and Protected Areas Policy

The former Ministry of Public Utilities and the Environment (MPUE) pursued the preparation of a Protected Areas Policy to be approved by Cabinet. In September 2007, a Technical Advisory Committee was convened to guide the Formulation of a New Forest Policy and Protected Areas Policy for Trinidad and Tobago. The Committee was under the chairmanship of the Environmental Management Authority.

The policies were presented through national stakeholder consultations in April 2010 along with the Climate Change Policy, under the former Ministry of Planning, Housing and Environment.

Convention on Biological Diversity

Trinidad and Tobago as a party to the Convention on Biological Diversity (CBD) is in support of and was committed to achieving by 2010 a significant reduction in the rate of biodiversity loss at the global, national and regional levels, as a contribution to poverty alleviation and to the benefit of all life on earth. In keeping with the Convention it became necessary to prepare a national report to the Secretariat for the CBD.

The EMA commenced development of this report in 2010. The first consultation was held with Non Governmental Organisations (NGOs) and Community Based Organisations (CBOs) on June 10, 2010. The final version of the report was submitted to the National Focal Point for the Convention at the Ministry of Housing and the Environment on July 30, 2010. The Cabinet approved the Fourth National Report of Trinidad and Tobago to the CBD on October 14, 2010.

International Year of Biodiversity (IYB)

In response to the recommendation adopted by the 8th meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD); 2010 was proclaimed as the International Year of Biodiversity. In 2010, exhibitions and events were held by the EMA to raise awareness on the International year of Bio-diversity. This included all EMA schools' competitions, Environmental Commemorative Day celebrations and the bi-annual Green Leaf Awards.

The EMA was also engaged in collaborative projects with other agencies and Government Ministries including the Ministry of Housing and the Environment and the Ministry of Food Production, Land and Marine Resources. One such project was the production of a series of stamps in commemoration of the International Year of Biodiversity. The media was also utilized as a medium for raising awareness on the International Year of Biodiversity and local biodiversity issues affecting the country.

Invasive Alien Species

Invasive alien species (IAS) are a major threat to the vulnerable marine, freshwater and terrestrial biodiversity of Caribbean islands and the people who depend upon it for their livelihood. As such, Caribbean States have recognised the need for developing an integrated regional strategy. The EMA endorsed the regional project "Mitigating the Threats of Invasive Alien Species in the Insular Caribbean," proposed by Center for Agriculture and Bio-Sciences International (CABI) through UNEP for funding by the Global Environment Facility (GEF) in 2009. In 2010, the EMA attended the first meeting of the National Steering Committee for the Trinidad and Tobago element of the UNEP/GEF project "Mitigating the Threats of Invasive Alien Species in the Insular Caribbean."

As at December 2010, the draft National Invasive Alien Species Strategy (NISS) was prepared with input from the EMA, along with a final list of Invasive Alien Species (IAS) for Trinidad and Tobago.

Designation of Golden Tree Frog and Ocelot as Environmentally Sensitive Species

Under Section 41 of the EM Act and further to the Environmentally Sensitive Areas Rules 2001, the EMA is vested with the power to designate any species of living plant or animal as an environmentally sensitive species (ESS).

In 2008, the EMA proceeded with the designation of the Golden Tree Frog and the Ocelot as environmentally sensitive species. In compliance with Section 27-28 of the EM Act, the Golden Tree Frog and Ocelot Legal Notices were submitted for public and stakeholder comments which were received up to April 2009.

Following the Public Comments phase the EMA engaged in a comprehensive review of the draft Legal Notices, which have since been revised in 2010 and pending finalization before submission to the Ministry of Housing and the Environment for further action.

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

The EMA received 252 CEC applications in 2010 and this can be further dissected into:

- 66 Energy related applications and
- 186 Non-energy (internally referred to as General) related applications.

The EMA received seven Environmental Impact Assessments (EIAs) in 2010 as detailed below:

1. CEC1471/2006 - WASA - Establishment of a potable water treatment plant in Salybia and Matura
2. CEC1597/2006 - WASA - The establishment of a regional wastewater collection system and treatment plant for San Fernando and environs
3. CEC2824/2010 - Ministry of Works and Transport - Construction of a Highway from Paria Suites to St Mary's Junction
4. CEC1029/2005 – WASA - The establishment of a wastewater treatment facility and associated collection system in Southwest Tobago
5. CEC 2498/2009 - Soogl Antillies (Trinidad) Limited- The proposed drilling of two exploratory wells for oil or natural gas in the East Brighton Block
6. CEC1729/2006- National Quarries Company Limited - Mining and processing of aggregate for sale in Valencia.
7. CEC1497/2006 – Optimal Services Limited - The proposed drilling of 20 production wells inclusive of the establishment of storage facilities and pipelines from the well locations to the production facilities.

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

For the period January – December 2010, the EMA received 179 noise complaints. Of those complaints, 164 files remained active, while 15 were closed during that period. Reasons for

closure included, the problem no longer persisted, the complaint already existed in the EMA's database, the complaint was not in EMA's jurisdiction and the complaint investigated did not breach the Noise Pollution Control Rules, 2001 (NPCR).

Noise from stereos or radios accounted for the majority (67%) of complaints received. Noise emanating from bars was the second largest source of noise, accounting for 12% of the total number of noise complaints received. In 2010, the EMA received 242 Noise Variation applications and of this figure 235 were granted.

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

In 2010, the EMA received 79 general and 200 CEC complaints and resolved 352 complaints during this period. Complaints are closed for several reasons such as; through voluntary compliance, if the complaint no longer exists, the complainant relocated or the person complained against relocated. In 2010, there were 64 oil spills reported and three fish kills reported to the EMA.

Enforcement action under the EM Act is the thrust of the Legal Services Department's activities since this area of law predominantly relies on the support of legal services.

The jurisdiction for the majority of enforcement matters under the Act resides with the Environmental Commission (EC). Notwithstanding, where appropriate, matters are also taken to the High Court and Court of Appeal.

Non-Court Enforcement Actions- Notices Of Violations (NOVs)

- Twenty-two (22) NOVs regarding breaches of sections 62(f) and (g) of the EM Act were served against persons (including companies). Sections 62(f) and (g) respectively describe the environmental requirements upon a person to apply for and obtain a CEC before commencing any of the 44 activities described in the Certificate of Environmental Clearance (Designated Activities) Order or the requirement upon a person to comply with the terms and conditions of a CEC.

- In the case of breaches of the NPCR, five (5) NOVs were issued by the Authority. These NOVs related to the failure of persons to apply for a noise variation with respect to events which exceeded the maximum permissible sound levels prescribed in the NPCR or breaches of noise variations granted to persons.

Court

Court of Appeal Allows EMA's Appeals

- EAP 005 of 2007 Fishermen & Friends of the Sea v Environmental Management Authority, Civil Appeal 199/2008

- EMA v South West Tobago Fishermen's Association Civil Appeal #219/2009

On June 28, 2010, the Court of Appeal delivered its judgments on both matters above which concerned similar issues regarding the interpretation and consequent scope of sections 81(5) (a) and (i) of the EM Act.

The Court of Appeal allowed the EMA's appeals of the Environmental Commission's decisions in both matters above. It was the opinion of the Court of Appeal that the Commission was wrong in law to construe sub-section 81(5) (a) as conferring jurisdiction on the Commission to hear appeals from all or any decisions or actions of the Authority. The Court found that section 81 (5) (a) was to be interpreted as only granting limited jurisdiction to the Commission to hear and determine specified appeals.

Summary of the Court's decision:

The Court was asked to determine the proper interpretation of Section 81(5) (a) of the EM Act, which states as follows that *'The Commission shall have jurisdiction to hear and determine appeals from decisions or actions of the Authority as specifically authorized under this Act'*.

The question for determination was whether the words *'as specifically authorized under this Act'* qualify the words *'appeals'* or the words *'from decisions or actions of the Authority'*.

It was held that the words '*as specifically authorized under this Act'* qualify the word '*appeals*'. Therefore, the Commission has jurisdiction to hear and determine only appeals (from decisions or actions of the Authority) that are specifically authorized under the Act. No order as to costs was made.

MATTERS IN THE ENVIRONMENTAL COMMISSION

Several matters were taken to the Environmental Commission (EC) by the EMA.

1. EAA 008/2010 -EMA v. National Gas Company Trinidad and Tobago Ltd

This relates to an application under section 67(1) of the EM Act to enforce a consent agreement which was entered into between the Authority and NGC in 2005. This consent agreement secured NGC's agreement to implement key conditions of CEC 0394/2003. Some of these

conditions related to NGC's obligations to install safety barriers, berms and maintenance of the minimal width of the buffer zone.

The said CEC was granted to NGC in 2004 for the carrying on of designated activities 8(a), 9, 33(a), 36 and 41(a)-(c) for the purpose of the expansion of an industrial estate at Union, La Brea.

Based on statements made in NGC's defence to the EMA's application, the EMA made an interlocutory application in November 2010 for judgment on admissions in that NGC in its defence admitted to violations which amounted to breaches of the Consent Agreement and thereby the Consent Agreement should be enforced against them by Order of the EC. The hearing of the Authority's interlocutory application seeking an order for judgment on admissions was heard in the EC on December 13, 2010.

The EC reserved judgment on the interlocutory application. The hearing of substantive application made by the Authority under section 67(1) has been adjourned generally pending the EC's ruling on the interlocutory application.

2. EAA 009/2010- EMA v. Daniel Doodnath

This relates to an application made by the EMA under section 67(1) of the EM Act for enforcement of a Consent Agreement entered in March 2010 between the EMA and Daniel Doodnath concerning compliance with the NPCR.

3. EAA 005 of 2009 –EMA v. Fizul Khan

On October 05, 2009, the EMA filed this Notice of Application in the EC pursuant to section 68(b) of the Act seeking the closure of an autobody shop situate at No. 17 Dookiesingh Street, St. Augustine owned by Fizul Khan.

By Order of the EC dated November 13, 2009, Joyce Boodram and Joycelyn Boodram were granted leave to intervene as interested parties in these proceedings. Consequently, all parties participated in mediation during the period December 07-18, 2009.

Following mediation, the parties resolved the matter through a Consent Order filed in the EC on February 22, 2010 wherein the EMA's application was granted. The EMA was also required to amend and re-issue CEC 2520/2009 according to the terms of the Consent Order. No order as to costs was made by the EC. On March 12, 2010, the CEC was amended and re-issued to Mr. Khan.

4. EAA 006 of 2009 – EMA v. Jack Farah & Company Limited (Respondent)

On October 23, 2009, the Authority filed an application pursuant to section 67(1) of the Act for enforcement of an Administrative Order AO/NV/CEC 93 of 2009, the latter issued by the Authority on July 28, 2010 against the Respondent based on the Authority's finding that the

Respondent was unable to resolve violations of the Act as contained in the Authority's Notice of Violation NV/CEC 93 of 2009. The Notice of Violation related to the establishment of a facility for the manufacture of household products or fixtures which is a designated activity requiring a CEC from the Authority which the Violator did not apply for and obtain.

Following mediation between the EMA and the Respondent, this matter was resolved out of court by Consent Agreement CA/NV/CEC 93 of 2009 dated March 01, 2010 wherein the Respondent agreed to cease and desist from continuing the designated activity without first applying for and obtaining a CEC and to pay an administrative civil assessment penalty of $8,159.66 to the Authority.

By Order of the EC filed February 24, 2010, the EMA withdrew its application for enforcement of the Administrative Order AO/NV/CEC 93 of 2009 given the resolution of the matter by the Consent Agreement.

5. EAA 010 of 2009- EMA v. Allan Warner

On November 11, 2009, the EMA filed an application in the EC pursuant to section 68 of the Act for the closure of a pig and rabbit farm situated at Green Hill, Mount St. George, Tobago and established by Allan Warner (the Respondent).

The EMA and the Respondent later entered into mediation to discuss possible alternative methods of resolution out of court. As a result, the parties agreed to resolve the matter by Consent Agreement dated June 16, 2010. Through the Consent Agreement, Mr. Warner paid the EMA an administrative civil assessment of $22,132.16.

6. EAA 011 of 2009 – EMA v. Vinod Jadoo

On November 11, 2009, the EMA filed an application in the EC pursuant to section 68 of the Act for the closure of an automotive repair shop located at Waterloo Road, Arouca and established by Vinod Jadoo (the Respondent).

Subsequent to mediation between the EMA and the Respondent, the parties resolved the matter by Consent Order entered into before the EC and filed on May 12, 2010. Through the Consent Order, the EMA's application was allowed; the Respondent was ordered to cease and desist from initiating or continuing with activities of the automotive repair garage and to pay a total administrative civil assessment of $1500.00 to the Authority.

7. EAA 002 of 2010 – EMA v. Joanne Emmanuel & Shermin Emmanuel (K's Recreation and Club)

This matter relates to a notice of application for enforcement filed by the EMA on January 25, 2010 pursuant to section 67(1) in the EC seeking to enforce an Administrative Order served against Joanne Emmanuel & Shermin Emmanuel regarding breaches of the NPCR.

The matter was heard in the EC on April 19, 2010 and May 19, 2010. Mediation was held on May 11, 2010 wherein the parties entered into a mediation agreement. By Consent Order dated May 19, 2010 entered into before the Environmental Commission, the Respondents were ordered to immediately cease & desist from further violations of the NPCR and to pay the EMA's administrative civil assessment of costs and damages in the sum of $4,810.25.

8. EAA 003 of 2010 – EMA v. Sean Caruth

This matter relates to a notice of application for enforcement filed on January 25, 2010 by the EMA pursuant to section 67(1) in the EC seeking to enforce an Administrative Order served against Sean Caruth regarding breaches of the NPCR.

By Consent Order dated May 18, 2010 entered into before the Environmental Commission, Sean Caruth was ordered to immediately cease & desist from further violations of the NPCR, to pay the EMA's administrative civil assessment of costs and damages in the sum of $5,256.92 and to hire an approved consultant to investigate the breach and make recommendations to prevent future breaches of the NPCR. The results of said investigation were to be submitted to the EMA.

9. EAA 004 of 2010 – EMA v. Ramnarine Sammy

This matter relates to a notice of application for enforcement filed by the EMA pursuant to section 67(1) of the Act on March 05, 2010 in the EC seeking to enforce an Administrative Order served against Ramnarine Sammy regarding breaches of the NPCR. Hearing and mediation in this matter took place in April, 2010. A mediation agreement was entered into between the Parties on May 03, 2010.

By Consent Order dated June 28, 2010 entered into before the Environmental Commission, the EMA's application for the Administrative Order to be enforced was granted and the Respondent was ordered to (*inter alia)* cease from further violation of the NPCR and to pay the EMA's administrative civil assessment of costs and damages in the sum of $4,226.68.

10. EAA 005 of 2010 – EMA v. Zena Loach & Khaneraj Loach (Dread & Zen's Bar)

This relates to a notice of application filed by the EMA in the EC on March 10, 2010 pursuant to section 67(1) of the Act seeking to enforce a Consent Agreement entered into by the parties on April 02, 2008 wherein the Zena Loach and Khaneraj Loach (owners and operators of Dread &

Zena's Bar) agreed to cease and desist from violations of the NPCR and the said consent agreement.

By Consent Order dated May 26, 2010 entered into before the Environmental Commission, the Respondents were ordered to immediately cease & desist from further violations of the NPCR and to pay the EMA's administrative civil assessment of costs and damages in the sum of $4,726.11.

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

CEC Process Changes

In 2010, the EMA undertook an initiative to introduce a more direct hands-on approach in reviewing all CEC related documents to identify areas requiring improvements. As part of this initiative to streamline the CEC process, a system was set up to document, communicate and implement approved operational and policy changes.

Revised CEC Layout

It was determined that the layout of the existing CEC should be revised to make it more user friendly. As such, a small working group was established aimed at developing a revised CEC Template. The exercise entailed extracting all CEC conditions that appeared in 90% or more of a CEC. Two additional templates were developed to capture conditions that appeared in 75% of the CEC - onshore template and an offshore template. The final draft templates were revised and will be implemented in early 2011.

Improving the CEC Process

In 2010 an exercise was conducted aimed at improving the efficiency and effectiveness of CEC processing for customer satisfaction and protection of human health and the environment. As such, work was done on the processing of CEC applications for Poultry Farms. The EMA conducted research and liaised with several government ministries and agencies in gathering specific information with respect to poultry farm operations in Trinidad and Tobago. An analysis of CEC applications for poultry farms was conducted and a report was submitted with findings of the analysis and research.

Compliance Assistance Programme (CAP)

- Agriculture

As part of the CAP initiative, the EMA met with members of the Ministry of Food Production, Land and Marine Resources to discuss how these two offices can better collaborate to facilitate

stakeholders in the agricultural sector. It was determined that the EMA should first focus on assisting persons who were soon to be awarded State lands for the establishment of large farms. In response, a session was held with these potential CEC applicants to assist them in better understanding the CEC Process.

A package to assist CEC applicants in understanding the impacts of animal husbandry and production (small to medium scale) as well as the requirements of the EMA in processing such applications was also developed.

- *Land Disturbing Activities*

  The first revised draft of the CAP document for Designated Activity 8 was completed and submitted for comments. The revised document will be sent to external stakeholders for review before discussions begin on the establishment of a third party verification system. A draft rapid environmental assessment form for single family dwelling on a slope of 1:4 or more was developed and sent forward for comments.

- *Biodiversity*

  The CAP Biodiversity project began in July 2009. However, the project has been revised and a new Terms of Reference was prepared in preparation for recruitment of a new consultant.

Environmental Database

This project was conceptualised and developed with the objective of making existing environmental data easily accessible. In 2010, work was done on developing preliminary meteorology and water interfaces. However after testing, challenges were encountered with data entry. In order to ensure that the data extraction component could proceed, Microsoft Excel tables were developed as an interim measure.

Entry of water quality data was near completion at the end of 2010 for three municipal corporations; Couva/Tabaquite/Talparo, Siparia and Point Fortin. Most EIAs did not contain location co-ordinates for the project sites and this data was collected using the 2007 geo-referenced satellite imagery in ArcView.

CEC Database

The expected date of delivery for the CEC Database prototype was March 2010 however; due to challenges the prototype has not yet been delivered. Once the final prototype is delivered and accepted by the EMA, the database must be populated with all CEC applications received to date. This exercise is expected to be a long-term exercise.

Environmental Impact Assessment (EIA) Frequently Asked Questions (FAQS) Booklet

An Environmental Impact Assessment (EIA) - Frequently Asked Questions (FAQs) Booklet was developed by the EMA in 2010 to sensitise the general public on the EIA process and to assist them in better understanding their role in the process. The EIA FAQ booklets were distributed to various stakeholder groups and a copy was posted on the EMA's website.

2.2 ENABLING STRATEGIES

- ATTRACT, RETAIN AND DEVELOP COMPETENT STAFF

At the EMA the Human Resource (HR) function continues to meet the needs of management and staff for information for decision making to advance the work of the Authority. HR does this by addressing a range of issues which supports the objectives of the Authority as outlined in the Draft Strategic Plan 2009 - 2012. Human Resource has identified a series of projects for implementation, to support the strategic objectives outlined by the Authority. These include the following:

Recruitment of staff consistent with the phased recruitment plan and other specific approvals.

There was the need to recruit staff to all approved positions where legislation has been enacted. Recruitment done was to replace staff who would have exited the Authority. During the period January 01 to December 31, 2010 there were fifteen (15) persons hired. A breakdown of hires is as follows: Legal Services 2; Corporate Services 2; Technical Services 6; CR&PE 1. Recruitment of all the Nariva Swamp Restoration, Carbon Sequestration and Livelihoods Project (a Green Fund Project) was completed with the employment of four (4) persons in the period under review.

Since the Authority faces an ever-present constraint of insufficient office accommodation, recruitment has been selective based on the areas identified as priority. Nine (9) staff exited the Authority over the same period. The departments affected were as follows: Office of the MD 1; Corporate Services 1; Legal Services 3; CR&PE 1; and Technical Services: 3.

Development of Performance Indicators/Standards for each EMA job and Implementation of a new Performance Management System.

A new Performance Management System was developed and introduced to staff in 2010. A series of workshops were held to acquaint staff with the requirements of the new system. The standards established for evaluating staff were developed in collaboration with a consulting group. The system is expected to be implemented in June 2011.

Creation of a reserved pool of trained individuals within the EMA to facilitate transition to vacant positions as they arise.

This has not commenced in any structured way. However, the Authority has been supporting the mandate of the Ministry of Public Administration to place returning scholars. The Authority assigned three Associate Professionals to the Technical Services Department. The Authority has also engaged one On-the-Job Trainee. These professionals are being exposed to training in environmental areas. The respective Ministries would welcome the opportunity for them to be absorbed as permanent staff of the Authority.

Responding to the specific needs of employees in the workplace by having them determine areas for their self-development. It is expected that this would be advanced with the implementation of the new Performance Appraisal System since the system gives staff the opportunity to make comments in this regard.

Building mentoring relationships between colleagues, supervisors and managers.

This is to be advanced with the introduction of the new Performance Appraisal System since the system provides for meaningful supervisor /supervisee interaction on how to positively impact performance. Since the system has already been developed, more focused coaching is expected when the system is implemented in 2011.

Implementing phased transition to pension plan.

This project was not advanced in 2010. It is expected that it would receive the consideration of the MD and the Board of Directors in the next period.

Ensure that compensation is objectively reviewed and approved by the Public Sector Negotiating Committee (PSNC) so that the compensation structure remains updated and competitive.

The Authority is expected to forward to the PSNC, a revised salary structure for their consideration. The Comparator Study was completed. It is expected that it would receive the consideration of the MD and the Board of Directors in the next period so that the proposed compensation can be advanced in the next period.

Implementation of a project to update the EMA's existing Organisational Structure to achieve alignment with the EMA's draft strategic plan for 2009-2012.

This will be followed by a Job Evaluation Exercise to appropriately rate and rank all jobs. It is expected that it would receive the consideration of the MD and the Board of Directors in the next period.

Development and implementation of a reward program based on performance.

Proposals for non-cash incentives were forwarded for the consideration of the Executive Management. It is expected that it would receive the consideration of the MD and the Board of Directors in the next period.

Development and implementation of a system of merit increases linked to the Performance Management System

Now that the new Performance Management System has been developed, a draft Merit Increase proposal will be submitted for the consideration of the MD in the next period.

Building a team approach to work.

Effective Teamwork is an approach to work that is desirable. It is expected that the Team Building and Leadership Training will be realized in the next calendar year. Provision was made for this training in the training budget.

Training and Development/Conferences

HR delivered the approved Training Plan in the current fiscal year. Although the approved Training Plan was significantly tailored to meet the constraints of a budget that was approximately 50% of what was requested, staff in all departments benefited from training spanning a range of areas as follows:

Technical Services Department staff:

- Tropical Basic Offshore Safety and Emergency Training
- ISO Quality Systems
- Green Manufacturing
- Oil Spill
- Water and Wastewater
- Amcham HSE
- Safety Awareness
- Stress Management and GIS

Corporate Services Department:

- Blackberry Infrastructure (IT staff)
- Incident Reporting for HSE
- Inventory Management
- Public Procurement
- Professional Office Administration
- Excellence in Hospitality

CR&PE Department:

- Public speaking and Presentation Skills
- Protocol.

Legal Services Department:

- Implications of Equal Opportunity Legislation.

Office of the MD:

- Forensics of Academic Credential and CV Fraud.

All Departments:

- Fire Warden
- Staff Orientation.

EPU:

- Oil spill
- Noise Meter Training

In addition, some amount of staff development occurred with other opportunities created through acting and internal promotions. A total of fourteen (14) staff members had opportunities to act at a higher level.

Review the existing Human Resource Policy.

HR issues continually arise which establish the need for the review of the existing Human Resource Manual which outlines the various policies with respect to how the Human Resource will be managed. Issues that are raised with HR suggest that there is the need to clarify and elaborate on certain policies. It is expected that the review of the Human Resource Manual will begin in the next period.

Other Significant Activities

Unionisation

During the current period staff of the Authority sought to become unionized. The final decision is yet to be determined; however during this process the EMA provided all requested information to the Registration, Recognition and Certification Board.

Industrial Court Matter

The Authority invested a significant amount of time in preparing for the hearing of the staff matter before the Industrial Court. To date, all evidence and arguments have been submitted to the Court. Hearings should begin in the next period.

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

Development of an Environmental Database

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Environmental Impact Assessment (EIA) Frequently Asked Questions (FAQS) Booklet

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Administrative Civil Assessments

The EMA's Legal Services department led a project which sought to develop proposals and policies for calculating the administrative civil assessment pursuant to section 66 of the EM Act. In particular, a consultant was engaged in 2009 to develop proposals to calculate the following:

- Administrative civil assessment of damages for economic benefit of amount saved by a person with respect to breaches of the environmental requirements listed in section 62 of the EM Act.

- Administrative civil assessment of damages for failure of a person to comply with the environmental requirements specifically described in sections 62(f) and (g) of the EM Act. These environmental requirements relate to the Certificate of Environmental Clearance and the Noise Pollution Control Rules regime.

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

International Year of Biodiversity (IYB)

In response to the recommendation adopted by the 8th meeting of the Conference of the Parties to the Convention of Biological Diversity; 2010 was proclaimed as the International Year of Biodiversity. In commemoration of IYB with its international theme being, "**Biodiversity is life. Biodiversity is our life"**, the EMA was engaged in activities to show the connection between biodiversity and economic development. This vital link between the promotion of sustainable development and the maintenance of the country's unique biodiversity was key throughout the public education and awareness campaign executed by the CR/PE department.

One of the main teaching tools was the IYB-themed calendar and diary. With themes such as Species Diversity; Cultural Diversity and Sustainable Livelihoods; Agricultural Diversity; the Protection of Rivers & Beaches; Threatened Species; Invasive Alien Species; Coastal & Marine Habitats; Eco-Tourism; Terrestrial Biodiversity; Mountains; Horticultural Biodiversity and Protected Areas, the images and information shared, offered an excellent opportunity to learn more about the rich tapestry of life that exists in Trinidad & Tobago and to discover the importance of having healthy eco-systems.

IYB Stamp Launch

The EMA was also engaged in collaborative projects with other agencies and Government Ministries including the Ministry of Planning, Housing & the Environment, in collaboration with the Ministry of Agriculture, Land and Marine Resources. One such project was the production of a series of stamps in commemoration of the IYB.

The EMA submitted some of the biodiversity pictures from its IYB Calendar in support of the stamp series which was launched in collaboration with the Trinidad and Tobago Postal Corporation (TT Post) on May 19, 2010 at the Trinidad Hilton, Port of Spain. The stamps highlight Trinidad & Tobago's rich and diverse biodiversity through images of flora, fauna and various ecosystems.

These miniature works of art, which will act as ambassadors of T&T's rich biodiversity, was sent to the Secretariat of the Convention on Biological Diversity and was also part of the International Stamp Exhibition at the London ***2010: Festival of Stamps.*** As one of the materials produced in occasion on the International Year of Biodiversity, they can be found in the International Year of Biodiversity Museum. The stamps will also be exhibited in Nagoya during the Conference of the Parties to the Convention on Biological Diversity and also at the 66th UN General Assembly in 2011.

Green Lifestyle Show

The EMA's inaugural Green Lifestyle Show (GLS) on World Environment Day – June 05 –was considered a huge success as it provided a unique opportunity which brought buyers and sellers of environmentally-friendly goods and services together.

Exhibitors included:

- Paramita International Limited
- Moksha Yoga Trinidad
- WINDTNT Limited
- Calypso Fabric Architecture
- Eco Impact
- New Earth Organic Enterprises Limited and
- Nature Seekers Inc.
- Eco-Life Solutions
- Earth Scents
- Wade Enterprises Caribbean Ltd
- Rose Environmental
- Energy Dynamics Ltd
- Piranha Technology Asset Management Ltd
- Body Beautiful
- Kiara Kreations
- Akilah's Jewellery
- Omega Telecom
- SWMCOL
- Bri Cha Ltd.
- The Green Fund
- Environment Tobago
- Asa Wright Nature
- Centre and Citizens for a Better Trinidad and Tobago
- Green Transformations Eco Events and Marketing Services
- Infinite Barrel Concepts
- Caribbean Water and Wastewater Association
- Trinidad Cement Limited
- Tourism Intelligence International/Being Sustainable
- S & R Distribution Industrial Nanotech Inc
- Desaltech Limited
- Ecohill

Green Leaf Awards

Green Leaf Awards were also presented to three recipients in a gala event on Saturday June 05, at the Trinidad Hilton in Port of Spain. The Minister of Housing and the Environment, the Honourable Dr. Roodal Moonilal delivered his first World Environment Day address at this distinguished ceremony which also marked the EMA's 15th anniversary.

Adventure Farm and Eco Villas, the "Bush Diary with Robert Clarke" television series produced by Idiom Productions Ltd. and special awardee, Jirjodhan Mahabir, were presented with their awards at the function which coincided with commemoration of World Environment Day 2010.

The Adventure Farm and Eco Villas facility is located at Arnos Vale in Tobago. It is situated in the midst of a 12 acre nature reserve and organic farm run by Ean Mackay. With solar panel energy use, it is a sustainable venture that grows its own food and is considered a perfect balance between wildlife and sustainable eco-tourism.

The "Bush Diary with Robert Clarke" television series explores Trinidad and Tobago's diverse wildlife and recognises the unsung work of conservationists in the preservation of the country's fragile natural heritage. During the series, journalist Robert Clarke goes into untouched spaces to tell the story of diverse and unique ecosystems.

Eighty one year-old Jirjodhan Mahabir received a special award for his life's work in preserving the environment. His love for agriculture encouraged him to cultivate acres of land with vegetables, in the dry season, using special techniques for the conservation of moisture. He also practiced forest rehabilitation and the inter-planting of various plant species between forest crops and also planted 80 acres of Red Cedar on his farm.

The EMA also presented Long Service awards to its former Environmental Police Unit Officers. The EMA salutes all winners of this year's Green Leaf Awards 2010.

Information Center

The Information Center continued to provide information resources to members of staff and the public. Our information resources are found in books, environmental impact assessments, information files, posters and handouts. The national registers provide additional resources to applicants, students and others.

In 2010 at the Information Center, approximately one thousand four hundred and eighty-three (1483) external clients were served. These clients were students, applicants (prospective and current) and others. Internally, one thousand and sixty-eight (1068) members of staff were served. Requests were processed via e-mail, telephone calls and walk-in requests.

The Information Center also achieved a milestone. Two online public access catalogues were made accessible to users. These catalogues would allow clients to conduct independent searches. Work on the completion of the retrospective cataloguing of our bibliographic records in the library collection is ongoing. The goal of the project is the modification and standardisation of the bibliographic records to meet the MARC standard as devised by the Library of Congress.

The Information Center plans to make available our online public access catalogue (OPAC) on the EMA's website by 2011-2012.

- MAXIMIZE SELF-FUNDING OF EMA OPERATIONS

- COORDINATE ENVIRONMENTAL MANAGEMENT ACTIVITIES IN TRINIDAD AND TOBAGO

C&B T&T Campaign

The EMA was an active and leading participant in the Clean-Up & Beautify Trinidad and Tobago (C&B T&T) exercise which was launched on June 12, 2010 in preparation for the National Clean-Up day on June 27, 2010. C&B T&T was an initiative of the Honourable Prime Minister, Mrs. Kamla Persad-Bissessar. As part of the campaign, the staff of the EMA came together to play a leading role in the exercise that was engaged throughout the country.

At the launch, the EMA cleaned a mangrove wetland area which exists on the fringe of the Caroni Swamp, off Cacandee Road, Felicity. This area was chosen due to its environmental significance as the Caroni Swamp is an ecologically sensitive area. The area is also culturally significant as it borders the Lakhan Karriah cremation site and it is also significant as a fishing community.

The C&B, T&T programme was the first step in a large scale, collaborative national effort in addressing the flooding issue. It was also considered as a success nation-wide as thousands of people came out to demonstrate their commitment as concerned citizens and be part of positive action towards the environment.

The EMA continued its clean-up efforts on Sunday June 27, 2010 by engaging in a clean-up of Los Iros Beach in South Trinidad. Los Iros was chosen due to specific environmental concerns that were noticed by the EMA team as they conducted site visits to the South Coast. All together about 40-50 large bags of garbage were collected ranging from large sheets of plastic to small pieces of broken glass. All glass items were collected in separate crocus bags to be recycled by Carib Glassworks Ltd. The EMA also did its part to beautify the area by planting trees that would thrive in coastal areas such as palm and almond. The appropriate trees and planting methods were guided by Forestry experts.

International Coastal Clean-Up

The EMA hosted the launch of the annual International Coastal Clean-Up (ICC) on August 10, 2010 in collaboration with the Caribbean Network for Integrated Rural Development (CNIRD) and the National Planning Committee (NPC) which comprise other organisational volunteers. The EMA has been a member of the NPC which has been coordinating the local Clean-up since 2004.

The ICC is the largest volunteer effort on behalf of the ocean's health and this year, especially, it provided an ideal complement to the Clean-up and Beautify Trinidad and Tobago campaign launched in June by Prime Minister Kamla Persad-Bissessar.

Global results for the 2010 ICC indicated that 615,000 volunteers from 114 countries picked up and recorded close to 8 million pounds of debris in just 1 day. In Trinidad and Tobago 2,360 volunteers collected 22,927 lbs of garbage on 19 beaches. At the EMA's clean-up site in Manzanilla, the EMA, with the help of CEPEP, various NGOs, schools and community groups, collected 162 bags of trash weighing 1,899 lbs. in just three hours.

The EMA continues to participate in this annual event as it raises awareness about the environmental effects of littering and flooding and is prepared to become more involved to ensure that it becomes a more sustainable effort locally.

❖ OPERATE THE EMA AS A MODEL FOR GOOD ENVIRONMENTAL MANAGEMENT PRACTICES

CNG Fleet Conversion

The Authority, in its commitment to lead by example, started the process of conversion of its 12-vehicle fleet to Compressed Natural Gas (CNG). In 2010, the Government re-launched its CNG conversion initiative in keeping with climate change commitments made at the 2009's Commonwealth Heads of Government Meeting (CHOGM) in Port-of-Spain and the United Nations Climate Summit in Copenhagen, Denmark. In 2010, Conversion kits were procured and installed in Five (5) vehicles.

CNG is a safe, clean and economical fuel and is emerging as one of the most significant alternatives to traditional motor vehicle fuels globally and could make a significant impact in greenhouse gas emissions reductions right here in Trinidad and Tobago. The overall cost of converting to CNG was reduced in 2009 when custom duties and Value Added Tax (VAT) were removed from conversion kit purchases.

There are many other economic gains to be derived from CNG conversion. Since CNG is non-corrosive, maintenance costs are reduced and intervals between tune-ups and oil changes are extended. It has also been found that natural gas does not react to metals the way gasoline

does, thus, sparkplugs, exhaust pipes and mufflers last longer. It has also been noted that engines burning CNG last longer than those utilizing gas. CNG also has a slight efficiency advantage over gasoline. Thus, from a public transportation perspective, if drivers' operational costs are reduced, these savings could be passed on to commuters in the form of lower fares.

From an environmental perspective, CNG promises many benefits. Recent studies show that CNG powered vehicles produce up to 29% less greenhouse gas emissions than gasoline powered ones and 22% less than comparable diesel ones. Additionally, CNG vehicles produce little or no evaporative emissions during fuelling and use while in gasoline fuelled vehicles, evaporative and fuelling emissions account for at least 50% of a vehicle's total hydrocarbon emissions. Exhaust or tail-pipe emissions from CNG vehicles are much lower than equivalent gasoline powered vehicles.

Information Technology

The EMA's Information Technology Unit also had some major achievements in 2010:

- Installation and configuration of two (2) workstations in the library for clients to peruse the library catalogue at their fingertips. This was done in consultation with the Information Center.

- Two (2) network switches were changed thereby increasing efficiency, as the speed of data is transferred from 100MBps to 1GBps.

- The EMA's Combination Server Portal or Comboserv was redesigned and upgraded to enhance the capabilities of all databases including noise, complaints, IT helpdesk, the Intranet, HRp5 staff directory and HR documents.

- The computer room was redesigned and an independent air condition system was installed thereby reducing the amount of peripherals used and reducing energy usage.

- Installation of a wireless network at Elizabeth Street Office allowing both staff and visitors wireless capabilities for presentations and Skype conferencing.

- Central administration of Anti-Virus Protection for the organisation was installed which give computers and users 24 hrs protection with automatic updates.

3.0 PLANS FOR 2011

To protect and improve air quality to reduce and eliminate risk to human and ecosystem health

Installation of the new AAQM station at the Port of Point Lisas and the relocation of the current AAQM Station at Sea Lots

The objective of this project is to capture air quality data downwind of the Point Lisas Industrial Estate and in the Sea Lots air shed. As such, the new shelter will be installed on or near the Port of Point Lisas and the current shelter located at the Point Lisas Industrial Port Development Corporation Ltd (PLIPDECO) will be relocated to the Trinidad and Tobago National Petroleum Marketing Company Ltd (NP) at Sea Lots. The new shelter is best suited for installation at the Port of Point Lisas because it includes an attachment that is designed to measure hydrogen fluoride but can be used to measure other potential pollutants from the Estate.

To protect and restore the water quality of inland and coastal waters to safeguard human and ecosystem health

Water Pollution monitoring equipment

The Water Pollution Rules, 2001 (as amended) came into effect in May, 2007 with the aim of getting industries in Trinidad and Tobago to reduce both the volumes and concentrations of pollutants discharged in their wastewater, in order to improve the quality of receiving waters. The primary objective is to acquire water quality testing equipment to ascertain the presence and concentration of water pollutants whilst conducting environmental investigation and water quality monitoring assessments.

To protect communities and ecosystems from health consequences of hazardous chemicals spills and the unsafe handling and disposal of solid and hazardous wastes

Remediation of lead contaminated soil at Food Crop Road, Guayaguayare

A lead investigation and assessment project conducted by the EMA during 2006 as a follow up to the 2004 Blood Lead Level Survey identified three sites for further investigation. One such location was found at Food Crop Road, Guayaguayare, where the lead from ULABs was smelted for making fish net sinkers. The primary purpose of this study is to remediate lead contaminated soil at Food Crop Road, Guayaguayare to below the USEPA action limits of 400 ppm in soil and TCLP of 5 ppm.

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

Biodiversity Assessment of Trinidad and Tobago

The information base on the state of the biodiversity resources of T&T is outdated, undeveloped, fragmented and inaccessible to the decision-makers of the country. This project is envisioned as a two-year study and seeks to address the deficiency in biodiversity information and its use in planning, integration and decision-making by compiling, collating, discussing the state of the country's biodiversity, and using the latest available information, technology and studies to do so. Its long-term goal will be the mainstreaming of biodiversity information to produce guidelines and protocols for the integration of biodiversity conservation issues into national plans, programmes and policies.

Implementation of the Updated Management Plan for the Aripo Savannas Environmentally Sensitive Area

Work on this project was initiated and is on-going since the 2006 – 2007 fiscal year. This project is therefore to continue with the implementation of priorities that were identified in the management planning project, with a Project Coordinator managing implementation of the activities.

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

Population of Certificate of Environmental Clearance (CEC) Database

The Environmental Management Authority (EMA) is currently in the final stage of building a Certificate of Environmental Clearance (CEC) database to administer all aspects of the CEC process, such as electronic entry, evaluation, response and tracking of all CEC applications received. It is expected that this database will allow for easier management of personnel involved in the CEC process and will facilitate a more efficient and effective decision making process. The objective of this exercise is to populate the database once the above is completed.

4.0 APPENDIX 1 - BOARD OF DIRECTORS

- **As at December 2010**

- Professor Julian Kenny-Chairman
- Mr. Shyam Dyal-Deputy Chairman
- Mr. Terrence Holmes
- Mr. John Julien
- Dr. Vincent Lasse
- Mr. Michael Rooplal
- Ms Ashvini Supersad
- Dr. Lena Brereton-Wolffe
- Mr. Kelvin Ramnath

Board of Trustees

- Professor Julian Kenny
- Mr. Shyam Dyal
- Mr. Paolo Kernahan
- Mr. Michael Rooplal
- Dr. Lena Brereton-Wolffe

Co-ordination Committee

- Mr. Shyam Dyal (Chairman)
- Ms. Ashvini Supersad
- Mr. Paolo Kernahan

Human Resource Committee

- Mr. Kelvin Ramnath (Chairman)
- Mr. John Julien
- Dr. Vincent Lasse

Tenders Committee

- Professor Julian Kenny (Chairman)
- Mr. Michael Rooplal

Noise Advisory Committee

- Mr. Terrence Holmes (Chairman)
- Dr. Lena Brereton-Wolffe
- Dr. Deborah Pinder
- Dr. Wesley Shim
- Ms. Gayatri Badri Maharaj
- Frances Mitchell Wanliss

PART C: FINANCIAL STATEMENTS

Environmental Trust Fund

Audited Financial Report
for the year ended
September 30, 2010.

Auditor General's Report

REPORT OF THE AUDITOR GENERAL OF THE REPUBLIC OF TRINIDAD AND TOBAGO ON THE FINANCIAL STATEMENTS OF THE ENVIRONMENTAL MANAGEMENT AUTHORITY - ENVIRONMENTAL TRUST FUND FOR THE YEAR ENDED 2010 SEPTEMBER 30

The accompanying Financial Statements of the Environmental Management Authority - Environmental Trust Fund for the year ended 2010 September 30 have been audited. The Statements as set out on pages 2 to 19 comprise a Statement of Financial Position as at 2010 September 30, a Statement of Comprehensive Income, a Statement of Movement of Funds and a Statement of Cash Flows for the year ended 2010 September 30 and Notes to the Financial Statements numbered 1 to 14.

2. The audit was conducted by a firm of Accountants appointed by the Board of Directors with the written consent of the Auditor General. Their Report dated 2011 March 01 which is attached refers.

SUBMISSION OF REPORT

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

2012 September 27

REPUBLIC OF TRINIDAD AND TOBAGO
2012 09 27
AUDITOR GENERAL

MAJEED ALI
ACTING AUDITOR GENERAL

Auditor's Report

PKF

Chartered Accountants
& Business Advisors

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

FINANCIAL STATEMENTS

30 SEPTEMBER 2010

PKF

Chartered Accountants
& Business Advisors

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

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PKF

Chartered Accountants
& Business Advisors

INDEPENDENT AUDITORS' REPORT

The Trustees
Environmental Management Authority -
Environmental Trust Fund

We have audited the accompanying financial statements of Environmental Management Authority – Environmental Trust Fund, which comprise the statement of financial position as at 30 September 2010, the statements of comprehensive income, movement of funds and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory notes.

Management's Responsibility for the Financial Statements

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

Auditors' Responsibility

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

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

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of Environmental Management Authority – Environmental Trust Fund as of 30 September 2010, and of its financial performance and cash flows for the year then ended in accordance with International Financial Reporting Standards.

PKF

Port of Spain
1 March 2011

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Balance Sheet

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

STATEMENT OF FINANCIAL POSITION

ASSETS

	Notes	30 September 2010	2009
Cash Resources:			
Cash in hand and at bank	5	$ 24,268,984	$ 7,769,015
Short-term investments	6	5,670,509	5,513,360
Total Cash Resources		29,939,493	13,282,375
Other Assets:			
Accounts receivable and prepayments	7	2,822,506	2,299,882
Fixed assets	8	44,372,996	27,605,733
Total Assets		**$ 77,134,995**	**$ 43,187,990**

LIABILITIES AND FUNDS

Liabilities:			
Accounts payable and accruals	9	$ 12,752,853	$ 4,396,429
Deferred income	10	1,347,830	-
Total Liabilities		14,100,683	4,396,429
Funds:			
GORTT Fund		40,423,598	34,058,032
UNDP Fund		505,253	720,804
IBRD Fund		3,051,959	3,537,216
Other Fund		1,071,358	475,509
Revaluation surplus		17,982,144	-
Total Funds		63,034,312	38,791,561
Total Liabilities and Funds		**$ 77,134,995**	**$ 43,187,990**

Trustee

Trustee

(The accompanying notes form part of these financial statements)

Statement of Income

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

STATEMENT OF COMPREHENSIVE INCOME

	For the year ended 30 September 2010	2009
Income:		
GORTT Fund	$ 41,560,523	$ 38,898,521
UNDP Fund	-	536,907
NSRCSL Project Fund	117,595	-
Other Fund income	699,763	10,919
Activities income	973,500	1,171,833
Interest income	207,119	484,822
Profit on disposal of fixed assets	123,878	346,056
(Loss)/gain on foreign exchange	(9,200)	98
	43,673,178	41,449,156
Project expenses	(2,676,488)	(7,226,209)
Income after project expenditure	40,996,690	34,222,947

(The accompanying notes form part of these financial statements)

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

STATEMENT OF COMPREHENSIVE INCOME (CONT'D)

	For the year ended 30 September 2010	2009
Expenditure:		
Advertising and promotions	$ 760,508	$ 1,069,533
Audit fees	82,119	196,500
Conference costs	-	67,679
Contract services	570,323	675,076
Depreciation	1,605,138	1,638,600
Directors' expenses	53,039	-
Directors' fees	428,200	386,300
Interest and bank charges	12,840	10,754
Insurance	486,910	434,977
Motor vehicle expenses	352,059	396,917
Maintenance contracts	408,101	570,386
Management fees	18,000	16,500
Office and general expenses	60,304	109,158
Permitting and compliance costs	1,458,362	2,356,318
Professional fees	996,576	411,384
Publication costs	2,905	112,979
Reference and research cost	193,176	131,431
Rent	1,354,976	1,420,792
Repairs and maintenance	544,144	353,705
Salaries and benefits	22,181,091	23,370,680
Security	759,227	757,633
Selection and recruitment costs	90,273	84,967
Supplies	858,433	843,154
Training	161,912	310,319
Travel	77,932	74,812
Utilities	1,120,521	1,195,692
	34,637,069	36,996,246
Net surplus/(deficit) for the year	6,359,621	(2,773,299)
Other Comprehensive Income:		
Revaluation surplus	17,982,144	-
Total Comprehensive Income for the year	**$ 24,341,765**	**$ (2,773,299)**

(The accompanying notes form part of these financial statements)

Statement of Cash Flows

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

STATEMENT OF CASH FLOWS

	For the year ended 30 September 2010	2009
Cash Flows from Operating Activities:		
Net surplus/(deficit) for the year	$ 6,359,621	$ (2,773,299)
Adjustments:		
Depreciation	1,605,138	1,638,600
Gain on disposal of fixed assets	(123,877)	(346,056)
Equity adjustment	(99,014)	(28,219)
	7,741,868	(1,508,974)
Net change in accounts receivable and prepayments	(522,624)	(969,164)
Net change in accounts payable and accruals	8,356,424	(2,284,146)
Net change in deferred income	1,347,830	-
Cash provided by/(used in) Operating Activities	16,923,498	(4,762,284)
Cash Flows from Investing Activities:		
Purchase of fixed assets	(438,336)	(971,607)
Proceeds from sale of fixed assets	171,956	354,782
Cash used in Investing Activities	(266,380)	(616,825)
Increase/(decrease) in cash and cash equivalents	16,657,118	(5,379,109)
Cash and cash equivalents, beginning of year	13,282,375	18,661,484
Cash and cash equivalents, end of year	**$29,939,493**	**$13,282,375**
Represented by:		
Cash in hand and at bank	$24,268,984	$ 7,769,015
Short-term investments	5,670,509	5,513,360
	$29,939,493	**$13,282,375**

(The accompanying notes form part of these financial statements)

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

STATEMENT OF MOVEMENT OF FUNDS

For the year ended 30 September 2010

	GORTT Fund	UNDP Fund	IBRD Fund	Other Fund	NSRCSL Project Fund	Revaluation Surplus	Total
Balance as at 1 October 2008	$ 36,283,290	649,916	$ 3,888,680	$ 771,188	$ -	$ -	$ 41,593,074
Equity adjustment	-	(28,219)	-	-	-	-	(28,219)
Funds received	38,898,521	536,907	-	10,919	-	-	39,446,347
Interest income	484,667	-	155	-	-	-	484,822
Activities income	1,171,833	-	-	-	-	-	1,171,833
Profit on disposal of fixed assets	346,056	-	-	-	-	-	346,056
Gain on foreign exchange	98	-	-	-	-	-	98
Expenditure	(43,126,433)	(437,800)	(351,619)	(306,598)	-	-	(44,222,450)
Balance as at 1 October 2009	34,058,032	720,804	3,537,216	475,509	-	-	38,791,561
Equity adjustment (**Note 14**)	-	-	-	(99,014)	-	-	(99,014)
Funds received	41,560,523	-	-	699,763	117,595	-	42,377,881
Interest income	207,119	-	-	-	-	-	207,119
Activities income	973,500	-	-	-	-	-	973,500
Profit on disposal of fixed assets	123,878	-	-	-	-	-	123,878
Loss on foreign exchange	(9,200)	-	-	-	-	-	(9,200)
Fixed asset revaluation	-	-	-	-	-	17,982,144	17,982,144
Expenditure	(36,490,254)	(215,551)	(485,257)	(4,900)	(117,595)	-	(37,313,557)
Balance at 30 September 2010	**$ 40,423,598**	**$ 505,253**	**$ 3,051,959**	**$ 1,071,358**	**$ -**	**$ 17,982,144**	**$ 63,034,312**

(The accompanying notes form part of these financial statements)

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS

30 SEPTEMBER 2010

1. **Registration and Activities:**

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

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

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

During the twelve month period ended 30 September 2010, the Authority continued its work in enforcing the Noise Pollution Control Rules, 2001; the Noise Pollution Control (Fees) Regulation, 2001; Certificate of Environmental Clearance Rules; the Certificate of Environmental Clearance (Designated Activities) Amendment Order, 2008 & 2007; Certificate of Environmental Clearance (Designated Activities) Order, 2001; the Certificate of Environmental Clearance (Fees and Charges) Regulations, 2001; the Environmental Commission Rules of Practice and Procedure; Water Pollution (Amendment) Rules, 2006; Water Pollution Rules, 2001; Water Pollution (Amendment) Fees; Water Pollution (Fees) Regulations, the Environmentally Sensitive Areas Rules, 2001; and Environmentally Sensitive Species Rules, 2001.

The draft Air Pollution and Hazardous & Non Hazardous and Waste Rules are also in various stages of development. The Authority is currently in the process of devising its Strategic Plan for the period 2009-2012.

2. **Summary of Significant Accounting Policies:**

(a) Basis of financial statements preparation -

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

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

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

(b) **New Accounting Standards and Interpretations -**

i) The Authority has not applied the following International Financial Reporting Interpretations Committee Interpretations (IFRICs) that became effective during the current year, as they do not apply to the activities of the Authority:

IFRIC 15 Agreements for the Construction of Real Estate

IFRIC 17 Distributions of Non-cash Assets to Owners

IFRIC 18 Transfers of Assets from Customers

IFRIC 19 Extinguishing Financial Liabilities with Equity Instruments

ii) The Authority has not applied the following standards, revised standards and interpretations that have been issued, as they either do not apply to the activities of the Authority or have no material impact on its financial statements:

IFRS 1 First-time Adoption of International Financial Reporting Standards – Amendments relating to oil and gas assets and determining whether an arrangement contains a lease (effective for accounting periods beginning on or after 1 January 2010).

IFRS 1 First-time Adoption of International Financial Reporting Standards – Limited exemption from comparative IFRS 7 disclosures for first time adopters (effective for accounting periods beginning on or after 1 July 2010).

IFRS 1 First-time Adoption of International Financial Reporting Standards – Amendments resulting from May 2010 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2011).

IFRS 2 Share-based Payment – Amendment relating to group cash-settled share-based payment transactions (effective for accounting periods beginning on or after 1 January 2010).

IFRS 3 Business Combinations – Amendments resulting from May 2010 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 July 2010).

IFRS 5 Non-current Assets Held for Sale and Discontinued Operations – Amendments resulting from April 2009 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2010).

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

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

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

ii) (cont'd) -

IFRS 7	Financial Instruments: Disclosures – Amendments resulting from May 2010 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2011).
IFRS 7	Financial Instruments: Disclosures – Amendments enhancing disclosure about transfers of financial assets (effective for accounting periods beginning on or after 1 July 2011).
IFRS 8	Operating Segments – Amendments resulting from April 2009 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2010).
IFRS 9	Financial Instruments: Classification and Measurement (effective for accounting periods beginning on or after 1 January 2013.
IAS 1	Presentation of Financial Statements – Amendments resulting from April 2009 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2010).
IAS 1	Presentation of Financial Statements – Amendments resulting from May 2010 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2011).
IAS 7	Statement of Cash Flows – Amendments resulting from April 2009 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2010).
IAS 17	Leases – Amendments resulting from April 2009 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2010).
IAS 24	Related Party Disclosures: Revised definition of related parties (effective for accounting periods beginning on or after 1 January 2011).
IAS 27	Consolidated and Separate Financial Statements - Amendments resulting from May 2010 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 July 2010).

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

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

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

IAS 32 Financial Instruments: Presentation - Amendments relating to classification of rights issues (effective for accounting periods beginning on or after 1 February 2010).

IAS 34 Interim Financial Reporting – Amendments resulting from May 2010 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2011).

IAS 36 Impairment of Assets - Amendments resulting from April 2009 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2010).

IAS 39 Financial Instruments: Recognition and Measurement - Amendments resulting from April 2009 Annual Improvements to IFRSs (effective for accounting periods beginning on or after 1 January 2010).

(c) Fixed assets and depreciation -

Land and building comprise offices occupied by the Authority and include land purchased for construction of new offices in Trincity. A valuation was completed on the building at #8 Elizabeth Street, St. Clair by independent valuer G. A. Farrell & Associates Limited. The effective date of the valuation was 4 January 2010 and the value of **TT$26 million** was determined after consideration and use of one of more of the following approaches: the Direct Sales Comparison Approach; the Income Approach; and the Cost Approach. Land and building are stated at historical cost/valuation, less depreciation in the case of building. Historical cost includes expenditure that is directly attributable to the acquisition of the items.

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

Depreciation is calculated on the reducing balance method to write off the cost of assets to their residual values over their estimated useful life as follows:

Building	-	2% - 20% per annum
Furniture and fittings	-	10% per annum
Office equipment	-	20% per annum
Motor vehicles and computer equipment	-	25% per annum
Library/Information	-	10% per annum

Land is not depreciated as it is deemed to have an indefinite life.

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

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

(c) **Fixed assets and depreciation (cont'd) -**

Where the carrying amount of an asset is greater than its estimated recoverable amount, it is written down immediately to its recoverable amount.

Gains and losses on disposal of property, plant and equipment are determined by reference to their carrying amounts and are included in the Statement of Comprehensive Income.

(d) **Foreign currency -**

Monetary assets and liabilities denominated in foreign currencies are expressed in Trinidad and Tobago dollars at rates of exchange ruling at the Statement of Financial Position date. All revenue and expenditure transactions denominated in foreign currencies are translated at the rates of exchange ruling at the date of the transaction and the resulting profits and losses on exchange from trading activities are recorded in the Statement of Comprehensive Income.

(e) **Taxation -**

The Authority is exempt from taxation under the Environmental Management Act of 2000, Part VII Section 76. According to Section 76:-

'...The Fund and the Authority shall be exempted from stamp duty, corporation tax, customs duties, value added taxes, motor vehicle taxes, fees, charges, assessments, levies and imposts on any income or profits or on assets which are acquired for use by the Fund or the Authority...'

(f) **Use of estimates -**

The preparation of the financial statements in conformity with International Financial Reporting Standards, requires management to make estimates and assumptions that affect the reported amount of assets and liabilities. Also required is the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

(g) **Financial instruments -**

Financial assets and financial liabilities are recognised on the Authority's Statement of Financial Position when the Authority becomes a party to the contractual provisions of the instrument.

Trade payables

Trade payables are stated at amounts due.

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

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

(g) **Financial instruments (cont'd) -**

Cash and cash equivalents

Cash and cash equivalents consist of highly liquid investments with original maturities of three months or less and are carried at cost, which approximates market value.

(h) **Income and funding -**

Funding was provided to the Environmental Management Authority Environmental Trust Fund as follows:

(i) Proceeds of a loan of US$6.25 million from the IBRD to the Government of the Republic of Trinidad and Tobago (GORTT). The loan facility closed on 31 December 2000.

(ii) Ongoing funding from the GORTT to cover recurrent and development programme expenditure.

(iii) Grant funds are provided by the United Nations Development and Environment Programmes (UNDP and UNEP) to fund specific activities that are set out in the relevant multilateral agreements. The main projects administered by the Environmental Management Authority Environmental Trust Fund during the financial year ended 30 September 2010 are the Second National Communication to the Convention on Climate Change; Phase V of the Institutional Strengthening Programme for the Phase-out of Ozone Depleting Substances; and Phase II of the Terminal Management Plan for the Phase-out of CFC's.

(iv) A Memorandum of Agreement was signed on 20 April 2010 with the Minister of Planning, Housing and the Environment acting on behalf of the GORTT to receive funding from the Green Fund to continue with the Nariva Swamp Restoration, Carbon Sequestration and Livelihoods Project (NSRCSL Project). The project duration is from 20 April 2011 to 31 March 2017. Upon signing of the agreement, the first tranche of **TT$8.471 million** was received. The total amount to be disbursed over the period is **TT$68.545 million**. Future disbursements will be made based on approved progress reports.

(i) **Comparative information -**

Where necessary, comparative amounts have been adjusted to conform with changes in presentation in the current year.

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

3. Financial Risk Management:

Financial risk factors

The Authority is exposed to liquidity risk, currency risk, operational risk, compliance risk and reputational risk arising from the financial instruments that it holds. The risk management policies employed by the Authority to manage these risks are discussed below:

(a) Liquidity risk -

Liquidity risk is the risk that arises when the maturity of assets and liabilities do not match. An unmatched position potentially enhances net surplus for the year, but can also increase the risk of losses. The Authority has procedures with the object of minimising such losses such as maintaining sufficient cash and other highly liquid current assets.

(i) Risk management

The matching and controlled mismatching of the maturities and interest rates of assets and liabilities are fundamental to the management of the Authority. The Authority employs various asset/liability techniques to manage liquidity gaps. Liquidity gaps are mitigated by the liquid nature of a substantial amount of the Authority's assets as well as securing sufficient cash from the Government of the Republic of Trinidad and Tobago.

To manage and reduce liquidity risk the Authority's management actively seeks to match cash inflows with liability requirements.

(b) Currency risk -

Currency risk is the risk that the value of financial instruments will fluctuate due to changes in foreign exchange rates. Currency risk arises when future commercial transactions and recognised assets and liabilities are denominated in a currency that is not the Authority's measurement currency. The Authority is exposed to foreign exchange risk arising from various currency exposures primarily with respect to the United States dollar. The Authority's management monitors the exchange rate fluctuations on a continuous basis and acts accordingly.

(c) Operational risk -

Operational risk is the risk that derives from deficiencies relating to the Authority's information technology and control systems, as well as the risk of human error and natural disasters. The Authority's systems are evaluated, maintained and upgraded periodically.

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

3. **Financial Risk Management (Cont'd):**

(d) Compliance risk -

Compliance risk is the risk of financial loss, including fines and other penalties, which arise from non-compliance with laws and regulations of the State.

(e) Reputational risk -

The risk of loss of reputation arising from the negative publicity relating to the Authority's operations (whether true or false) may result in a reduction in its revenue from government funding.

4. **Critical Accounting Estimates and Judgements:**

The preparation of financial statements in accordance with International Financial Reporting Standards requires management to make judgements, estimates and assumptions in the process of applying the Authority's accounting policies.

Estimates and judgements are continually evaluated and are based on historical experience and other factors, including expectations of future events that are believed to be reasonable under the circumstances. The Authority makes estimates and assumptions concerning the future and actual results could differ from those estimates as the resulting accounting estimates will, by definition, seldom equal the related actual results. The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below:

Changes in accounting estimates are recognised in the Statement of Comprehensive Income in the period in which the estimate is changed, if the change affects that period only. If the change affects a prior period, the Authority recognizes this change in the Statement of Movement of Funds in the current period.

The critical judgement, apart from that involving estimations, which has the most significant effect on the amounts recognised in the financial statements, is as follows:-

1. Which depreciation method for building and equipment is used.
2. Whether fixed assets are measured at cost or revalued amount.

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

4. **Critical Accounting Estimates and Judgements (Cont'd):**

The key assumption concerning the future and other key sources of estimation uncertainty at the Statement of Financial Position date (requiring management's most difficult, subjective or complex judgements) that has a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year is with respect to building and equipment. Management exercises judgement in determining whether future economic benefits can be derived from expenditures to be capitalised and in estimating the useful lives and residual values of these assets.

5. **Cash in Hand and at Bank:**

	30 September 2010	2009
Petty cash	$ 13,069	$ 13,069
Republic Bank Limited -		
Operating account	10,773,419	5,586,869
Nariva Carbon Assessment Grant	7,757	7,759
NSRCSL Project Account	8,407,310	-
First Citizens Bank Limited -		
Permit income account	3,283,560	587,255
RBTT Bank Limited -		
Institutional strengthening	24,278	142,634
Other projects	246,253	246,273
Biodiversity	14,062	14,062
Biosafety	97,490	97,490
NCSA	654,015	512
UNFCCC	343,442	407,442
Scotiabank Trinidad and Tobago Limited -		
Terminal Phaseout Management Plan	381,375	638,087
Fleet Card	22,954	27,563
	$ 24,268,984	$ 7,769,015

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

6. **Short-term Investments:**

Available-for-Sale:	30 September 2010	2009
Republic Bank Limited Pool Bond	$ 2,091,037	$ 2,012,174
Trinidad and Tobago Unit Trust Corporation	3,579,472	1,432,249
RBTT Bank Limited	-	1,172,719
ROYTRIN climate change	-	894,951
RBTT Bank Limited US$ Account	-	1,267
	$ 5,670,509	$ 5,513,360

7. **Accounts Receivable and Prepayments:**

	30 September 2010	2009
Accounts receivable	$ 16,750	$ 13,750
VAT receivable	2,560,646	2,035,938
Other receivables	135,214	101,958
Prepayments	109,896	148,236
	$ 2,822,506	$ 2,299,882

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

8. **Fixed Assets:**

Cost/Valuation	Land	Building	Furniture and fittings	Office equipment	Motor vehicles	Computer equipment	Library/ Information	Total
Balance as at 1 October 2009	$13,729,868	$ 11,336,082	$ 3,530,235	$ 4,319,546	$ 2,954,639	$ 4,041,530	$ 332,331	$ 40,244,231
Additions	-	-	67,516	180,817	-	190,003	-	438,336
Revaluation (**Note 2 (c)**)	-	17,982,144	-	-	-	-	-	17,982,144
Revaluation Adjustment	-	(3,318,226)	-	-	-	-	-	(3,318,226)
Disposal adjustment	-	-	-	-	-	1,170	-	1,170
Disposals	-	-	-	-	(608,155)	-	-	(608,155)
Balance as at 30 September 2010	13,729,868	26,000,000	3,597,751	4,500,363	2,346,484	4,232,703	332,331	54,739,500
Accumulated Depreciation								
Balance as at 1 October 2009	-	3,318,226	1,531,401	2,852,403	1,853,809	2,853,049	229,610	12,638,498
Revaluation Adjustment	-	(3,318,226)	-	-	-	-	-	(3,318,226)
Charge for the year	-	506,835	202,481	307,815	263,638	314,097	10,272	1,605,138
Disposal adjustment	-	-	-	-	-	1,135	-	1,135
Disposals	-	-	-	-	(560,041)	-	-	(560,041)
Balance as at 30 September 2010	-	506,835	1,733,882	3,160,218	1,557,406	3,168,281	239,882	10,366,504
Net Book Value								
Balance as at 30 September 2010	**$13,729,868**	**$ 25,493,165**	**$ 1,863,869**	**$ 1,340,145**	**$ 789,078**	**$ 1,064,422**	**$ 92,449**	**$ 44,372,996**
Balance as at 30 September 2009	**$13,729,868**	**$ 8,017,856**	**$ 1,998,834**	**$ 1,467,143**	**$ 1,100,830**	**$ 1,188,481**	**$ 102,721**	**$ 27,605,733**

ENVIRONMENTAL MANAGEMENT AUTHORITY
ENVIRONMENTAL TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

9. **Accounts Payable and Accruals:**

	30 September 2010	2009
Accounts payable	$ 1,568,963	$ 1,470,471
Other payables	31,009	426,141
Accruals	465,457	1,527,845
Violations payable	1,907,184	197,803
Ministry of Public Utilities and the Environment		
- National Forest Inventory Project	426,782	774,169
NSRCSL Project	8,353,458	-
	$ 12,752,853	**$ 4,396,429**

10. **Deferred Income:**

	30 September 2010	2009
Records and Information Management (RIM) Project	$ 988,900	$ -
UWI Aripo Savannah Biological Survey	358,930	-
	$ 1,347,830	**$ -**

11. **Funding:**

Funds received during the year ended 30 September 2010 are as follows:

		30 September 2010	2009
External Funding			
UNDP	TT$	$ -	$ 536,907
Other	TT$	699,763	10,919
Core Funding			
GORTT	TT$	42,908,353	38,898,521
Activities Income	TT$	973,500	1,171,833
GORTT NSRCSL Project	TT$	117,595	-

ENVIRONMENTAL MANAGEMENT AUTHORITY
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NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

30 SEPTEMBER 2010

12. Fair Values:

Fair value is the amount for which an asset could be exchanged, or a liability settled between knowledgeable, willing parties in an arm's length transaction. The existence of published price quotation in an active market is the best evidence of fair value. Where market prices are not available, fair values are estimated using various valuation techniques, including using recent arm's length market transactions between knowledgeable, willing parties, if available, current fair value of another financial instrument that is substantially the same and discounted cash flow analysis.

The following methods have been used to estimate the fair values of various classes of financial assets and liabilities:

Current assets and liabilities -

The carrying amounts of current assets and liabilities are a reasonable approximation of the fair values because of their short-term nature.

13. Related Party Transactions:

Parties are considered to be related if one party has the ability to control the other party or exercise significant influence over the other party in making financial decisions.

Key management personnel are those persons having the authority and responsibility for planning, directing and controlling the activities of the Authority.

A number of transactions are entered into with related parties in the normal course of business. These transactions were carried out on commercial terms at market rates.

Balances and transactions with related parties and key management personnel during the year were as follows:

	30 September 2010	2009
Other expenses		
Directors' fees	$ 428,200	$ 386,300
Key management compensation		
Short-term benefits	1,810,947	2,412,513

14. Equity Adjustment:

The equity adjustment of **$99,014** represents a reversal of an invoice issued to the United Nations Development Programme (UNDP) for expenditure incurred on the Third National Report on the convention on Biological Diversity – The Trust for Sustainable Livelihoods where UNDP confirmed that they will not be covering this cost as the project was never completed.

PART D: FINANCIAL ASSISTANCE OR OTHER SUPPORT

There are no qualifying activities under Section 14 (1d) of the Environmental Management Act, Chapter 35:05, for the year 2010.

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