RURAL DEVELOPMENT COMPANY
OF TRINIDAD AND TOBAGO

COUVA/TABAQUITE/TALPARO
DRAFT REGIONAL DEVELOPMENT PLAN

Prepared by All-Inclusive Project Development Services Limited
on behalf of the Couva/Tabaquite/Talparo Regional Corporation
# Couva/Tabaquite/Talparo Draft Regional Development Plan: CONTENTS

1. **INTRODUCTION** 01  
   1.1 COMMUNITY VISION 01  
   1.2 PURPOSE OF THE PLAN 01  
   1.3 METHODOLOGY 03

2. **STRATEGIC REVIEW AND POLICY CONTEXT** 06  
   2.1 OVERVIEW OF THE REGION 06  
   2.2 SWOT ANALYSIS 12  
   2.3 KEY DEVELOPMENT ISSUES 14  
   2.4 THE REGION’S ROLE IN NATIONAL DEVELOPMENT 15

3. **REGIONAL DEVELOPMENT STRATEGY** 18  
   3.1 DEVELOPMENT OBJECTIVES 18  
   3.2 DEVELOPMENT SCENARIOS 18  
   3.3 THE SELECTED STRATEGY 23

4. **THEMATIC POLICIES AND PROPOSALS** 27  
   4.1 GROWTH MANAGEMENT 27  
   4.2 ENVIRONMENTAL MANAGEMENT 32  
   4.3 REGIONAL FORM AND URBAN DESIGN 38  
   4.4 COMMUNITY FACILITIES AND HOUSING 40  
   4.5 PHYSICAL INFRASTRUCTURE 41  
   4.6 TRANSPORTATION 45  
   4.7 MUNICIPAL MANAGEMENT 51

5. **ZONAL POLICIES AND PROPOSALS** 53  
   5.1 MONTSERRAT HILLS LANDSCAPE ZONE 53  
   5.2 NORTH EAST LANDSCAPE ZONE 57  
   5.3 SOUTH EAST LANDSCAPE ZONE 58  
   5.4 NORTH WEST LANDSCAPE ZONE 61  
   5.5 SOUTH WEST LANDSCAPE ZONE 65

6. **IMPLEMENTATION** 67  
   6.1 COORDINATION AND MANAGEMENT 67  
   6.2 ACTION PROGRAMME 68  
   6.3 STRATEGIC REVIEW 68

**References** 78

**Technical Appendices**  
Appendix 1: Development Zones/Communities 82  
Appendix 2: Economic Development Proposals 86  
Appendix 3: Infrastructure 127  
Appendix 4: Traffic and Transportation Projects 166
LIST OF TABLES

Table 2.1: Population by Development Zones 2000 09
Table 2.2: SWOT Analysis of Couva/Tabaquite/Talparo Region 12
Table 3.1: Population by Development Zones 2000 and 2020 24
Table 4.1: Population and Community Facilities by Development Zones 28
Table 4.2: Summary of Environmental Assets and Plan Recommendations 32
Table 4.3: Walking and Cycling – Detailed Requirements 51
Table 5.1: Montserrat Hills Landscape Zone Proposals 53
Table 5.2: North East Landscape Zone Proposals 57
Table 5.3: South East Landscape Zone Proposals 58
Table 5.4: North West Landscape Zone Proposals 61
Table 5.5: South West Landscape Zone Proposals 65
Table 6.1: Action Programme 69

LIST OF MAPS

Figure 1.1: Location of the Region 02
Figure 2.1: Development Zones and Population Distribution 2000 08
Figure 2.2: Generalised Land Use and Elements of Urban Form 10
Figure 2.3: Community Facilities 11
Figure 3.1: Development Option 1: Development Rationalisation 20
Figure 3.2: Development Option 2: Dispersed Development 21
Figure 3.3: Development Option 3: Consolidated Development 22
Figure 3.4: Population Distribution 2020 25
Figure 3.5: Development Strategy 26
Figure 4.1: Development Sensitivity 36
1. INTRODUCTION

1.1 COMMUNITY VISION

_Couva/Tabaquite/Talparo Region is seen as a clean and aesthetically beautiful environment in which its citizens are civic minded, healthy, economically independent, technologically driven, culturally and socially progressive and enjoy the highest standard of living by the year 2015._

This vision statement for the Couva/Tabaquite/Talparo Region is outlined in the Strategic Plan for the Regional Corporation for the period 2009 to 2011. The Community Vision provides an adequate framework and medium term goal to guide future development activity in the Region.

With a view to providing a strategic framework within which to pursue the Community Vision, the current Regional Development Plan has been prepared for the Couva/Tabaquite/Talparo Region (Figure 1.1). The plan was formulated as part of a Regional Planning Programme embarked upon by the Ministry of Local Government and administered by the Local Area and Regional Planning and Development Unit within the Ministry. The purpose of the programme is to facilitate the formulation of Regional/Spatial Development Plans for the fourteen (14) Municipal Corporations in Trinidad. A key objective of the planning programme is the building of institutional capacity at the Municipal Corporations for the preparation of regional and local area plans.

1.2 PURPOSE OF THE PLAN

The primary purpose of the Couva/Tabaquite/Talparo Regional Development Plan is to provide an integrated and coherent framework to promote and guide development activity in a sustainable manner. More specifically, key functions of the plan are to formulate strategic land use policies and project proposals; to facilitate consistency in the regulation and control of development activity; and to provide a framework for more detailed local and action area planning.

The Couva/Tabaquite/Talparo Regional Development Plan is conceived as a medium term plan with a planning horizon to the year 2020. Essentially, the plan comprises a diagnosis of key development issues, strategic objectives for future development activity, and a basic regional development strategy as well as thematic and zonal policies and proposals.

In keeping with Vision 2020 National Strategic Plan, the plan is expected to be beneficial to the Couva/Tabaquite/Talparo Region in terms of providing a framework to facilitate the development of sustainable communities and a better quality of life.
1.3 METHODOLOGY

The methodology followed in the preparation of the plan is summarised in the Work Plan in Chart 1 which also shows the progress to-date.

The earlier reports submitted by the Consultant were:
- Inception Report
- Situation Report 1
- Supplementary Report to Situation Report 1
- Situation Report 2.

A report on the Visioning Exercise conducted among the regional stakeholders was prepared by the Independent Consultant Tracy Wilson.

The reports which will follow this Draft Regional Development Plan will be:
- Report of the Stakeholder Consultation on the Plan
- Final Draft Regional Development Plan.

There will also be a number of technical memoranda elaborating some elements in more detail.

The Inception Report confirmed the details of the planning exercise including the programme of work, the specific steps in plan preparation, and the consulting team.

Situation Report 1 dealt with the Survey and Analysis of the Couva/Tabaquite/Talparo Region. The report included an overview of the development history, geographic dimensions, communities, and planning policy context of the region. The development framework of the region was also defined in terms of its environmental context and existing trends in land use and settlement, population dynamics, economic activities, and transportation. As well, Situation Report 1 presented a strategic analysis of the region in the form of a SWOT analysis and an outline of the key development issues facing the region.

The Supplementary Report to Situation Report 1 provided further details on the region. In particular, two key development zones – Couva and California/Dow Village – were selected for detailing of existing land use and significant sectoral proposals and commitments. Further information was provided on the road network in the region, highlighting the various classes of roads and the junctions assessed as critical. The Supplementary Report also presented information on the drainage network and watersheds in the region and on the methodology employed in grouping communities into development zones.
**Situation Report 2** presented the strategic vision, development objectives, and three development scenarios for regional development. The scenarios comprised possible alternative spatial allocations of growth and development based on the concepts of Development Rationalisation, Dispersed Development, and Consolidated Development. A report on a consultation session held with the Couva/Tabaquite/Talparo Regional Corporation on the scenarios and the procedure and outcome of the scenario evaluation exercise were also presented in Situation Report 2.

The exercise of Visioning for the region conducted with a wide cross-section of public stakeholders and official agencies contributed to the identification of the concerns and issues in the region from the perspective of the people of the region and the articulation of their hopes and aspirations for the future of the region.

The remainder of the current Draft Regional Development Plan is organised as follows:

- Section 2 comprises an overview of the Region; key development issues; and the proposed role of the Region in the national development context.

- Section 3 presents the strategic objectives for future development activity; the alternative scenarios; and the development theme, strategic policies, and spatial development framework of the selected development strategy.

- Thematic and zonal policies and proposals are presented in Sections 4 and 5, respectively.

- Section 6 outlines mechanisms and an action programme for implementation of development proposals and projects.

The Draft Plan will be presented for stakeholder consultation and reviewed and elaborated into the Final Draft Regional Development Plan in accordance with comments received from stakeholders.
CHART 1

WORK PLAN OUTLINE

START UP OF PROJECT

DATA COLLECTION

DOCUMENT REVIEW

ANALYSIS

VISIONING

(i) GENERATION OF DEVELOPMENT SCENARIOS

(ii) EVALUATION

CONSULTATION

DRAFT REGIONAL DEVELOPMENT PLAN

STAKEHOLDER/CLIENT REVIEW & FEEDBACK

PREPARATION FINAL DRAFT REGIONAL DEVELOPMENT PLAN

KEY:

Item completed  Item in progress  Item not started
2. STRATEGIC REVIEW AND POLICY CONTEXT

2.1 OVERVIEW OF THE REGION

The Couva/Tabaquite/Talparo Region is one of the most complex regions in Trinidad by virtue of certain of its key characteristics, namely:

- Strategic location in the central part of the island with major arterial road links.
- Sharing of boundaries with six other municipal corporations.
- Wide variety of geographic characteristics including coastline, plains, the Central Range, forested areas, and main river basins.
- Large areal size and population and the vast number of communities.
- Very diverse land use pattern comprising urban and rural settlements, heavy and light industrial areas, major sporting facilities, extensive areas of former sugarcane lands, and other agricultural and tree crop areas.
- Potential for growth on the reservoir of vacant land.

These characteristics suggested that the development planning process for the Couva/Tabaquite/Talparo Region must be comprehensive and reach beyond the traditional land use planning approach to embrace all the components of the regional spatial system.

The study area comprises the Couva/Tabaquite/Talparo Regional Corporation (CTTRC) as defined by the Central Statistical Office. The CTTRC came into being with Act No. 21 of 1990 and its Amendment Act No. 8 of 1992 (Corporation’s Website: www.cttrc.org).

The region holds a west central location in Trinidad and is surrounded by the Chaguanas Borough and the Tunapuna/Piarco Regional Corporation in the north, the Sangre Grande and Mayaro/Rio Claro Regional Corporations in the east, the San Fernando City Corporation and the Princes Town Regional Corporation in the south, and the Gulf of Paria in the west (Figure 1.1).

The primary means of access to the region from areas in north and south Trinidad are the Uriah Butler and Solomon Hochoy Highways and the Southern Main Road. Also, a route between Chaguanas and Rio Claro, in the form of the Caparo Valley Brasso Road and the Tabaquite Rio Claro Road, runs diagonally through the region. There is no strong road link with areas to the east of the region. Access is also possible by sea through existing industrial port facilities at Point Lisas, and there are plans to establish a water taxi dock at the port. The national helicopter service is also based at Camden in Couva.

The region is roughly rectangular in shape and covers an area of approximately 71,964 hectares, which represents the third largest region after Sangre Grande and Mayaro/Rio Claro (Vision 2020 Regional Development). It averages 25 kilometres in a north-south
direction and 30 kilometres in an east-west direction and has a coastline of approximately 25 kilometres.

The west coastal area of the region is generally flat and rises gently to the Solomon Hochoy Highway in the east. Areas east of the Highway are generally undulating; however, the Central Range is a very complex landform feature in this part of the region with moderate to steep slopes and a maximum elevation of 198 metres.

The region is drained by a series of river systems which generally originate on the Central Range and flow in a radial pattern through the region. Other key environmental features in the region include forest reserves, mangrove swamps, and reservoir impoundments.

The Region comprises ninety-three (93) separate communities which for planning purposes have been aggregated into fourteen (14) development zones based on their natural and historical links. These development zones and their respective populations at 2000 are shown in Figure 2.1, while the communities making up each development zone are outlined in Appendix 1.

At the last Population Census in 2000, the population of the region was recorded as 162,779 persons, or 13% of the national population of 1,262,366 persons (CSO, 2002). Table 2.1 shows the distribution of the population, dwelling units, and businesses among the development zones in 2000. The greatest share of the population of the region (16.6%) was resident in the Gasparillo Development Zone. The development zones of Couva (13.3%), Claxton Bay (10.4%), and Carapichaima (9.0%) also accommodated significant portions of the regional population. Low populations were recorded in Preysal (3.4%) and Chandenagore (3.5%) development zones.

Over the period 2000 to 2006, the labour force in the region increased by 8% from 53% of the non-institutional population to 61%. The unemployment rate declined significantly over the same period from 12.5% to 4.7%.

The main economic sectors in the region are as follows:

- Commercial business activities largely restricted to retail trade (personal and household products, auto parts and services, banks, and mini-marts and groceries, etc.).
- Industrial development based on the existence of cement manufacturing in Claxton Bay by the Trinidad Cement Limited (TCL); petrochemical related industries at Point Lisas Industrial Estate; Petrotrin’s oil refinery operations at Point-a-Pierre; and other small light industry parks established by the Evolving Tecknologies and Enterprise Development Company (eTeck).
- Agricultural activities comprising livestock rearing, mixed agriculture, and other agriculture.
In addition, there are six beaches in the region where a significant amount and value of fish are landed. These beaches are Brickfield, Claxton Bay, Carli Bay, Orange Valley, St.Margaret Bay, and Waterloo.

Table 2.1: Couva/Tabaquite/Talparo Region: Population by Development Zones - 2000

<table>
<thead>
<tr>
<th>Development Zone</th>
<th>Communities</th>
<th>Population</th>
<th>Dwelling Units</th>
<th>Businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cunupia</td>
<td>4</td>
<td>8,157</td>
<td>2,130</td>
<td>180</td>
</tr>
<tr>
<td>Las Lomas</td>
<td>3</td>
<td>6,590</td>
<td>1,672</td>
<td>104</td>
</tr>
<tr>
<td>San Raphael</td>
<td>4</td>
<td>6,875</td>
<td>1,895</td>
<td>193</td>
</tr>
<tr>
<td>Carapichaima</td>
<td>8</td>
<td>14,459</td>
<td>3,820</td>
<td>398</td>
</tr>
<tr>
<td>Chandenagore</td>
<td>3</td>
<td>5,674</td>
<td>1,515</td>
<td>210</td>
</tr>
<tr>
<td>Todd's Road/Caparo</td>
<td>6</td>
<td>9,197</td>
<td>2,367</td>
<td>197</td>
</tr>
<tr>
<td>Couva</td>
<td>10</td>
<td>21,672</td>
<td>5,597</td>
<td>789</td>
</tr>
<tr>
<td>Freeport</td>
<td>5</td>
<td>14,982</td>
<td>3,918</td>
<td>445</td>
</tr>
<tr>
<td>Tabaquite</td>
<td>12</td>
<td>10,557</td>
<td>2,902</td>
<td>228</td>
</tr>
<tr>
<td>California/Dow Vge</td>
<td>10</td>
<td>14,535</td>
<td>3,685</td>
<td>552</td>
</tr>
<tr>
<td>Preysal</td>
<td>2</td>
<td>5,468</td>
<td>1,483</td>
<td>129</td>
</tr>
<tr>
<td>Claxton Bay</td>
<td>9</td>
<td>16,992</td>
<td>4,576</td>
<td>422</td>
</tr>
<tr>
<td>Gasparillo</td>
<td>16</td>
<td>26,987</td>
<td>7,258</td>
<td>721</td>
</tr>
<tr>
<td>Point-a-Pierre</td>
<td>1</td>
<td>622</td>
<td>277</td>
<td>31</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>93</strong></td>
<td><strong>162,767</strong></td>
<td><strong>43,095</strong></td>
<td><strong>4,599</strong></td>
</tr>
</tbody>
</table>

Source: Community Register (2000)

Land use in the region is generally characterised by urban and industrial development and former sugarcane lands in the western part of the region and mixed agriculture, forest cover, and village development in the eastern section (Figure 2.2). Two major sporting facilities – Ato Boldon Stadium and the National Cricket Centre – are also located in the western section of the region. The distribution of certain other selected community facilities is presented in Figure 2.3.

Settlement pattern in the region is characterised by rural village development comprising mainly ribbon development along roads in the eastern parts of the region and more compact urban development in the western zones. In particular, development is concentrated in the Chase Village-St. Mary’s area, in Couva-California, and in the Claxton Bay-Gasparillo area.

Couva Central is by far the primary centre within a determined hierarchy of centres, as follows:

a. Primary Centre – Couva Central.
b. Secondary Centres – California, St. Margaret, and Gasparillo.
c. Tertiary Centres – Talparo, San Rafael/Brazil, Chase Village, St. Mary’s Village, Freeport, Flanagin Town, and Tabaquite (Figure 2.1).
Couva is the administrative and commercial centre of the region and the Point Lisas Port and Industrial Estate falls within the Greater Couva Urban Area. In 2000 Couva had the highest number (789) of businesses in the region (Table 2.1). It is expected that with the closure of Caroni (1975) Limited and the resultant decline in sugarcane production, more lands in the Greater Couva Area will be under pressure for residential, commercial, and industrial expansion.

2.2 SWOT ANALYSIS

On the basis of documentation review, field investigations, and consultations held with stakeholders, particularly the Regional Corporation, an assessment was made of the internal conditions and external factors affecting the Couva/Tabaquite/Talparo Region. The results of the SWOT Analysis are summarised in Table 2.2.

Table 2.2: SWOT Analysis of Couva/Tabaquite/Talparo Region

<table>
<thead>
<tr>
<th>INTERNAL ENVIRONMENT</th>
<th>STRENGTHS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>▪ Central coastal location and good accessibility on western region</td>
<td>▪ Remote location, poor quality road access, and inadequate public transportation in eastern region</td>
</tr>
<tr>
<td></td>
<td>▪ Diverse and visually appealing landform</td>
<td>▪ Management constraints resulting from large size of the region</td>
</tr>
<tr>
<td></td>
<td>▪ Key natural and cultural heritage resources suitable for local tourism activities</td>
<td>▪ Infrastructure constraints (water shortage, sewage disposal, poor condition of roads and bridges, etc.)</td>
</tr>
<tr>
<td></td>
<td>▪ Rich cultural heritage comprising cross cultural, multi-religious population</td>
<td>▪ Need to repair heavily used private roads</td>
</tr>
<tr>
<td></td>
<td>▪ Hub of industrial activity on west coast</td>
<td>▪ Severe flooding problems in several areas</td>
</tr>
<tr>
<td></td>
<td>▪ Strong agricultural base and potential</td>
<td>▪ Poor sanitation and indiscriminate disposal of garbage</td>
</tr>
<tr>
<td></td>
<td>▪ Existence of port facilities</td>
<td>▪ Traffic congestion in main centres – Couva, Gasparillo, etc.</td>
</tr>
<tr>
<td></td>
<td>▪ Available lands for expansion of development activity</td>
<td>▪ Escalating levels of crime</td>
</tr>
<tr>
<td></td>
<td>▪ Regional celebrations</td>
<td>▪ Inadequate fire service</td>
</tr>
<tr>
<td></td>
<td>▪ Technical capacity and capability of the CTTRC</td>
<td>▪ Need for higher level health facilities</td>
</tr>
</tbody>
</table>
### INTERNAL ENVIRONMENT

<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Declining fishing industry</td>
</tr>
<tr>
<td></td>
<td>• Need to provide institutional and infrastructure support for farmers (agricultural access roads, etc)</td>
</tr>
<tr>
<td></td>
<td>• Inadequate community participation in decision-making process</td>
</tr>
<tr>
<td></td>
<td>• Need to develop a database of skills and expertise in the community and to build capacity and capability through training of burgesses</td>
</tr>
<tr>
<td></td>
<td>• Need to enhance image of the CTTRC</td>
</tr>
<tr>
<td></td>
<td>• Need to establish an Administrative Complex</td>
</tr>
</tbody>
</table>

### EXTERNAL ENVIRONMENT

<table>
<thead>
<tr>
<th>OPPORTUNITIES</th>
<th>THREATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Employment and other benefits from introduction of new industrial activities in proposed expanded Point Lisas Industrial Estate</td>
<td></td>
</tr>
<tr>
<td>• Good links with major urban centres – Port of Spain, San Fernando, Chaguanas</td>
<td></td>
</tr>
<tr>
<td>• Revitalisation of agriculture and fishing industries in the wider region</td>
<td></td>
</tr>
<tr>
<td>• Introduction of high level social facilities (hospital, tertiary institutions, centre for the performing arts, etc.) in the region</td>
<td></td>
</tr>
<tr>
<td>• Establishment of a national zoo in the Chickland area.</td>
<td></td>
</tr>
<tr>
<td>• Competition from San Fernando, Chaguanas, and other major centres for employment opportunities and other benefits from industrial expansion in the region</td>
<td></td>
</tr>
<tr>
<td>• Downturn in global economy</td>
<td></td>
</tr>
<tr>
<td>• Spiralling national crime rate and impact on the region</td>
<td></td>
</tr>
<tr>
<td>• Orientation of parts of the region to neighbouring corporations (e.g. Talparo to Arima; Gasparillo and Claxton Bay to San Fernando)</td>
<td></td>
</tr>
<tr>
<td>• Insufficient autonomy granted to the Regional Corporation</td>
<td></td>
</tr>
<tr>
<td>• Legal framework under which CTTRC operates is outdated</td>
<td></td>
</tr>
<tr>
<td>EXTERNAL ENVIRONMENT</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td><strong>OPPORTUNITIES</strong></td>
<td><strong>THREATS</strong></td>
</tr>
<tr>
<td></td>
<td>● Central government agencies operating in the region without proper coordination and collaboration with the Regional Corporation</td>
</tr>
</tbody>
</table>

### 2.3 KEY DEVELOPMENT ISSUES

From consultations with the Couva/Tabaquite/Talparo Regional Corporation and other stakeholders and based on the SWOT Analysis undertaken for the area, certain development issues were identified. The key issues identified may be summarised as follows:

a. For the convenience of the population and in order to stimulate economic activity, there is need to upgrade the levels of accessibility within the region, particularly access to and among the more rural communities.

b. There is a high concentration of social facilities and business activities in Couva and other urban areas and minimal facilities in the outlying communities. This results in low level servicing of the outer communities and congestion in the urban centres.

c. Congestion in the Couva town centre and other main commercial centres poses implications for pedestrian comfort and safety, free flow and parking of vehicles, and expansion of business activity.

d. Historically, the economy of the region was agricultural based and to a large extent depended on the production of sugarcane for its growth and development. With the closure of Caroni (1975) Limited however, there has been significant decline in sugarcane production. There is therefore need at this stage to diversify the agricultural sector to include other viable crops. This is particularly important in view of the vast extent of abandoned sugarcane lands in the region at present.

e. Diversification and expansion of the agricultural sector would however require the provision of greater support to farmers through incentives and other institutional measures and improvement of infrastructure facilities (agricultural access roads, markets, etc.).
f. The region has a rich natural and cultural resource base as represented by such features as its vast land resource, diverse and scenic landscape, historical and cultural sites, and cultural events and celebrations. These resources provide the region with good potential for development of such economic activities as agriculture and nature and cultural tourism. In order to maintain the integrity of the natural and cultural environment however, a sustainable development approach must be adopted in pursuing these economic activities.

g. The Couva/Tabaquite/Talparo Region is experiencing severe deficiencies in its social and physical infrastructure systems. This is particularly the case in the more rural communities. There is need to upgrade and maintain the facilities in order to provide the infrastructure support for economic development and for the health, safety, convenience, and social development of the population.

h. Management of the municipality is constrained by a number critical problems, including:

   - Orientation of parts of the region to neighbouring corporations (e.g. Talparo to Arima; Gasparillo and Claxton Bay to San Fernando)
   - Insufficient autonomy granted to the Regional Corporation
   - Outdated legal framework under which CTTRC is operating
   - Lack of information from and the power of agencies operating in the region to facilitate proper planning
   - Inadequate community participation in the decision-making process
   - Large size of the region and remoteness of settlements in the eastern sector.

These issues represented key areas which required focused and strategic attention in the planning process in order to facilitate sustainable development.

2.4 THE REGION’S ROLE IN NATIONAL DEVELOPMENT

2.4.1 National Policy Framework

The role of the Couva/Tabaquite/Talparo Region in the national spatial development context is defined in the National Physical Development Plan (TCPD 1982); the National Conceptual Development Plan (Halcrow 1999); and the National Spatial Strategy (Ministry of Planning and Development 2007).

The National Physical Development Plan (NPDP) adopted a spatial development strategy of “dispersed concentration” and a key feature of that strategy involved the pursuit of an overall national growth centre approach in order to effect some degree of decentralisation of activity outside of the Capital Region and redress the problems of
regional imbalances. In that context, Couva-Point Lisas was selected as one of four major growth centres and also as a sub-regional centre under the proposed settlement system. Couva-Point Lisas and the other sub-regional centres were seen as becoming important as places of employment as well as for service facilities, and they were expected to serve not only the local community but their sub-regional hinterlands which would include smaller urban centres and villages.

At the lower level in the settlement hierarchy, urban and rural district centres were proposed to function largely in terms of servicing the inhabitants of the immediate vicinity. Within the Couva/Tabaquite/Talparo Region, Gasparillo and St. Margaret’s-Claxton Bay were seen as being among the more urban districts, while the rural districts included St. Mary’s-Freeport, Carapichaima, Waterloo, Tabaquite, and Flanagin Town.

The National Conceptual Development Plan (NCDP) adopted a strategy of balanced growth, which provided for comprehensive and coordinated growth opportunities throughout Trinidad and Tobago. The NCDP proposals included a local concept plan framework which was to be used as a planning guide for the preparation of local concept plans. Within that framework, Couva-Point Lisas was seen as an area for comprehensive international growth opportunities. Other opportunities and proposals outlined for the Caroni Region included significant development opportunity land east of the Solomon Hochoy Highway to reduce potential congestion in Couva-Point Lisas; landscape management policies in the Central Range; and maintenance of quality agricultural land.

One of the pillars of Government’s strategy to achieve developed country status by 2020 is the creation of sustainable communities within a framework of balanced regional development. The National Spatial Strategy (NSS) for Trinidad and Tobago seeks to promote this strategy by adopting a development philosophy of creating balanced development across regions of the country in sustainable and liveable communities. Accordingly, Growth Poles or Development Magnets are proposed to be established at four locations: Wallerfield, Chaguanas/Couva, Point Fortin/La Brea, and Mayaro/Rio Claro. According to the NSS, targeted investments in economic activity and physical infrastructure will stimulate development at these nodes, which are located within specific regions of the country that are currently underdeveloped and reflect imbalances or inequities in the availability of essential services and facilities.

While Chaguanas/Couva is designated as a Growth Pole/Development Magnet, Couva itself is classified as an Urban Centre in the Settlement Hierarchy and Classification Scheme outlined in the NSS. Urban Centres are seen as service centres that provide a range of social and community services, facilities, and some employment opportunities. Couva is intended to function as an important service centre within the wider Chaguanas/Couva Growth Pole.
2.4.2 Local Area Planning Initiatives

The **Couva-Point Lisas Structure Plan** was formulated within the context of the NPDP. The development concept underlying the Couva-Point Lisas Structure Plan was that Couva would provide high level commercial and social services and a variety of employment opportunities. The primary focus of the Structure Plan was a proposed new town centre on twenty (20) hectares of land located north of the existing commercial centre in Couva. The town centre was proposed to include commercial, administrative and civic facilities and services. Residential activity was generally proposed to be located north of the Couva Main Road and to comprise various housing types, densities, and tenure arrangements. Downstream and light manufacturing industry was proposed on ninety-six (96) hectares of land south of the existing heavy Industrial Estate, and a Free Zone on five (5) hectares of land west of that area was also proposed. Cottage type industries were to be integrated into residential areas north of the Camden Airstrip.

Within the framework of the NCDP, the **Couva Land Use Plan** was formulated for the Greater Couva Area in 1999 with a time frame of twenty (20) years to 2020. A principal objective of the planning exercise was to develop a Master Plan which, among other features, would have provided the basis for development control decisions and future land use allocations and which would have enabled the programming of major infrastructure and industrial expansion.

Couva was proposed to be maintained and enhanced as the principal settlement in the area, with a mix of commercial uses and housing types, as well as health, educational, and sporting facilities. Large areas of land were allocated for housing, a new town centre, and a new landscaped boulevard around the edge of the town.

2.4.3 Overall Role and Function

At the national spatial planning level, the west coast sub-region is seen as possessing many advantages for development, particularly with Couva-Point Lisas as an area for comprehensive international growth opportunities. The eastern sector of the region is viewed as having potential for significant land development to reduce potential congestion in Couva-Point Lisas; landscape management of the Central Range; conservation and development of good quality agricultural lands; and increasing the service function of rural district centres.
3. REGIONAL DEVELOPMENT STRATEGY

3.1 DEVELOPMENT OBJECTIVES

In keeping with settlement objectives in the Vision 2020 National Strategic Plan, the Couva/Tabaquite/Talparo Regional Development Plan seeks to address and resolve current problems and conflicts and to provide for a process of sustainable development and an improved quality of life in the Region. Within that context and considering the stated Community Vision, development objectives were defined to guide the nature and direction of the future development thrust. The objectives are as follows:

**Growth Management**
Promote spatially integrated and balanced development over the region with particular regard to settlement pattern, land use, and economic activity.

**Environmental Management**
Secure environmental and cultural sustainability across the region.

**Regional Form and Urban Design**
Enhance the structure, functioning, and aesthetics of the regional landscape and the urban and rural centres.

**Community Facilities**
Provide for the equitable distribution and efficient development of the facilities and services required to promote social advancement and human development.

**Physical Infrastructure**
Upgrade physical infrastructure facilities and services in a timely and cost effective manner.

**Transportation**
Improve accessibility within the region and linkages to adjoining regions.

**Municipal Management**
Promote effective management of the development process in the region.

3.2 DEVELOPMENT SCENARIOS

Current development trends in the Couva/Tabaquite/Talparo Region are characterised by a very high concentration of development activity and population in the Greater Couva Urban Area and the wider west coast sub-region and sparse development in the eastern section of the Region. If unmanaged, these trends would place severe
development pressure on the west coast and adversely affect the quality of life in the Greater Couva Urban Area and the wider west coast. In contrast, the lack of any development initiatives in the eastern section of the region would result in stagnation of the social and economic vitality of the outlying communities.

The basic trend forecast demonstrated the need to intervene in the development process and to consider development options and select an appropriate development strategy for the region. Accordingly, three development options were developed for testing and evaluation which essentially comprised possible alternative spatial allocations of growth and development in the region. It was assumed that the size of the projected regional population of 190,000 persons to the year 2020 would be constant for the three development options. The spatial distribution of the population would however vary among the options.

Details of the development options, including their respective advantages and limitations, were presented in Situation Report 2. In summary however, the options were based on the following concepts:

**Option 1: Development Rationalisation**
This option sought to guide and rationalise the existing momentum towards concentration of economic activity, social facilities, and population in the Greater Couva Urban Area and the wider west coast sub-region.

**Option 2: Dispersed Development**
This option sought to promote the dispersal of new growth across the region in order to minimise development disparities among communities.

**Option 3: Consolidated Development**
This option sought to achieve an efficient system of settlements and balanced development across the region by employing the growth centre concept. Growth centres were proposed at Couva, St. Mary’s, Claxton Bay, and Gasparillo on the west coast and at Tabaquite and Talparo in the eastern sub-region.

Figures 3.1 to 3.3 represent abstract illustrations of the relative scale of development and concentration of population among key centres in the region under the respective development options.

On the basis of consultation with the Couva/Tabaquite/Talparo Regional Corporation and evaluation of the development options, **Option 3: Consolidated Development** was selected as the preferred strategy.

---

1 In 2000 the region’s share of the national population was approximately 13%. The projected regional population to 2020 is based on the assumption that the region would more or less maintain this proportion of the national population of 1.4 million persons by the end of the planning period.
- Dispersal of new growth across the region in order to minimise development disparities among communities.
- Upgrading and establishment of higher order social facilities and physical infrastructure at the town and village level.
- Provision of liberal incentives to encourage new business activities to locate in outlying communities.
NOTE:
- Employment of the growth-centre concept to achieve an efficient system of settlements and balanced development across the region.
- Rationalization of development in the west coast, with Couva as the main service centre complemented by St. Mary’s, Claxton Bay, and Gasparillo.
- Strengthening of the service function of two selected outlying growth centres – Tabaquite and Talparo – to service the eastern sub-region.
THE SELECTED STRATEGY

3.3.1 Development Theme and Strategic Policies

The basic development theme of the selected strategy involves decentralisation of development activity by employing the growth centre concept to establish an efficient system of settlements and balanced development across the region. The concept involves focussing growth in areas with the highest development potential and at centres with the capability to stimulate growth in lagging communities. Strategic policies emerging from the selected strategy are as follows:

a. Upgrading of the social and physical infrastructure in all settlements, as required.

b. Strengthening the service function and economic base of two outlying growth centres – Tabaquite and Talparo.

c. Rationalisation of development in the western section of the region, including revitalisation and enhancement of town centres, reduction of traffic congestion, and reduction of the perennial flooding problem.

d. Strengthening of the economic base of the region by expanding traditional commercial and industrial activities, particularly in the west coast sub-region.

e. Diversification of the regional economy by attracting investment in nature and cultural tourism and other sustainable economic activities.

f. Safeguarding the natural and scenic qualities of the regional landscape and upgrading of the functional efficiency and aesthetic appeal of the urban and rural centres.

3.4.2 Population Size and Distribution

The proposed increase in economic activity and improvements in social and physical infrastructure facilities in the region are expected to stem migration trends and to attract persons seeking new job opportunities and a better quality of life. On that basis and taking account of natural increase in population, the population of the region is projected to increase to approximately 190,000 persons by the year 2020 (Table 3.1).

In keeping with the growth centre strategy however, the population distribution pattern in the region is expected to shift somewhat in favour of the eastern sub-region, mainly as a result of the upgrading of the status of Tabaquite and Talparo. In contrast, the major development zones in the west (Couva, Claxton Bay, Gasparillo) are expected to experience some decline in their share of the regional population. In overall terms however, consistent with the growth centre strategy, the majority of the population will
be in the more developed western section of the region. Table 3.1 and Figure 3.4 show the distribution of the projected population by development zones.

### 3.4.3 Spatial Development Concept

Figure 3.5 provides a graphic illustration of the selected development strategy. Most evident is the proposed settlement pattern indicating Couva as the primary urban centre and St. Mary’s, Claxton Bay, and Gasparillo as secondary urban centres in the western section of the region. Tabaquite and Talparo have also been upgraded to function as important secondary centres servicing the eastern section of the region. Significant expansion of industrial and other urban development activities is proposed in the western sub-region. The eastern sub-region will experience expansion in agriculture, community tourism, and other compatible economic activities. Conservation of forest reserves, water resources, and other environmental assets is also an important component of the spatial development concept in the eastern sub-region.

Details of the development strategy are elaborated in Sections 4 and 5.

### Table 3.1: Couva/Tabaquite/Talparo Region: Population by Development Zones 2000 and 2020

<table>
<thead>
<tr>
<th>Development Zone</th>
<th>Communities</th>
<th>Census Population 2000</th>
<th>Projected Population 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Cunupia</td>
<td>4</td>
<td>8,157</td>
<td>5.0%</td>
</tr>
<tr>
<td>02 Las Lomas</td>
<td>3</td>
<td>6,590</td>
<td>4.0%</td>
</tr>
<tr>
<td>03 San Raphael</td>
<td>4</td>
<td>6,875</td>
<td>4.2%</td>
</tr>
<tr>
<td>04 Carapichaima</td>
<td>8</td>
<td>14,459</td>
<td>9.0%</td>
</tr>
<tr>
<td>05 Chandenagore</td>
<td>3</td>
<td>5,674</td>
<td>3.5%</td>
</tr>
<tr>
<td>06 Todd's Road/Caparo</td>
<td>6</td>
<td>9,197</td>
<td>5.6%</td>
</tr>
<tr>
<td>07 Couva</td>
<td>10</td>
<td>21,672</td>
<td>13.3%</td>
</tr>
<tr>
<td>08 Freeport</td>
<td>5</td>
<td>14,982</td>
<td>9.2%</td>
</tr>
<tr>
<td>09 Tabaquite</td>
<td>12</td>
<td>10,557</td>
<td>6.5%</td>
</tr>
<tr>
<td>10 California/Dow Vge</td>
<td>10</td>
<td>14,535</td>
<td>8.9%</td>
</tr>
<tr>
<td>11 Preysal</td>
<td>2</td>
<td>5,468</td>
<td>3.4%</td>
</tr>
<tr>
<td>12 Claxton Bay</td>
<td>9</td>
<td>16,992</td>
<td>10.4%</td>
</tr>
<tr>
<td>13 Gasparillo</td>
<td>16</td>
<td>26,987</td>
<td>16.6%</td>
</tr>
<tr>
<td>14 Point-a-Pierre</td>
<td>1</td>
<td>622</td>
<td>0.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>93</strong></td>
<td><strong>162,767</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Note:** Projected percentages do not sum to 100% due to rounding.
4. THEMATIC POLICIES AND PROPOSALS

4.1 GROWTH MANAGEMENT

The overriding issue in the Couva/Tabaquite/Talparo Region relates to the high concentration of population and development activity (social facilities, industrial and commercial development, highway access) on the west coast and sparse development and low levels of accessibility in the outlying communities to the east. This spatial development pattern is resulting in stagnation and low levels of servicing of the outer communities and congestion in Couva and other urban centres on the west coast. Growth management in the region therefore aims at promoting spatially integrated and balanced development over the region with particular regard to land use, settlement pattern, and economic activity.

Objective A:
*Promote spatially integrated and balanced development over the Region with particular regard to settlement pattern, land use, and economic activity.*

Policy A1:
*Promote the development of a hierarchy of interactive and vibrant urban and rural settlements, with optimum levels of population and services.*

Strategies for establishing a hierarchy of interactive and vibrant urban and rural centres will include:

a. Provision will be made for the range and level of community facilities and services required in each centre in accordance with the selected growth centre concept. Table 4.1 illustrates the existing and projected distribution of population, housing, and community facilities among the development zones within which growth centres have been selected in accordance with the chosen development strategy. The community facilities proposals are based mainly on standards outlined in the *Guide to Developers and Applicants for Planning Permission* (TCPD, 1989).

b. Incentives will be formulated to attract investment projects, business enterprises, and meaningful and secure jobs to the outlying growth centres of Tabaquite and Talparo and to other lagging communities in the eastern section of the region. The incentives could take the form of upgraded infrastructure facilities, serviced development sites, tax concessions, and planning bonuses.
Table 4.1: Population and Community Facilities by Development Zones with Growth Centres

<table>
<thead>
<tr>
<th>Population and Facilities</th>
<th>Development Zone (Growth Centre)</th>
<th>San Rafael (Talparo)</th>
<th>Carapichaima (St. Mary’s)</th>
<th>Couva (Couva)</th>
<th>Tabaquite (Tabaquite)</th>
<th>Claxton Bay (Claxton Bay)</th>
<th>Gasparillo (Gasparillo)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing 2020</td>
<td>Existing 2020</td>
<td>Existing 2020</td>
<td>Existing 2020</td>
<td>Existing 2020</td>
<td>Existing 2020</td>
<td>Existing 2020</td>
</tr>
<tr>
<td>Population</td>
<td>6,875</td>
<td>14,459</td>
<td>21,672</td>
<td>10,557</td>
<td>14,250</td>
<td>16,992</td>
<td>26,987</td>
</tr>
<tr>
<td>Dwelling Units</td>
<td>1,895</td>
<td>3,700</td>
<td>5,597</td>
<td>2,902</td>
<td>3,750</td>
<td>4,576</td>
<td>7,258</td>
</tr>
<tr>
<td>Community Centre</td>
<td>1 (A Typ) 1 (B Typ)</td>
<td>0</td>
<td>1 (A Typ)</td>
<td>0</td>
<td>1 (A Typ) 2 (B Typ)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Police Station</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fire Station</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Health Facility</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Branch Library</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Primary School</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Secondary School</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Market</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Court</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Local Govt Office</td>
<td>1 (Sub-Office)</td>
<td>1 (Sub-Office)</td>
<td>0</td>
<td>1 (Main Office)</td>
<td>1 (Main Office)</td>
<td>0</td>
<td>1 (Sub-Office)</td>
</tr>
</tbody>
</table>
Policy A2:

*Coordinate the type, location, scale, and sequence of development activity to secure the most sustainable and efficient use of land resources and convenient access to community facilities and employment centres.*

An important measure for implementation of this policy involves building the capacity of CTTRC to administer physical planning at the regional and local levels and to facilitate corporate partnering and community participation in the planning and development process. A strategic planning exercise would be required to determine the requirements for this activity such as staffing, training, equipment, and office space. As well, certain key activities would need to be carried out in order to operationalise the planning functions, including:

a. Preparation and implementation of a sub-regional and local area planning programme, with particular regard to the following areas:

- Preparation of a structure plan for the eastern sub-region comprising the Montserrat Hills Landscape Zone, North East Landscape Zone, and South East Landscape Zone as defined in Figures 4.1 and 5.1.
- Preparation of separate structure plans for the North West Landscape Zone and the South West Landscape Zone, as defined in Figure 4.1 and in Section 5.
- Review and update of the *Couva Land Use Plan* (Halcrow 1999), including an action area plan for Couva Town Centre.
- Preparation of local area plans for St. Mary’s, Claxton Bay, Gasparillo, Tabaquite, and Talparo.

Preliminary indications of strategic proposals for the eastern sub-region (Montserrat Hills Landscape Zone, North East Landscape Zone, and South East Landscape Zone), North West Landscape Zone, and South West Landscape Zone are illustrated in Figures 5.1, 5.3, and 5.5, respectively. As well, basic land use frameworks for Tabaquite and Couva are illustrated in Figures 5.2 and 5.4.

b. Reviewing and updating of existing development control policies and standards.

c. Integration of planning and environmental policies and standards into management programmes in order to secure sustainable development.

d. Formulation of appropriate mechanisms (local area plans, action plans, development programmes and projects, etc.) for effective coordination and implementation of development activity.
e. Formulation of strategic projects to facilitate collaboration among public, private, and community organisations in the implementation process.

Close collaboration among the CTTRC, the Ministry of Local Government (MLG), and Town and Country Planning Division (TCPD) would be an important requirement for the successful decentralisation of the planning function.

**Policy A3:**
*Provide for the expansion of traditional economic activities and the emergence of new growth sectors.*

At the national spatial planning level, the west coast sub-region is seen as possessing many advantages for development, particularly with Couva-Point Lisas as an area for comprehensive international growth opportunities. The eastern sector of the region is viewed as having potential for significant land development to reduce potential congestion in Couva-Point Lisas; landscape management of the Central Range; conservation and development of good quality agricultural lands; and increasing the service function of rural district centres. Within that policy framework, economic development in the Couva/Tabaquite/Talparo Region will be based on traditional activities of retail trade and industrial and agricultural development and on such new growth sectors of tourism, information technology, and agricultural technology.

*Appendix 2* presents comprehensive strategies and techniques for development of the agricultural, tourism, and small and medium size business sectors. Physical planning strategies to support development in the proposed economic sectors may be outlined as follows:

a. New methods and techniques should be adopted for the revival of agriculture. An option of pursuing food production operations, using non-traditional methods such as greenhouse and hydroponic techniques, exists. These methods have the advantage of requiring limited land space for production.

b. Town centres at Couva, St. Mary’s, Claxton Bay, and Gasparillo will be strengthened and expanded to better serve as important business and employment centres accommodating a mix of traditional retail and office activities as well as micro and small businesses.

c. As stated under Policy A1, incentives will be formulated to attract business activities to the growth centres of Tabaquite and Talparo and to other centres in the east.

d. Provision will be made for the expansion of industrial activity, particularly in areas south and east of the existing Point Lisas Industrial Estate.
The National Energy Corporation (NEC) commissioned the preparation of a development plan for the expansion of Point Lisas Industrial Estate in the area bounded by Solomon Hochoy Highway in the east, Southern Main Road in the west, Rivulet Road in the north, and Cedar Hill Road in the south. The plan outlines proposals for substantial areas of heavy and light industry together with buffer zones around existing settlements. Approximately 360 hectares of land have been allocated for heavy industry and 750 hectares for light industry. An arterial road system with improved linkage to the Solomon Hochoy Highway is also proposed for the area as well as port development to service industrial activity.

Since the preparation of the development plan there appears to be no firm commitment to proceed with the expansion scheme. Sites have however been allocated to Essar (approx. 204 ha) and Westlake (approx. 120 ha) for industrial purposes, but these projects appear to be in abeyance at present. Port development is also in a state of uncertainty mainly because of environmental concerns.

It is recommended that in principle the provisions for expansion of the Industrial Estate be maintained, as illustrated in Figure 5.5. The details of the proposals should however be reviewed as part of the process of formulating a structure plan for the wider South West Landscape Zone, as proposed under Policy A2a. A key concern in preparing the structure plan however would be the need to maintain the existing settlements as far as possible and to protect them from any adverse impacts from industrial development.

e. Facilities will be upgraded and developed to support an economically viable and environmentally sustainable tourism industry built upon the rich cultural and environmental assets of the region. Such facilities will include parks and other recreation facilities, hotels and guesthouses, and a Centre for the Arts. It is also recommended that previous proposals to establish a regional zoo at Chickland should be revived and implemented as part of the tourism development thrust in the region.

The economic development strategy for the Couva/Tabaquite/Talparo Region assumes heavy private sector investment in business activities. Emphasis will be placed on developing the local entrepreneurial spirit and encouraging community oriented development and small business activity. Joint venture arrangements and community partnerships with the Couva/Tabaquite/Talparo Regional Corporation will also be encouraged.
4.2 ENVIRONMENTAL MANAGEMENT

Objective B:
Secure environmental and cultural sustainability across the Region.

Policy B1:
Maintain and enhance the ecological integrity and environmental assets of the Region.

The Couva/Tabaquite/Talparo Region has a rich environmental resource base, particularly the eastern section of the region. A development sensitivity analysis carried out for the region indicated that the region has varying levels of sensitivity as represented in five landscape zones. The landscape zones were used as a framework to determine environmental sensitivity to human activity and constraints to development, particularly built development. Development sensitivity was determined on the basis of sensitivity factors of topography (elevation, slope), forest cover (forest, forest reserve, mangrove), water resources (impounding reservoirs), small settlements (village settlement), points of interest, and visual quality. Figure 4.1 illustrates the varying levels of development sensitivity among the five landscape zones in the region.

Future development activity in the region must recognise the sensitivity levels of the region and measures must be instituted to safeguard the key ecosystems and environmental assets.

The key resources of biological interest in the region have been identified as soils, forest reserves, wetlands/mangroves, wildlife sanctuaries, freshwater resources, fisheries, beaches, and hydrocarbon and mineral resources. Measures to safeguard these assets and offset any associated concerns have been outlined in the Environmental Context Report (Ecoengineering, 2009) and summarised in Table 4.2.

<table>
<thead>
<tr>
<th>ENVIRONMENTAL RESOURCE</th>
<th>MASTER PLAN ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil &amp; Land Capability</td>
<td>Reserve Class III lands only for agricultural development, to the extent practical; and</td>
</tr>
<tr>
<td></td>
<td>Give priority to agricultural development on Class IV and V lands.</td>
</tr>
<tr>
<td>Forest Reserves</td>
<td>Heavy industry and waste disposal facilities should be prohibited in close proximity to the Reserves;</td>
</tr>
<tr>
<td>ENVIRONMENTAL RESOURCE</td>
<td>MASTER PLAN ACTIONS</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>The Forestry Division should be consulted for any other development plans in close proximity to any forest reserve;</td>
</tr>
<tr>
<td></td>
<td>Should the Forestry Division approve of such a development, it must be planned, constructed and monitored with their assistance;</td>
</tr>
<tr>
<td></td>
<td>Areas where species are harvested should be replanted using local species;</td>
</tr>
<tr>
<td></td>
<td>There should be diligent enforcement of the law with respect to illegal clearing of forest (for timber, agriculture, squatting etc.); and</td>
</tr>
<tr>
<td></td>
<td>Reforestation, rehabilitation and watershed conservation projects under the Forestry Division should be encouraged.</td>
</tr>
<tr>
<td>Wetlands</td>
<td>The Claxton Bay wetland supports unique species (for example, Scarlet Ibis, Eudocimis ruber) and associations (Mullet hatchery), therefore preservation or best use (fishing, ecotourism etc.) of this wetland is encouraged;</td>
</tr>
<tr>
<td></td>
<td>Consult Forestry, Wildlife and Fisheries Division for any planned development near wetlands, and proceed with their assistance through planning, construction, and monitoring;</td>
</tr>
<tr>
<td></td>
<td>As outlined in the Ramsar Convention, a ‘no net loss’ wetland policy should be adopted, should it be decided that an area of wetland would be lost to development; and</td>
</tr>
<tr>
<td></td>
<td>Plan any development that has the potential to emit hazardous releases away from wetland areas.</td>
</tr>
<tr>
<td>Wildlife Sanctuaries</td>
<td>There should be no development in the wildlife reserve;</td>
</tr>
<tr>
<td></td>
<td>Forestry and Wildlife Division should be consulted for development plans in close proximity to the wildlife reserve;</td>
</tr>
<tr>
<td></td>
<td>Should Forestry and Wildlife Division approve of such a development, it must be planned, constructed and monitored with their assistance;</td>
</tr>
<tr>
<td></td>
<td>Areas where floral species are harvested should be replanted</td>
</tr>
<tr>
<td>ENVIRONMENTAL RESOURCE</td>
<td>MASTER PLAN ACTIONS</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td>using local species;</td>
</tr>
<tr>
<td></td>
<td>There should be diligent enforcement of the law with respect to illegal clearing of forest (for timber, agriculture, squatting etc.) and illegal hunting;</td>
</tr>
<tr>
<td></td>
<td>Breeding and release programmes under the Wildlife Division should be encouraged;</td>
</tr>
<tr>
<td></td>
<td>Reforestation, rehabilitation and watershed conservation projects under the Forestry Division should be encouraged; and</td>
</tr>
<tr>
<td></td>
<td>Prohibit heavy industry and waste disposal facilities from being located in close proximity to the Reserves (a minimum of a 500 m buffer zone has been suggested in Section 2.3.1.2)</td>
</tr>
<tr>
<td>Freshwater Resources</td>
<td>Designate the lands in the Arena and Navet catchments to be kept strictly under forest;</td>
</tr>
<tr>
<td></td>
<td>Other compatible development may be considered within the catchments (fruit tree plantation, cocoa and coffee, ecotourism etc., with negligible concerns to water quality from agrochemicals and sewage); and</td>
</tr>
<tr>
<td></td>
<td>Any development which has the potential to or that will impair water quality should be restricted to outside of the catchments (intensive agriculture, livestock, solid waste and sewage treatment facilities, industry etc).</td>
</tr>
<tr>
<td>Fisheries</td>
<td>Work with the Maritime Services Division (MSD) of the Ministry of Works and Transport (MOWT) to establish marine traffic routes (for industry, cargo, and transport) with a path of least interference to fishing vessels in the known fishing areas;</td>
</tr>
<tr>
<td></td>
<td>Develop and maintain landing facilities (approaches, landing site, storage, security etc.), for fishermen, and</td>
</tr>
<tr>
<td></td>
<td>Ensure that industrial and other effluent types meet the prescribed standards set in the Water Pollution Rules 2005 (Amended 2006), or comply with a recognised guideline or criteria should it not be governed by the said Rules.</td>
</tr>
<tr>
<td>Hydrocarbon &amp;</td>
<td>Establish a sufficient buffer zone (500 m has been suggested in</td>
</tr>
<tr>
<td>ENVIRONMENTAL RESOURCE</td>
<td>MASTER PLAN ACTIONS</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Mineral Resources</td>
<td>Section 2.3.1.2) around the oil and gas field, or quarry; and restrict other forms of development that involve risking human life or property (residential, commercial institutional etc.) from being located close to the buffer.</td>
</tr>
<tr>
<td>Beaches</td>
<td>Carli Bay should not be destroyed to make way for any other type of development. A water quality monitoring programme should be implemented and if the quality is unfavourable, “no swimming due to poor water quality” signs should be erected. The road leading to Carli Bay also needs to be improved.</td>
</tr>
</tbody>
</table>

**Policy B2:**

*Ensure minimisation of energy usage, effective waste reduction and management, and reduction of pollution.*

As an industrial zone, the west coast sub-region of the Couva/Tabaquite/Talparo Region could be subjected to high levels of energy consumption, waste generation, and pollution. Future development in the sub-region must avoid those environmental impacts by introducing environmentally sensitive and energy efficient activities to the area and pursuing an integrated waste management programme of source reduction, recycling, composting, and sanitary landfilling.

Further, the concept of the Eco-Industrial Park (EIP) should be applied to existing and new industrial estates so that businesses can seek “enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues”. Key elements of the EIP Concept involve:

- Improvement of the economic performance of the participating companies while minimising their environmental impacts.
- Green design of park infrastructure and plants (new or retrofitted).
- Cleaner production, pollution prevention, and energy efficiency.
- Provision of benefits to the local community in terms of a cleaner, healthier environment; business and job development; attraction for recruitment; and an end to conflict between the economy and the environment (*Eco-Industrial Park Handbook*).

Application of the EIP Concept should however also be supported by the enforcement of pollution control measures, including effluent discharge standards and appropriate policy measures and guidelines to address existing environmental problems.
Policy B3: *Restoration and conservation of important aspects of the cultural environment.*

It will be necessary to review and update existing inventories of important aspects of the cultural heritage of the Couva/Tabaquite/Talparo Region, including key cultural events and sites and structures of archaeological, architectural, or historic interest. The heritage inventory will serve as a basis for the formulation of a restoration and conservation programme. Features which should be given consideration in the restoration and conservation programme include archaeological sites and other sites of interest identified in the Environmental Context Report (Ecoengineering, 2009). Preliminary recommendations for the conservation and development of these features include (Ecoengineering, 2009):

a. Follow up on the issue of archaeological sites in the CTTR with the Archaeological Committee.

b. Plan intrusive or damaging forms of development (quarries, housing, industry, institutions, waste disposal facilities etc.) away from known or suspected archaeological sites, and other sites of interest.

c. Protect and maintain existing access routes to sites of interest, or develop alternative routes to them.

Policy B4: *Protect natural resources, population, property, economic activity, and infrastructure from the effects of environmental hazards and the impacts of climate change.*

In order to reduce the risk of hazardous events, there will be need to institute appropriate disaster mitigation and preparedness measures in the region, including land use controls and building construction and infrastructure standards. A disaster mitigation and emergency action plan should also be instituted in the west coast sub-region in view of proposals to intensify the industrial development thrust in that area.

With the aim of minimising the effects of climate change, the levels of CO₂ emissions from industrial and transportation activities should be reduced and a comprehensive green infrastructure system should be maintained in the region.
4.3 REGIONAL FORM AND URBAN DESIGN

Objective C:
*Enhance the structure, functioning, and aesthetics of the regional landscape and urban and rural centres.*

Policy C1:
*Safeguard and enhance the natural and scenic values of the regional landscape.*

The Couva/Tabaquite/Talparo Region represents a spectacular landscape formation which is characterised by forest cover, mixed agriculture, and village development in the eastern sub-region and more intense settlement and industrial development in the western sub-region. The most dominant landform feature in the region is the Montserrat Hills which provides strategic vantage points for panoramic views to other parts of the region. The western sub-region holds a coastal location along the Gulf of Paria.

Overall, the region is rich in cultural and natural resources and holds tremendous potential for educational and recreation activities and nature and cultural tourism. There is need however to maintain the distinctiveness of the region by safeguarding and enhancing the natural and scenic values of the regional landscape. A key approach in that regard would be to identify and evaluate the significant visual resources in the region and, on that basis, to formulate and apply landscape management policies for conservation or modification of the scenic landscapes, as follows:

a. Identify the key visual resources of the natural and cultural landscape and rate defined landscape units in terms of scenic quality.

b. Formulate landscape management policies for the levels of conservation or modification of the scenic landscapes, based on the visual resource inventory and rating system (U.S. Bureau of Land Management. *Visual Resource Management System*).

c. Optimise the conservation and use of such key landscape features as the visual resources, Caroni Arena Dam, Navet Dam, and forest reserves.

Policy C2:
*Enhance the liveability, identity, and image of the urban and rural centres in the region.*

In the more rural settlements in the eastern sub-region, development form is generally characterised by nucleated villages at major road junctions and ribbon development along main roads. Development form in the western sub-region is characterised by more compact and intensive urban development. In particular, development is highly
Addressing problems of settlement form in the region should involve enhancement of the liveability, identity, and image of the urban and rural centres by applying basic urban design strategies, including the following:

- Consolidation of ribbon development and areas of piecemeal, low density development.
- Definition of clear street hierarchies and rationalisation of traffic patterns.
- Enhancement of key activity nodes, landmarks, and vehicular and pedestrian routes.
- Rationalisation of existing commercial strips into more compact and consolidated nodes.
- Conservation of historic and other important renewable urban resources.
- Establishment of an underlying, coherent landscape framework in each centre comprising recreation open space, riverside parks, hillside areas, and the street environment.
- Designing new development projects in harmony with the natural and cultural environment.

Couva represents the primary administrative and commercial centre in the Couva/Tabaquite/Talparo Region and therefore deserves special attention in terms of its identity, function, and aesthetics. In terms of form, Couva assumes an east-west linear pattern along the Southern Main Road, which represents a strong axis and the major commercial street in the town. The shopping street is characterised by heavy pedestrian and vehicular traffic; cluttering of signs and overhead wiring; pedestrian and vehicular conflicts; and a lack of shade, shelter, and other amenities for pedestrian comfort.

In order to address problems of urban form and environmental quality in Couva, a design framework should be prepared for the Downtown District that includes provision for the following features:

- Expansion and enhancement of the town centre.
- A clearly defined pedestrian realm, including widened, barrier-free sidewalks, sidewalk extensions at crosswalks, and conveniently located and clearly marked street crossings.
- Features for pedestrian comfort, including weather protection canopies and street trees, street furniture (benches, lighting, planters, etc.).
- Placement of utility cables underground.
- Appropriate traffic management measures.

Overall, the design framework and strategies proposed for the Couva/Tabaquite/Talparo Region are expected to protect visual values and safeguard
the landscape character of the region and enhance the character and vitality of the urban and rural centres.

4.4 COMMUNITY FACILITIES AND HOUSING

Objective D: 

*Provide for the equitable distribution and efficient development of the facilities and services required to promote social advancement and human development.*

Policy D1: 

*Provide the level, range, and spatial distribution of facilities required for educational advancement, healthcare, childcare, cultural expression, recreation, personal business and leisure pursuits, and safety and security.*

The selected development strategy involves improvements in social and other community facilities to serve the population of the region and to support the thrust in agricultural development, industrial expansion, and community tourism. The facilities development programme will include the following key elements:

a. Provide for the upgrading of existing facilities including schools, health centres, parks and other recreation facilities, community centres, public markets, administrative and protective facilities.

b. Provide for the establishment of new facilities as required including the development of a new hospital at Couva, local government administrative complex, and visual and performing arts facility. The possibility of upgrading the existing health facility on Couva Main Road to a hospital is one option that could be considered for improving healthcare services in the region.

Table 4.1 illustrates the existing and proposed distribution of community facilities among the development zones within which growth centres have been selected.

Policy D2: 

*Increase housing choices to meet the needs of existing and future residents, particularly in terms of location, housing type, cost, and residential environment.*

There would be need at a more detailed planning level to determine housing needs and identify opportunities for development of safe and affordable housing forms and environments.

At this stage however, based on the population projection of 190,000 persons to the year 2020, a rough estimate of housing requirements was determined. It was assumed that the 2000 household size of 3.9 persons per household would remain constant to 2020. The projected population of 190,000 persons would therefore comprise 48,718
households. A household to dwelling unit ratio of 1:1 was assumed to be a desirable target, and thus 48,718 dwelling units would be required by 2020. In 2000 there were 43,095 dwelling units in the region. A total of 5,623 new dwelling units would have been required between 2000 and 2020. This estimate however does not take into account the need to replace poor quality units in the existing housing stock.

Further, there would be need to provide support for the renovation and upgrading of substandard housing and regularisation or relocation of squatter communities.

A key aspect of the housing provision would be the creation of sustainable residential environments in terms of design, safety from environmental hazards, availability of social and physical infrastructure, and proximity to employment centres.

Housing expansion in the region is expected to assume various forms including mixed use developments; town centre housing; and consolidation and intensification of existing communities. Compact development forms are proposed, rather than widespread expansion of existing communities, in order to conserve land resources and to facilitate efficient infrastructure servicing and ease of access to community services and facilities.

4.5 PHYSICAL INFRASTRUCTURE

Objective E:
Upgrade physical infrastructure facilities and services in a timely and cost effective manner.

Policy E1:
Provide adequate capacity and efficiency of service to the systems for water supply, sewage disposal, drainage, solid waste management, electricity, and telecommunications.

Improvements in the infrastructure systems would be important to generate and support development activity and to maintain sanitary and public health conditions in the region. The population must be provided with safe, reliable, and affordable infrastructure service.

Specific infrastructure development programmes will include the following key elements:

a. Improvement in the water supply, storage, transmission, and distribution system in order to provide an adequate level of service to consumers, including residential, commercial, industrial, and recreation and tourism consumers.
Having reviewed the information on the existing water supply system and future development plans for the region, the Infrastructure Consultant recommends that the following be considered:

- A firm policy must be developed for utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (>1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), Telecommunication and Signal Cabling and Water and Sewage Lines.

- The Couva-Tabaquite-Talparo Regional Corporation and all developers of the area should provide timely information at the planning stage to WASA so that their requirements could be integrated in their development plans.

- It can be determined from WASA’s GIS Maps that:
  
  o Significant development is still to be done in the Couva-Tabaquite-Talparo Regional Corporation as many roads that lead to developments have no water mains. This therefore shows that future expansion of the piping network is required.

  o The GIS maps need to be updated and then an assessment of the existing potable and wastewater systems should be performed.

b. Improvement of sewage disposal methods and facilities to avoid problems of environmental pollution and any threats to public health.

c. Carry out a drainage study in the region and improve drainage facilities in order to prevent the perennial problem of flooding in the region.

Flooding is a considerable issue in the Couva/Tabaquite/Talparo region. This is primarily due to additional development in the area, subsequent to initial designs and construction of the drainage system as well as insufficient maintenance of the existing system. Since this initial planning stage, there has been considerable increase in impermeable cover, and thus a resultant decrease in open land areas that before would collect and distribute runoff waters during and after rainfall.

It is likely that the area would benefit from an upgrade in the existing drainage network, by increasing the sizes of the existing drains. This will allow the excess water to be directed into the drainage network. This larger volume of water can possibly be managed and ultimately disposed of in several ways:

- Design of communal detention ponds to regulate runoff in urban centres.
• Dam construction in the higher reaches of the catchments to increase overall Time of Concentration, $T_c$, of the catchment and reduce flooding in the low lying areas.

• Upgrade and preparation of a proper maintenance plan for existing drainage infrastructure. Expansion of drainage channels and construction of levees where runoff exceeds the capacity of the existing infrastructure.

• Examine the feasibility of rerouting of storm water away from urban centres and into neighboring wetlands (with silt removal) or diverting of certain waterways.

• Elevation of stretches of roads that, when flooded, cut off residents from their destinations. Additionally, install balancing culverts along these elevated stretches of road, so that road embankment does not act as a dam. Balancing culverts will allow the flow of water through the road embankment, thus reducing the dam effect.

• It goes without saying that employing any of these methods will not permanently relieve the problem if the said systems are not maintained over their lifespan. It is therefore recommended that any potential solutions be carefully considered, not just for its initial capital cost, but also it maintenance cost over the projected life.

d. Rationalisation of the existing solid waste management operations and introduction of an integrated programme of source reduction, recycling, composting, and landfilling.

e. Improvement of electricity service and facilities, including elimination of unsightly overhead wires in town centres.

Having reviewed the information on the existing electricity system and future development plans for the region, the Infrastructure Consultant recommends that the following be considered:

• As more information on development projects becomes available, T&TEC would need to revisit and refine the projected demands and generating capacities for the Central Distribution Area with respect to design specifications for the new Sub-Stations to be constructed at Chase Village and Chaguanas.
• Develop a firm policy on utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (>1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), and Telecommunication and Signal Cabling and other utilities.

• For underground infrastructure, expansion of main corridors along roadways might mean that any unencased electricity ducting originally under the grass verge end up under the travel lane. Therefore for future underground infrastructure, concrete encasement of ducts is required for physical protection and T&T EC should standardize their requirements.

• The developers of the Couva-Talparo-Tabaquite area should provide timely information at the planning stage to T&T EC regarding the characteristics of the supply and estimated demand for T&T EC to include in their plans.

f. Improvement of telecommunications service and facilities, including elimination of unsightly overhead wires in town centres.

Having reviewed the information on the existing telecommunications system and future development plans for the region, the Infrastructure Consultant recommends that the following be considered:

• For future underground infrastructure, concrete encasement of ducts is required for physical protection and Telecommunications Services of Trinidad and Tobago (TSTT) and Columbus Communication Trinidad Limited (CCTL) should standardize their requirements.

• A firm policy must be developed for utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (>1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), and Telecommunication and Signal Cabling.

• All developers of the Couva-Tabaquite-Talparo region should provide timely information at the planning stage to TSTT and CCTL so that their requirements can be integrated into the designs.

• Despite the limited availability of CCTL service in the Couva-Tabaquite-Talparo area, telephone and data services are also provided by TSTT and satellite television service is available from Direct TV. Further development of CCTL’s fixed line network to feed the present customers in the Couva-Tabaquite-Talparo Regional Corporation would be a significant investment, in particular if it is only to supply a supplementary service to TSTT. As such, expansion of CCTL’s fixed
line network should mostly take place in areas where there are plans for future development.

- No specific provisions are required to improve the reliability of the cellular service in the Couva-Tabaquite-Talparo area. However the approval process for cellular site construction must be noted and the Couva-Tabaquite-Talparo Regional Corporation and approving agencies should provide any necessary support for the development of cellular services in the area as required.

4.6 TRANSPORTATION

Objective F:
*Improve accessibility within the Region and linkages to adjoining regions.*

Policy F1:
*Establish a transportation system which will be complementary to the land use system and offer safe, convenient, and efficient access to and within the Region.*

To a large extent, the proposed new development thrust in the Couva/Tabaquite/Talparo Region will depend upon improved accessibility within the region and within the major urban centres. Improvement of access from other regions and development centres, particularly Port of Spain and San Fernando, would also be critical. *Appendix 4* presents a comprehensive analysis and policies regarding transportation issues and proposals for the Region. Aspects of the proposals are presented in this section.

*Urban Transportation Principles*

With respect to urban transportation in the region, the transportation planning initiative for Couva, Gasparillo, Claxton Bay, and St. Mary’s is based on the following principles and steps:

a. A people-oriented design would be much more attractive, efficient and sustainable than conventional car-dominated development.

b. To achieve the goal of each urban area as multifunctional activity centre, the transportation system should be designed to support its activities and provide good accessibility without negative impacts which multilane streets with high traffic volumes and large garages would have.

c. Internal travel and transportation in each urban area will be performed by pedestrians, cars, minibuses, buses and other vehicles travelling at moderate speeds, because most of the vehicles will terminate their travel in the area.
d. External trips to and from each urban area will favour public transport modes: buses, maxi-taxi and other paratransit vehicles. Regular and, possibly, articulated buses will be directed to the central transit hub which will be an off-street facility allowing simultaneous arrivals of many buses, as timed transfer bus system operates. At the terminal there will be convenient transferring from external buses and minibuses that will serve as local collectors-distributors among major activity centres and areas in each urban area. Auto trips will have convenient access to the garages which will be located on the periphery of the urban centre.

e. This type of a coordinated intermodal transport system will provide good accessibility among the business places and residential buildings, making each urban area an efficient local area supporting diversified activities required by the land use plan.

The planning principles applied here are based on the latest experiences in city planning for developments with fully integrated land uses and transportation system, both designed to achieve dynamic, multifunctional urban areas with features of liveability and sustainability.

**Regional Road Development Programme**

The following roads have been ranked for development through either construction, expansion, road condition improvement, or road capacity improvement. These roads are ranked by consideration of the travel demands resulting from activities in the regions and the travel times between the regions. Excluded from this submission is the evaluation of the following factors in ranking the proposed roads: property requirements, construction and operating costs, safety, environmental considerations, and social impacts. Roads within town centres have not been considered.

1. Road condition and geometric improvement to Cedar Hill Road between Southern Main Road, Claxton Bay and Tortuga Village.
2. Road condition and geometric improvement to the Caparo Valley Brasso Road between Southern Main Road, Montrose and Guaracara Junction.
3. Road condition and geometric improvement to Arena Road between Freeport and Chickland Village.
4. Road condition and geometric improvement to Chickland Caparo Road between Chickland Village and Caparo Village.
5. Road condition and geometric improvement to Todd’s Station Road between Caparo Valley Brasso Road and Talparo Road, Talparo Village.
6. Road condition and geometric improvement to road linking Todd’s Station Road and Caroni Road, Nancoo Village, and passing just west of Todd’s Road North Forest Reserve, and passing through Las Lomas.
7. Road condition and geometric improvement to Chin Chin Road between Southern Main Road and Las Lomas Village.
8. Dualling of Rivulet Road in Couva, including improvement to the Preysal Interchange on the Solomon Hochoy Highway and the Brechin Castle Roundabout on the Southern Main Road

9. Road condition and geometric improvement to Windsor Park Road, Mount Pleasant Road, Milton Road, Basterhall Road and Diamond Road

10. Construction, including improvement, to the existing gravel road linking Basterhall Road to Railway Road.

11. Road condition and geometric improvement to Mayo Road between Tortuga and Morichal.

12. Road condition and geometric improvement to Indian Trail Road between Tortuga and Rivulet Road, Couva.

13. Road condition and geometric improvement to Brasso Caparo Station Road between Brasso Junction and Pepper Village, Gran Couva.

14. Road condition and geometric improvement to Couva Road between Pepper Village and Preysal.

15. Road condition and geometric improvement to Freeport Mission Road between Freeport and Preysal.

16. Road condition and geometric improvement to Freeport Todd’s Road between Arena Road and Caparo Valley Brasso Road.

17. Road condition and geometric improvement to Mamoral Road between Caparo Valley Brasso Road and Talparo Road, Mundo Nuevo Village.

18. Road condition and geometric improvement to the Guaracara Tabaquite Road between Southern Main Road, Marabella and Tabaquite.

19. Road condition and geometric improvement to Torrib Tabaquite Road between Naparima-Mayaro Road and Tabaquite Rio Claro Road.

20. Road condition and geometric improvement to Sisters Road between Torrib Tabaquite Road and Guaracara Tabaquite Road.

21. Road condition and geometric improvement to Pascual Road between Torrib Tabaquite Road and Piparo Road.

22. Road condition and geometric improvement to Piparo between Pascual Road and Guaracara Tabaquite Road.

23. Road condition and geometric improvement to Tamana Road between Talparo Road and Mamon Village.

24. Road condition and geometric improvement to Guaico Tamana Road between Mamon Village and Guaico Village.

25. Road condition and geometric improvement to road linking Cunapo Southern Road to Guaico Tamana Road.


Detailed studies should be conducted on each road above to determine the property requirements, construction and operating costs, safety, environmental considerations, and social impacts involved in its construction or improvement.
With regard to transportation proposals to complement the proposed expansion of Point Lisas Industrial Estate, conclusions and recommendations of the National Energy Corporation (NEC) Point Lisas South and East Transportation Impact Assessment (TIA) Study are included in Appendix 4. This study considered traffic conditions in the area bounded by the Solomon Hochoy Highway, Southern Main Road, Rivulet Road, and Cedar Hill Road. The study makes recommendations regarding the standards of proposed roads in the area and for the improvement of Rivulet Road, the roundabout intersection Southern Main Road / Rivulet Road / Atlantic Avenue, and the intersection of Couva Main Road / Solomon Hochoy Highway Ramps / Rivulet Road.

Conclusions from PETROTRIN - Construction of New Office Complex and Support Facilities: Traffic Access Improvements: A Congestion Management Strategy Study are also included in Appendix 4. Petrotrin has long ago recognised that any development of its estate must be linked to major access improvements via the Solomon Hochoy Highway. In order to facilitate access to its New Corporate Headquarters, Petrotrin hired a consultant in April 2006 to examine several alternative access arrangements, and a preferred option was agreed upon. This was a partial diamond-type (with a roundabout) and trumpet-type interchange dedicated to Petrotrin and located approximately 2 km north of the New Corporate Headquarters and existing Gasparillo Interchange.

The Highways Division of the Ministry of Works and Transport reviewed this conceptual plan and in March 2007 required that amendments be made to connect Charles Street, Gasparillo with the proposed interchange, in order that the wider public may also have access to this interchange.

**Public Transport System**

There is need to enhance public transportation service to and within the region including scheduling, routing, bus and taxi stands, and transit hubs. Transit hubs are proposed for the urban areas of Couva, Gasparillo, and St. Mary’s. Key features of these transit hubs include:

a. Convenient and safe access to on-site Park and Ride facilities.

b. Pedestrian priority routes are to be provided to ensure that the Transit Hub can be conveniently and safely accessed from adjacent roads or developments, with zebra crossings across the access road. Pedestrian footpaths to be located adjacent to roadways, raised by standard kerb heights. Where a footpath cuts across the roadway, this should be clearly marked (such as a zebra crossing) to warn drivers to give way, and/or supported by a raised kerb.

c. Comprehensive transport information boards with:
   - Bus network diagram;
   - Service schedules with exact departure times;
- Information on fares and tickets (including marketing for pre-pay);
- Maps indicating walking and cycling routes;
- General public transport marketing with strong branding and notifications on new initiatives.

d. Kiosks selling pre-paid tickets and convenience items appropriately located.

e. Lay-by areas for service regulating and driver facilities.

f. The express and busiest services will be allocated the bus stop space where passengers will board/alight efficiently.

g. The less busy services will be required to be allocated the bus stop space to that allows passengers to interchange from, say the Internal Shuttle, to the Express if they require a service.

h. Shelter should be provided.

It would be valuable to have a dedicated school bus transport that is properly planned and administered. It would ensure safe, efficient and reliable transport is available for students. School children would not be subjected to undue influence, duress or social de-motivation. They would benefit from educational opportunities through the ready accessibility to public transportation. They would benefit from social, sporting and cultural activities through accessibility to public transport.

The drivers of these school buses would be known by the members of the community and school staff within which they operate. They would know the students and may also function as additional overseers in the development of these children.

Consideration may also be given to developing the concept of alternative work hours in order to facilitate school children, such as (1) Staggered hours: different work groups are assigned to begin at different times (2) Flexi-time: allows employees to choose their own schedules within company-set guidelines (3) Compressed work-week: Four-day work weeks allow employees to complete 40 hours of work in four 10-hour days

In the longer term, plans may be made to create subsidiaries of the prestige school in other areas in order to encourage decentralisation. Perhaps a better move may be to create zoning, whereby parents would have to send their children to schools within the zones in which they live.

These ideas do not require that we design our transport system around any particular technology, but around the needs of the customer.
Parking Garages

An urban parking garage would normally be used in a central focus parking model. This model provides parking in a large parking reservoir in the activity centre of the city. It provides for both short- and long-term parkers within the core of the city. The key to this type of facility is having good vehicular access, otherwise bringing this large number of vehicles within and out of the centralized parking facility would encourage traffic congestion.

Park-and-ride is a concept where motorists drive to a car parks which are located well away from the urban centre that is, on the fringes, and then travel by public transit to their destinations. Potential parkers are intercepted at the perimeter or further away from the urban centre. If this parking is relatively inexpensive, convenient, and directly connected to a shuttle service from the parking sites into very close proximity to the ultimate destination of the user, the concept would be successful. The location of park-and-ride facilities is critical to their effectiveness. The most effective is nearest the origin of the journey.

The planning for park-and-ride facilities would require agreement of several issues, including (a) availability of location, (b) provision of alternative accommodation when the site has another conflicting activity having a higher priority, (c) site operator parking charge, including provision of adequate security, (d) transit operator charge, (e) park-and-ride user fees, (f) government subsidy (considered here as part of Government’s congestion alleviation support); and, (g) continuing and ample publicity for the system so that the commuter is fully aware of the advantages associated with the service.

The following are proposed locations for Park-and-Ride facilities in Couva:

- The intersection of Camden Road (Exchange Estate Road) and Couva Main Road
- The intersection of Camden Road and South Main Road, and
- Phoenix Park Road, just east of the Fire Station.

Walking and Cycling

As a conservation measure, energy efficiency and CO₂ reduction should be secured in the transportation system by promoting non-motorised forms of transport (walking, cycling) and the use of public transport over private vehicles.

Table 4.3 sets out the key detailed requirements in providing high quality walking and cycling alternatives to users.
TABLE 4.3 WALKING AND CYCLING - DETAILED REQUIREMENTS

<table>
<thead>
<tr>
<th>Mode</th>
<th>Objective</th>
<th>Measures</th>
</tr>
</thead>
</table>
| Cycling   | Promote cycling   | • Provide Region-owned bicycles with bicycle locks and racks at key locations including the Transit Hub, Educational Institutions, and businesses  
• Provide adequate promotion on cycling, with emphasis on a healthy lifestyle, zero emission/environmentally friendly mode, free and quick  
• Distinctive branding of bicycles  
• Provide additional bicycle racks at prominent key locations for private bicycle parking  
• Encourage tenants to provide shower facilities for cyclists  
• Well and regularly maintained estate bicycles to ensure good condition. Free basic maintenance services to private bicycles for tenants |
|           | Ensure safety and security of cyclist | • Dedicated, clearly marked and distinguished and step-free cycle paths adjacent to main roads, preferably alongside pedestrian footpath  
• Cyclists have priority over vehicles at road crossings  
• Well lit and patrolled streets at night  
• Free hire of cyclist helmets on request at Transit Hub |
| Walking   | Promote walking   | • Ensure a clean and well maintained environment along footpaths  
• Priority to pedestrians over vehicles and cyclists at road crossings  
• Crossings clearly marked as zebra crossing at intersections and provide step free crossing, either by dropping the kerb or raising the road at crossing to promote access for mobility impaired  
• Avoid footpaths which are obscured from the main roads  
• Well lit and patrolled streets at night |

4.7 MUNICIPAL MANAGEMENT

Objective G:
Promote effective management of the development process in the Region.

Policy G1:
Promote community empowerment, participatory governance, and local government autonomy.

The Couva/Tabaquite/Talparo Regional Corporation (CTTRC) must play a greater role in the management of the overall development process in the Region. The Ministry of Local Government should therefore consider existing managerial requirements and implications in the Region and on that basis, determine the future role and responsibilities of the Corporation in the development process.

It is recommended that CTTRC should be provided with greater autonomy to at least play a more important role in coordinating and monitoring development activity within the Region. In order to carry out this function in an effective manner however, CTTRC would need to be provided with supporting legislative and administrative mechanisms and adequate human, financial, and physical resources.
As stated under Policy A2, one institutional measure recommended for early implementation involves building the capacity of CTTRC to administer physical planning at the regional and local levels and to facilitate corporate partnering and community participation in the planning and development process. A strategic planning exercise and certain key activities (local area planning programme, etc.) would need to be carried out in order to operationalise the planning functions (See Policy A2).
5. ZONAL POLICIES AND PROPOSALS

From a regional form analysis of the Couva/Tabaquite/Talparo Region and on the basis of its overall landform pattern, the region was seen as comprising five landscape zones, or units (Figure 4.1). The landscape zones are being used in this section as the basis for outlining policies and proposals at a zonal level.

5.1 MONTSERRAT HILLS LANDSCAPE ZONE

The Montserrat Hills Landscape Zone comprises the western half of the Central Range of Trinidad and runs in a north-east to south-west direction for a distance of approximately sixteen (16) kilometres in the south central portion of the region. The key characteristics and development proposals of this zone are presented in Table 5.1 and Figure 5.1.

Table 5.1: Montserrat Landscape Zone

<table>
<thead>
<tr>
<th>MONTSERRAT HILLS LANDSCAPE ZONE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key Characteristics</strong></td>
</tr>
<tr>
<td>▪ Most dominant landform feature in the region which comprises an extensive main ridge and a generally steep and rugged hill formation.</td>
</tr>
<tr>
<td>▪ Attains an elevation of 198 metres at its highest point.</td>
</tr>
<tr>
<td>▪ Largely under forest cover and includes forest reserves.</td>
</tr>
<tr>
<td>▪ Elevation and orientation of the hills provide strategic vantage points for panoramic views to other parts of the region.</td>
</tr>
<tr>
<td>▪ Landform and forest cover create a visually appealing landscape.</td>
</tr>
<tr>
<td>▪ Sites of interest include Knolly’s Tunnel, Tortuga Roman Catholic Church (historic structure), and the Weather Radar Tower at the eastern end of the main ridge.</td>
</tr>
</tbody>
</table>
Views from the Regional Weather Radar Tower
Knolly’s Tunnel
5.2 NORTH EAST LANDSCAPE ZONE

The North East Landscape Zone includes such settlements as San Rafael, Brazil, Talparo, Caparo, and Madras Settlement. The key characteristics and development proposals of this zone are presented in Table 5.2 and Figure 5.1.

Table 5.2: North East Landscape Zone

<table>
<thead>
<tr>
<th>Key Characteristics</th>
<th>Development Proposals</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Generally undulating landform.</td>
<td>▪ As a regional project, carry out an inventory of sites of interest and formulate and implement a restoration and conservation programme for educational and tourism purposes.</td>
</tr>
<tr>
<td>▪ Caroni Arena Dam located in the northeast corner of the zone.</td>
<td>▪ Upgrade the service function of Talparo as an important secondary centre to serve the north east section of the region and including local government services, commercial expansion, light industrial development, etc.</td>
</tr>
<tr>
<td>▪ Built development is sparse and comprises mainly village settlement, including Talparo, San Rafael, and Brazil.</td>
<td>▪ Conservation of forest reserves and other forest cover.</td>
</tr>
<tr>
<td>▪ Forest cover and mixed agriculture are significant land uses.</td>
<td>▪ Conservation of the visual quality of the area.</td>
</tr>
<tr>
<td>▪ Several forest reserves fall within the zone.</td>
<td>▪ Conservation and use of Caroni Arena Dam for recreation and education purposes.</td>
</tr>
<tr>
<td>▪ San Rafael Roman Catholic Church is a significant historic structure.</td>
<td>▪ Safeguard the image and integrity of small settlements.</td>
</tr>
</tbody>
</table>

Promotion of agriculture, agro-processing, and other light manufacturing activities.

Upgrade road conditions and other physical infrastructure.

Revival and implementation of previous proposals to establish a regional zoo at Chickland as part of the tourism development thrust in the region.
5.3 SOUTH EAST LANDSCAPE ZONE

The South East Landscape Zone is located south of the Montserrat Hills and includes such places as Tabaquite, Brickfield, and Piparo. The key characteristics and development proposals of this zone are presented in Table 5.3 and Figure 5.1. Figure 5.2 provides a basic land use framework for Tabaquite.

Table 5.3: South East Landscape Zone

<table>
<thead>
<tr>
<th>Key Characteristics</th>
<th>Development Proposals</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Generally undulating landform.                                                    ▪ As a regional project, carry out an inventory of sites of interest and formulate and implement a restoration and conservation programme for educational and tourism purposes.</td>
<td></td>
</tr>
<tr>
<td>▪ Navet Dam located in the northeast corner of the zone.                           ▪ Upgrade the service function of Tabaquite as an important secondary centre to serve the south east section of the region and including local government services, commercial expansion, light industrial development, etc.</td>
<td></td>
</tr>
<tr>
<td>▪ A key site of interest in this zone is the Piparo Mud Volcanoes.                  ▪ Conservation and use of the Navet Dam for recreation and education purposes.</td>
<td></td>
</tr>
<tr>
<td>▪ Built development is sparse and comprises mainly village settlement.              ▪ Conservation of forest reserves, other forested areas, and wildlife sanctuaries.</td>
<td></td>
</tr>
<tr>
<td>▪ Forest cover and mixed agriculture are significant land uses and a large portion of the Central Range Forest Reserve falls within this zone.</td>
<td>▪ Conservation of the visual quality of the area.</td>
</tr>
<tr>
<td>▪ Safeguard the image and integrity of small settlements.</td>
<td></td>
</tr>
<tr>
<td>▪ Promotion of agriculture, agro-processing, and other light manufacturing activities.</td>
<td></td>
</tr>
<tr>
<td>▪ Upgrading of roads and other infrastructure systems in the area.</td>
<td></td>
</tr>
</tbody>
</table>
Recreation Facility in Tabaquite
5.4 NORTH WEST LANDSCAPE ZONE

The North West Landscape Zone extents from Couva northwards and is bounded in the east by Preysal and other areas immediately east of the Solomon Hochoy Highway. The key characteristics and development proposals of this zone are presented in Table 5.4 and Figure 5.3, while Figure 5.4 provides a basic land use framework for Couva.

Table 5.4: North West Landscape Zone

<table>
<thead>
<tr>
<th>NORTH WEST LANDSCAPE ZONE</th>
<th>Key Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Characteristics</td>
<td>Development Proposals</td>
</tr>
<tr>
<td>Virtually flat landscape with a coastal</td>
<td>Upgrade the Solomon Hochoy Highway and its interchanges, particularly the</td>
</tr>
<tr>
<td>component along the Gulf of Paria.</td>
<td>Couva Interchange, as required.</td>
</tr>
<tr>
<td>Mangrove communities exist in Carli Bay Area.</td>
<td>Upgrade the quality of local roads in the area.</td>
</tr>
<tr>
<td>Represents one of the more developed</td>
<td>Establish a water taxi terminal and associated parking facilities in the Greater</td>
</tr>
<tr>
<td>areas in the region and includes such</td>
<td>Couva Urban Area.</td>
</tr>
<tr>
<td>settlements as Couva, Preysal, Carapichaima,</td>
<td>Protect the beach and mangrove communities at Carli Bay.</td>
</tr>
<tr>
<td>Chase Village, and St. Mary’s Village.</td>
<td>As a regional project, carry out an inventory of sites of interest and formulate and</td>
</tr>
<tr>
<td>Previously an area of intensive sugarcane</td>
<td>implement a restoration and conservation programme for educational and tourism</td>
</tr>
<tr>
<td>production.</td>
<td>purposes.</td>
</tr>
<tr>
<td>Key public attractions in this zone</td>
<td>Rationalise the development pattern, including traffic, in Couva, St. Mary’s, and</td>
</tr>
<tr>
<td>include the Temple in the Sea at Waterloo,</td>
<td>other centres.</td>
</tr>
<tr>
<td>Hanuman Monument, Ato Boldon Stadium, National</td>
<td>Upgrade the service functions of Couva, as the primary urban centre, and St. Mary’s,</td>
</tr>
<tr>
<td>Cricket Centre, and Carli Bay Beach Park.</td>
<td>as a secondary urban centre.</td>
</tr>
<tr>
<td>Solomon Hochoy Highway runs through this zone.</td>
<td>Facilitate housing and agricultural expansion in areas north of Couva Town.</td>
</tr>
</tbody>
</table>
5.5 SOUTH WEST LANDSCAPE ZONE

The South West Landscape Zone is located south of Couva and includes such areas as Claxton Bay, St. Margaret, and Gasparillo. The key characteristics and development proposals of this zone are presented in Table 5.5 and Figure 5.5.

Table 5.5: South West Landscape Zone

<table>
<thead>
<tr>
<th>SOUTH WEST LANDSCAPE ZONE</th>
<th>Key Characteristics</th>
<th>Development Proposals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>▪ Generally flat to undulating landform with a coastal component.</td>
<td>▪ Upgrade the Solomon Hochoy Highway and its interchanges, as required.</td>
</tr>
<tr>
<td></td>
<td>▪ Mangrove communities exist in Claxton Bay Area.</td>
<td>▪ Upgrade the condition of local roads in the area.</td>
</tr>
<tr>
<td></td>
<td>▪ Highly developed zone, including industrial and port development at Point Lisas, Claxton Bay, and Point-a-Pierre and settlements such as Claxton Bay, Phoenix Park, St. Margaret, and Gasparillo.</td>
<td>▪ As a regional project, carry out an inventory of sites of interest and formulate and implement a restoration and conservation programme for educational and tourism purposes.</td>
</tr>
<tr>
<td></td>
<td>▪ Point-a-Pierre Wildfowl Trust is a key educational and tourism attraction in this zone.</td>
<td>▪ Rationalise development activity and traffic patterns in Gasparillo and Claxton Bay.</td>
</tr>
<tr>
<td></td>
<td>▪ Solomon Hochoy Highway runs through the zone.</td>
<td>▪ Upgrade the service function of Gasparillo and Claxton Bay as important secondary urban centres.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Expansion of Point Lisas Industrial Estate in the area south of Rivulet Road, east of Southern Main Road, north of Cedar Hill Road, and west of Solomon Hochoy Highway.</td>
</tr>
</tbody>
</table>
6. IMPLEMENTATION

6.1 COORDINATION AND MANAGEMENT

As the institution responsible for the management of the local affairs of the Couva/Tabaquite/Talparo Region, the Couva/Tabaquite/Talparo Regional Corporation (CTTRC) will be responsible for coordinating the implementation of the Regional Development Plan. In particular, the role of the CTTRC will include promoting the community vision and objectives of the plan, securing the required social and physical infrastructure, and monitoring and safeguarding environmental quality.

This role will require a high level of coordination with various public sector agencies operating in the region and involved in implementing aspects of the plan. Such agencies will include the Water and Sewerage Authority, Housing Development Corporation, Ministry of Works and Transport, and the Ministry of Agriculture, Land and Marine Resources. Additionally, with a view to instituting a process of co-development and co-management, a high degree of collaboration must be pursued with the private sector and non-governmental and community based organisations. Collaboration with these groups will be most important in order to achieve efficient, effective, and timely development.

There will be need however to strengthen the CTTRC to coordinate the development process in the region. For instance, as stated under Policy A2, there is need to build the capacity of CTTRC to administer physical planning at the regional and local levels and to facilitate corporate partnering and community participation in the planning and development process.

The private sector must also play a leading role in implementing the provisions of the Regional Development Plan. Whereas the role of government in the overall development thrust will be primarily facilitatory, the private sector is expected to exert more direct influence through strategic investment of human and financial resources.

Non-governmental and community based organisations also have an important role to play in terms of maintaining overall community involvement in the development process. The organisations are expected to have an interest in promoting and monitoring the implementation of the Regional Development Plan to ensure timely delivery of services to the wider community. The organisations will also be directly involved in certain actions to secure objectives outlined in the plan that relate to their individual areas of operation. With a view to institutionalising the participatory process, community groups should be strengthened for more effective participation in the development process.
6.2 ACTION PROGRAMME

In order to facilitate effective implementation of the stated objectives and policies of the plan, an action programme has been formulated to guide the implementation process in an integrated and coherent manner (Table 6.1).

Essentially, the action programme comprises sets of action steps required to achieve the objectives and policies and thus address the fundamental development issues facing the region. For each stated action the action programme also indicates agency responsibility, timing, and expected impacts.

The action programme seeks to integrate and schedule the implementation process in such a manner as to achieve an efficient sequence of development activity and timely benefits to the community. However, as the implementation process advances over the plan period and as further studies are undertaken, the nature and timing of some programme activities might need to be modified.

6.3 STRATEGIC REVIEW

Within the ten-year timeframe of the Regional Development Plan, regular strategic reviews will have to be conducted to determine changing conditions and the possible need to revise specific objectives and policies. The reviews should probably be carried out on an annual basis or as determined necessary by particular circumstances.
### GROWTH MANAGEMENT

**OBJECTIVE A:**
Promote spatially integrated and balanced development over the region.

**POLICY A1:**
Promote the development of a hierarchy of interactive and vibrant urban and rural settlements, with optimum levels of population and services.

**Action Steps:**

**A1.1:** Provide the range and level of facilities and services in each centre in accordance with the selected growth centre concept (see Table 4.1).

- Relevant social and physical infrastructure agencies coordinated by CTTRC – Immediate action required.  
- Balanced development; availability of social and physical infrastructure

**A1.2:** Provide incentives to attract investment projects, business enterprises, meaningful and secure jobs in Tabaquite, Talparo, and lagging communities in the east of the region.

- CTTRC/Min. of Finance/TCPD – Short term.  
- Balanced development and economic revitalisation (jobs, revenue generation)

**POLICY A2:**
Coordinate the type, location, scale, and sequence of development activity.

**Action Steps:**

**A2.1:** Build the administrative capacity for the administration of physical planning in CTTRC including staffing, training, equipment, office space, etc.

- CTTRC in collaboration with MLG and TCPD – Short term. Strategic planning measures req’d.  
- Institutional strengthening.

**A2.2:** Prepare and implement a sub-regional and local area planning programme, including the preparation of structure plans and local area plans for the areas outlined under Policy A2a.

**A2.3:** Review and update existing development control policies and standards.

---

**Table 6.1: Action Programme**

<table>
<thead>
<tr>
<th>OBJECTIVES/POLICIES/ACTION STEPS</th>
<th>IMPLEMENTATION REQUIREMENTS</th>
<th>EXPECTED IMPACTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OBJECTIVE A:</strong> Promote spatially integrated and balanced development over the region.</td>
<td>Relevant social and physical infrastructure agencies coordinated by CTTRC – Immediate action required.</td>
<td>Balanced development; availability of social and physical infrastructure</td>
</tr>
<tr>
<td><strong>POLICY A1:</strong> Promote the development of a hierarchy of interactive and vibrant urban and rural settlements, with optimum levels of population and services.</td>
<td>CTTRC/Min. of Finance/TCPD – Short term.</td>
<td>Balanced development and economic revitalisation (jobs, revenue generation)</td>
</tr>
<tr>
<td><strong>POLICY A2:</strong> Coordinate the type, location, scale, and sequence of development activity.</td>
<td>CTTRC in collaboration with MLG and TCPD – Short term. Strategic planning measures req’d.</td>
<td>Institutional strengthening.</td>
</tr>
<tr>
<td><strong>A1.1:</strong> Provide the range and level of facilities and services in each centre in accordance with the selected growth centre concept (see Table 4.1).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A1.2:</strong> Provide incentives to attract investment projects, business enterprises, meaningful and secure jobs in Tabaquite, Talparo, and lagging communities in the east of the region.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A2.1:</strong> Build the administrative capacity for the administration of physical planning in CTTRC including staffing, training, equipment, office space, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A2.2:</strong> Prepare and implement a sub-regional and local area planning programme, including the preparation of structure plans and local area plans for the areas outlined under Policy A2a.</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td><strong>A2.3:</strong> Review and update existing development control policies and standards.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBJECTIVES/POLICIES/ACTION STEPS</td>
<td>IMPLEMENTATION REQUIREMENTS</td>
<td>EXPECTED IMPACTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>POLICY A3:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide for the expansion of traditional economic activities and the emergence of new growth sectors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Action Steps:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3.1: Promote the revival of the traditional activities of agriculture and fishing, including adoption of new methods and techniques (greenhouse agriculture, fish farming, etc.).</td>
<td>CTTRC in collaboration with MALMR for required technical assistance – Short term.</td>
<td>Economic revitalization (jobs, investment opportunities, etc.)</td>
</tr>
<tr>
<td>A3.2: Provide for the proposed expansion of Point Lisas Industrial Estate (see Policy A3d. and Figure 5.5).</td>
<td>PLIPDECO with coordinating input from CTTRC – Medium term</td>
<td>Jobs, business expansion, revenue generation</td>
</tr>
<tr>
<td>A3.3: Strengthen and expand town centres at Couva, St.Mary’s, Claxton Bay, and Gasparillo as important centres of commerce and employment accommodating a mix of traditional retail and office activities as well as micro and small businesses.</td>
<td>CTTRC in collaboration with TCPD and Chamber of Commerce – Medium term.</td>
<td>Business expansion, investment opportunities, jobs</td>
</tr>
<tr>
<td>A3.4: Provide incentives to attract business activities to the growth centres of Tabaquite and Talparo and to other centres in the east.</td>
<td>CTTRC/Min. of Finance/TCPD – Short term.</td>
<td>Economic revitalisation (jobs, revenue generation)</td>
</tr>
<tr>
<td>A3.5: Develop attractions as outlined in Section 4.1 Policy A3e and provide supporting infrastructure and other incentives for the development of an economically viable and environmentally sustainable community based tourism industry.</td>
<td>CTTRC in collaboration with TDC. Consultancy required re formulation of a tourism plan. Medium term.</td>
<td>Economic diversification (jobs, investment opportunities, etc.)</td>
</tr>
</tbody>
</table>

**ENVIRONMENTAL MANAGEMENT**

**OBJECTIVE B:**
Secure environmental and cultural sustainability across the region.

**POLICY B1:**
Maintain and enhance the ecological integrity and environmental assets of the Region.
<table>
<thead>
<tr>
<th>OBJECTIVES/POLICIES/ACTION STEPS</th>
<th>IMPLEMENTATION REQUIREMENTS</th>
<th>EXPECTED IMPACTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action Steps:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B1.1:</strong> Establish a system of conservation areas for the conservation and regeneration of the critical ecosystems and natural resources, including mangrove forest, forest reserves, river systems, wildlife sanctuary, and Navet and Caroni Arena Dams</td>
<td>Forestry Division in collaboration with EMA and CTTRC. Consultancy required. Medium Term.</td>
<td>Environmental conservation; flood protection; recreation and tourism</td>
</tr>
<tr>
<td><strong>B1.2:</strong> Formulate and implement management measures for designated conservation areas.</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>

**POLICY B2:**
Ensure minimisation of energy usage, effective waste reduction and management, and reduction of pollution.

**Action Steps:**

**B2.1:** Introduce environmentally sensitive and energy efficient activities to the region.
PLIPDECO and CTTRC with EMA monitoring – Ongoing activity. Environmental conservation (pollution and waste reduction)

**B2.2:** Apply the Eco-Industrial Park Concept to existing and new industrial estates (Eco-Industrial Park Handbook).
eTeck and PLIPDECO coordinated by CTTRC – Medium to Long term. -do-

**B2.3:** Formulate and enforce pollution control measures, including effluent discharge standards and appropriate policy measures and guidelines to address existing environmental problems.
EMA with CTTRC enforcement. -do-

**POLICY B3:**
Restoration and conservation of important aspects of the cultural environment.

**Action Steps:**

**B3.1:** Review and update existing inventories of key sites, structures, and events.
Consultant on behalf of CTTRC and in collaboration with TDC – Short to Medium term. Conservation of key aspects of cultural environment

**B3.2:** Formulate a restoration and conservation programme. -do- -do-
<table>
<thead>
<tr>
<th>POLICY B4: Protect natural resources, population, property, economic activity, and infrastructure from the effects of environmental hazards and the impacts of climate change.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action Steps:</strong></td>
</tr>
<tr>
<td><strong>B4.1:</strong> Institute appropriate disaster mitigation and preparedness measures, including land use controls and building construction standards.</td>
</tr>
<tr>
<td><strong>B4.2:</strong> Maintain a comprehensive green infrastructure system in the region to reduce the effects of climate change.</td>
</tr>
</tbody>
</table>

**REGIONAL FORM AND URBAN DESIGN**

**OBJECTIVE C:** Enhance the structure, functioning, and aesthetics of the regional landscape and urban and rural centres.

**POLICY C1:** Safeguard and enhance the natural and scenic values of the regional landscape.

**Action Steps:**

| **C1.1:** Identify the key visual resources of the natural and cultural landscape and rate defined landscape units in terms of scenic quality. | Consultancy required under CTTRC and with input from Forestry Division – Long term. | Data base for landscape management |
| **C1.2:** Formulate landscape management policies for the levels of conservation or modification of the scenic landscapes, based on the visual resource inventory and rating system (U.S. Bureau of Land Management. Visual Resource Management System). | -do- | Environmental conservation (natural and scenic resources) |
| **C1.3:** Optimise the conservation and use of such key landscape features as the visual resources, Caroni Arena Dam, Navet Dam, and forest reserves. | -do- | Environmental conservation; ecotourism development |
OBJECTIVES/POLICIES/ACTION STEPS | IMPLEMENTATION REQUIREMENTS | EXPECTED IMPACTS
--- | --- | ---
**POLICY C2:**
Enhance the liveability, identity, and image of the urban and rural centres in the region.

**Action Steps:**

C2.1: Apply general urban design strategies for settlements in the region including the following measures:

- Consolidation of ribbon development and areas of piecemeal, low density development.
- Definition of clear street hierarchies and rationalisation of traffic patterns.
- Enhancement of key activity nodes, landmarks, and circulation routes.
- Rationalisation of existing commercial strips into consolidated nodes.
- Conservation of historic and other important renewable urban resources.
- Establishment of an underlying, coherent landscape framework in each centre comprising recreation open space, riverside parks, hillside areas, and the street environment.
- Designing new development projects in harmony with the natural and cultural environment.

Detailed local area plans required – Couva, St. Mary’s, Claxton Bay, Gasparillo (see Policy A2a).

Consultancy required under CTTRC with input from TCPD – Short to Medium term.

Improvement of functional efficiency and aesthetic appeal of centres.

C2.2: Prepare an urban design framework for Downtown Couva that includes provision for the following features:

- Expansion and enhancement of the town centre.
- Clearly defined pedestrian realm, including widened, barrier-free sidewalks, sidewalk extensions at crosswalks, clearly marked street crossings.
- Pedestrian comfort, including weather protection canopies and street trees, street furniture (benches, lighting, planters, etc.).
- Placement of utility cables underground.
- Appropriate traffic management measures.

To be carried out as part of a local area plan for Couva Central.

Consultancy required under CTTRC and with input from TCPD.

Improvement of functional efficiency and aesthetic appeal of Downtown Couva.
### COMMUNITY FACILITIES

**OBJECTIVE D:**
Provide for the equitable distribution and efficient development of the facilities and services required to promote social advancement and human development.

**POLICY D1:**
Provide the level, range, and spatial distribution of facilities required for educational advancement, healthcare, childcare, cultural expression, recreation, personal business and leisure pursuits, and safety and security.

**Action Steps:**

<table>
<thead>
<tr>
<th>D1.1</th>
<th>Provide for the upgrading of existing facilities including schools, health centres, parks and other recreation facilities, community centres, public markets, administrative and protective facilities.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Need to formulate sector development programmes. Relevant agencies coordinated by CTTRC – Immediate action.</td>
</tr>
<tr>
<td></td>
<td>Improvement of social and administrative facilities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D1.2</th>
<th>Provide for the establishment of new facilities as required including the development of a new hospital at Couva, local government administrative complex, and visual and performing arts facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Development programmes required. Relevant agencies coordinated by CTTRC – Short to Medium term.</td>
</tr>
<tr>
<td></td>
<td>Increase in availability of social and administrative facilities.</td>
</tr>
</tbody>
</table>

**POLICY D2:**
Increase housing choices, particularly in terms of location, housing type, cost, and residential environment.

**Action Steps:**

<table>
<thead>
<tr>
<th>D2.1</th>
<th>Determine housing needs and demands by reviewing existing housing data and carrying out supplementary surveys as might be required.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ministry of Housing with Consultancy input and CTTRC coordination – Short term.</td>
</tr>
<tr>
<td></td>
<td>Available data base for provision of housing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D2.2</th>
<th>Identify opportunities for the development of safe and appropriate housing forms and environments including mixed use development, town centre housing, and settlement intensification and expansion.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td>-do-</td>
</tr>
<tr>
<td>OBJECTIVES/POLICIES/ACTION STEPS</td>
<td>IMPLEMENTATION REQUIREMENTS</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td><strong>D2.3:</strong> Provide support for renovation and upgrading of substandard housing, and for cost effective development of new housing.</td>
<td>-do-</td>
</tr>
<tr>
<td><strong>D2.4:</strong> Provide for the regularisation or relocation of squatter communities.</td>
<td>-do-</td>
</tr>
<tr>
<td><strong>D2.5:</strong> Create high quality residential environments in terms of design, safety, availability of social and physical infrastructure, and proximity to employment centres.</td>
<td>TCPD with Consultancy input and CTTRC coordination.</td>
</tr>
</tbody>
</table>

**PHYSICAL INFRASTRUCTURE**

**OBJECTIVE E:**
Upgrade physical infrastructure facilities and services in a timely and cost effective manner.

**POLICY E1:**
Provide adequate capacity and efficiency of service to the systems for water supply, sewage disposal, drainage, solid waste management, electricity, and telecommunications.

**Action Steps:**

- **E1.1:** Improve water supply, storage, transmission, and distribution system and sewage and wastewater disposal facilities.
  - Infrastructure agencies with coordination by CTTRC – Immediate action. Availability of infrastructure

- **E1.2:** Carry out a drainage study in the region and improve drainage facilities in order to prevent perennial problem of flooding in the region.
  - Consultancy required under CTTRC and with input from Drainage Division – Short to Medium term. Flood protection

- **E1.3:** Adopt an integrated municipal waste management system.
  - CTTRC and SWMCOL – Short term. Improvement in waste management

- **E1.4:** Improve electricity and telecommunications service, including elimination of unsightly overhead wires in town centres.
  - Infrastructure agencies with coordination by CTTRC – Short term. Improvement of electricity and telecommunications
TRANSPORTATION

OBJECTIVE F:
Improve accessibility within the region and linkages to adjoining regions.

POLICY F1:
Establish a transportation system which will be complementary to the land use system and offer safe, convenient, and efficient access to and within the region.

Action Steps:
F1.1: Upgrade the Solomon Hochoy Highway and its interchanges, particularly the Couva Interchange, as required. Hwys Division with input from CTTRC – Medium term. Improved access.
F1.2: Upgrade the capacity and surface condition of other major and local roads as well as critical intersections in the region. Hwys Division and CTTRC – Short term.
F1.3: Develop a system of alternative routes utilising former tasker roads. -do-
F1.4: Enhance public transportation service to and within the region including scheduling, routing, bus and taxi stands, etc. PTSC in collaboration with CTTRC – Short to Medium term.
F1.5: Establish transportation hubs at Couva, St. Mary’s, Claxton Bay, Gasparillo, and Tabaquite. Traffic Management Division in collaboration with CTTRC – Short to Medium term.
F1.6: Institute traffic management measures to reduce congestion in Couva, St. Mary’s, Claxton Bay, and Gasparillo. -do-

MUNICIPAL MANAGEMENT

OBJECTIVE G:
Promote effective management of the development process in the region.

POLICY G1:
Promote community empowerment, participatory governance, and local government autonomy.
<table>
<thead>
<tr>
<th>Action Steps:</th>
<th>IMPLEMENTATION REQUIREMENTS</th>
<th>EXPECTED IMPACTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1.1: Clarify the role and responsibilities of the Couva/Tabaquete/Talparo Regional Corporation, including any proposed new functions, and provide supporting legislative and administrative mechanisms and adequate funding to facilitate proper coordination of the development process in the region.</td>
<td>MLG within inputs from CTTRC – Short term.</td>
<td>Effective management and implementation</td>
</tr>
<tr>
<td>G1.2: Strengthen the capacity of CTTRC to administer physical planning at the local and regional levels.</td>
<td>MLG with inputs from TCPD and CTTRC. Short term activity.</td>
<td>-do-</td>
</tr>
<tr>
<td>G1.2: Formulate appropriate mechanisms (local area plans, action plans, programmes, projects, etc.) for effective coordination and implementation of development activity.</td>
<td>CTTRC and MLG with Consultancy input – Short to Medium term.</td>
<td>-do-</td>
</tr>
<tr>
<td>G1.3: Formulate strategic projects to facilitate collaboration among public, private, and community organizations in the implementation process.</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>
REFERENCES
REFERENCES:


Central Statistical Office. **Community Register: 2000 Population & Housing Census.**

Couva/Tabaquite/Talparo Regional Corporation. **Strategic Plan 2009-2011.**


Halcrow. **National Conceptual Development Plan.** The Republic of Trinidad and Tobago. May 1999.

Halcrow. **Couva Land Use Plan.** The Republic of Trinidad and Tobago. 1999.


Ministry of Planning and Development. **Vision 2020 Draft National Strategic Plan.**

APPENDICES
APPENDIX 1:
DEVELOPMENT ZONES/COMMUNITIES IN
THE COUVA/TABAQUIE/TALPARO REGION
APPENDIX 1:
Development Zones/Communities in the Couva/Tabaquite/Talparo Region

- **CUNUPIA DEVELOPMENT ZONE #1**
  - Cunupia
  - Chin Chin
  - Welcome
  - Longdenville

- **LAS LOMAS DEVELOPMENT ZONE #2**
  - Las Lomas Nos. 1&2
  - Madras Settlement
  - Nancoo Village

- **SAN RAFAEL DEVELOPMENT ZONE #3**
  - Mundo Nuevo
  - Talparo
  - Tamana Road
  - San Rafael/Brazil

- **CARAPICHAIMA DEVELOPMENT ZONE #4**
  - Bucarro
  - Brickfield
  - Butler Village
  - Carapichaima
  - Chase Village
  - St. Mary’s Village
  - Waterloo
  - Warren Village

- **CHANDERNAGORE DEVELOPMENT ZONE #5**
  - Agostini Village
  - Chandernagore
  - Edinburgh Village

- **TODD’S ROAD/CAPARO DEVELOPMENT ZONE #6**
  - Carlsen Field
  - Caparo
  - Palmiste
  - Ravine Sable
  - Todd’s Road
  - Todd’s Station

- **COUVA DEVELOPMENT ZONE #7**
  - Balmain
  - Calcutta Settlement No. 2
- **FREEPORT DEVELOPMENT ZONE #8**
  - Freeport
  - Arena
  - Calcutta Road No. 2
  - Fairview Park
  - Chickland

- **TABAQUITE DEVELOPMENT ZONE #9**
  - Brasso Tamana
  - Brasso Venado
  - Brasso Manuel Junction
  - Flanagin Town
  - Mamoral No. 2

- **CALIFORNIA/DOW VILLAGE DEVELOPMENT ZONE #10**
  - California
  - Dow Village
  - Basta Hall
  - Brechin Castle
  - Esperanza
  - Friendship

- **PREYSAL DEVELOPMENT ZONE #11**
  - Preysal
  - Brasso Caparo Village
  - Gran Couva
  - Pepper Village

- **CLAXTON BAY DEVELOPMENT ZONE #12**
  - Claxton Bay
  - Cedar Hill
  - Diamond
  - Macaulay
  - Mount Pleasant
  - Indian Trail
  - Ouplay Village
  - Phoenix Park
  - Point Lisas Industrial Estate
  - Plaisance Park
  - Sum Sum Hill
  - St. Margaret
  - Union Village
  - Pointe-a-Pierre
- GASPARILLO DEVELOPMENT ZONE #13
  - Gasparillo
  - Bonne Aventure
  - Caratal
  - Corosal
  - Eccles Village
  - Farnum Village
  - Forres Park
  - Guaracara
  - Hermitage
  - Mayo
  - Parforce
  - Poonah
  - Riversdale
  - Springland
  - Tortuga

- POINTE A PIERRE ZONE #14
  - Petrotrin Compound
APPENDIX 2:
COUVA/TABAQUITE/TALAPRO REGIONAL DEVELOPMENT PLAN
ECONOMIC DEVELOPMENT PROPOSALS
Appendix 2
Couva/Tabaquite/Talparo Regional Development Plan
Economic Development Proposals

Introduction
The Couva/Tabaquite/Talparo (CTT) region displays features of a dual economy which comprises a sub region of relatively high-tech petrochemical industries concentrated in the Couva region and located at Pt. Lisas on the west coast. New industrial activity is also planned for the Pt. Lisas area with the establishment of the Pt. Lisas South and East industrial estate. The Tabaquite and Talparo sub regions, on the other hand, have remained in their traditional state of being agricultural areas with little or no industrial activities. The CTT region is also home to significant fishing activity with major fish landing beaches located in the region.

The CTT Regional Corporation does not have a role to play in the heavy industrial development of the region because this is the responsibility of state-owned enterprises specifically mandated to carry out this form of development. With this realization, the Corporation intends to base the future economic development activities in the CTT region on three strategic development planks: agricultural production, tourism, and small and medium size businesses. These areas of activity were identified in discussions and consultations with the Regional Corporation, as being those with the greatest potential for improving the economic well-being of the region based on the resource base in the respective local areas. In particular, the Corporation expressed the need to diversify the agricultural sector with the closure of Caroni (1975) Ltd. and decline in sugarcane production. Diversification is to be based on the inclusion of other viable crops, the availability of vast areas of abandoned sugarcane lands, and the provide greater support to farmers (incentives, improvement of infrastructure, etc.).

The Corporation viewed the key prospects for economic development as anchored in the natural and cultural resource base of the region which includes: a vast land resource, diverse and scenic landscapes, historical and cultural sites, cultural events and celebrations, potential for development of agriculture, and nature and cultural tourism. These were to be pursued using a sustainable development approach.

Agricultural Production
Food production by traditional means has been in decline in Trinidad for the past 15 years, but recent experience with rapidly increasing food prices, has provided an incentive for persons to return to basic agricultural production. There is general recognition that we cannot fail to attend to the safety and sustainability of local agricultural supplies. The consequences of an interruption in the global food supply chain can be dire, because the sources of food supply are primarily a shrinking number of centralized and distant corporations which causes the food supply system to be essentially fragile.

The areas of food production relevant to the CTT region are: traditional production of vegetables and root crops, greenhouse vegetable products, meat products from small livestock, downstream cocoa products, seasonings and spices, and fisheries and fish processing.
Traditional Food Crops
The opportunity exists for moving agricultural production in the region to a higher level because of the steep price increases experienced in the basic food items which are consumed daily and include: green vegetables (tomato, cabbage, melongene, bodi, pumpkin, sweet pepper), root crops such as (cassava, dasheen, yam, eddoes, sweet potato), pulses (green corn, beans, pigeon peas, rice). The forecast of local production of these items from 2010 to 2030 are shown in Appendix A which establishes a sound demand basis for expanding production. The Corporation’s role is to act as an intermediary between farmers and the Ministry of Agriculture, Land and Marine Resources (MALMR), with the objective or removing the constraints faced by agriculturists. The lands freed up from sugar cane production with the closure of Caroni (1975) Limited should be the trigger for the agricultural development thrust.

Greenhouse Vegetable Production
An option of pursuing food production operations, using non-traditional methods such as greenhouse and hydroponic techniques, exists. A review of greenhouse operations by the University of Georgia (2000), showed that greenhouse vegetable production is a highly intensive enterprise requiring substantial labour and capital inputs. Because of this, potential growers should carefully consider all of the factors necessary for a successful enterprise. Greenhouse vegetable production is in many ways a 24 hour-a-day commitment. Greenhouse maintenance, crop production and handling emergencies require constant vigilance. Every 4,000 square feet of greenhouse space requires an estimated 25 to 30 hours of crop care and upkeep.

Greenhouse structures require constant maintenance and repair. Many of the selected greenhouse covers must be replaced on a regular basis, and cooling and watering systems must be maintained and routinely serviced. In addition, contingency plans and backup systems must be in place, in case any of these major systems should break down. Even a one-day loss of cooling, or water during a critical period can result in complete crop failure.

Along with the essential skills, capital and labour to build, maintain and grow a crop, producers must develop markets willing to pay the relatively high prices necessary to make the enterprise economically viable. Under normal conditions, greenhouse-grown vegetables cannot compete with comparable field-grown crops based on price; therefore, greenhouse-grown vegetables often are marketed to buyers based on superior quality and off-season availability. It is the aspect of off-season availability which makes greenhouse production viable in Trinidad and Tobago.

Although greenhouse production is an intensive undertaking, it can be very satisfying and rewarding. One advantage of greenhouse vegetable production is the relatively small amount of area required compared with field-grown produce. In addition, the return on investment can be good if the requisite markets can be found.

Hydroponic Vegetable Production Systems
A variation on the greenhouse method of vegetable production, is hydroponic production, which is defined as growing plants without soil. This production system may use a wide variety of organic and inorganic materials. The nutrient solution, rather than the media in which the plants are growing, always supplies most of the plant nutrient requirements. This method of growing has also been referred to as nutrient-solution culture, soilless culture,
water culture, gravel culture and nutriculture. Today, hydroponics is used in commercial greenhouse vegetable production around the world.

There are several advantages to hydroponic culture. Some of the problems associated with conventional soil culture such as poor soil structure, poor drainage and non-uniform texture, as well as weeds and soil-borne pathogens, are eliminated. In automated hydroponic culture, some of the watering and fertilizer additions can be computerized, reducing labour input. There are also disadvantages to hydroponic culture, such as the responsibility of the grower to maintain the proper level and balance of chemicals in the solution and to provide the proper biological environment for good plant growth. Hydroponic culture provides little or no buffering action to maintain the pH and nutrient concentration of the solution.

In a conventional soil system, clay soil particles and organic matter bind and gradually release plant nutrients. These particles also can absorb potentially toxic elements and, therefore, offer plants some protection against toxicity. In a hydroponic system, water must be provided constantly to the plant roots; a malfunction in the pump, especially on a hot day, can result in rapid wilting, serious plant stress and death. Although hydroponic systems initially are free of diseases they can be infected readily because they lack the wide range of micro-organisms found in a soil system that act as antagonists to suppress soil-borne pathogens. Finally, hydroponic culture is more costly than conventional soil systems. A complete description of the requirements for establishment of greenhouse and hydroponic systems of vegetable production is attached at Appendix B.

Meat Products from Small Livestock
There are opportunities in small livestock, poultry production and wildlife farming. Goat meat continues to be popular among the general populace and duck meat has increased considerably in retail price, making duck farming profitable. The MALMR has been promoting the farming of wildlife, especially agouti which presents a potentially very profitable business which can be operated on a small scale. Dr. Gary Garcia of the University of the West Indies has developed a plan to establish a wildlife production and development centre that will promote commercial production of popular, but fast declining stocks of wildlife. Expertise can also be tapped from the Wildlife Breeders and Farmers Association. The area also has ample land space away from residential settlements which are appropriate to pig production. The forecast of production from 2010 to 2030 of some of these products are shown Appendix C.

Cocoa, Coffee and Citrus Products
The production data of the main agricultural commodities of cocoa and coffee and selected products such as citrus over the period 2010 to 2030 are shown at Appendix C. The projections are based on the current trend which shows flat production in respect of cocoa and citrus. This trend can be reversed, if decisive measures are taken in regions like CTT to increase production. The cocoa estates in the Talparo area can be rehabilitated with support from the Cocoa Revitalizer Programme, which programme is aimed at attracting young people to cocoa farming, with the objective of creating enterprises based on value added cocoa products. Reasonable success has already been recorded in the Siparia region with this programme which can be studied as a model for the CTT region. There are 2,000 cocoa and coffee farmers currently compared with 10,000 in 1966. In terms of the age structure, 10-% are between 20 and 40 years, and 85% are between 40 and 55. There are therefore prospects for promoting downstream products from the cocoa beans cultivated in the region.

Seasonings and Spices
The production and processing of seasonings and spices remain a valid business opportunity for both local and export purposes. A product such as cilantro (shadon beni) is air freighted
regularly from Trinidad to metropolitan centres in the USA and pepper sauce are now established condiments with growing appeal in foreign centres and therefore opportunities exist for this product.

Agribusiness Opportunities

The picture with respect to agricultural food production demonstrates that there are continuing opportunities in the primary agriculture area focusing on food crops of the types identified above. Further, opportunities exist in the area of food processing, even at the cottage level, where production can be undertaken in home kitchens or small outlets. With the increasing trend in demand for health foods and convenience foods, initiatives such as producing vegetable juices and frozen vegetables are distinct opportunities.

Workshops on “Technology Foresighting for the Food and Beverage Industry” are conducted by the Food and Beverage Industry Committee, the Ministry of Trade and industry, CARIRI, and Caribbean Services Limited which cover: fruit and vegetable processing, meat processing, poultry products, bakery products, snack foods, dairy and ice cream, seasonings and condiments, fruit preservation, and alcoholic beverages. These areas all present opportunities that can be exploited in the south west Trinidad region and similar workshops should be conducted in that region.

Food and Beverage Industry Development Strategies

The Strategic Plan for the Food and Beverage Industry suggested that the following critical intervention strategies needed to be executed by the Government which are endorsed as vital to development action in the region. The intervention strategies are detailed at Appendix D.

Fisheries and Fish Processing

Fish and fish processing was identified as one of the seven major areas of focus by the government and the CTT region has marine fisheries resources to be exploited in conjunction with the Seafood Industry Development Company (SIDC). The SIDC has been focusing considerable energies on upgrading the skills of fisher folk by providing training in areas such as the use of ice by fishermen, computer literacy, certification to work on larger fishing vessels, HACCP, smoking and salting of fish, business management, and more.

Recognizing the importance of a unified sector for critical mass, the SIDC has been working with fishing communities around the island with a view to getting fisher folk organized into associations, cooperatives and other types of business enterprise. Ultimately, the SIDC hopes to see the emergence of coastal communities that, through economic diversification, become resilient and self-reliant with improved quality of life and living standards that would discourage migration away from these communities.

Business Opportunities in Fisheries

Fishing as a primary business opportunity remains valid, provided the constraints identified in the Vision 2020 Report are removed. With the fluctuations in the prices of fish, exacerbated in recent years at peak periods of demand, there are prospects for fish processing businesses in the areas of drying, salting, smoking, fresh freezing and even canning at the cottage level based on available small scale technology.

Business opportunities also exist in the area of aquaculture or fish farming but mainly aimed at the export market. The main fish farming product is red tilapia which enjoys a growing market in the USA. The Sugar Cane Feed Centre at Longdenville in Chaguanas has many years experience in producing red tilapia which can be tapped for training persons in the south west.
Fisheries Sector Strategic Plan

The Strategic Plan (2005) noted that a well-established fish processing sector, a lucrative tourism–linked and recreational or game fishing sector, with promising offshore resources, suggest that there exists potential for focused development within the industry. In addition, the inshore resource that has been the mainstay of the industry in the past can still be a supplier to the local and regional markets, however sustainable management of the resource is a necessary condition for this to occur. There are however, key challenges that constrain the further development of the industry which are detailed at Appendix E.

Tourism Development

The CTT region proposes to develop its tourism industry based on the creation of visitor sites and attractions geared towards a vibrant domestic tourism industry which, in turn, will attract foreign visitors. The Corporation has identified several sites which can form the basis of a cluster of attractions from which to promote their local tourism initiatives. The strategies for developing sustainable tourism are detailed at Appendix F.

System for Development and Management of Sites and Attractions

The experience with the development of tourism in Trinidad and Tobago, is that there is no framework within which tourism products can be developed, and the management of sites and attractions has left serious gaps in the system. To fill this gap, a new system for the development and management of visitor sites and attractions was devised and identified four levels of action: national policy, organizational level, management level, and site level. The national level addresses the need for an appropriate policy and legislative framework; the organizational level deals with two vital activities, the categorization and the evaluation of sites and attractions; the management and site levels cover the overall framework for development and management of sites and attractions and involve the project management function, operations function, and maintenance responsibilities. The system is detailed graphically in Chart 1.

National Policy Level

The policy and legal infrastructure is a central government responsibility and therefore, outside of the direct responsibility of the Corporation, but a modern policy and legal framework is required to permit the Corporation to fully explore its tourism potential. A revised tourism policy was recently published and the Corporation will therefore, have to lobby the relevant central agencies to undertake a review of the legislation in support of the policies relevant to the CTT region.

Organizational level

The main responsibility at the organizational level is to undertake the categorization and evaluation of the various sites and attractions in a region. The purpose of categorizing visitor sites and attractions, is to facilitate easy identification, location, and inventory of touristic opportunities associated with the various attractions. This would serve as an important input in establishing tourism development policies on a sectoral and spatial basis, and in formulating product development, management and marketing strategies. The proposed Categorization Model suggests three major categories of sites and attractions – natural, cultural, and
contemporary attractions which are divided into more specific sub-categories and attraction types which are detailed as a guide at Appendix G.

Selection of the three major attraction categories, was influenced by the rich natural, and cultural resource base of the country, and by an increasing level of touristic interest in certain
contemporary facilities and events. Categorization of the diverse range of natural and cultural resources can commence with the use of the existing databases or information available to the Corporation. The proposed Categorization Model establishes a framework for easy classification of the attraction features that have already been identified by the Corporation, and for the identification and categorisation of other potential sites and attractions. The model will therefore facilitate easy identification and inventory of touristic opportunities associated with the various attraction features.

Evaluation and Ranking of Attractions
The purpose of undertaking the evaluation and ranking of attractions is to determine the relative importance of the different categories of attractions and the different regions in terms of the quality of available attractions. The proposed system therefore involves evaluation and ranking of attractions by type and region in defined areas. The ranking of attractions would serve as an important input in establishing tourism development policies on a sectoral and regional basis and in formulating product development and management strategies including the marketing of attractions where clustering may be an effective strategy.

The selected methodology for the evaluation and ranking system involve the formulation of evaluation criteria and scoring and ranking systems. A spatial component must also be defined for the system in order to carry out the evaluation and ranking on a regional basis. Details of the criteria are at Appendix H.

Framework for Development and Management

This level essentially embraces the project management, site development, operations, and maintenance functions at the individual sites. The dynamic integration of these components at the operational level is what will determine the success of the framework in achieving effective development and management of sites and attractions.

The project management function may be a central level or delegated local level responsibility depending on the nature and complexity of the site. Operations management is the routine management of the site which involves marshalling the attraction’s resources, including staff and equipment, to provide a satisfactory service for the customer and an acceptable rate of return for the use of the resources. As such, the issues involved include marketing, financial and human resources. Creating user-friendly operational management systems which enhance the visitor experience is a big challenge, but these help remove obstacles to visitor enjoyment. Operations management is in many ways the key to customer satisfaction and optimizing financial performance. Effective requirements are precise objectives and clear guidelines on responsibilities of each staff member, setting performance targets in areas such as level of complaints which are acceptable, time limits for resolving particular problems, being prepared for predictable problems and flexibility to cope with sudden unexpected emergencies.

Maintenance is carried out at three levels: basic, preventive, and major. The effective performance of the maintenance function is crucial to the overall attractiveness of a site. Clearly, visitors will not frequent a site that is poorly maintained especially in relation to the basic functions of cleaning, refuse collection, water and electricity supply and landscaping. The responsibility for maintenance is primarily that of the site management and the way to ensure that an acceptable level of maintenance is achieved is by introducing a system of monitoring. The monitoring function is a local level responsibility, and the Corporation will have to provide for its execution on a systematic basis. A high standard of maintenance must be a requirement for including any site or attraction in local and international promotional efforts. The details of the development and management framework are at Appendix I.
Priority Development Requirements for All Attractions

Sites and attractions represent the core of any tourism development plan and certain priority requirements were identified as: facilities upgrade, construction of interpretation facilities, incorporating a mix of attractions, clustering of different types of attractions to create a package or full experience, and planning for the future evolution of attractions. A guide to how these four components of a sites and attractions package should be approached is outlined at Appendix J.

Tourism Based Opportunities in the Couva/Tabaquite/Talparo Region

The Corporation’s strategic plan identifies, as a major goal, the establishment of a thriving tourism sector to increase employment within the region. The Corporation’s plan includes: an influx of local and foreign tourists to visit heritage sites, developing of tourism mementos, development of cottage industries, hiring of tourist guides, purchase of a tourism tour bus, and introducing storytelling sessions for visitors.

Visitor Sites and Attractions
Tourism related business opportunities that are particularly relevant to the CTT region lie in the development of sites and attractions. The sites with potential as tourist attractions in the CTT region comprise the nine forest reserves, dams, the Dattatreya Yoga Centre (Hanuman Murti), Temple by the Sea, Arena massacre site, Claxton Bay bunker, Wild Fowl Trust, La Vega Estate, Piparo mud volcano, Sonny Mann Park, Caparo, and Knolly’s Tunnel, Tabaquite. Some of these sites are already developed as attractions but are not marketed as a regional cluster.

Cultural Tourism
The development of cultural tourism relies on the creative talent of the people in a particular region. The creative economy constitutes a cluster of knowledge based economic activities making use of creative talent, techniques, or technology to add value to the intellectual assets. The historical/heritage attractions would be ideally served by having interpretive centres with appropriate features such as replicas of the original site if restoration is impossible or undesirable, artefacts, historical documentaries in the form of films and videos, literature about the site, interpretive performances by artistes using historic dress, dance, music, drama and story-telling to bring the historic period to life.

There is also considerable potential for developing heritage tourism in the CTT region based on the buildings and artifacts from the sugar growing and refining processes as well as the religious monuments and structures still in existence in the area. The guiding principles and actions necessary for developing heritage tourism, are outlined at Appendix L.

Sports Tourism
Sports tourism is a growing area of the industry and sporting facilities are increasingly transformed into visitor attractions. The region has a history of producing top cricketers and the opportunity exists to build facilities for multi-purpose use including incorporating attractions such as sports halls of fame, video showings, training camps, sports lectures, conference facilities and restaurants. The achievements of local cricketers and other sports achievers can provide the stimulus to such an initiative.

Industrial Tourism
There is also scope for the development of a structured industrial tourism initiative using the Point Lisas Industrial Estate and surrounding industrial plants, such as cement manufacture, as attractions. Industrial tourism is an area of tourism development that has considerable
scope locally and is emerging as a major aspect of sites and attractions globally but is at an underdeveloped stage in Trinidad despite the existence of energy-based and other industries, the classic example being the La Brea Pitch Lake. The Point Lisas development can also be added to a cluster of industrial tourism sites which can include the development of a sugar industry museum and which can be promoted locally, regionally and internationally.

**Business Development**

The Corporation has recognized that there is a low level of business formation in the region and that the business activities currently undertaken are not entrepreneurial but are focussed on the traditional retail and service sectors. The projected level of business activity based on the trend in the growth of the number of business establishments is shown in **Appendix M** and CTT will show sluggish growth in business creation over the period 2010 to 2030, if the trend continues. Clearly there is a need to stimulate the start up of new businesses in the region and towards this end, the Corporation intends to establish an “entrepreneurial mall’ which will function as an business incubator to nurture the development of new small businesses.

Apart from the regional distribution of businesses, the number of businesses by industry and economic activity was projected for the period 2010 to 2030 using trend analysis and is shown at **Appendix N**. The development of entrepreneurial businesses in the region will present opportunities for broadening the business base away from mainly distribution activities to perhaps food and drink processing, wood and related products and miscellaneous manufacturing which activities can be fostered by the industrial business operations in the wider region.

In order to address the apparent decline, or otherwise low level, of business activity in the region, an integrated small business development programme must be instituted. There are many facets to implementing such a programme which involve a range of institutions over which the Corporation has no control. However, the role of the Corporation is to identify the specific small business development needs and resources and to create the integrating and monitoring mechanisms to achieve the objective of stimulating business development. There is an acknowledged process for realizing this objective which involves the formulation of precise business specifications and matching the business to potential small business operators. There are proven techniques for achieving this match up which include:

- System for business profile preparation
- Screening of potential small business persons
- Establishment of business incubators
- Facilitation of community based businesses
- Formation of business partnerships, networks and other collaborative arrangements based on complementary skills
- Youth in business programmes
- Provision of mentoring and advisory services.

A special intervention is required in order to implement these initiatives in the region, if small business development is to take place, because of the challenges identified in the regional planning process regarding the demographics and education levels of the population of the region. There already exists a range of such services provided by varied public and private organizations in Trinidad and Tobago. The obvious requirement is for the implementation of a coordinated system of delivery of the business development and support services available.
To address the issue of the development of entrepreneurship, a model was created requiring five specific sets of actions:

1. Enlarging the base of potential entrepreneurs through motivation and business skills through targeting young people, single mothers, and persons displaced by retrenchment and the introduction of specially designed educational programmes at all levels.

2. Developing entrepreneurial networks and teams through the establishment of an information and experience sharing forum.

3. Accelerating business start up through research on business opportunities, assistance with preparation of business plans and marketing, business financing, and establishment of business incubators where feasible.

4. Reducing barriers to growth and development of new businesses through provision of a range of support services including training, mentoring, and export promotion.

5. Strengthening the institutional context through coordination of the services of organizations such as NEDCO and BDC.

The details of the entrepreneurship development model are in Chart 2.

**Chart 2**

Model of Caribbean Entrepreneurship Development: Start Up Ventures
1. ENLARGE BASE OF POTENTIAL ENTREPRENEURS:
   STIMULATE MOTIVATION AND BUSINESS SKILLS

- Define target groups especially youth, single mothers, retrenched workers
- Disseminate profiles of role models through effective media
- Design educational programmes:
  - Primary schools engage children in entrepreneurship games to instil early notions of business
  - Secondary schools focus on shaping attitudes and values that create receptivity to entrepreneurial behaviour
  - Tertiary institutions foster founding of dynamic ventures by stimulating critical entrepreneurial competencies such as willingness to take risks, tolerance of uncertainty, teamwork, creativity, negotiation, interpersonal skills, marketing, solution finding.

2. DEVELOP ENTREPRENEURIAL NETWORKS AND TEAMS

- Facilitate development of entrepreneurial networks:
  - Owners of SMEs share knowledge and experience
  - Create fora for new entrepreneurs to meet experienced entrepreneurs, consultants, financiers, policy makers.
- Create appropriate settings and incentives for building teams by setting up multi-disciplinary groups to work on business ideas and plans.
- Facilitate business development in tertiary education institutions.

3. ACCELERATE BUSINESS START-UP

- Research business opportunities in all economic sectors and promote them
- Expand opportunities for new firms through innovation and business linkages
- Facilitate preparation activities such as marketing and financing
- Introduce business incubators or work spaces.
4. REDUCE BARRIERS TO GROWTH AND DEVELOPMENT OF NEW BUSINESSES

- Build up a menu of financial instruments
- Reduce red tape and compliance costs
- Tailor training, counselling and mentoring programmes, support services and incentives to early development stage of the business
- Facilitate exports
- Promote B2B relationships (CSME).

5. STRENGTHEN THE INSTITUTIONAL CONTEXT TO PROMOTE ENTREPRENEURSHIP

- Develop a value-added institutional network that pools the complementary skills and resources of institutions including business development, NGOs, private foundations
- Different levels of government must act as catalysts in conceptualising, mobilizing, promoting a strategy to foster dynamic entrepreneurship.


APPENDIX A

Forecast of Traditional Food Production – T&T

<table>
<thead>
<tr>
<th>Product</th>
<th>Unit (000)</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>kg</td>
<td>3,145</td>
<td>3,498</td>
<td>3,851</td>
<td>4,204</td>
<td>4,557</td>
</tr>
<tr>
<td>Crop</td>
<td>Unit</td>
<td>2022</td>
<td>2023</td>
<td>2024</td>
<td>2025</td>
<td>2026</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Cabbage</td>
<td>kg</td>
<td>2,628</td>
<td>2,983</td>
<td>3,338</td>
<td>3,693</td>
<td>4,048</td>
</tr>
<tr>
<td>Melongene</td>
<td>kg</td>
<td>1,760</td>
<td>1,760</td>
<td>1,760</td>
<td>1,760</td>
<td>1,760</td>
</tr>
<tr>
<td>Bodi</td>
<td>Bundle</td>
<td>1,786</td>
<td>1,786</td>
<td>1,786</td>
<td>1,786</td>
<td>1,786</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>kg</td>
<td>8,490</td>
<td>9,205</td>
<td>9,920</td>
<td>10,634</td>
<td>11,349</td>
</tr>
<tr>
<td>Sweet Pepper</td>
<td>kg</td>
<td>787</td>
<td>954</td>
<td>1,122</td>
<td>1,289</td>
<td>1,456</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>kg</td>
<td>442</td>
<td>494</td>
<td>546</td>
<td>598</td>
<td>650</td>
</tr>
<tr>
<td>Hot Pepper</td>
<td>Single</td>
<td>112,950</td>
<td>139,730</td>
<td>166,510</td>
<td>193,290</td>
<td>220,070</td>
</tr>
<tr>
<td>Dasheen Bush</td>
<td>Bundle</td>
<td>797</td>
<td>923</td>
<td>1,048</td>
<td>1,174</td>
<td>1,300</td>
</tr>
<tr>
<td>Sorrel</td>
<td>kg</td>
<td>245</td>
<td>245</td>
<td>245</td>
<td>245</td>
<td>245</td>
</tr>
<tr>
<td>Root Crops</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassava</td>
<td>kg</td>
<td>268</td>
<td>870</td>
<td>870</td>
<td>870</td>
<td>870</td>
</tr>
<tr>
<td>Dasheen</td>
<td>kg</td>
<td>2286</td>
<td>3,232</td>
<td>3,766</td>
<td>4,300</td>
<td>4,834</td>
</tr>
<tr>
<td>Yam</td>
<td>kg</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Eddoes</td>
<td>kg</td>
<td>843</td>
<td>1,061</td>
<td>1,061</td>
<td>1,061</td>
<td>1,061</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>kg</td>
<td>188</td>
<td>215</td>
<td>215</td>
<td>215</td>
<td>215</td>
</tr>
<tr>
<td>Other Pulses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Corn</td>
<td>Ears</td>
<td>4365</td>
<td>3,785</td>
<td>3,785</td>
<td>3,785</td>
<td>3,785</td>
</tr>
<tr>
<td>Beans</td>
<td>kg</td>
<td>304</td>
<td>280</td>
<td>342</td>
<td>404</td>
<td>467</td>
</tr>
<tr>
<td>Pigeon Peas</td>
<td>kg</td>
<td>1642</td>
<td>2,594</td>
<td>2,594</td>
<td>2,594</td>
<td>2,594</td>
</tr>
<tr>
<td>Rice</td>
<td>kg</td>
<td>3262</td>
<td>6,623</td>
<td>6,623</td>
<td>6,623</td>
<td>6,623</td>
</tr>
</tbody>
</table>

**Note:** Trend analysis was used to project tomato, cabbage, pumpkin, sweet pepper, cauliflower, hot pepper, dasheen bush, dasheen, and beans. The average was used for melongene, bodi, sorrel, cassava, eddoes, sweet potato, green corn, pigeon peas and rice.

---

**Appendix B**

**Greenhouse Vegetable Production**

**Introduction**

Greenhouse vegetable production is a highly intensive enterprise requiring substantial labour and capital inputs. Because of this, potential growers should carefully consider all of the factors necessary for a successful enterprise. Greenhouse vegetable production is in many ways a 24-hour-a-day commitment. Greenhouse maintenance, crop production and handling emergencies require constant vigilance. Every 4,000 square feet of greenhouse space requires an estimated 25 to 30 hours of crop care and upkeep.

Greenhouse structures require constant maintenance and repair. Many of the selected greenhouse covers must be replaced on a regular basis. Heating, cooling and watering systems must be maintained and routinely serviced. In addition, contingency plans and
backup systems must be in place in case any of these major systems should break down. Even a one-day loss of cooling, heating or water during a critical period can result in complete crop failure.

Along with the essential skills, capital and labour to build, maintain and grow a crop, producers must develop markets willing to pay the relatively high prices necessary to make the enterprise economically viable. Greenhouse-grown vegetables cannot compete with comparable field-grown crops based on price; therefore, greenhouse-grown vegetables often are marketed to buyers based on superior quality and off-season availability.

Finally, the personality and skills of the person or people involved in the enterprise should be considered. As mentioned earlier, this can be a 24-hour-a-day commitment. If you don’t have the personality to commit and to be available day or night as needed, then this is not for you. In addition, a successful greenhouse vegetable production operation requires mechanical aptitude, crop production skills and business acumen.

Although greenhouse production is an intensive undertaking, it can be very satisfying and rewarding. One advantage of greenhouse vegetable production is the relatively small amount of area required compared with field-grown produce. In addition, the return on investment can be good if the requisite markets can be found.

Site Selection

Several factors should be considered in selecting a suitable site. Whenever practical, the site should be level or nearly so. Sloped sites are not completely out of the question, but they do raise construction costs considerably because the site must be levelled or terraced to accommodate the new structure.

Zoning regulations must be checked to determine if a greenhouse is allowed at the chosen location. In this regard, care concerning waste disposal (irrigation water runoff, etc.) should be considered.

The site should be near a power source and have a ready supply of usable water. Typically, water from a well is better than surface water because there is less likelihood of disease and algae contamination. Water is critically important in greenhouse production, especially if one of the various hydroponic systems, as outlined here, is used. The water used in the fertilizer solutions must be tested before beginning the crop cycle. Water in Georgia can range from acid to alkaline depending on the source. In addition, the water may contain significant levels of dissolved minerals, particularly calcium and magnesium. City water systems may be troublesome for growers, especially if the water has been chlorinated. Chlorine can cause problems for plants, particularly lettuce.

Availability of labor is very important. Although much of the work in crop production is repetitive and tedious, one should not expect suitable labor performance at minimum wage levels. Labor that is conscientious and skilled, or at least trainable, is less expensive and more reliable in the long run.

Access to good roads and proximity to expected markets should also be considered. Modern refrigeration and transportation reduces the need to locate the facility near markets, but shipping costs are reduced when the facility is nearer the expected markets.
Greenhouse Types, Designs and Construction

Greenhouses can range from simple homemade designs to sophisticated prefabricated structures. Materials used to construct a greenhouse frame can be wood, PVC, aluminum or steel; coverings can be glass or various rigid or flexible plastic materials.

Several factors should be considered when choosing a particular greenhouse design, not the least of which are local building codes. Make sure all building codes are met and necessary permits secured before construction begins. Structural load from environmental forces as well as for trellises should be considered in the design. Sufficient heating and cooling capacity must be incorporated into the design to meet the crop’s needs for the given geographic location. Because of the specialized nature of a greenhouse structure, obtaining a proven design before construction begins is advisable. In addition, an experienced designer and builder may be in order. Figure 1 shows several different styles of greenhouses.

Several covers can be used with a greenhouse. The most widely used covering materials are ultraviolet (UV) light resistant polyethylene plastics. These covers are often installed two layers thick with an inflated air space between. This increases the cover’s insulating capabilities while reducing the chances of a catastrophic loss because of wind-induced flexing. These materials are specially manufactured for the greenhouse industry. Common polyethylene plastic is not the same, because it has not been manufactured to withstand UV radiation. Common polyethylene will not last a year; UV resistant polyethylene plastic is designed to last one to four years, depending on the grade. Many of these coverings have additives to reduce condensation in the house as well as to trap more infrared (heat) radiation.

Rigid plastic materials such as polycarbonate have advantages and disadvantages. The initial cost is higher than polyethylene but generally less than glass. Light transmittance is greater than polyethylene but, again, less than glass. Impact resistance is the best of any material available. Rigid plastic materials are available in different grades with guarantees ranging from five to 20 years. They are also available in single-(corrugated) or double-layer construction.

Figure 1. Greenhouse design can vary from stand-alone to gutter connected.
Glass is an excellent choice for high light transmission and longevity. Glass can last 25 years or more. Glass does have some disadvantages, such as high initial cost and low impact resistance.

**Production Methods**

Several different methods can be used to produce vegetables in a greenhouse. These include planting directly in the soil within the greenhouse, using containers with soilless mixes, nutrient film technique (NFT), Rockwool production and production in perlite. The last three techniques are called hydroponic production because all of the nutrients required by the plant are supplied in the irrigation water.

**Soil System**

Planting directly into the soil requires the least amount of initial labor. The big disadvantage is possible disease, insect and weed problems that can be present in the soil. This problem can increase over time with successive cropping, particularly if the same crop is grown repeatedly. Fumigating the soil may minimize these problems. Care must be exercised when using a chemical fumigant in an enclosed structure; removing the greenhouse cover before fumigation may be advised.

Soil solarization, in which the greenhouse structure itself acts as the solarizing unit, may control some problems with the soil system. This works best if the soil is turned and moistened during the hot summer months. The house is then closed for at least two weeks to reduce the number of soil borne pathogens.

Soil fertility should be determined and managed with soil testing. As with any field soil, the soil pH should be adjusted to 6.0 to 6.5. Soluble salts build-up can be particularly severe with the soil system. To minimize this problem, the house can be uncovered when not in production to allow rainfall to leach the soil. In addition, use fertilizers that do not contribute excess soluble salts. This would include calcium nitrate, potassium nitrate, triple superphosphate, diammonium phosphate, potassium sulfate and sulphate of potash-magnesia. Plants should be mulched to control weeds, retain soil moisture and prevent soil compaction. Plants can be set in plastic mulch, or organic mulches can be used.

**Container System**

Planting in a typical soilless potting media can also be successful. Many different manufactured media are available, most of which are peat based and include various blends of peat with perlite, vermiculite, sand or ground pine bark. In addition, these media may have fertilizer and/or wetting agents added. Usually the amount of fertilizer incorporated in these media is not sufficient to carry the crop to completion. The disadvantage of these media is that they can harbor various pathogens. Although these media are generally pathogen free when sold, the high organic matter present is an ideal substrate to support the growth of microorganisms that may be introduced to the greenhouse over time. In addition, using large quantities of this material can be costly.
Fertilizer sources can be either soluble or slow-release formulations. Follow a fertility program similar to one used for greenhouse ornamental production.

**Hydroponic Systems**

The various methods of hydroponic production have become the de facto standard for producing greenhouse vegetables. These methods are very clean, with no organic material present. In addition, they give the grower complete control over the crops’ nutritional needs. This allows the grower to maximize growth and fruit production. The disadvantage of this method is that it requires calculating and measuring exact amounts of fertilizers. This usually means handling several different fertilizer compounds. Mistakes in calculations or quantities used are more likely to show up as deficiencies or toxicities in the crop than in other methods employed. See Table 1 and the section on preparing fertilizers for a complete discussion of this topic.

Plants can be grown in various media in these systems; all are essentially nutrient free. In one system called the nutrient film technique (NFT), plants are placed in a polyethylene tube that has slits cut in the plastic for the roots to be inserted. Nutrient solution is pumped through this tube, bathing the roots. The solution recirculates, and nutrients are added as depletion occurs. Other systems use Rockwool as the supporting medium. More recently, polyethylene bags of perlite have been used as the supporting medium (Figure 2). Regardless of the production system, most will require some type of automation to supply water. This is particularly important in any of the hydroponic systems.

**Crop Selection**

Several vegetables have been successfully produced in a greenhouse, including cucumbers, peppers, lettuce, herbs and, by far the most important, tomatoes. Each has different requirements for production.

_Cucumbers_
Cucumber varieties grown in greenhouses are known as European types. These special cucumbers are parthenocarpic; that is, they produce fruit without the need for pollinization. In fact, care should be taken to avoid pollinization by non-parthenocarpic cucumbers because this will result in bitter, misshapen fruit.

Cucumbers are a warm season crop; therefore, greenhouse temperatures should not be allowed to drop below 65°F. Seed germination can occur with media temperatures above 60°F, but optimal germination occurs at 85° to 95°F.

Typically, cucumbers will be germinated in flats of Rockwool or foam blocks, usually with a single seed per well to ensure plants can be transplanted with minimal root damage. Plants should be transplanted to final spacing in the greenhouse when they are large enough to handle without damage. They will usually be ready for transplanting in two to three weeks under optimal conditions. Cucumbers are vining crops, so they are grown with a trellis system. As the plant is trained, all fruit below 24 to 30 inches are removed to maximize foliar growth.

Above this height, fruit are allowed to set. Several different trellis systems have been developed to produce greenhouse cucumbers. These systems, using either one or two wires strung approximately 8 feet above the crop, are referred to as single and V-cordon systems. Both single and double rows of plants can be used with the single cordon system. In either case, the plants are trained up a string to the suspended wire where the plant is draped over the wire. At this time, the plant may be pinched and two laterals allowed to grow down to the ground, or the primary stem may be allowed to continue growing to the ground. In either case, all other laterals are removed as they appear and at least one fruit is allowed to develop at each node. In the V-cordon system, two wires are suspended so that the plants can be alternately strung to one wire or the other. This results in a V-shaped system of plants growing to the respective wires. In all other ways they are treated the same as the single wire system in terms of pruning laterals and draping over the wire.

In addition, the in-row spacing will differ between the two systems. In the single cordon system, plants are spaced 12 to 18 inches apart. If a single wire with a double row is used, the plants are spaced 18 to 24 inches apart with 2 feet between the double rows. With the V-cordon system, the plants are spaced 12 inches apart with plants alternatively strung to one wire or the other. Between-row spacing for the double-row single-wire system is 5 to 6 feet; for the single-row single-wire system, 4 to 5 feet. With the V-cordon system, between-row spacing is 5 feet.

Fruit matures continuously as the plants grow. Flower opening to harvestable fruit will take between 10 and 14 days. Therefore, harvesting is a continual process usually done three times a week. Harvested fruit must be protected from desiccation and bruising because the skin is rather tender and prone to water loss. Greenhouse cucumbers are individually shrink-wrapped to restrict desiccation and extend shelf life. This is a labor-intensive process.

**Peppers**

Peppers require a long growing period to reach transplant size. This may be from 30 to 85 days depending on the time of year and greenhouse conditions. Because of this, a fertility program should begin shortly after the plants have emerged and continue throughout the production cycle. Optimal temperature for pepper seed germination is between 80° and 85°F.
After germination, the greenhouse temperature should be lowered to about 75°F. A relative humidity of 75 percent is ideal for pepper growth. Higher humidity will encourage disease development.

After transplanting, greenhouse temperatures should be maintained above 60°F and below 100°F, with ideal growth between 70° and 85°F. Plants should be pruned to the two strongest stems, and these should be supported by tying to a wire suspended 8 feet above the plants. All lateral stems are removed for the first five to seven nodes above the ground. Above this, plants are allowed to branch from the two main stems. One to two fruit will set per node. Plants are often vibrated or trellis wires tapped to ensure proper pollination and fruit set.

*Leafy Vegetables*

The most important leafy vegetable grown under greenhouse conditions is lettuce. Many different types and varieties of lettuce can be grown under greenhouse conditions, including specialty types. Generally, the loose leaf, butter head and romaine or cos types are grown in greenhouses rather than the crisp head types.

Many varieties specifically developed for greenhouse production are available. A crop of lettuce can be produced from seed in about 35 to 45 days. Greenhouse lettuce is harvested earlier and thus is smaller than those grown in the field. Seed are germinated at 75°F and should emerge in two to three days. When seedlings are large enough to handle, they are transplanted to their final spacing based on the production system and lettuce type grown. In float systems, they may be moved twice after seeding to an initial spacing of 16 square inches per plant after 10 to 11 days and to 41 square inches per plant 21 days after seeding.

*Tomatoes*

Tomatoes selected for greenhouse production are indeterminate types. Indeterminate tomatoes continue to grow and set fruit throughout their life cycle. Varieties selected for greenhouse production fall into two broad categories: large beefsteak or slicing types and cluster or hand types. The larger types are harvested singly. The cluster or hand types are harvested in clusters of four to seven fruit and are sold with the cluster stem still attached.

Tomatoes can be seeded into various soilless mixes as well as into Rockwool or foam cubes. The seed should be kept at 75° to 80°F during germination. Seedlings emerge in seven to 10 days. Plants for transplanting should be available in about three to four weeks after seeding. Make sure the medium the plants will be grown in is thoroughly moistened with water or dilute nutrient solution.
If bags of perlite are used for production, they should be moistened as described above, and the irrigation emitters should be placed in each bag before slits are cut to allow excess solution to drain away. In general, for perlite bag culture or Rockwool culture, plants are set 18 to 24 inches apart in the row with a between-row spacing of 4 to 5 feet. Plant spacing for tomatoes in the soil system should have a between-row spacing of 3 feet and an in-row spacing of 16 to 18 inches. Plant spacing can vary widely depending on individual preferences and needs. Indeterminate tomato varieties are trained to a single stem and supported by twine. Spacing will vary based on the system used.

Tomatoes are usually transplanted to their final spacing in the greenhouse in September for winter and spring production. High temperatures can be a problem at this time of year. The grower should try to keep temperatures at 80° to 85°F as much as possible. Using fans, cool pads and shading the house are all methods that can help reduce the temperature. The best yields for tomatoes occur with day temperatures of 80° to 85°F and night temperatures of 62° to 72°F. Temperatures higher or lower than this range can result in fruit quality problems. High temperatures can result in flower abortion.

The indeterminate tomato varieties grown in greenhouse culture must be trellised and pruned on a regular basis. Over the 10 months the plants are in production, they will grow as long as 30 feet. Clearly, the greenhouse will not be able to accommodate the plants vertically. Therefore, the plants are trellised up a string to a cable suspended about 8 feet above, at which time the plants are lowered and leaned. Sufficient string is used with each plant so that the string can be unwound and extended as the plants are lowered and leaned (Figure 3). As the plants continue to grow, they are periodically lowered from the overhead cable and leaned. At the same time, more string is unwound to accommodate the growing plant.

The plants must be pruned and the fruit thinned throughout the crop cycle. As the plants grow up the string, lateral branches are removed from leaf axials while the main stem is allowed to continue to grow. Fruit must be thinned as they form in the flower clusters. The variety will determine how many fruit should be left at each flower cluster. Hand or cluster tomatoes can support more fruit in a cluster than larger types, which may only support three to five fruit per cluster.
The flowers must be vibrated or shaken in order to ensure pollination. This can be done with an electric tomato pollinator, an old electric toothbrush, a modified door bell motor or a small lawn blower. The flowers must be vibrated or shaken each day that flowers are produced. The best time to do this necessary operation is between 10 a.m. and 3 p.m. During overcast or rainy days, pollen will not be dry enough to adequately pollinate the crop; therefore, plants must be shaken during sunny, dry days.

Bumblebees are also available to handle pollination. These small hives can be purchased commercially and placed in the greenhouse. These hives will last from eight to 12 weeks. Bumblebees tend to be more efficient at pollinating flowers, but less aggressive, than honeybees.

**Fertilization**

The solution pH is critically important when growing plants hydroponically. The nutrient solution has no buffering capacity like that in solid media. This means that pH can readily change during the production cycle and must be monitored and adjusted to 5.5 to 6.5.

Most hydroponic production systems require the use of two stock solutions (Figure 4). This is done to avoid precipitates that can occur if all the nutrients are mixed in a concentrated form in a single stock tank. Mixing calcium nitrate with phosphorus materials can result in insoluble calcium phosphate. In addition, calcium sulfate can precipitate when calcium nitrate is mixed with magnesium sulfate. To avoid these problems, one stock solution is prepared with calcium nitrate and iron chelate. The remaining materials are mixed in a second stock solution.

Nutrient requirements are listed in parts per million (ppm) as shown in Table 1 for various stages of greenhouse tomato growth. Any combination of chemicals that meets these requirements is acceptable, including prepackaged materials. Growers may find that purchasing stock chemicals rather than prepackaged materials is cheaper. Once they feel comfortable mixing these materials, they will have the added benefit of allowing more fine tuning of plant nutrient needs. Table 2 is an example of the type and amount of material required to meet the needs of a tomato crop throughout a crop cycle. This information is given as an example only. Any combination of fertilizers that meet the needs outlined in Table 1 will work.

**Insect and Disease Control**
Modern greenhouse design has tried to minimize or eliminate insect and disease problems so that plants can be grown pesticide free under many conditions. Some of the innovations have included using ultra-fine screening over all openings to prevent insects, including thrips, from entering the house (Figure 5). Building a vestibule at all entrances is also helpful in preventing insects from entering the greenhouse (Figure 6).

Preventing insects from entering the house is the best way of controlling insect problems. Plants should, however, be inspected daily for insect infestations. If pesticides are to be used, care must be exercised in selecting materials. Products that are registered for field use may not be registered for greenhouse use. In addition, caution should be exercised when applying pesticides because certain materials, such as emulsifiable concentrates, can cause plant damage under greenhouse conditions.

Moving fan jets to ground level and automating the watering and fertilizing process have eliminated free water on plant surfaces, which reduces disease incidence.

The use of disease resistant varieties when available has also helped reduce disease problems. As mentioned above, care should be exercised when selecting products for disease control in greenhouses. For more information on insect and disease control under greenhouse conditions, contact your local county Extension office.

**Harvesting and Handling**

Harvesting of tomato, pepper and cucumber will be a continual process throughout the growing cycle. All of the lettuce, on the other hand, will be ready at the same time after seeding. Tomatoes and peppers are harvested with stems attached and are packed that way to avoid bruising and damage. Care should be taken so that tomatoes are not stored or transported with other vegetables such as peppers, lettuce or cucumbers. Tomatoes produce ethylene during the ripening process that can damage other vegetables.

Harvest should occur during the cooler part of the day, and the vegetables should be protected from heat. Harvested material should be precooled as soon as possible if this is part of the postharvest procedure. Table 4 shows the best precool method and storage conditions for optimal storage life.

The USDA has grade standards for greenhouse-grown tomatoes, cucumbers and lettuce as well as grade standards for sweet peppers. These standards are available from the USDA at:
Table 1. Final nutrient solution concentration at various stages for tomato, cucumber and leafy vegetables (PPM)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>S</th>
<th>Fe</th>
<th>B</th>
<th>Cu</th>
<th>Mn</th>
<th>Zn</th>
<th>Mo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tomatoes</strong>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transplant to first cluster</td>
<td>65</td>
<td>50</td>
<td>120</td>
<td>80</td>
<td>40</td>
<td>56</td>
<td>2.8</td>
<td>0.7</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>First cluster to second cluster</td>
<td>75</td>
<td>50</td>
<td>120</td>
<td>92</td>
<td>40</td>
<td>56</td>
<td>2.8</td>
<td>0.7</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>Second cluster to third cluster</td>
<td>95</td>
<td>50</td>
<td>150</td>
<td>104</td>
<td>40</td>
<td>56</td>
<td>2.8</td>
<td>0.7</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>Third cluster to fifth cluster</td>
<td>114</td>
<td>50</td>
<td>150</td>
<td>127</td>
<td>48</td>
<td>66</td>
<td>2.8</td>
<td>0.7</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>Fifth cluster to termination</td>
<td>148</td>
<td>50</td>
<td>208</td>
<td>127</td>
<td>48</td>
<td>66</td>
<td>2.8</td>
<td>0.7</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Peppers</strong>†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedling to termination</td>
<td>225</td>
<td>40</td>
<td>350</td>
<td>175</td>
<td>40</td>
<td>56</td>
<td>2.8</td>
<td>0.7</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Cucumbers</strong>†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedling to first fruit</td>
<td>133</td>
<td>62</td>
<td>150</td>
<td>130</td>
<td>50</td>
<td>70</td>
<td>2.5</td>
<td>0.44</td>
<td>0.05</td>
<td>0.62</td>
<td>0.09</td>
<td>0.03</td>
</tr>
<tr>
<td>First fruit to termination</td>
<td>240</td>
<td>62</td>
<td>150</td>
<td>260</td>
<td>50</td>
<td>70</td>
<td>2.5</td>
<td>0.44</td>
<td>0.05</td>
<td>0.62</td>
<td>0.09</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Leafy Vegetables</strong>†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedling to termination</td>
<td>200</td>
<td>62</td>
<td>150</td>
<td>210</td>
<td>50</td>
<td>70</td>
<td>2.5</td>
<td>0.44</td>
<td>0.05</td>
<td>0.62</td>
<td>0.09</td>
<td>0.03</td>
</tr>
</tbody>
</table>

† Fertility levels are based on Canadian recommendations. Lower levels of fertilizer may be required, particularly during early stages of production.

Table 2. Example of fertilizers and amounts to meet tomato production needs as outlined in

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Amount required in 100 L of final solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transplant to first cluster</td>
<td>First cluster to second cluster</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 109 of 197
Phosphoric acid (54% P$_2$O$_5$) | 9.3 L | 9.3 L | 9.3 L | 9.3 L | 9.3 L
Potassium chloride | 16.7 g | 16.2 g | 20.1 g | 19.1 g | 26.8 g
Magnesium sulphate | 40 g | 40 g | 40 g | 48 g | 48 g
Potassium nitrate | 45.6 g | 52.6 g | 67.4 g | 80.7 g | 106.8 g
Calcium nitrate | 38.1 g | 43.8 g | 49.5 g | 60.5 g | 60.5 g
Micronutrient stock (see Table 3) | 1 L | 1 L | 1 L | 1 L | 1 L

**Table 3. Micronutrient stock solution**

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Grams per 100 liters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese sulfate (25% MN)</td>
<td>32</td>
</tr>
<tr>
<td>Solubor (20% B)</td>
<td>35</td>
</tr>
<tr>
<td>Copper sulfate (25% Cu)</td>
<td>8</td>
</tr>
<tr>
<td>Zinc sulfate (23% Zn)</td>
<td>8.7</td>
</tr>
<tr>
<td>Iron chelates (10% Fe)</td>
<td>280</td>
</tr>
<tr>
<td>Sodium molybdate (39% MO)</td>
<td>1.3</td>
</tr>
</tbody>
</table>


**Table 4. Optimal storage conditions for greenhouse-grown vegetables**

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Precooling method*</th>
<th>Temperature (°F)</th>
<th>Relative humidity</th>
<th>Storage life (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cucumber</td>
<td>FA</td>
<td>50-55</td>
<td>95%</td>
<td>10-14</td>
</tr>
<tr>
<td>Pepper</td>
<td>FA</td>
<td>45-55</td>
<td>90-95%</td>
<td>14-21</td>
</tr>
<tr>
<td>Lettuce</td>
<td>VA, HY, PI</td>
<td>33</td>
<td>95-100%</td>
<td>14-21</td>
</tr>
<tr>
<td>Tomato</td>
<td>ROOM, FA</td>
<td>50-55</td>
<td>90-95%</td>
<td>7-21</td>
</tr>
</tbody>
</table>
Table 5. Conversion Table

<table>
<thead>
<tr>
<th></th>
<th>1 pound = 454 grams</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.2 pounds = 1 kilogram</td>
</tr>
<tr>
<td></td>
<td>1 gram = 1,000 milligrams</td>
</tr>
<tr>
<td></td>
<td>1 gallon = 3.78 liters</td>
</tr>
<tr>
<td></td>
<td>1 liter = 1,000 milliliters</td>
</tr>
<tr>
<td></td>
<td>1 milligram per liter = 1 part per million</td>
</tr>
<tr>
<td></td>
<td>1 pound = 16 ounces (mass)</td>
</tr>
<tr>
<td></td>
<td>1 gallon water = 8.3 pounds</td>
</tr>
<tr>
<td></td>
<td>1 quart = 0.95 liters</td>
</tr>
<tr>
<td></td>
<td>1 gallon = 128 ounces (volume)</td>
</tr>
<tr>
<td></td>
<td>1 gallon = 3,780 milliliters</td>
</tr>
</tbody>
</table>

Source: The University of Georgia, College of Agricultural and Environmental Sciences and the U.S. Department of Agriculture, Bulletin 1182, June 2000.

APPENDIX C

Commodities and Meat Products Projections (000)

<table>
<thead>
<tr>
<th>Product</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocoa (kg)</td>
<td>1,545</td>
<td>1,545</td>
<td>1,545</td>
<td>1,545</td>
<td>1,545</td>
</tr>
<tr>
<td>Coffee (kg)</td>
<td>2,108</td>
<td>3,077</td>
<td>4,046</td>
<td>5,015</td>
<td>5,984</td>
</tr>
<tr>
<td>Citrus (tonnes) - O&amp;G</td>
<td>5,709</td>
<td>5,709</td>
<td>5,709</td>
<td>5,709</td>
<td>5,709</td>
</tr>
<tr>
<td>Selected Food Crops (kg)</td>
<td>24,855</td>
<td>27,631</td>
<td>30,407</td>
<td>33,183</td>
<td>35,959</td>
</tr>
<tr>
<td>Beef and Veal (kg)</td>
<td>811</td>
<td>811</td>
<td>811</td>
<td>811</td>
<td>811</td>
</tr>
<tr>
<td>Pork (kg)</td>
<td>3,358</td>
<td>4,010</td>
<td>4,662</td>
<td>5,315</td>
<td>5,967</td>
</tr>
<tr>
<td>Mutton (kg)</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Broilers</td>
<td>51,795</td>
<td>60,941</td>
<td>70,088</td>
<td>79,234</td>
<td>88,380</td>
</tr>
<tr>
<td>Eggs (doz.)</td>
<td>8,073</td>
<td>9,737</td>
<td>11,400</td>
<td>13,064</td>
<td>14,727</td>
</tr>
<tr>
<td>Milk (litres)</td>
<td>9,278</td>
<td>9,278</td>
<td>9,278</td>
<td>9,278</td>
<td>9,278</td>
</tr>
</tbody>
</table>
Note: Projections were based on the trend for coffee, selected food crops, pork and mutton while the average was applied to the other food products.

APPENDIX D

Food and Beverage Industry Development Strategies

1. Improving the legislative framework and regulatory system to ensure the highest standards of food safety. A single regulatory authority is needed for food safety to ensure greater coordination and effectiveness. This body would also be responsible for developing a national policy on food safety which would accompany the legislative framework and regulatory system.

2. Providing for increased access to business management and technical training and technological support by entrepreneurs as they seek to improve their quality and efficiency and respond to new opportunities in the industry. There needs to be a consistent education campaign with respect to product safety/quality. This campaign can focus on HACCP, Sanitary and Phytosanitary Measures and Good Manufacturing Practices (GMPs), along with quality control measures.

3. Establishing a Scientific Research and Development Steering Committee to determine how funds provided by the State for training and research and development should be allocated to the existing institutions. The country spends significant funds in research and development and it is suggested that these funds be placed under the management of a committee with institutions bidding for these funds through submission of research and development proposals. Research and development (including technology intelligence especially for SMEs) and training should be market driven and the aforementioned committee should also be mandated to develop an annual list of projects for these activities in order of priority.

4. Providing market intelligence on foreign markets to identify opportunities and provide information on competition and regulatory requirements. The Industry urgently requires State support for obtaining market intelligence on foreign markets much beyond what is currently provided by agencies currently.

5. Improving access to financing for expansion and improvement projects. The developmental financial institutions serving the Industry such as the Agricultural Development Bank must align their core products with the changing needs of the Industry e.g. provide loans for product development, market research, implementation of marketing strategies and implementation of food safety measures such as HACCP.

6. Implementing the CSME as soon as possible to progress the development of regional markets for both demand and supply. The CSME is critical to the successful development of this country’s Food and Beverage Industry from two perspectives, as a market for the outputs of the Industry and as a supplier of inputs for the Industry.

7. Trade Agreements (bilateral or multilateral) have to be carefully negotiated (products, timeframes etc.) and designed to ensure a degree of reciprocity as opposed to entering
into agreements that bring the same or greater strengths than this country’s Food and Beverage Industry.

8. Improving the efficiency of Customs and Excise Division and the Ports is needed in order to reduce costs and improve export delivery. Inefficiencies at these bodies have resulted in increasing shipping costs and growing reluctance among shipping lines to travel to this country.

The Strategic Plan (2005) expects that with the support of Government’s implementation of the recommendations outlined, the key outcomes will be a wide range of high quality value added products emanating out of the industry and an improved level of competitiveness.

**Source:** Food and Beverage Industry Team. (2005). Draft Strategic Plan for the Food and Beverage Industry.

---

**APPENDIX E**

Fisheries Sector Development Challenges
• The absence of a national policy to guide development of, and investment in the sector

• An inshore resource in which most of the commercially important species are over-exploited

• Fisheries legislation, which is outdated. The Fisheries Act (1916) is clearly inadequate to manage the fisheries, which have evolved considerably over time

• A regulatory framework, which is outmoded, with almost no capacity for monitoring, enforcement and surveillance, and with, limited capability for the necessary economic and performance analyses to support development planning

• Landing site infrastructure inadequate to the needs of the inshore fleets and, the lack of suitable port facilities catering to the needs of offshore vessels

• Market and related facilities which are sub-standard and in urgent need of overhaul and upgrade

• A general inability to meet modern food safety standards in fish handling limiting or prohibiting access to foreign markets, particularly in the case of the European Union

• The absence of a unified private sector or national stakeholder body to effectively represent the needs of the sector

• The absence of a social policy for coastal fishing communities, particularly with respect to alternative or new job opportunities.

An analysis of strategies employed in the development of successful fishing industries or operations both internationally and regionally indicated that key elements of best practice included:

• The employment of strategies to attain sustainable fishery resources;
• The creation of an economically competitive industry;
• An inclusive or collaborative approach to management of the sector;
• A rural/coastal development agenda;
• An integrated approach to coastal and marine areas management;

Based on these and other findings, the Strategic Plan (2005) determined that the ultimate objective of a national strategic plan must be the emergence of a modern, profitable, sustainable and environmentally mindful fish and fish processing industry. It has determined further, that this vision can be achieved through the implementation of the following strategic interventions:

• Establishment of a national policy for the fisheries sector;

• Achievement of sustainable utilization and management of the fish resources, through the updating of fisheries legislation and the development and application of a national fisheries resource management plan;
• Development of a profitable and commercially viable industry, by upgrading or constructing new infrastructure at strategic locations, providing incentives and support for the development of the offshore fishery, providing increased and improved training in HACCP and quality assurance standards, developing market intelligence capability, encouraging and supporting new and value added product development, supporting initiatives for developing the game fishing and the aquaculture sub-sectors;

• Modernization of the governance framework of the sector through the creation of a lead agency to spearhead business development initiatives, strengthening the human resource capability within fisheries related agencies (particularly in project management, economic analysis, marketing and information dissemination), and the creation of a unified private sector representative body with a voice in the governance process;

• Empowering coastal fishing communities through programmes for skills development in harvesting, handling, processing and value adding, small enterprise management, and alternative employment opportunities, while encouraging and supporting innovative business development activities, improving safety and security at sea and onshore, and improving the general standard of living and overall quality of life.


APPENDIX F

Sustainable Tourism Development Strategies

The development of a sustainable tourism industry is to be based on the strategic development guidelines established in the Vision 2020 Strategic Tourism Development Plan and include:

Focus on high value added tourism: Physical service and standards must be consistently high through sustained investment in product, plant, infrastructure, education and training. Well-educated, well-travelled individuals with high disposable income characterize this market segment, well represented in the major markets of USA, Europe and South America.

Ensuring environmental sensitivity: Socio-economic development must be balanced with environmental conservation. Environmental impact assessments must be done for planned developments and established guidelines followed.
Establishing ongoing asset management: Ensuring that tourism becomes an economic support rather than a consumer of the destination’s limited resources.

Recognising the need for authenticity: This is extremely pertinent in light of Trinidad and Tobago’s cultural attributes. The destination’s cultural assets must be preserved and all tourism activity must be done with sensitivity and accurate interpretation.

Developing an effective institutional structure: Ensuring a coordinated approach to the overall tourism strategy. This would require strengthening existing organisational structures, legislative and regulatory frameworks and adequate financial arrangements.

Proactive approach to destination marketing: An innovative, imaginative approach incorporating e-commerce techniques and technologies as part of an aggressive destination marketing and promotion campaign.

Sustained investment in human resource development: Providing an experience, not a hotel room, therefore the service must be of a high standard requiring adequate training and development programmes.


APPENDIX G
CATEGORIZATION OF TOURISM ATTRACTIONS BY TYPE AND ASSOCIATED ACTIVITIES

<table>
<thead>
<tr>
<th>NATURAL ATTRACTIONS</th>
<th>CULTURAL ATTRACTIONS</th>
<th>CONTEMPORARY ATTRACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion for Selection of Attractions:</td>
<td>Criterion for Selection of Attractions:</td>
<td>Criterion for Selection of Attractions:</td>
</tr>
<tr>
<td>Key representative features of our natural environment that provide the setting or focus for recreational, educational, or research activities.</td>
<td>Inherent cultural features and events generally reflecting our distinctive way of life and presenting opportunities for education and recreation.</td>
<td>Contemporary features not generally unique to our local culture or environment but representing important tourism focal points.</td>
</tr>
</tbody>
</table>

Sub-Categories:
Coastal-Marine Features
- Recreational Beaches
- Reefs and Associated Features

Associated Activities:
Beach recreation, swimming, water skiing, wind surfing, boating, scuba diving, sport fishing, marine research, etc.

Landscape and Environmental Features
- Scenic Landscapes

Sub-Categories:
Historical/Heritage Features
- Archaeological Sites
- Historical Sites/Districts
- Ceremonial Sites
- Cemeteries
- Museums
- Archives
- Interesting Historic Architecture

Associated Activities:
Historical and cultural interpretation, research, touring historic districts and

Sub-Categories:
Business Facilities and Events
- Distinctive Modern Business Enterprises
- Specialised Business Enterprises (e.g. Oil Producing Wells)
- Trade Exhibitions
- Conferences and Conventions

Associated Activities:
Industrial tours and interpretation, petroleum interpretation, commerce, exhibiting products.
- Outstanding Viewpoints
- Scenic Routes and Corridors
- Flora and Fauna
- Distinctive Landform Features
- Unique Geological Formations (e.g. La Brea Pitch Lake)
- Water Features

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Categories</th>
<th>Associated Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Attractions</td>
<td></td>
<td>Hiking, touring, picnicking, landscape viewing, wildlife viewing, pleasure driving, jogging, bicycling, nature appreciation and interpretation, scientific research, fishing, riverside recreation.</td>
</tr>
<tr>
<td>Cultural Attractions</td>
<td></td>
<td>Interesting Towns and Villages (e.g. Local Communities)</td>
</tr>
<tr>
<td>Contemporary Attractions</td>
<td></td>
<td>Golf Courses</td>
</tr>
</tbody>
</table>


APPENDIX G (Cont’d):
CATEGORIZATION OF TOURISM ATTRACTIONS BY TYPE AND ASSOCIATED ACTIVITIES

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Categories</th>
<th>Associated Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Attractions</td>
<td></td>
<td>National Parks</td>
</tr>
<tr>
<td>Cultural Attractions</td>
<td></td>
<td>Interesting Modern Architecture</td>
</tr>
<tr>
<td>Contemporary Attractions</td>
<td></td>
<td>Interesting Modern Architecture</td>
</tr>
</tbody>
</table>

Criterion for Selection of Attractions:
Key representative features of our natural environment that provide the setting or focus for recreational, educational, or research activities.

Criterion for Selection of Attractions:
Inherent cultural features and events generally reflecting our distinctive way of life and presenting opportunities for education and recreation.

Criterion for Selection of Attractions:
Contemporary features not generally unique to our local culture or environment but representing important tourism focal points.

Sub-Categories:
Landscape and Environmental Features (Cont’d) | Traditional Features (Cont’d) | Sporting Facilities and Events |
--- | --- | --- |
Interesting Towns and Villages (e.g. Local Communities) | Interesting Modern Architecture | Golf Courses |
Interesting Modern Architecture | Special Traditional Economic Activities (e.g. seine fishing, markets) | Tennis Centres |
Special Traditional Economic Activities (e.g. seine fishing, markets) | Cultural interpretation, spiritual inspiration, academic research. | Hockey Centres |
Associated Activities: | | Horse Racing Complex |
- Hiking, touring, picnicking, landscape viewing, wildlife viewing, pleasure driving, jogging, bicycling, nature appreciation and interpretation, scientific research, fishing, riverside recreation. | - Golf Courses | Motor Racing Complex |
- National Parks | - Interesting Modern Architecture | Football and Athletic Stadiums |
- Interesting Towns and Villages (e.g. Local Communities) | - Special Traditional Economic Activities (e.g. seine fishing, markets) | Cricket Centres |
- Interesting Modern Architecture | - Cultural interpretation, spiritual inspiration, academic research. | Marlins (e.g. Yacht Club, Yachting Assoc.) |
APPENDIX H
Criteria for Evaluation of Attractions

1. Accessibility
   - Ease of negotiating access to the attraction in terms of condition of the access route (road, trail, etc.)
   - Travel time to the attraction from major population centres and from the airports and cruise ship terminals
   - Availability of reliable public transport or organized tours to the attraction.

2. Use
   - Existing level of use of the attraction in relation to its carrying capacity
   - Visitor satisfaction with the attraction.

3. Uniqueness
   - Rarity or infrequency of occurrence of that particular type of attraction
   - Unique or distinctiveness characteristics.

4. Significance
   - International awareness and recognition of the attraction
   - National importance of the attraction as a key element of the tourism product
   - Importance of the attraction at the district level regarding socio-economic and environmental benefits to the local community.

5. Quality
   - Authentic in nature and representative of an important natural, cultural, or contemporary feature of the country
   - Diversity or mix of activity programmes and facilities for meaningful visitor

Associated Activities:
- Nature and Scientific Reserves
- Nature Trails
- Recreation Parks
- Nature-Oriented Theme Parks

Associated Activities:
Hiking, picnicking, camping, nature appreciation and interpretation, scientific research, jogging, bicycling, horseback riding, field games.

Attending concerts, dining, touring towns and villages, farm tours, architectural appreciation, interpretation of traditional economic activities.

Festivals and Events
- Festivals (e.g. Sugar & Energy)
- Special Cultural Events
- Indigenous Sporting Events

Associated Activities:
Cultural appreciation, active participation in cultural activities, social research.

Sporting Events (e.g. cricket, football tournaments, marathons)

Associated Activities:
Viewing or actively participating in respective sports (field sports, court games, golf, horse racing, motor racing, recreational boating).
experiences (educational, recreational, interpretive, etc.)
- Association or linkages with other attractions
- Adequate levels of supporting infrastructure facilities (water supply, etc.)
- Potential for further development.

6. Sustainability
- Feasibility of maintaining and enhancing the quality of the attraction
- Conservation of associated natural resources including significant species, habitats, and scenic resources; and control of pollution and waste generation
- Protection of community values including cultural resources, authenticity of cultural representations, community identity and image, and employment for local residents; and control of land values and infrastructure demands
- Effective management structure and practices to maintain the quality of the attraction.

FRAMEWORK FOR DEVELOPMENT AND MANAGEMENT OF SITES AND ATTRACTIONS

Project Management

Major Facilities Upgrade
Interpretation
Product Development
Ownership of Attractions
General Funding
Codes of Practice and Quality Management
Quality and Visitor Attractions
Managing the Framework

Development

Site Identification; Site Planning; Design Services; Resource Conservation; Development Standards; Development Finance.

Operations Management

Facility Management; Concessions; User Fees; Security; Parking; Functions and Events.

Maintenance

Basic Maintenance (cleaning, refuse collection, water supply, electricity, landscaping, opening and closing hours)
Preventive Maintenance (minor repairs to buildings and utilities)
Major Maintenance (breakdown repairs, subcontracting, upgrading and enhancement).
APPENDIX J
Guide to Requirements for Visitor Sites and Attractions

a) Facilities Upgrade
The overwhelming requirement for the short term is to undertake a programme of upgrade and restoration of the major sites and attractions in the three categories espoused in this report. Selected investigations of specific sites and a plan of action should be drawn up for major upgrade and restoration works.

b) Interpretation
A serious deficiency observed through visits to various sites and attractions is the absence of interpretive centres. Such centres exist in countries where best practices are observed in the development and management of sites and attractions. Interpretive centres are merely facilities where the origin and evolution of the specific attraction is presented in various forms of communication whether print, film, and/or oral. The centres can be established at different levels of technological sophistication, as may be appropriate to the specific site.

c) Incorporating a Mix of Attractions
Sites that have grown as major attractions have had a mix of other features incorporated, but this has been an evolutionary process. The problems encountered, as a result of this growth, centre on the provision of food stalls, craft outlets, music accommodation, and such facilities. The lesson to be learnt is that in developing and managing sites, planning for growth and expansion is a vital ingredient.

There is considerable scope for incorporating a mix of attractions at most sites but this action must respect the nature and type of attraction and be sensitive to the overall environment and patronage of visitors. Typically, the attractions that should be considered for incorporating in sites are: local food and beverages; local craft based on natural materials; locally designed clothing and accessories; short musical and drama productions and outlets for sale of products based on the particular site experience such as videos.

d) Clustering
The clustering of sites is a technique for enhancing marketing strategies and promoting viability and the concept can be based on several approaches including by geographic area, by type of attraction, by customer life style and by demography. There are certain distinct geographical areas that can form clusters for sites and attractions purposes.

e) Future of Attractions
In a dynamic world experiencing rapid changes in life style and technology, the demands on sites and attractions will also be impacted. The key issues are:

(a) The first challenge is increasing concerns over environmental issues. Environmental concerns can threaten attractions such as turtle watching, industrial plant tours and wildlife and protected areas.
(b) Attractions will have to provide learning experiences in the future which favour cultural and educational attractions. A learning-by-doing activity will have to be built into the attraction visit.

(c) The concept of heritage tourism is changing and will include:
- The cultural heritage of ethnic communities
- The culture of recent decades such as the 1970’s or even later
- Traditional manufacturing industries as well as service industries which developed in the last thirty years
- Use of oral history as a central focus of heritage attractions since it is a more imaginative method of interpretation
- Forgotten areas of food and drink
- Popular culture such as film, television, music and dance will come to be seen as an integral part of heritage.

(d) The use of technology will be a feature of many attractions of the future including the virtual reality experience. This provides opportunities to persons in Trinidad and Tobago and the regions, to develop new sites or invigorate old attractions. While it is impossible to generalize about the future of attractions, there are distinct trends which have been observed:
- The attraction product will become more sophisticated and technology based
- The distinction between attractions will become more blurred
- Entertainment based attractions will offer more learning experiences while education attractions will add entertainment features
- Ownership of large-scale attractions, such as entertainment theme parks, will be concentrated in a few hands
- Technological developments will create new opportunities
- The attractions market will increasingly comprise niche markets based on shared life styles, opinions and attitudes
- The industry will become more global embracing a larger market
- Marketing of attractions will be technology based allowing direct communication with prospective visitors
- Quality and ethical values will count for more than price
- Visitor attraction managers will have to constantly embrace the new challenges to create competitive advantage and induce income generation.

APPENDIX K
ECOTOURISM ATTRACTIONS IN THE

APPENDIX L
Guiding Principles for Getting Started in Cultural Heritage Tourism

Collaborate. Cultural heritage tourism brings together many different perspectives – preservation, tourism, economic development, the arts, museums, main street, humanities, elected officials, public land managers and more. Collaboration will lead to success.

Find the fit between the community and tourism. A good cultural heritage tourism programme balances the needs of visitors and residents alike so it is important to involve the community in shaping tourism efforts.
Make sites and programmes come alive. Find creative ways to engage visitors and provide them with a memorable experience. Provide interactive experiences that engage as many of the visitors’ five senses as possible.

Focus on authenticity and quality. Modern travellers are more sophisticated and well travelled than the previous generation, and they expect both quality and authenticity in their heritage travel experiences.

Preserve and protect resources. The historic, cultural and natural resources which make up the cultural heritage tourism programme must be adequately protected for future generations to enjoy.

Following these principles, the actual actions to be taken follow these stages:

Assess the potential. Evaluate what the community has to offer in attractions, visitor services, organizational capabilities, ability to protect resources and marketing.

Plan and organize. Make good use of human and financial resources which are keys that open the doors to sustainable heritage tourism. Set priorities and measurable goals.

Prepare for visitors. Protect and manage resources. While preparing in the present look to the future and ensure that the choices made now improve the community for the long term.

Market for success. Develop a multi-year, many tiered marketing plan that targets the market. Look for partners in local, regional or national groups.


APPENDIX M
Projected Businesses by Corporate Area

<table>
<thead>
<tr>
<th>Type of Corporation</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Corporations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port of Spain</td>
<td>5,697</td>
<td>5,971</td>
<td>6,245</td>
<td>6,519</td>
<td>6,793</td>
</tr>
<tr>
<td>San Fernando</td>
<td>2,094</td>
<td>2,100</td>
<td>2,106</td>
<td>2,112</td>
<td>2,118</td>
</tr>
<tr>
<td>Borough Corporations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arima</td>
<td>1,056</td>
<td>1,146</td>
<td>1,236</td>
<td>1,326</td>
<td>1,416</td>
</tr>
<tr>
<td>Chaguanas</td>
<td>1,791</td>
<td>2,157</td>
<td>2,522</td>
<td>2,888</td>
<td>3,253</td>
</tr>
<tr>
<td>Point Fortin</td>
<td>442</td>
<td>459</td>
<td>477</td>
<td>494</td>
<td>512</td>
</tr>
<tr>
<td>Municipal Corporations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diego martin</td>
<td>2,516</td>
<td>2,905</td>
<td>3,294</td>
<td>3,683</td>
<td>4,072</td>
</tr>
<tr>
<td>San Juan/Laventille</td>
<td>3,007</td>
<td>3,076</td>
<td>3,145</td>
<td>3,214</td>
<td>3,283</td>
</tr>
<tr>
<td>Tunapuna/Piarco</td>
<td>3,541</td>
<td>3,976</td>
<td>4,410</td>
<td>4,845</td>
<td>5,279</td>
</tr>
<tr>
<td>Couva/Tabaquite/Talparo</td>
<td>3,183</td>
<td>3,334</td>
<td>3,484</td>
<td>3,635</td>
<td>3,785</td>
</tr>
<tr>
<td>Mayaro/Rio Claro</td>
<td>699</td>
<td>775</td>
<td>851</td>
<td>927</td>
<td>1,003</td>
</tr>
<tr>
<td>Sangre Grande</td>
<td>971</td>
<td>1,050</td>
<td>1,129</td>
<td>1,208</td>
<td>1,287</td>
</tr>
<tr>
<td>Princes Town</td>
<td>1,148</td>
<td>1,126</td>
<td>1,105</td>
<td>1,083</td>
<td>1,062</td>
</tr>
</tbody>
</table>
Penal/Debe 1,612 1,769 1,927 2,084 2,242
Siparia 1,127 1,091 1,056 1,020 985
**Total Trinidad** 28,884 30,935 32,987 35,038 37,090
Tobago 3,596 4,697 5,799 6,900 8,002
**Trinidad & Tobago** 32,479 35,632 38,785 41,938 45,091

Note: Projections based on the trend.

### Appendix N

Projected Businesses by Industry/Economic Activity

<table>
<thead>
<tr>
<th>Industry</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petroleum Industries</td>
<td>659</td>
<td>724</td>
<td>789</td>
<td>854</td>
<td>920</td>
</tr>
<tr>
<td>Food Processors and Drink</td>
<td>370</td>
<td>329</td>
<td>288</td>
<td>248</td>
<td>207</td>
</tr>
<tr>
<td>Textiles, Garments, Footwear, Headgear</td>
<td>132</td>
<td>125</td>
<td>119</td>
<td>113</td>
<td>108</td>
</tr>
<tr>
<td>Printing, Publishing, Paper</td>
<td>311</td>
<td>334</td>
<td>358</td>
<td>381</td>
<td>405</td>
</tr>
<tr>
<td>Converting</td>
<td>243</td>
<td>193</td>
<td>143</td>
<td>93</td>
<td>43</td>
</tr>
<tr>
<td>Wood and Related Products</td>
<td>165</td>
<td>152</td>
<td>139</td>
<td>126</td>
<td>113</td>
</tr>
<tr>
<td>Chemicals and Non-Metallic Minerals</td>
<td>363</td>
<td>363</td>
<td>363</td>
<td>363</td>
<td>363</td>
</tr>
<tr>
<td>Assembly Type</td>
<td>157</td>
<td>157</td>
<td>157</td>
<td>157</td>
<td>157</td>
</tr>
<tr>
<td>Misc. Manufacturing</td>
<td>2,910</td>
<td>3,768</td>
<td>4,627</td>
<td>5,486</td>
<td>6,344</td>
</tr>
<tr>
<td>Construction</td>
<td>17,852</td>
<td>20,285</td>
<td>22,718</td>
<td>25,151</td>
<td>27,584</td>
</tr>
<tr>
<td>Distribution</td>
<td>359</td>
<td>377</td>
<td>395</td>
<td>413</td>
<td>431</td>
</tr>
<tr>
<td>Hotels and Guest Houses</td>
<td>1,352</td>
<td>1,618</td>
<td>1,883</td>
<td>2,148</td>
<td>2,414</td>
</tr>
<tr>
<td>Transportation, Communication, Storage</td>
<td>3,996</td>
<td>4,739</td>
<td>5,481</td>
<td>6,223</td>
<td>6,966</td>
</tr>
<tr>
<td>Finance, Insurance, Real Estate, Business Services</td>
<td>594</td>
<td>601</td>
<td>609</td>
<td>616</td>
<td>623</td>
</tr>
<tr>
<td>Services</td>
<td>2004</td>
<td>2005</td>
<td>2006</td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Personal Services</td>
<td>4,284</td>
<td>4,284</td>
<td>4,283</td>
<td>4,282</td>
<td>4,281</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33,747</strong></td>
<td><strong>38,049</strong></td>
<td><strong>42,351</strong></td>
<td><strong>46,654</strong></td>
<td><strong>50,957</strong></td>
</tr>
</tbody>
</table>

**Note:** Projections based on the trend except for Textiles where judgement was used and Misc. manufacturing which was held constant at the 2006 figure.
APPENDIX 3:

INFRASTRUCTURE
X.1 **Water and Sewerage Authority (WASA)**

**Project Approach and Response**

Information was sought from WASA with respect to their existing installations, transmission and distribution network and production capability in the Couva-Tabaquite-Talparo region. However despite several attempts to get all the required information from WASA, the Consultant was subsequently only able to obtain incomplete map data for this area from WASA’s Geographic Information System (GIS) office. The utility was not very responsive in providing information required for the project and hence limited detailed information was available for compilation of this section of the report.

**Water Supply**

The locations and quantities of the following potable and waste water infrastructure were obtained from the maps:

- Observation Wells
- Production Wells
- Water Treatment Plants
- Wastewater Treatment Plants (location only)
- Booster Stations
- Storage Tanks
- Reservoirs
- Water Mains

Figure x-1 illustrates a key plan of the Couva-Tabaquite-Talparo Regional Corporation broken up into one hundred and five different blocks. The data represented in each block was summarized in Table x-1. Detailed maps of each of the blocks can be seen in Appendix x.

![Figure x-1: Key plan for Couva-Tabaquite-Talparo](image-url)
### COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>Water mains located on approximately 100% of the major roads and 30% of the minor roads. 1 production well, 1 storage tank and 1 water treatment plant located in the Oropuna Village area.</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located along the 75% of the major roads and approximately 10% of the minor roads.</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads. 1 observation well and 1 pumping well located in the Caparo area.</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 5% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 50% of the major roads and 5% of the minor roads.</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 90% of the major roads and 10% of the minor roads. 1 observation well and 1 wastewater treatment plant located in the Chin Chin area.</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>Water mains located on approximately 60% of the major roads and 5% of the minor roads. 1 observation well in the Las Lomas #1 area. 2 production wells, 1 storage tank and 1 water treatment plant located in the Las Lomas #2 area.</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 30% of the major roads and 5% of the minor roads. 5 observation wells and 1 production well in the Brazil area.</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaque-Talparo WASA Infrastructure Summary per Key Plan by Block
### COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 30% of the major roads and 20% of the minor roads.</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 75% of the major roads and 15% of the minor roads. 1 observation well and 1 production well in the Madras area.</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 80% of the major roads and 10% of the minor roads. 2 observation wells and 3 production wells located between Las Lomas #1 and #2.</td>
</tr>
<tr>
<td>13</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 40% of the major roads and 10% of the minor roads. Minor road network in the area.</td>
</tr>
<tr>
<td>14</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 0% of the major roads and 20% of the minor roads. Minor road network in the area.</td>
</tr>
<tr>
<td>15</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 30% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>16</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 0% of the major roads and 0% of the minor roads.</td>
</tr>
</tbody>
</table>

*Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block*
### COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 50% of the major roads and 25% of the minor roads. 1 wastewater treatment plant in the Chaguanas area</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 100% of the major roads and 50% of the minor roads. 2 production and one observation well in the Lange Park area. 2 wastewater treatment plants in Edingburgh, 1 in Enterprise and 1 in Endeavour.</td>
</tr>
<tr>
<td>19</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 30% of the major roads and 15% of the minor roads.</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 25% of the major roads and 30% of the minor roads. 1 observation well in the Las Lomas #2 area.</td>
</tr>
<tr>
<td>21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>Water mains located on approximately 50% of the major roads and 15% of the minor roads. 1 storage tank in the Tamana area.</td>
</tr>
<tr>
<td>22</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 30% of the major roads and 0% of the minor roads. Only a minor road network in this block.</td>
</tr>
<tr>
<td>23</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 25% of the major roads and 0% of the minor roads. Only a minor road network in this block.</td>
</tr>
<tr>
<td>24</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block
## COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 25% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>26</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 50% of the minor roads. 3 observation wells and one production well in the Carlsen Field area and 1 wastewater treatment plant in the Montrose area.</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 15% of the minor roads. 1 water treatment plan, 1 observation well and 1 booster station in the Carlsen Field area.</td>
</tr>
<tr>
<td>28</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 25% of the major roads and 0% of the minor roads. Only a minor road network in this block.</td>
</tr>
<tr>
<td>29</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 1% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 5% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>31</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>32</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 40% of the major roads and 5% of the minor roads.</td>
</tr>
<tr>
<td>33</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 60% of the major roads and 5% of the minor roads. 1 wastewater treatment plant in the Orange Field area.</td>
</tr>
</tbody>
</table>

*Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block*
## COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 90% of the major roads and 35% of the minor roads. 4 production wells, 1 observation well, one water treatment plant in the Carlsen Field area. 2 production wells in the Freeport area. 1 wastewater treatment plant and 1 observation well in the Agostini Village area.</td>
</tr>
<tr>
<td>35</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 100% of the major roads and 5% of the minor roads. 4 production wells and 1 booster station in the Todd’s Road area. 2 observation wells located in the Palmiste area.</td>
</tr>
<tr>
<td>36</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on approximately 60% of the major roads and 100% of the minor roads.</td>
</tr>
<tr>
<td>37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>38</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>39</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 15% of the major roads and 0% of the minor roads.</td>
</tr>
</tbody>
</table>

*Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block*
**COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA**

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 40% of the major roads and 15% of the minor roads. 2 wastewater treatment plants in the Freeport area.</td>
</tr>
<tr>
<td>42</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 90% of the major roads and 5% of the minor roads. 4 production wells in the Freeport area.</td>
</tr>
<tr>
<td>43</td>
<td>4</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 90% of the major roads and 15% of the minor roads. 4 observation wells and 8 production wells located between Freeport and Chickland.1 production well located in the Arena area.</td>
</tr>
<tr>
<td>44</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 90% of the major roads and 15% of the minor roads. 1 production well in Caparo.</td>
</tr>
<tr>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 30% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>46</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>47</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>48</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No roads in this block</td>
</tr>
<tr>
<td>49</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 30% of the minor roads.</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block
## COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>Water mains located on 70% of the major roads and 5% of the minor roads. 2 production wells, 1 observation well, 1 water treatment plant and 1 storage tank in the Freeport area.</td>
</tr>
<tr>
<td>51</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 5% of the minor roads. 3 production wells and 2 observation wells in the Freeport area and 1 production well in the Calcutta Road #2 area.</td>
</tr>
<tr>
<td>52</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 35% of the major roads and 0% of the minor roads. 7 production wells in the Freeport area.</td>
</tr>
<tr>
<td>53</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 60% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>54</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 5% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>55</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads. Only 2 roads in this block.</td>
</tr>
<tr>
<td>56</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No roads in this block.</td>
</tr>
<tr>
<td>57</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 30% of the major roads with only 3 roads in this block.</td>
</tr>
<tr>
<td>58</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 35% of the minor roads. 1 wastewater treatment plant in the Point Lisas area.</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block
### COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 25% of the minor roads. 2 production wells and 2 wastewater treatment plants in the Balmain area.</td>
</tr>
<tr>
<td>60</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 65% of the major roads and 10% of the minor roads. 1 production well and 1 wastewater treatment plant in the Preysal area.</td>
</tr>
<tr>
<td>61</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>62</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 60% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>63</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>64</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 30% of the roads with only 2 roads in this block.</td>
</tr>
<tr>
<td>65</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 100% of the road in this block</td>
</tr>
<tr>
<td>66</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 100% of the major roads and 5% of the minor roads.</td>
</tr>
<tr>
<td>67</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 60% of the major roads and 45% of the minor roads.</td>
</tr>
<tr>
<td>68</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>Water mains located on 40% of the major roads and 5% of the minor roads. 1 storage tank in the Baster Hall area.</td>
</tr>
<tr>
<td>69</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 0% of the minor roads. 1 booster station in the Preysal area.</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block
### COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>Water mains located on 40% of the major roads and 0% of the minor roads. 1 storage tank in the Gran Couva area.</td>
</tr>
<tr>
<td>71</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 0% of the minor roads. 1 storage tank in the Brasso Emmanuel Junction area.</td>
</tr>
<tr>
<td>72</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>73</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 70% of the major roads and 0% of the minor roads. 1 water treatment plant in the Navet Reservoir.</td>
</tr>
<tr>
<td>74</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No roads in this block</td>
</tr>
<tr>
<td>75</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No roads in this block</td>
</tr>
<tr>
<td>76</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 60% of the major roads and 10% of the minor roads. 3 observation wells and 1 booster station in the Friendship area.</td>
</tr>
<tr>
<td>77</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>Water mains located on 70% of the major roads and 1% of the minor roads. 1 production well and 1 storage tank in the Oplay Village area.</td>
</tr>
<tr>
<td>78</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 40% of the major roads and 0% of the minor roads. 2 production wells in the Gran Couva area.</td>
</tr>
</tbody>
</table>

*Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block*
### COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>79</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>80</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 60% of the major roads and 0% of the minor roads. 1 wastewater treatment plant in the Tabaquite area.</td>
</tr>
<tr>
<td>81</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 0% of the minor roads. 1 booster station in the Tabaquite area.</td>
</tr>
<tr>
<td>82</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 30% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>83</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No roads in this block</td>
</tr>
<tr>
<td>84</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 70% of the major roads and 20% of the minor roads. 1 production well in the Claxton Bay area and 1 observation well in the Randhanie Village area.</td>
</tr>
<tr>
<td>85</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 15% of the minor roads.</td>
</tr>
<tr>
<td>86</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 30% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>87</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 40% of the major roads and 0% of the minor roads. 3 storage tanks and 1 observation well in the Stone Road Morichal area</td>
</tr>
<tr>
<td>88</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 15% of the major roads and 0% of the minor roads.</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block
<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 0% of the minor roads. 1 storage tank and booster station in the Brickfield Navet area.</td>
</tr>
<tr>
<td>90</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 10% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>91</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the major roads and 0% of the minor roads. Minor road network in this block.</td>
</tr>
<tr>
<td>92</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 80% of the major roads and 60% of the minor roads.</td>
</tr>
<tr>
<td>93</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 70% of the major roads and 20% of the minor roads. 1 storage tank in the Macaulay Village area and 1 in the Spring Land San Fabien area.</td>
</tr>
<tr>
<td>94</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 15% of the minor roads.</td>
</tr>
<tr>
<td>95</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 100% of the major roads and 0% of the minor roads. 2 booster stations and 1 storage tank in the Rivers Dale Guaracara area.</td>
</tr>
<tr>
<td>96</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 75% of the major roads and 15% of the minor roads. 1 booster station and 1 storage tank in the Sancho area.</td>
</tr>
<tr>
<td>97</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 40% of the major roads and 0% of the minor roads.</td>
</tr>
<tr>
<td>98</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 65% of the major roads and 0% of the minor roads.</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block
# COUVA-TABAQUITE-TALPARO DEVELOPMENT PLAN BASED ON WASA GIS DATA

<table>
<thead>
<tr>
<th>Block No.</th>
<th>Observation Well</th>
<th>Production Well</th>
<th>Water Treatment Plant</th>
<th>Waste Water Treatment Plant</th>
<th>Booster Station</th>
<th>Storage Tank</th>
<th>Reservoirs</th>
<th>Water Mains &amp; Block Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 35% of the major roads and 5% of the minor roads.</td>
</tr>
<tr>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 80% of the major roads and 20% of the minor roads.</td>
</tr>
<tr>
<td>101</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 50% of the major roads and 40% of the minor roads. 1 wastewater treatment plant in the Union Hall area.</td>
</tr>
<tr>
<td>102</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 30% of the major roads and 15% of the minor roads. 1 wastewater treatment plant in the Gasparillo area.</td>
</tr>
<tr>
<td>103</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 0% of the road in this block</td>
</tr>
<tr>
<td>104</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 40% of the major roads and 30% of the minor roads.</td>
</tr>
<tr>
<td>105</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Water mains located on 20% of the road in this block</td>
</tr>
</tbody>
</table>

Table x-1: Couva-Tabaquite-Talparo WASA Infrastructure Summary per Key Plan by Block
Assessment of Development Plans for Water Supply System

Information was obtained from WASA via its GIS office, where maps were purchased showing water mains and various water storage & maintenance facilities in the Couva-Tabaquite-Talparo region.

It was determined from the figures that WASA has not adequately supplied the Couva-Tabaquite-Talparo area with potable water based on the water mains distribution layout. In some sections where there is an extensive road network minimal water distribution infrastructure was shown. Further to this no distinction was made between potable water mains and wastewater mains. It was assumed that the water mains shown were for potable water only as there was no physical connection between the water mains and the wastewater treatment plants. As such, there is insufficient information to make an assessment of the wastewater infrastructure.

The Consultant believes that either WASA has yet to develop some areas of the Couva-Tabaquite-Talparo Regional Corporation or the maps obtained from the GIS office are missing significant infrastructure details and need to be updated. As a result the assessment of the water supply system in the Couva-Tabaquite-Talparo Regional Corporation is speculative at best.

Recommendations

Having reviewed the information on the existing system and future development plans, based on our assessment the Consultant recommends that the following be considered:

1. A firm policy must be developed for utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (> 1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), Telecommunication and Signal Cabling and Water and Sewage Lines.

2. The Couva-Tabaquite-Talparo Regional Corporation and all developers of the area should provide timely information at the planning stage to WASA so that their requirements could be integrated in their development plans.

3. It can be determined from the maps that:

   1. Significant development is still to be done in the Couva-Tabaquite-Talparo Regional Corporation as many roads that lead to developments have no water mains. This therefore shows that future expansion of the piping network is required.

   2. The GIS maps need to be updated and then an assessment of the existing potable and wastewater systems should be performed.
X.2 National Gas Company (NGC)

Project Approach and Response

The Consultants held a meeting requesting information and had follow-up discussions with NGC regarding their existing transmission distribution systems and present capacities in the Couva-Tabaquite-Talparo region. Information on the existing transmission and distribution systems were requested and provided by NGC. This utility company was responsive in presenting information to consultant within a reasonable timeframe in the project execution period.

Natural Gas Pipelines

NGC has submitted maps that show their current and proposed gas pipeline routes in the Couva-Tabaquite-Talparo area, as shown in Figures x-2 and x-3. This information can be used to determine all crossing points and set back distances from the pipelines.

NGC has indicated that the information supplied is the property of NGC, is confidential and should not be reproduced or disclosed to any other third party or used for any other than indicated and as authorized by NGC.

NGC has provided guidelines and conditions for works near gas pipelines. It is to be noted that the actual locations must be confirmed in the field prior to any field work. Accordingly, NGC shall reconfirm the exact depths and locations of the gas pipelines at a mutually convenient time prior to the proposed works. This aspect of the work shall be co-ordinated by NGC and Designer/Developer. After any design is complete that comes within range of these pipelines, NGC requests that such designs be submitted to them for their perusal and determination of indemnity agreements.

It should be noted that supervision of all the construction works in the vicinity of NGC's gas pipelines remain the responsibility of Designer/Developer. Co-ordination of works with NGC's representative on site is required to ensure that no damage is done to the gas pipelines.

NGC has requested that the following conditions must be satisfied for any works near these pipelines:

1) NGC shall be given at least two (2) weeks notice prior to any field works. Details of all excavation works and crossings to be done in the vicinity of the gas pipeline should be forwarded for NGC's approvals.

2) NGC must have a representative present for all works within twenty five feet (25') of the gas pipeline.

3) NGC requires that all excavations within three feet (3') of the gas pipeline shall be executed by the use of hand tools.

4) NGC requires the installation of shoring equipment where excavations exceed three feet (3') in the vicinity of the gas pipeline.

5) Only clean, granular backfill material (red sand) approved by NGC shall be used to reinstate the exposed NGC gas pipeline.
6) Any damage to the pipeline coating (nicks/scrapes) shall be properly assessed and repaired by NGC, the cost of which shall be borne by the third party body.

7) Upon completion of the job, the third party body shall reinstate NGC’s gas pipeline Right-of-Way (ROW) to its original condition or better.

8) No heavy equipment shall be allowed to traverse the gas pipeline ROW, except with the expressed written permission from NGC and at the designated protected areas.

Assessment of Development Plans

NGC has done adequate work in detailing their current and proposed detail layouts for works on their pipeline system. They have also made mention of requirements necessary in order for any works to be carried out near existing pipeline infrastructure to be done.

Recommendations

Having reviewed the information on the existing system and future development plans, based on our assessment the Consultant recommends that the following be considered:

1. A firm policy must be developed for utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (>1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), Telecommunication and Signal Cabling and Gas pipe lines.

2. The Couva-Tabaquite-Talparo Regional Corporation and all developers of the Borough should provide timely information at the planning stage to NGC so that their requirements could be integrated in their development plans.
Figure x-2: NGC Pipe Lines in Central Trinidad
Figure x-3: NGC Pipe Lines in Central Trinidad
CHAPTER X
INFRASTRUCTURE AND UTILITIES

X.1 ELECTRICITY

X.1.1 Project Approach and Response

The Consultants held meetings and discussions with the Trinidad and Tobago Electricity Commission (T&TEC) regarding their existing transmission and distribution systems and present capacities in the project area, and future development plans. The relevant information was requested and subsequently provided by T&TEC.

X.1.2 Electricity Supply

Electrical Power in Trinidad and Tobago is primarily generated by The Power Generation Company of Trinidad and Tobago Limited (Powergen) which was established in 1994 out of the partial divestment of T&TEC. Powergen owns, operates and maintains the three power stations at Port of Spain (300 MW), Point Lisas (834 MW), and Penal (236 MW). Trinity Power, formerly InnCogen, also generates and supplies 225 MW to the National Grid.

The power is generated at 132 kV for supply in bulk form to T&TEC which in turn transmits this power to substations and breaks the power down to lower voltages for distribution to industrial, commercial and residential customers. T&TEC currently supplies over 350,000 customers.

The maximum peak power demand recorded for electricity nationwide was 1,181 MW and with the present total generating capacity of 1,595 MW, there is sufficient capacity to satisfy the needs of the country, only in the short term. In the long term, the power companies appreciate that in order to meet the requirements of new industrial developments with loads in excess of 100 MW in the deep Southwest area of Trinidad, upgrade of existing power stations and transmission systems and construction of new power stations, substations and transmission systems would be necessary.

Transmission and Distribution System Information Provided by T&TEC

The operating voltages of the Central Distribution Area are as follows: 132kV, 66kV, 12kV, 230/400 volts and 115/230 volts. The Area has eleven (11) Distribution Sub-Stations with a present capacity of 280MVA and a running load of 143MVA. Figures x-1, x-2, below illustrate the Central Transmission System and the 12kV Distribution System. Table x-1 shows a listing of the electrical loads of the major housing projects in the Central region while Table x-2 shows a breakdown of the Distribution Sub-Stations capacities and present. The Commission based on the increasing domestic loads hereby request any assistance which may be provided to secure approximately two (2) half acre plots to construct two (2) 12kV Distribution Sub-Stations. The Areas being considered for the construction of these Sub-
Stations are Between Freeport and Chase Village flyovers on the Eastern side of the Sir Solomon Hochoy Highway and in the Factory Road, Chaguanas Area.

<table>
<thead>
<tr>
<th>R/S#</th>
<th>Development/Location</th>
<th>Address</th>
<th>No. of Lots/Units</th>
<th>kVA Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>0931/08</td>
<td>HDC</td>
<td>Carlsen Field Phase 3C</td>
<td>701</td>
<td>3505</td>
</tr>
<tr>
<td>1112/06</td>
<td>HDC</td>
<td>Carlsen Field Phase 3B, Section 3</td>
<td>81</td>
<td>405</td>
</tr>
<tr>
<td>1112/06</td>
<td>HDC</td>
<td>Carlsen Field Phase 3B</td>
<td>81</td>
<td>430</td>
</tr>
<tr>
<td>3242/07</td>
<td>HDC</td>
<td>HDC Edinburgh 500 Towers</td>
<td>122 MA &amp; 1 D1</td>
<td>810</td>
</tr>
<tr>
<td>2111/08</td>
<td>HDC</td>
<td>Edinburgh 500 Infill</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>0231/08</td>
<td>HDC</td>
<td>Couva Infill Housing Programme</td>
<td>476</td>
<td>2380</td>
</tr>
<tr>
<td>2490/08</td>
<td>HDC</td>
<td>Edinburgh South Development (Blocks 1, 2, 3, 3A, 3B, 4, 5, 6 &amp; 6A)</td>
<td>138</td>
<td>690</td>
</tr>
<tr>
<td>0444/05</td>
<td>HDC</td>
<td>Edinburgh South Development (Blocks 7-20, 38-43)</td>
<td>872</td>
<td>4360</td>
</tr>
<tr>
<td>0444/05</td>
<td>HDC</td>
<td>Edinburgh South Development (Blocks 23, 30, 31, 31A, 33, 34, 35, 36 &amp; 37)</td>
<td>172</td>
<td>860</td>
</tr>
<tr>
<td>0444/05</td>
<td>HDC</td>
<td>Edinburgh South Development (Blocks 21, 27, 28, 29)</td>
<td>188</td>
<td>940</td>
</tr>
<tr>
<td>0444/05</td>
<td>HDC</td>
<td>Edinburgh South Development (Block 32)</td>
<td>44</td>
<td>220</td>
</tr>
<tr>
<td>0444/05</td>
<td>HDC</td>
<td>Edinburgh South Development (Blocks 22 &amp; 24)</td>
<td>136</td>
<td>680</td>
</tr>
<tr>
<td>0444/04</td>
<td>HDC</td>
<td>Edinburgh South Development (Blocks 25 &amp; 26)</td>
<td>49</td>
<td>245</td>
</tr>
<tr>
<td>3032/07</td>
<td>Hanover Construction</td>
<td>Couva North Housing, Phase 6D</td>
<td>166</td>
<td>830</td>
</tr>
<tr>
<td>1005/08</td>
<td>Hanover Construction</td>
<td>Couva North Housing, Phase 6C1</td>
<td>11</td>
<td>55</td>
</tr>
<tr>
<td>1431/05</td>
<td>Riverview Development</td>
<td>Penco Lands, Longdenville</td>
<td>211</td>
<td>1055</td>
</tr>
<tr>
<td>2257/08</td>
<td>E-Teck</td>
<td>Frederick Industrial Park, Caroni</td>
<td>334</td>
<td>1670</td>
</tr>
<tr>
<td>0093/09</td>
<td>Caribbean Housing Ltd</td>
<td>Brentwood Palms, Cor. Edinburgh Boulevard</td>
<td>81</td>
<td>430</td>
</tr>
<tr>
<td>0477/09</td>
<td>Land Settlement Agency</td>
<td>Squatterville, Macaulay</td>
<td>50</td>
<td>250</td>
</tr>
<tr>
<td>2278/08</td>
<td>Land Settlement Agency</td>
<td>Milton Village, Couva</td>
<td>335</td>
<td>1675</td>
</tr>
<tr>
<td>0679/07</td>
<td>Bissoondath Maharaj</td>
<td>Endeavour Road, Chaguanas</td>
<td>26</td>
<td>130</td>
</tr>
<tr>
<td>2151/08</td>
<td>Verdan Estate Ltd</td>
<td>Mc Bean, Couva</td>
<td>138</td>
<td>690</td>
</tr>
<tr>
<td>2306/07</td>
<td>Genivar T&amp;T</td>
<td>Lions Gate Development, Enterprise, Chaguanas</td>
<td>215</td>
<td>1075</td>
</tr>
<tr>
<td>0581/09</td>
<td>Development &amp; Innovations</td>
<td>Endeavour Gardens</td>
<td>85</td>
<td>425</td>
</tr>
<tr>
<td>0719/08</td>
<td>Ashmead Ali</td>
<td>Francis Lalla Road</td>
<td>38</td>
<td>190</td>
</tr>
<tr>
<td>2527/07</td>
<td>Lange Holdings Ltd</td>
<td>Lange Park, Chaguanas</td>
<td>21</td>
<td>105</td>
</tr>
<tr>
<td>0433/07</td>
<td>Caribbean Housing Ltd</td>
<td>Aberdeen Park, Section 3 Part 4</td>
<td>32</td>
<td>160</td>
</tr>
</tbody>
</table>
Table x-1: Electrical Loads of the Major Housing Developments in the Project Area

<table>
<thead>
<tr>
<th>R/S#</th>
<th>Development/Location</th>
<th>Address</th>
<th>No. of Lots/Units</th>
<th>kVA Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>0003/08</td>
<td>H.S.M.D.T.</td>
<td>Cara Courts Condominiums, Claxton Bay</td>
<td>600</td>
<td>3000</td>
</tr>
<tr>
<td>0247/06</td>
<td>E.M.B.D.</td>
<td>Factory Road, Chaguanaas</td>
<td>268</td>
<td>1340</td>
</tr>
<tr>
<td>0653/06</td>
<td>E.M.B.D.</td>
<td>Felicity Housing Development</td>
<td>737</td>
<td>3685</td>
</tr>
<tr>
<td>0273/06</td>
<td>E.M.B.D.</td>
<td>Balmain</td>
<td>160</td>
<td>800</td>
</tr>
<tr>
<td>0006/06</td>
<td>E.M.B.D.</td>
<td>Beaucar Road, Freeport</td>
<td>208</td>
<td>1040</td>
</tr>
<tr>
<td>0258/06</td>
<td>E.M.B.D.</td>
<td>Calcutta Road #1, Mc Bean</td>
<td>77</td>
<td>385</td>
</tr>
<tr>
<td>0661/06</td>
<td>E.M.B.D.</td>
<td>Chin Chin Road, Cunupia</td>
<td>802</td>
<td>4010</td>
</tr>
<tr>
<td>0203/06</td>
<td>E.M.B.D.</td>
<td>Paul &amp; George Street, Esperanza</td>
<td>49</td>
<td>245</td>
</tr>
<tr>
<td>0242/06</td>
<td>E.M.B.D.</td>
<td>S.M.R., Mc Bean</td>
<td>495</td>
<td>2475</td>
</tr>
<tr>
<td>2675/05</td>
<td>E.M.B.D.</td>
<td>Orangefield Road, Carapichaima</td>
<td>167</td>
<td>835</td>
</tr>
<tr>
<td>0036/06</td>
<td>E.M.B.D.</td>
<td>Roopsingh Road</td>
<td>545</td>
<td>2725</td>
</tr>
<tr>
<td>0036/06</td>
<td>E.M.B.D.</td>
<td>Sonny Ladoo</td>
<td>256</td>
<td>1280</td>
</tr>
<tr>
<td>2601/05</td>
<td>E.M.B.D.</td>
<td>Waterloo Housing Development</td>
<td>26</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Atlantic Avenue, Point Lisas</td>
<td></td>
<td>3MVA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Caribbean Drive, Point Lisas</td>
<td></td>
<td>7MVA</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL LOTS</strong></td>
<td></td>
<td><strong>46365</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table x-1 (Continued): Electrical Loads of the Major Housing Developments in the Project Area

<table>
<thead>
<tr>
<th>Distribution Sub-Stations</th>
<th>Installed Capacity (MVA)</th>
<th>Present Load (MVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brechin Castle</td>
<td>24/32</td>
<td>12</td>
</tr>
<tr>
<td>Couva</td>
<td>12.5/16</td>
<td>6</td>
</tr>
<tr>
<td>Pt. Lisas</td>
<td>40/60</td>
<td>30</td>
</tr>
<tr>
<td>Central</td>
<td>25/32</td>
<td>14</td>
</tr>
<tr>
<td>Chaguanas East</td>
<td>25/32</td>
<td>21</td>
</tr>
<tr>
<td>Chaguanas West</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Endeavour</td>
<td>25/32</td>
<td>24</td>
</tr>
<tr>
<td>Charlieville</td>
<td>12/16</td>
<td>5</td>
</tr>
<tr>
<td>Longdenville</td>
<td>25/32</td>
<td>12</td>
</tr>
<tr>
<td>Claxton Bay</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Savonetta</td>
<td>12/16</td>
<td>10</td>
</tr>
</tbody>
</table>

Table x-2: Power Output Capacity & Present Load of the Sub-Stations in the Central Region
Figure x.2: Single Line Diagram of Couva – Talparo–Tabaquite Area
Figure x-3: Distribution of 12kv Supply in Couva-Talparo-Tabaquite
X.1.3 Assessment of Development Plans

T&TEC has done a considerable amount of planning for the electrical system for present and future development in the region as evident in the above section. The two main generation companies in Trinidad and Tobago that generate electrical power are PowerGen and Trinity Power. From T&TEC's report, the maximum generating capacity can supply a total of 1,595MW, which is sufficient for the near future as the current demand is approximately 1,181MW.

The Couva-Talparo-Tabaquite region has a comprehensive 132kV, 66kV and 12kV transmission system illustrated in Figures x-1 & x-2. Further to this, the information in the Tables x-1 and x-2 show that T&TEC has made plans to provide additional capacity and infrastructure for housing developments and industrial estates to be constructed in the coming years. Meaning that some of these areas require the placement of substations and various utility corridors, as this is the means by which power will be delivered to future customers.

Information provided by T&TEC is based only on forthcoming development projects that they are aware of. There could be additional projects which would have to be taken into consideration, where the magnitude of these additional demands will determine the spare capacity in the system and the need for additional capacity in the future.

From Table x-1 it is shown that a number of developments have started and are being built, the most demanding of which is the Edinburgh South Development with a total projected load of approximately 8 MVA. The most demanding industrial estate will be located on Caribbean Drive Point Lisas requiring 7MVA. The least demanding development is being done by E.M.B.D. is the Waterloo Housing Development with a demand of 130 kVA. In total the expected increase in demand for the housing developments are 46,365MVA and another 10MVA for the industrial estates in Point Lisas. This increase in demand in the project area will be offset by the construction of Sub-Stations at Chase Village and Chaguanas which are already in the planning stages.

Table x-2 provided by T&TEC shows the present demands of the central area where Point Lisas has the highest demand being 30MVA. The Areas with the lowest demand are Couva, Charlieville, Claxton Bay, and Chaguanas West with 6MVA, 5MVA, 5MVA and 4MVA respectively. When the Distribution Sub-Stations installed capacities are compared to the areas they supply it can be determined that there is overall adequacy in the current for capacity for near future loads. However some capacities are close to the present load meaning near future upgrades of these sub-stations will be required. These are the sub-stations at Claxton Bay and Chaguanas West which are currently only 1 and 2 MVA respectively from their limit. If any major developments occur in these regions an upgrade of these sub-stations would be required.
X.1.4 Recommendations

Having reviewed the information on the existing system and future development plans; based on the assessment done the Consultant recommends that the following be considered:

1. As more information on development projects becomes available, T&TEC would need to revisit and refine the projected demands and generating capacities for the Central Distribution Area with respect to design specifications for the new Sub-Stations to be constructed at Chase Village and Chaguanas.

2. Develop a firm policy on utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (>1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), and Telecommunication and Signal Cabling and other utilities.

3. For underground infrastructure, expansion of main corridors along roadways might mean that any unencased electricity ducting originally under the grass verge end up under the travel lane.

   Therefore for future underground infrastructure, concrete encasement of ducts is required for physical protection and T&TEC should standardize their requirements.

4. The developers of the Couva-Talparo-Tabaquite area should provide timely information at the planning stage to T&TEC regarding the characteristics of the supply and estimated demand for T&TEC to include in their plans.
X.2 TELECOMMUNICATIONS

I) Fixed Line Systems

Telecommunications Services of Trinidad & Tobago (TSTT)

X.2.1 Project Approach and Response

The Consultant corresponded via letter and telephone with Telecommunications Services of Trinidad & Tobago (TSTT) and a meeting was held regarding their existing infrastructure and future development plans for fixed line services in the Couva-Tabaquite-Talparo area.

X.2.2 Fixed Line System

The area has evolved over the last 15 to 20 years with the inclusion of many switches with Couva Exchange as the host. These include the Point Lisas RLCM, Preysal OPAC, Gran Couva, Flanigin Town which were placed around 10 years ago and more recently Roystonia, Balmain and future switches in the McBean area.

These developments came about as a result of areas growth and also because of the necessity to reduce the loop lengths to provide enhanced services as well as cut down maintenance activities. Currently Tabaquite is the only area without Blink service but this problem should also be rectified by June 2010. A map showing the network layout for this area is provided in Figure x-3.
Figure x-3: TSTT's Fixed Line Coverage in the South-West
X.2.3 **Assessment of Development Plans**

TSTT has approximately 100% coverage of the area with respect to fixed line telephone services. Blink represents TSTT’s new fibre optic fixed line network which is the replacement for old copper line system which is being phased out. These new cables are used for both voice and data systems. The Blink service is not yet available in Tabaquite however TSTT is presently upgrading their system to provide Blink services to the Tabaquite area by June 2010.

It can be determined from TSTT’s information that development of an area occurs as the need arises. As can be seen in Figure x-3 the Couva-Tabaquite-Talparo area has good coverage with respect to land lines. Areas that have not been developed are currently isolated and very small in population but as the demands for services increase TSTT will expand their network accordingly.

X.2.4 **Recommendations**

Having reviewed the information on the existing system and future development plans, based on our assessment the Consultant recommends that the following be considered:

1. For future underground infrastructure, concrete encasement of ducts is required for physical protection and TSTT should standardize their requirements.

2. A firm policy must be developed for utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (>1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), and Telecommunication and Signal Cabling.

3. All developers of the Couva-Tabaquite-Talparo region should provide timely information at the planning stage to TSTT so that their requirements can be integrated into the designs.
Columbus Communication Trinidad Limited (CCTL)

X.2.5 Project Approach and Response

Correspondence from the Consultant was sent to Columbus Communications Trinidad Limited (CCTL) and a meeting was held to discuss the project and the information required by the Consultant. CCTL indicated willingness to provide general information that would aid in the expansion of their services however; they stated that it was company policy to not disclose any detailed technical information regarding their Plant. In addition to being a provider of cable television service, they now provide voice and data services, and are currently expanding their network across the country.

X.2.6 Existing Service Capabilities as per Flow Trinidad’s Website

Columbus Communications Trinidad Limited is wholly owned by Columbus Communications Inc., an International Business Corporation (IBC) incorporated in 2004 under the Companies Act of Barbados.

Columbus Communications Inc. is a diversified telecommunications company whose core operating business is to provide video services, broadband access, digital telephone and internet infrastructure services (retail) and the development of an undersea fibre optic cable network as well as the sale and lease of the telecom capacity provided by the network (wholesale).

Columbus Communications Inc. operates in 21 countries throughout the Caribbean and Latin America. On June 1, 2005, Columbus Communications Inc. completed the acquisition of Trinidad and Tobago Transcable Company Ltd. (CCTT) and renamed the company Columbus Communications Trinidad Limited, operating under the brand ‘Flow’. CCTL is the main video service provider in Trinidad and since the purchase by Columbus Communications Inc., has over 125,000 subscribers.

CCTL is in year 3 of a 5 year US$160 million plant rebuild and system extension capital program. This plan will see the entire current RF plant reconstructed to 860MHz. In addition, Columbus plans to extend the current network footprint to reach the estimated 80,000 to 100,000 residences in Trinidad that do not currently have access to video and internet services.


X.2.7 Future Plans

CCTL’s future development plans are influenced mostly by private and Government developments both housing and otherwise. To provide superior protection to their network infrastructure CCTL prefers to provide an underground supply to all new developments. Their infrastructure requirements
consist of the installation of underground ducts and splicing manholes in utility corridors adjacent to major roadways. As such, no public land space is required except for utility poles in areas to be fed by an overhead supply, and splicing manhole access points in areas to be supplied from underground.

CCTL is currently doing a feasibility study on different methods to expand its network in the area and would like to arrange a meeting with the Couva-Tabaquite-Talparo Regional Cooperation to explore these arrangements.

X.2.8 Assessment

The Consultant views the service CCTL offers as a utility as they now provide both voice and data apart from cable television. They are currently pursuing expansion of their voice and data network in the central area to meet the demands of customers as can be seen from their map of Trinidad Figure x-4.

From the information obtained on the Flow Website, it appears that CCTL presently does not adequately service the Couva-Tabaquite-Talparo area with respect to fixed lines services.

Their future development plans are influenced mostly by private and Government developments as such; network development is only undertaken as the need arises. This approach is acceptable given the high cost of network expansion and upgrade which must be viewed in light of expected revenue to come from such investments.

X.2.9 Recommendations

Having reviewed the information on the existing system and future development plans, based on our assessment the Consultant recommends that the following be considered:

1. For future underground infrastructure, concrete encasement of ducts is required for physical protection and CCTL should standardize their requirements.

2. A firm policy must be developed for utility corridors requirements, including separation between High Voltage (HV) (> 5000 Volts), Medium Voltage (MV) (>1000 Volts and < 5000 Volts), Low Voltage (LV) (< 1000 Volts), and Telecommunication and Signal Cabling.

3. The Couva-Tabaquite-Talparo Regional Corporation, Trinidad and Tobago Housing Development Corporation (HDC) and all developers of the area should provide timely information at the planning stage to CCTL so that their requirements could be integrated in their development plans.

4. Despite the limited availability of CCTL service in the Couva-Tabaquite-Talparo area, telephone and data services are also provided by TSTT and satellite television service is available from Direct TV. Further development of CCTL’s fixed line network to feed the present customers in the Couva-Tabaquite-Talparo Regional Corporation would be a
significant investment, in particular if it is only to supply a
supplementary service to TSTT. As such, expansion of CCTL’s fixed
line network should mostly take place in areas where there are plans for
future development.
Flow’s Digital Service Areas

- **Coming 2009**
- **Digital Ready Areas**
- **Cable Only**

**Coming 2009**
- Arima
- Borne Aventure
- Carapo
- Chaguaramas
- Gasparillo
- Iere Village
- Indian Walk
- Lengua
- Longdenville
- Malabar
- Princes Town
- Reform
- Signature Park
- Sixth Company
- St. Julien
- St. Margaret’s
- Third Company
- Williamsville

**Digital Ready Areas**
- Dibe, Long Circular
- Diamond Village
- Diego Martin
- Duncan Village
- El Socorro
- Five Rivers
- Glencoe
- Goodwood Park
- Green Acres
- Gulf View
- Hermitage
- La Horquette
- La Romaine
- Lopinot
- Macoya
- Marabella
- Maracas
- Maraval
- Mayaro
- Moka
- Mon Repos
- Monkey Town
- Mt. Hope
- Mt. Lambert
- Oropune
- Palmiste
- Paramin
- Petit Bourg
- Petit Valley
- Pleasantville
- Port of Spain
- Rosewood
- San Fernando
- San Juan
- San Rafael
- Santa Rosa

**Cable Only**
- Roystonia
- Caroni

N.B. The conversion to our digital platform is done on a phased basis. Some streets in the areas listed may not be fully digital ready.
Figure x-4: Flow Existing Infrastructure
(Ref: http://www.flowtrinidad.com/servicemap/tabid/289/Default.aspx)
II) Cellular Service

Digicel & Telecommunications Services of Trinidad & Tobago (TSTT)

X.2.10 Project Approach and Response

The Consultant corresponded via letter and telephone with TSTT bmobile and Digicel on several occasions requesting information regarding their respective cellular network infrastructure, present cellular service area and future development plans. At the time of preparation of this report both TSTT bmobile and Digicel were unable to meet with the Consultant or to provide any of the requested information.

X.2.11 Existing Service as per Published Information

Despite information not being provided by the service providers, the Consultant was able to source published information from TSTT’s Bmobile magazine, GSM World’s website and Digicel’s website. GSM World’s map showing TSTT’s cellular service coverage in the project area can be viewed at http://www.gsmworld.com/cgi-bin/ni_map.pl?cc=tt&net=ts. Figure x-5 below shows Digicel’s cellular service coverage in the Couva-Tabaquite-Talparo area. Both companies cellular service appear generally adequate however there are some areas without reliable coverage.

X.2.12 Assessment

The infrastructure requirements for future upgrades in the area would be limited to land space for cell tower sites, which are relatively small. This space requirement would not significantly affect the development of this service in the Couva-Tabaquite-Talparo area.

The process of cellular site construction requires obtaining initial approvals from the Telecommunications Authority of Trinidad and Tobago (In respect of co-location and potential RF emission levels) and the Town and Country Planning Division of the Ministry of Planning and Development (in respect of location and structural requirements). The Authority will forward all matters concerning the Town and Country Planning Division for its attention.

Any person may object to the proposed construction of cellular sites. All objections must be submitted in writing within fourteen (14) days from the date of first publication of the Notice, to the Telecommunications Authority of Trinidad and Tobago.

X.2.13 Recommendations

Having reviewed the general information available on the existing system and based on the assessment done with the limited information received, the Consultant is of the view that no specific provisions are required to improve the reliability of the service in the Couva-Tabaquite-Talparo area. However the approval process for cellular site construction must be noted and the Couva-Tabaquite-Talparo Regional Corporation and approving agencies should provide
any necessary support for the development of cellular services in the area as required.

Figure x-5: Digicel’s Cell Coverage in Trinidad & Tobago

X.3 Direct TV

X.3.1 Project Approach and Response

Prior to this study, DIRECTV had indicated that they have adequate coverage for the entire central area and beyond. They also added that they did not compete where there is already Cable TV physical infrastructure and service, but that their service goes beyond the point where the cost of the Cable TV infrastructure becomes uneconomical.

X.3.2 Existing System and Future Plans

By its very nature, DIRECTV’s direct-to-home satellite service is ubiquitous. There is no need for any further infrastructural support to service persons in the Couva-Tabaquite-Talparo area. In fact, DIRECTV already provides service to a significant number of residential and corporate customers throughout the area.

X.3.3 Assessment
The DIRECTV service is delivered to customers via a geosynchronous orbital satellite which covers Latin America and the Caribbean. The signals are received via a 90cm antenna, which is usually placed on the customer’s roof and wired into the receiving television inside the home. DIRECTV Trinidad authorizes the reception of various programming packages by sending a signal back to the satellite, via a unique smart card number in the company’s set top box.

DIRECTV offers the latest multi-channel distribution technology, which allows customers use of a remote control to order some programming at the push of a button. In the near future, all of the DIRECTV customers in the Caribbean will benefit from further developments in set-top-box technology as a result of alliances with DIRECTV in the United States.

It is also projected that within the next few years, DIRECTV may be in a position to offer a wireless broadband service to customers.

X.3.4 **Recommendations**

As stated above, there is no need for further infrastructural support to service the Couva-Tabaquite-Talparo area.
APPENDIX 4:

COUVA/TABAQUITE/TALPARO REGIONAL DEVELOPMENT PLAN
TRAFFIC AND TRANSPORTATION PROJECTS
1. Transportation Planning Policies and Principles

1.1 Introduction

Transportation problems represent a common phenomenon in many cities and urbanized regions around the world. Chronic traffic congestion, inadequate transit services, air pollution and neglect of pedestrians are some of the components of these problems. The resulting phenomenon of auto dependency, i.e. large portion of population depending on auto travel, is a social problem which negatively affects living standards and makes many countries extremely dependent on oil supplies and prices. It also makes non-auto owners “second class citizens.”

The problems of congestion and inadequate alternatives to auto travel are particularly serious in large cities. However, the situation in Trinidad clearly shows that the same problems exist, and can have very negative impacts, also in medium-sized cities and major urbanized corridors in the country.

1.2 Causes of Problems

Transportation developments in Trinidad follow the phenomenon known as the “vicious circle of urban transportation” which has occurred in many cities when car ownership began to increase rapidly. As more and more people buy cars and find them convenient for many or most of their trips, traffic congestion occurs on streets with all its negative impacts: wasted time and energy, increasing accidents, air pollution, noise and deterioration of city’s livability. At the same time, transit services lose passengers, their services become less frequent, slower and less reliable due to traffic congestion. As intensified vehicular traffic makes transit travel and walking less attractive and safe, more people are encouraged to buy cars, closing the “vicious circle” spiral.

The shift of travel from transit to car use is stimulated by the fact that car users face extremely low direct, “out-of-pocket” cost, while they do not consider fixed car-ownership costs, and they do not pay any of the costs and impacts they impose on other drivers, transit users, or on the city. The direct cost, consisting of the price of petrol, sometimes, price of parking, is so low, that in many cases it appears to people that car travel is cheaper than transit travel.

This process of increasing car dependency and deterioration of urban environment is often considered to be an inevitable feature of urban transportation when auto ownership is high, and that cities must either “live” with such conditions, or streets and highways must be built through the cities to accommodate “travel desires of individuals.”
However, experiences of cities which adopted policies of rebuilding city to accommodate unlimited car use, such as Detroit and Houston, clearly showed that such excessive highways and parking facilities seriously damage the city’s livability and sustainability, and yet do not solve the problems of congestion and auto dependency.

1.3 Policies and Principles for Solution

In recent decades, an increasing number of cities have developed new transportation policies and numerous innovative methods for their implementation. These cities, such as Singapore, Toronto, Oslo, Munich and Portland (Oregon, USA), have now demonstrated that it is possible to have cities with transportation that is not congested and wasteful, and that supports rather than hurts livability and prevents sustainability. Major steps these cities have made to achieve efficiency and livability can be summarized as follows.

(1) The goal for the city and its urban area has been defined at a higher level: instead of planning new roads to alleviate congestion, the goal of achieving a livable and sustainable city has been adopted.

(2) Transportation system is conceived as an important tool in achieving vitality, efficiency and good quality of life. To achieve that, different modes of transportation must be developed and coordinated into a balanced intermodal transportation system.

(3) When each individual uses the mode of travel which is most convenient to him/her in the short run, the system reaches an equilibrium that is much less efficient than a coordinated intermodal system would provide. This problem of a major difference between individual equilibrium and social optimum in transportation system can be solved through various measures in planning and operation of different urban transportation modes.

(4) The policies that lead from the individual optimum with congestion and inefficiencies to intermodal distribution that prevents excessive congestion and reduces negative impacts consist of two sets of implementation measures: (a) transit use and walking incentives, and (b) car use disincentives.

These implementation measures represent short- and long-term actions, and they must be included in the regional projects as well as in planning individual facilities or areas, such as in the urban areas of Couva, Gasparillo, St. Mary’s, and Montrose.

1.4 Transportation Planning for Couva – Tabaquite-Talparo Region

Learning from the experiences, mistakes and successful solutions for urban transportation described above, planning for each of the urban areas of Couva, Gasparillo, St. Mary’s, and Montrose has been based on the following principles and steps.
f. A people-oriented design would be much more attractive, efficient and sustainable than conventional car-dominated development.

g. To achieve the goal of each urban area as multifunctional activity centre, the transportation system should be designed to support its activities and provide good accessibility without negative impacts which multilane streets with high traffic volumes and large garages would have.

h. Internal travel and transportation in each urban area will be performed by pedestrians, cars, minibuses, buses and other vehicles travelling at moderate speeds, because most of the vehicles will terminate their travel in the area.

i. External trips to and from each urban area will favour public transport modes: buses, maxi-taxi and other paratransit vehicles. Regular and, possibly, articulated buses will be directed to the central transit hub which will be an off-street facility allowing simultaneous arrivals of many buses, as timed transfer bus system operates. At the terminal there will be convenient transferring from external buses and minibuses that will serve as local collectors-distributors among major activity centres and areas in each urban area. Auto trips will have convenient access to the garages which will be located on the periphery of the urban centre.

j. This type of a coordinated intermodal transport system will provide good accessibility among the business places and residential buildings, making each urban area an efficient local area supporting diversified activities required by the land use plan.

The planning principles applied here are based on the latest experiences in city planning for developments with fully integrated land uses and transportation system, both designed to achieve dynamic, multifunctional urban areas with features of livability and sustainability.

2. Proposed Road Development

The following roads have been ranked for development through either construction, expansion, road condition improvement, or road capacity improvement. These roads are ranked by consideration of the travel demands resulting from activities in the regions and the travel times between the regions. Excluded from this submission is the evaluation of the following factors in ranking the proposed roads: property requirements, construction and operating costs, safety, environmental considerations, and social impacts. Roads within town centres have not been considered.

1. Road condition and geometric improvement to Cedar Hill Road between Southern Main Road, Claxton Bay and Tortuga Village.
2. Road condition and geometric improvement to the Caparo Valley Brasso Road between Southern Main Road, Montrose and Guaracara Junction.
3. Road condition and geometric improvement to Arena Road between Freeport and Chickland Village.

4. Road condition and geometric improvement to Chickland Caparo Road between Chickland Village and Caparo Village.

5. Road condition and geometric improvement to Todd’s Station Road between Caparo Valley Brasso Road and Talparo Road, Talparo Village.

6. Road condition and geometric improvement to road linking Todd’s Station Road and Caroni Road, Nancoo Village, and passing just west of Todd’s Road North Forest Reserve, and passing through Las Lomas.

7. Road condition and geometric improvement to Chin Chin Road between Southern Main Road and Las Lomas Village.

8. Dualling of Rivulet Road in Couva, including improvement to the Preysal Interchange on the Solomon Hochoy Highway and the Brechin Castle Roundabout on the Southern Main Road.

9. Road condition and geometric improvement to Windsor Park Road, Mount Pleasant Road, Milton Road, Basterhall Road and Diamond Road.

10. Construction, including improvement, to the existing gravel road linking Basterhall Road to Railway Road.

11. Road condition and geometric improvement to Mayo Road between Tortuga and Morichal.

12. Road condition and geometric improvement to Indian Trail Road between Tortuga and Rivulet Road, Couva.

13. Road condition and geometric improvement to Brasso Caparo Station Road between Brasso Junction and Pepper Village, Gran Couva.

14. Road condition and geometric improvement to Couva Road between Pepper Village and Preysal.

15. Road condition and geometric improvement to Freeport Mission Road between Freeport and Preysal.

16. Road condition and geometric improvement to Freeport Todd’s Road between Arena Road and Caparo Valley Brasso Road.

17. Road condition and geometric improvement to Mamoral Road between Caparo Valley Brasso Road and Talparo Road, Mundo Nuevo Village.

18. Road condition and geometric improvement to the Guaracara Tabaquite Road between Southern Main Road, Marabella and Tabaquite.

19. Road condition and geometric improvement to Torrib Tabaquite Road between Naparima-Mayaro Road and Tabaquite Rio Claro Road.

20. Road condition and geometric improvement to Sisters Road between Torrib Tabaquite Road and Guaracara Tabaquite Road.

21. Road condition and geometric improvement to Pascual Road between Torrib Tabaquite Road and Piparo Road.

22. Road condition and geometric improvement to Piparo between Pascual Road and Guaracara Tabaquite Road.

23. Road condition and geometric improvement to Tamana Road between Talparo Road and Mamon Village.

24. Road condition and geometric improvement to Guaico Tamana Road between Mamon Village and Guaico Village.
25. Road condition and geometric improvement to road linking Cunapo Southern Road to Guaico Tamana Road.


Detailed studies should be conducted on each road above to determine the property requirements, construction and operating costs, safety, environmental considerations, and social impacts involved in its construction or improvement.

2.1 National Energy Corporation (NEC) Point Lisas South and East Transportation Impact Assessment (TIA) Study: Conclusions and Recommendations

The following were concluded from this study:

2.1.1 Current travel speeds on the following road links are below satisfactory levels:

(a) Northbound on the Southern Main Road during the morning peak period, between Cedar Hill Road and Industrial Gases Ltd and between Phoenix Park Road and BC Roundabout, the average speed is about 20 kmph.

(b) Southbound on the Southern Main Road during the morning peak period, between Pierre Street and Industrial Gases and between Lodge Alli Trace (near Prantz Gardens) and the Cedar Hill Road, the average speed is about 20 kmph.

(c) Westbound on Rivulet Road during the morning peak period, between Rivulet Road and Camden Road and between Factory Road and the Southern Main Road, the average speed is less than 30 kmph.

(d) Westbound on Phoenix Park Road during the morning peak period, the average speed is less than 40 kmph on Phoenix Park Road because of traffic delays at its intersection with the Southern Main Road.

(e) Southbound on Caroni (1975) Ltd Road between the University of Trinidad and Tobago and Phoenix Park Road, during the morning peak period the average speed is less than 40 kmph, largely because of the poor condition of the road in this segment.

(f) Westbound on Cedar Hill Road during the evening peak period between Solomon Hochoy Highway and Spring Vale and between Jusamco and the Southern Main Road, the average speed on average is less than 30 kmph.

(g) Northbound on the Southern Main Road during the evening peak period between Cedar Hill Road and Industrial Gases Ltd, the average speed is less than 30 kmph.
(h) Southbound on the Southern Main Road during the evening peak period between Pierre Street and Industrial Gases and between Lodge Alli Trace (near Prantz Gardens) and Cedar Hill Road, the average speed is less than 30 kmph.

(i) Eastbound on Rivulet Road during the evening peak period between Milton Road and Couva Main Road, the average speed is less than 30 kmph.

(j) Westbound on Phoenix Park Road during the evening peak period, the average speed is less than 40 kmph because of traffic delays at its intersection with the Southern Main Road.

(k) Southbound on Caroni (1975) Ltd Road during the evening peak period between the University of Trinidad and Tobago and Phoenix Park Road, the average speed is less than 40 kmph, largely because of the poor condition of the road in this segment.

2.1.2 Current Traffic Level of Service at the following intersections are below satisfactory levels:

(a) The roundabout intersection Southern Main Road / Rivulet Road / Atlantic Avenue. The traffic Level of Service (LOS) on the approaches from Southern Main Road South and Rivulet Road are LOS D and E, respectively. This is primarily due to vehicle activity, with cars stopping for newspapers, as well as maxi-taxis, taxis and PH cars stopping to pick-up or drop-off passengers on the approach and exit sides as well as the circulating road.

(b) Intersection of Couva Main Road / Solomon Hochoy Highway Ramps / Rivulet Road. This intersection is really a combination of three intersections: (a) Couva Main Road / Solomon Hochoy Highway Southbound Ramp; (b) Couva Main Road / Solomon Hochoy Highway Northbound Ramp; and, (c) Couva Main Road / Rivulet Road / SHH Northbound Exit Ramp. Each of these intersections was separately analysed for its optimum cycle time and phasing. The phase timings are then appropriately adjusted to give an overall synchronised cycle time and phasing. The LOS and travel speed on the Couva Main Road Westbound from Preysal (east of the Solomon Hochoy Highway is very poor (LOS F). The LOS for the right-turners from SHH Southbound Ramp is LOS F. All other approaches have LOS and speeds acceptable during peak periods (The LOS for the right-turners from SHH Northbound Ramp is LOS D, which is acceptable during peak periods).
1.3 Under conventional conditions of vehicle ownership and usage, the proposed Point Lisas South and East Industrial Estate will be expected to generate on average 8,139 vph entering the estate in the morning peak period, and 4,473 vph exiting the estate in the morning peak period. Under these conditions, at least four-lane highways (two lanes in each direction) are required for all arterial roads on the Estate. This study analysed a revised provision of road capacities within the Estate of 1,600 vph entering (or 20 percent of the expected entering morning peak traffic volumes) and 1,600 vph exiting (or about 30 percent of the expected exiting morning peak traffic volumes), and to develop transportation demand strategies to reduce the expected high vehicle usage on the Estate roads to this manageable level.

1.4 The modified Roundabout Intersection design of Southern Main Road / Rivulet Road / Atlantic Avenue is a double-lane roundabout with minimum circulatory lane width of 9.8 m and the central island diameter of 25.4 m. The traffic Level of Service (LOS) and travel speeds are quite good. This assumes that there is improved road user behaviour, with cars no longer stopping for newspapers, as well as maxi-taxis, taxis and PH cars no longer stopping to pick-up or drop-off passengers on the approach and exit sides as well as the circulating road.

1.5 Roundabout Intersections designs have been created designed connecting Couva Main Road with the Solomon Hochoy Highway. A new interchange design is created primarily for the new east-west Rivulet Road four-lane divided arterial, and so there is separation of a significant portion of the Rivulet Road arterial-oriented traffic from the Couva Main Road collector-oriented traffic. The existing northbound and southbound diamond-type ramps of the Solomon Hochoy Highway connection with Couva Main Road is each reconfigured to two single-lane roundabouts. The single-lane roundabouts have a minimum circulatory lane width of 6 m and a central island diameter of 20 m.

1.6 The following are the traffic movements for the improved operations design at the new Rivulet Road Interchange with the Solomon Hochoy Highway and the modified intersection of the Couva Main Road with the Solomon Hochoy Highway:

(a) Motorists northbound on the Solomon Hochoy Highway and wishing to proceed westbound on Rivulet Road would use Solomon Hochoy Highway Northbound Exit Ramp at the proposed Rivulet Road Interchange;

(b) Motorists northbound on the Solomon Hochoy Highway and wishing to proceed eastbound on Couva Main Road would use Solomon Hochoy Highway Northbound Exit Parclo Ramp at Couva Main Road Interchange, and then use the two proposed roundabouts at this interchange.

(c) Motorists northbound on the Solomon Hochoy Highway and wishing to proceed westbound on Couva Main Road would use either (a) Solomon Hochoy Highway Northbound Exit Parclo Ramp at Couva Main Road Interchange, and then use the proposed western roundabout at this interchange; or (b) Solomon Hochoy Highway Northbound Exit Ramp at Rivulet Road Interchange and this turn northbound (right-turn) at the first double-lane roundabout on the improved
Rivulet road and then a proposed connector road to another proposed single-lane roundabout on the Couva Main Road;

(d) Motorists southbound on the Solomon Hochoy Highway and wishing to proceed westbound on Rivulet Road would use Solomon Hochoy Highway southbound Exit Parclo Ramp at Rivulet Road Interchange;

(e) Motorists southbound on the Solomon Hochoy Highway and wishing to proceed eastbound on Couva Main Road would use Solomon Hochoy Highway southbound Exit Ramp at Couva Main Road Interchange and then the proposed eastern roundabout at this interchange;

(f) Motorists southbound on the Solomon Hochoy Highway and wishing to proceed westbound on Couva Main Road would use Solomon Hochoy Highway southbound Exit Ramp at Couva Main Road Interchange and then the two proposed roundabouts at this interchange;

(g) Motorists eastbound on the improved Rivulet Road and wishing to proceed northbound on Solomon Hochoy Highway would use either (a) Solomon Hochoy Highway northbound Exit Ramp at the proposed Rivulet Road Interchange, or (b) the last double-lane roundabout on the improved Rivulet road, then a connector road to another proposed single-lane roundabout on the Couva Main Road, then to the proposed western roundabout at the Couva Main Road Interchange, and finally onto Solomon Hochoy Highway Northbound Entry Ramp;

(h) Motorists eastbound on the improved Rivulet Road and wishing to proceed southbound on Solomon Hochoy Highway would use Solomon Hochoy Highway southbound Exit Parclo Ramp at the proposed Rivulet Road Interchange;

(i) Motorists eastbound on Couva Main Road and wishing to proceed northbound on Solomon Hochoy Highway would use the proposed western roundabout at the Couva Main Road Interchange, and finally onto Solomon Hochoy Highway Northbound Entry Ramp;

(j) Motorists eastbound on Couva Main Road and wishing to proceed southbound on Solomon Hochoy Highway would use the two proposed roundabouts at Couva Main Road interchange, then a connector road linking the eastern Roundabout at this interchange and the proposed Rivulet Road Interchange which is parallel to the Solomon Hochoy Highway, and finally Solomon Hochoy Highway southbound Exit Parclo Ramp at the proposed Rivulet Road Interchange;

(k) Motorists westbound on Couva Main Road and wishing to proceed northbound on Solomon Hochoy Highway would use the two proposed roundabouts at
Couva Main Road interchange, and then Solomon Hochoy Highway Northbound Entry Ramp;

(l) Motorists westbound on Couva Main Road and wishing to proceed southbound on Solomon Hochoy Highway would use the proposed eastern roundabout at Couva Main Road interchange, then a connector road linking the eastern Roundabout at this interchange and the proposed Rivulet Road Interchange which is parallel to the Solomon Hochoy Highway, and finally Solomon Hochoy Highway southbound Exit Parclo Ramp at the proposed Rivulet Road Interchange; and,

(m) Motorists westbound on Couva Main Road from Preysal and wishing to proceed onto the improved Rivulet Road would use the two proposed roundabouts at the Couva Main Road Interchange, then the proposed roundabout at the Ato Boldon Stadium, then the proposed connector road to the proposed double-lane roundabout on the improved Rivulet Road.


The following were concluded from this study:

2.2.1 Background

Vehicular traffic access to Petrotrin from the Solomon Hochoy Highway (SHH) is currently only at the Gasparillo Interchange via Bonne Aventure. The experience is very frustrating, especially during morning and evening peak periods due to high levels of traffic delays. The following routes are used to access Petrotrin facilities:

1. **To Petrotrin from the North:** Southbound on SHH, turn right at highway exit ramp, then westbound on Bonne Aventure Road to Petrotrin Gate. There are traffic delays on the ramp due to heavy traffic movement on Bonne Aventure Road

2. **To Petrotrin from the South:** Northbound on SHH, turn left at highway exit ramp, then westbound on Bonne Aventure Road to Petrotrin Gate. There are traffic delays on the ramp due to right turners from the ramp into Bonne Aventure Road eastbound.

3. **To Petrotrin from the East:** Westbound on Bonne Aventure Road. There are traffic delays on Bonne Aventure Road due to turning movements at the east and west intersections of the ramps, and poor motorists’ behaviour at the intersection of Bonne Aventure Road and Harmony Hall Road.

4. **From Petrotrin to the North:** From Petrotrin Gate, turn left into the northbound highway entry ramp to SHH. There is a short dedicated left-turn lane within the
Petrotrin compound. Some left-turners are delayed within the Petrotrin compound because of straight-through Petrotrin traffic.

5. **From Petrotrin to the South:** From Petrotrin Gate, east along Bonne Aventure Road, and turn right into the southbound highway entry ramp to SHH. There are traffic delays on Bonne Aventure Road due to turning movements at the east and west intersections of the ramps.

6. **From Petrotrin to the east:** along Bonne Aventure Road. There are traffic delays on Bonne Aventure Road due to turning movements at the east and west intersections of the ramps, and poor motorists operations at the intersection of Bonne Aventure Road and Harmony Hall Road.

At the west intersection of the Gasparillo Interchange, Petrotrin-associated traffic comprises 51 percent of the overall traffic during the morning peak period, and 46 percent of the overall traffic during the evening peak period. Therefore, about half of the traffic volume at the Gasparillo Interchange is due to vehicles associated with Petrotrin activities.

Petrotrin has long ago recognised that any development of its estate must be linked to major access improvements via the SHH. In order to facilitate access to its New Corporate Headquarters, Petrotrin hired a consultant in April 2006 to examine several alternative access arrangements, and a preferred option was agreed upon. This was a partial diamond-type (with a roundabout) and trumpet-type interchange dedicated to Petrotrin and located approximately 2 km north of the New Corporate Headquarters and existing Gasparillo Interchange.

The Highways Division of the Ministry of Works and Transport reviewed this conceptual plan and in March 2007 required that amendments be made to connect Charles Street, Gasparillo with the proposed interchange, in order that the wider public may also have access to this interchange.

2 **Land Use Master Plan: Petrotrin New Office Complex and Support Facilities**

Part of the process for the preparation of the current Land Use Master Plan for Petrotrin New Office Complex and Support Facilities was a review of access arrangements with the SHH. This new study showed that traffic and parking generators for the site would be of the order of four times that of the earlier plan for only the New Corporate Headquarters.

The following questions remain:

(a) Will the proposed Petrotrin Interchange north of Gasparillo Interchange satisfy the access demands of Petrotrin?
(b) Will the Gasparillo Interchange function for the wider public with an acceptable traffic Level of Service (LOS)?

(c) Will the design and investment for a dedicated Petrotrin Interchange bring an overall net social benefit?

The answer to item (a) above is in the affirmative provided the following could be achieved or adequately addressed:

(i) Petrotrin indicated that there are land ownership issues on the eastern side of the SHH, thus constraining the design.
(ii) The design geometrics of the trumpet and roundabout roadways would fit into the land allocated.
(iii) Highways Division usually demands that any connections or improvements to the existing highway system must cater for an eventual expansion of the highway to six divided lanes with generous shoulder provision.

3. **A Public Transport System**

3.1 **Introduction**

Trinidad and Tobago, like any country facing traffic congestion cannot build its way out of traffic congestion. Ways and means must be found to move more people in fewer vehicles. Public transport has to be a key element in moving more people with fewer vehicles.

The overwhelming majority of public transport services in Trinidad and Tobago are provided by private operators. In most developed countries public transport is provided by the public sector and is typically heavily subsidized with public funds and regulated. In comparison, the Government spends very little funding on public transport. They provide limited capital funds to the PTSC and guarantees bank loans to sustain its operations. The maxi taxi and route taxi industry receives no financial assistance from the Government.

The existing transit modes are (a) publicly-owned and publicly-operated: the Public Transport Service Corporation (PTSC); (b) privately-owned and publicly-operated: maxi-taxis, taxis, and PH (illegal). It is critical to not only understand these modes, but more significantly, to coordinate these modes to produce an integrated transit system operation. This must be done now, long before any new multimodal operations are considered, so as to assess existing deficiencies and constraints, and thereby determine improvements required. The second category of existing transit modes in TnT (maxis, taxis and PH) is also called paratransit. Paratransit modes also include private school vans, rented cars, and dial-a-ride taxis (such as, airport taxis, and hotel taxis). Paratransit modes are less regulated than transit modes (PTSC) and vary from strict controls and high quality
services to very little control with low standards of service quality and even basic traffic safety. In other words, the Government-owned PTSC is one component of the existing national transit system.

3.2 Assessment of Modal Options

The main options by mode and market segments are set out in Table 1. This process is required to ensure that the right mode of transport has been considered at an early stage for the specific market in consideration.

Based on our understanding of the suitability of each mode in catering for each market, the following logic matrix is drawn up. Where a mode is not considered as a potential solution for a market, clearly it can potentially form part of a multimodal journey.

**TABLE 1** MODES CONSIDERED FOR EACH MARKET

<table>
<thead>
<tr>
<th>Mode / Key Market</th>
<th>Short Distance &amp; Internal trips</th>
<th>Medium Distance</th>
<th>Long Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Cycling</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Maxi-taxis</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Private taxis</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Dial-a-ride</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Fixed route shuttle bus</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bus Rapid Transit (BRT)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Private car/ Kiss &amp; ride</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Park and Ride</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 2 sets out the qualitative assessment of each mode. Overall, short distance journeys are best catered for by sustainable modes such as walking and cycling. For medium and longer distance journeys, a form of mass transit should be provided, supported by a network of existing (or future) feeder services, such as maxi-taxis, private taxis and park-and-ride/kiss-and-ride close to the journey origin. Dial-a-ride may not be a practical way to cater for short distance trips, but perhaps it can be reserved for those with mobility difficulties and need to travel to/from external areas. BRT can be considered for internal trips.
<table>
<thead>
<tr>
<th>Mode</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>• Sustainable&lt;br&gt;• Healthy living lifestyle&lt;br&gt;• Low maintenance&lt;br&gt;• Fosters good working and living communities</td>
<td>• Challenging current attitude and habits&lt;br&gt;• Relatively slow&lt;br&gt;• Affected by adverse weather and hot climate&lt;br&gt;• Requires safety measures</td>
</tr>
<tr>
<td>Cycling</td>
<td>• Sustainable&lt;br&gt;• Relatively fast journey times and limited waiting time&lt;br&gt;• Develops cycling culture in local communities&lt;br&gt;• Fun and healthy living lifestyle</td>
<td>• Bicycle security&lt;br&gt;• Challenging current attitude, image and habits&lt;br&gt;• Affected by adverse weather and hot climate&lt;br&gt;• Would benefit from provisions of shower facilities at destinations</td>
</tr>
<tr>
<td>Maxi-taxis</td>
<td>• Flexible services to destinations&lt;br&gt;• Familiar mode of transport by locals&lt;br&gt;• Short waiting and journey times</td>
<td>• Likely to require significant subsidy or passengers pay a fare&lt;br&gt;• Large numbers of maxi taxis causing congestion and affecting urban realm&lt;br&gt;• Increased risk to pedestrians and cyclists&lt;br&gt;• Difficult to manage and regulate services</td>
</tr>
<tr>
<td>Private taxis</td>
<td>• Flexible services to destinations&lt;br&gt;• Offers tailored services&lt;br&gt;• High levels of comfort</td>
<td>• May be slow to respond at peak periods&lt;br&gt;• Likely to require significant subsidy or passengers pay a very high fare&lt;br&gt;• Large numbers of maxi taxis causing congestion and affecting urban realm&lt;br&gt;• Increased risk to pedestrians and cyclists&lt;br&gt;• Difficult to manage and regulate services</td>
</tr>
<tr>
<td>Dial-a-ride</td>
<td>• Flexible services from origins to destinations&lt;br&gt;• Offers tailored services&lt;br&gt;• High levels of comfort</td>
<td>• Unlikely to be sustainable for the high levels of demand – usually requires high subsidy&lt;br&gt;• May be slow to respond at peak periods unless planned in advance&lt;br&gt;• Contributions to congestion and affecting urban realm</td>
</tr>
<tr>
<td>Fixed route bus</td>
<td>• Offers flexibility in longer term changes in services in terms of frequency or service&lt;br&gt;• User friendly systems with clear boarding points&lt;br&gt;• Easy to convey service information&lt;br&gt;• Easy to regulate services&lt;br&gt;• Requires minimal capital works&lt;br&gt;• Cheapest mass transit solution available&lt;br&gt;• Can be upgraded to BRT or LRT in the future</td>
<td>• Does not always offer direct access to origin and/or destination&lt;br&gt;• Requires a relatively high level of frequency and thus expensive to operate&lt;br&gt;• Likely to require significant subsidy to have low or moderate fare&lt;br&gt;• Requires on-site secure storage and maintenance</td>
</tr>
<tr>
<td>Mode</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Bus Rapid Transit        | • Offers flexibility in longer term changes in services in terms of frequency or service  
                             • Offers high level of segregation and priority, significantly improving service reliability  
                             • User friendly systems with clear boarding points  
                             • Easy to convey service information  
                             • Easy to regulate services | • Requires political will to implement and deliver  
                             • Cannot be provided on busy urban streets  
                             • Its service greatly depends on traffic regulation and continuous enforcement of separate right-of-way  
                             • Has a tendency to degrade in time due to pressures to allow other vehicles on its rights-of-way  
                             • Often requires significant land uptake  
                             • Requires much higher investment in infrastructure than regular bus  
                             • Does not always offer direct access to origin and/or destination  
                             • Likely to require significant subsidy have low or moderate fare  
                             • Requires on-site secure storage and maintenance |                                                                                                                                                                                                                                                                 |
| Park and Ride / Kiss and Ride | • Offers an opportunity to those who live away from public transport to access stops conveniently  
                             • Reduce highway congestion  
                             • Reduce parking requirements in central cities (Port of Spain) | • Significant land take-up and construction cost (up to US$15-25K/parking space)  
                             • Requires security management  
                             • Creates local congestion  
                             • Locals unfamiliar with concept |                                                                                                                                                                                                                                                                 |

3.3 **Current Transit Operations in Trinidad and Tobago**

Typical advantages of paratransit include the following: (a) Very frequent service wherever high demand exists, such as between major urban centres; (b) Stopping only when requested, so they could travel faster than transit vehicles serving many stops; (c) Some paratransit services distribute passengers to a wide range of destinations; and, (d) Operating with little or no Government subsidies.

Typical disadvantages of paratransit include the following: (a) When travel demand is low, paratransit services are infrequent and unreliable; the same occurs when there is heavy traffic congestion without preferential treatment for transit or paratransit is nonexistent, and turnaround time is very long; (b) Safety standards are low and liability insurance for passengers is often nonexistent; (c) In some cases, overcrowding causes poor riding conditions, especially during peak hours; (d) Since competing services are not integrated, passengers have great inconvenience in getting information on destinations and stands, especially because there are no schedules and maps; (e) Their use by non-regular users is very difficult; (f) as a result of poor traffic enforcement, they greatly contribute to chaotic traffic conditions; (g) They are not obligated to provide their services, so that when operating conditions become unfavourable (such as in higher than usual traffic congestion when it rains or on a Friday during evening peak periods), they abandon their responsibility leaving the urban areas without services; and, (h) since fares
are not regulated, operators may overcharge passengers; there are also no transfer arrangements, so passengers pay an additional fare for every vehicle they enter. In summary, paratransit is a collection of independent services, rather than a system that can be readily planned and controlled. Because paratransit has limited regulations, planning of transit is extremely difficult because there are no data on the number of operators, passenger volumes and origin-destination patterns, etc., and without information and data about existing conditions, it is not possible to perform any planning, and it is difficult to implement any changes.

So transit not only has to compete with auto drivers for passengers and road space, but has to fight among its own operators (PTSC / maxi-taxi / taxi / PH). The development and success of national transit depends on the creation of preferential treatment for overall public transport.

The problems of current transit operations in Trinidad and Tobago are (a) For transit and paratransit users: unreliable operation, no schedules, no passenger information, too long waiting time, delay, congestion, improper location of stops, lack of park-and-ride facilities, too high cost, too far to walk, not accessible to all society, not caring or treating passengers with dignity and respect, not serving a wide range of origins and destinations, not responsive to changing travel needs and patterns of activity, no assurance of high standards of physical safety, no security from fear of assault, attack or other anti-social behaviour throughout the journey; (b) For paratransit operators: Too high operating cost, poor amenities, no concessions, no priority, no administration; and, (c) For the rest of us: severe traffic delays on the roadways due to the indiscriminate stopping, pulling off, driving on the road shoulders, and slow driving (looking for passengers) by paratransit.

It is difficult for public transport usage to be an attractive option to the auto driver, when the auto offers direct access to all points, almost door-to-door, while public transport requires unpredictable waiting, payment of several fares, has no coordination between trips on different routes, provides no easily available information or unified and logical fares, and has tremendous friction in transferring among routes and modes (that is, non-seamless intermodal travel).

All transit should be operated as efficiently as possible, but the entire transit system should serve passengers, rather than maximise profit. That is, the primary purpose of transit is to provide integrated, reasonably priced public service aimed at maximisation of ridership, and its secondary purpose is commercial enterprise aimed at increased economic and organisational efficiency.

Currently, the public agency (PTSC) competes with uncontrolled, privately-owned maxitaxis and taxis, and these private operators concentrate on the most lucrative routes and during peak periods, while they leave less lucrative services to the PTSC and PH taxis. Also the fares are charged for each service, so that every leg of the journey that requires a transfer to another vehicle demands a new fare. There is also varying quantity and quality of service by the transit players, including frequency, reliability, comfort, ventilation and
air conditioning, vehicle cleanliness, etc. Encouragement of unregulated services results in lower public expenditures for public transport, but also in lowering the quality and image of paratransit.

A national transit authority has long been required to arrange all transit services in an appropriate manner. These services will involve sequencing desired levels of PTSC operations together with the contracting of paratransit services with appropriate regulations. This will include consideration of the following: safety, franchise, and contractual arrangements. Safety regulation involves the following: vehicle design and performance, including structural strength, braking capabilities, fire resistance, etc; frequency and scope of vehicle maintenance; operational practices, such as driver hours and duties, and vehicle control.

Franchise is the right and obligation given to an operator to provide service on a given route. It ranges from free market and minimal regulation, with potential cut-throat competition and low service qualities to controlled competition with advanced regulations requiring adequate funding and competent management. The combination of one regulated operator (usually public owned) competing with unregulated ones (privately owned) usually results in provision of two types of services with different qualities or classes and low reliability and unstable conditions for all operators.

Contracting of paratransit services may be handled through Public-Private Partnerships. Service quality and contract cost should be the main criteria in selecting operators. The contracts would be given out for certain duration, usually three to five years in developed countries, with reviews of performance and renewal subject to satisfaction of the contract with respect to quality of services offered and economic efficiency, with a cancellation clause included. The operator is obliged to perform service and in the case of discontinuance must give a specified notice, usually several months ahead.

3.4 Transit Hub

The key features of the Transit Hub for each of the urban areas of Couva, Gasparillo, St. Mary’s, and Montrose include:

- Convenient and safe access to on-site Park and Ride facilities;

- Pedestrian priority routes are to be provided to ensure that the Transit Hub can be conveniently and safely accessed from adjacent roads or developments, with zebra crossings across the access road. Pedestrian footpaths to be located adjacent to roadways, raised by standard kerb heights. Where a footpath cuts across the roadway, this should be clearly marked (such as a zebra crossing) to warn drivers to give way, and/or supported by a raised kerb;

- Comprehensive transport information boards with:
- Bus network diagram;
- Service schedules with exact departure times;
- Information on fares and tickets (including marketing for pre-pay);
- Maps indicating walking and cycling routes;
- General public transport marketing with strong branding and notifications on new initiatives;

- Kiosks selling pre-paid tickets and convenience items appropriately located;
- Lay-by areas for service regulating and driver facilities
- The express and busiest services will be allocated the bus stop space where passengers will board/alight efficiently
- The less busy services will be required to be allocated the bus stop space to that allows passengers to interchange from, say the Internal Shuttle, to the Express if they require a service
- Shelter should be provided.

3.5 Transit Planning Strategy

3.5.1 Approach

The key approach taken in identifying key issues to be included in the transit planning strategy is set out below:

(a) Identify transport needs of different users and key markets
(b) Identify shortlist of options which may potentially satisfy objectives and needs
(c) Carry out qualitative and quantitative assessment of options
(d) Outline development of recommended options, including integration among different transit measures
(e) Recommend package of coherent transit measures

3.5.2 Demand Forecasting Methodology

The key stages in forecasting the demand for public transport services are as follows:

- Identify peak hour demand based on the number of jobs on site by land use zone in forecast years;
- Estimate commuter home locations based on the distance of towns from the region and the population;
- Identify key movements internally and externally for specifying service routes;
- Adjust demand based on parking availability by forecast year; and
- Determine peak period public transport demand for evaluation of transit solutions.

3.6 A Dedicated School Bus System

Schools are closed for at least 74 days in a year, due to vacation and public holidays. So a typical year consists of about 186 work days. A major drop in traffic congestion is experienced when school is out, like during the Easter, Christmas, and the July and August holidays. That is, for 72 percent of the year we have to cope with the daily frustration of traffic, or for nearly 30 percent of the year there is a significant improvement in rush hour transport demand situation in the country. Any optimal solution to our transportation problem must take account of this phenomenon.

Students are not driving their cars to school, except some who are attending tertiary institutions. The few school vans and vehicles of the stay-at-home moms are of course not in the traffic mix during these periods. So what is the reason for this drastic reduction in traffic? There are perhaps several reasons, including the following: (a) teachers are also on vacation; (b) there is no longer the confusion caused by parents / guardians dropping off / picking up students; and, (c) students are removed from the hustle for public transport.

Many years ago when most of our primary and secondary schools were planned and built, very few persons had vehicles. Many schools in the remote rural areas had the principal’s quarters usually located next door to the school premises. Of these schools still left standing, all of the quarters have since been converted to being part of the school facilities. In those schools that had no quarters, it was usually only the principal and maybe one or two teachers who had a car. In fact it was not uncommon for male teachers to ride a bicycle to school.

But now, almost every teacher has a car and other members of staff as well. Therefore, the parking requirements are very high, and so the traditional space provided for parking in the planning of schools is woefully inadequate. The result is that (1) children’s play areas are compromised, and (2) the surrounding communities are plagued with the aesthetic unpleasantness of parked vehicles on roadways, sidewalks, lawns, etc.; (3) pedestrians are forced to walk on the roadways because of vehicles parked on the sidewalks, creating increased vulnerability with moving vehicles, and (4) there is tremendous “friction” to vehicular traffic cause by double parking.

At every school during the morning drop-off and afternoon pick-up it is almost a nightmare, particularly for the through-traffic who have no business at the school, but are
simply passing by on their journey. It is not uncommon to experience the confusion and traffic delays caused by inconsiderate late-coming parent / guardian who, instead of parking some distance away as space permits, choose to double park or park so as to interrupt the smooth flow of traffic.

And during the school holidays the competition for space aboard unscheduled and unreliable public transport is reduced. The trips for work are therefore more organised and available within more predictable periods.

It would be valuable to have a dedicated school bus transport that is properly planned and administered. It would ensure safe, efficient and reliable transport is available for students. School children would not be subjected to undue influence, duress or social demotivation. They would benefit from educational opportunities through the ready accessibility to public transportation. They would benefit from social, sporting and cultural activities through accessibility to public transport.

The drivers of these school buses would be known by the members of the community and school staff within which they operate. They would know the students and may also function as additional overseers in the development of these children.

Consideration may also be given to developing the concept of alternative work hours in order to facilitate school children, such as (1) Staggered hours: different work groups are assigned to begin at different times (2) Flexi-time: allows employees to choose their own schedules within company-set guidelines (3) Compressed work-week: Four-day work weeks allow employees to complete 40 hours of work in four 10-hour days

In the longer term, plans may be made to create subsidiaries of the prestige school in other areas in order to encourage decentralization. Perhaps a better move may be to create zoning, whereby parents would have to send their children to schools within the zones in which they live.

These ideas do not require that we design our transport system around any particular technology, but around the needs of the customer.

3.7 Transit Management Strategy

It is proposed that a Transit Management Unit (TMU) be set up to control and manage all matters concerning transportation for the Region. As part of its responsibility, TMU would be interested in securing a well-organised transit system that delivers high quality passenger transport services in a safe, cost-effective and environmentally sound manner. The transit system should be:

- Accessible to all members of the Region community
- Affordable, representing good value for money
- Caring, treating passengers with dignity and respect
- Comfortable, improving vehicle standards and ride quality
- Effective, serving a wide range of origins and destinations
- Environmentally sound, progressively reducing the environmental impact of transit services
- Responsive to changing travel needs and patterns of activity
- Safe, ensuring high standards of physical safety
- Secure, providing a travel experience that is not blighted by fear of assault, attack or other anti-social behaviour throughout the journey
- Likely to increase the proportion of people who choose to use public transport to meet their travel needs.

TMU would set high operator performance and maintenance standards and would regulate the operator(s) of the transit system to ensure that services are safe, reliable and comfortable. TMU would register all transit vehicles for the TIP, including any buses, maxi-taxis, taxis, or any other appropriate forms of transit, and regulate the conduct of their drivers.

Transit would be regulated to ensure that: (a) The user's demands in terms of coverage are met; (b) Fares remain affordable; (c) Service is efficient and of a high quality; and, (d) The public has a range of transport choices.

Fares and routes would require the approval of TMU. In addition, transit services would be required to meet standards and specifications set by TMU, which cover route planning and design, service efficiency, operational hours, affordability and service information. Operational audits on the level of compliance with these standards would be carried out periodically.

Transit drivers for the Region would be registered with TMU, and must have a good knowledge of routes and places, and meet requirements on safe driving skills and service standards. They will be required to complete a defensive driving course, periodically.

The general transit demand in the Region would vary during the hours of the day, the day of the week, and even from one month to another. This demand would reflect the transportation needs of the Region community. Appropriate timetables would be set for each transit route to meet the variation in public demand.
4. A Parking Management System

4.1 Introduction

A parking management programme is any plan by which parking space is provided, controlled, regulated, or restricted in any manner. Parking management actions can be categorized into six major categories: on-street parking, off-street parking, fringe and corridor parking, pricing, enforcement and adjudication, and marketing.

In general, for a person to own a car there has to be one parking place at both residence and work. Also, there needs to be additional parking spaces for other purposes, such as shopping, etc. If we apply a standard of 50 sq. m. of land space to accommodate each person who owns a car (used by Washington State Dept of Transportation), we would require at least 1,250 Ha (3,089 Acres) of space in TnT to accommodate only private cars. This excludes parking spaces for trucks, buses, maxi-taxis, and taxis. And this requirement is rapidly growing! The absence of adequate parking management results in increased traffic congestion with motorists searching out parking spaces, and with inconsiderate parkers.

The rate at which traffic flows on a roadway is ultimately dependent upon the ability of the parking facilities (on-street or off-street) to absorb vehicles that are being fed from the roadway system, and includes the availability of parking spaces. There is not enough appreciation of the impacts of parking on traffic congestion; and, that a key to improving traffic flow lies with appropriate off-street parking strategies and enforcement methods. Off-street parking facilities increase the carrying capacity of the transportation system through getting the most out of transportation investments.

Important gains in road capacity may be achieved through improved parking, loading and unloading control and enforcement. Uncontrolled parking, loading and unloading of commercial vehicles reduces the capacity of roads to accommodate moving traffic.

A large number of motorists are already making effective use of readily-available, free, unofficial off-street park-and-ride facilities. All the shopping malls (because they are usually located in suburban centres) are opportunities for motorists to safely park and use easily-accessed PH or taxi shuttle service to the nearby urban centre to get to work or conduct business. A good clue to this activity is the mushrooming development of PH cars and taxi service at these malls.

In fact Mid-Centre Mall in Chaguanas has been operating as an unofficial park-and-ride facility for many years, where motorists from as far south as Couva, would leave their vehicles in the early morning and take the PTSC bus to take up work in POS, then return in the evening to retrieve it. Likewise, it is not uncommon to park at Long Circular Mall in St James and to use a taxi in the stand just outside the mall on Long Circular Road, or simply wave to a passing taxi or PH car, in order to conduct business in POS. Also, Gulf City Mall in La Romaine is an important park-and-ride service for many motorists wishing to access the city of San Fernando.
Clearly the management of these malls would have to put mechanisms in place to remove the encroachment of valuable and limited provision for customers. There is also an important lesson for the Government. Motorists are actually seeking out safe, convenient parking facilities tied to easily accessible transit services. Consideration should therefore be given to entering into public-private partnership arrangements for planning, design and operation of several appropriately prioritised and located suburban parking garages, in conjunction with increased parking restrictions and enforcement of urban centres.

A review of a number of US studies of journey to work by RW Willson and DC Shoup in 1990 concluded that (i) free parking greatly encourages solo driving; (ii) when subsidies are reduced or removed, a significant number of solo drivers switch to car pools or public transport (provided that there were subsidies on the cost of public transport); (iii) between 19 and 81 percent fewer employees drive alone to work when they have to pay for their own parking, leading to an overall drop in the number of cars driven to work between 15 and 38 percent. Another study done by Willson and Shoup in Ottawa showed that when car parking charges were increased for all employees, there was a reduction of 20 percent in the number of employees solo driving, but there was no increase in car pooling as virtually all the trips transferred to public transport.

The time taken in searching for a park (called parking search time) is recognised to be an important issue in several respects, as studied by JW Polak and KW Axhausen in 1990. (i) It can be responsible for a significant proportion of traffic circulating in the city centre areas. Estimates for Central London, for example, range from 10 to 40 percent of the total vehicle kilometres on the road network. (ii) It is time wasting and may deter some drivers from visiting town centres and city centres. They estimated that drivers may spend between 5 and 25 percent of their total journey time looking for a parking space.

Transport statistics in 1995 in Great Britain show that obstruction, waiting and parking offences account for 58 percent of all recorded motor vehicle offences. (Dangerous, careless, or drunken driving offences came in at 5 percent). Illegally parked vehicles represent a hazard to pedestrians and other road users. Also, research by the UK Department of Transport suggested that improved compliance with parking controls over the whole of London could produce economic benefits of between £100m and £200m a year with a 10 percent increase in journey speeds in the central area. Further, illegal parking causes difficulty of access to premises by clients and delivery vehicles of businesses.

In 1967, Parsons Brinckerhoff recommended the introduction of a Parking Authority as part of their National Transportation Study. The authority’s responsibilities would have been to: purchase or lease lands for parking; construct, maintain, and operate public parking facilities; charge fees for parking; conduct engineering and economic studies of potential parking developments. This is worthy of pursuit. In addition, this authority will contract and manage the transit operators for shuttle and long-haul trips.
4.2 Parking Garages

An urban parking garage would normally be used in a central focus parking model. This model provides parking in a large parking reservoir in the activity centre of the city. It provides for both short- and long-term parkers within the core of the city. The key to this type of facility is having good vehicular access, otherwise bringing this large number of vehicles within and out of the centralized parking facility would encourage traffic congestion.

Park-and-ride is a concept where motorists drive to a carparks which are located well away from the urban centre that is, on the fringes, and then travel by public transit to their destinations. Potential parkers are intercepted at the perimeter or further away from the urban centre. If this parking is relatively inexpensive, convenient, and directly connected to a shuttle service from the parking sites into very close proximity to the ultimate destination of the user, the concept would be successful. The location of park-and-ride facilities is critical to their effectiveness. The most effective is nearest the origin of the journey.

The planning for park-and-ride facilities would require agreement of several issues, including (a) availability of location, (b) provision of alternative accommodation when the site has another conflicting activity having a higher priority, (c) site operator parking charge, including provision of adequate security, (d) transit operator charge, (e) park-and-ride user fees, (f) government subsidy (considered here as part of Government’s congestion alleviation support); and, (g) continuing and ample publicity for the system so that the commuter is fully aware of the advantages associated with the service.

4.3 Proposed Locations for Park-and-Ride Facilities

The following are proposed locations for Park-and-Ride facilities in Couva:

- The intersection of Camden Road (Exchange Estate Road) and Couva Main Road
- The intersection of Camden Road and South Main Road, and
- Phoenix Park Road, just east of the Fire Station.

4.4 Parking Administration

It is proposed that accountability and responsibility for the administrative responsibility for parking be vested in a government unit. It would be given the appropriate legislative, organisational and regulatory authority. The framework for the car parking management is set out in Table 6
TABLE 6 ON-SITE PARKING MANAGEMENT STAGES

<table>
<thead>
<tr>
<th>Development Phase</th>
<th>Parking Restriction</th>
<th>Measures</th>
</tr>
</thead>
</table>
| Early stages with limited occupation and no transit service | Low | • Ensure safety and security of vehicles  
• Distribute proposed transit information leaflets to car park users in the build-up to introduction |
| Moderate occupancy and Transit service introduced | Medium | • Parking reserved for two or more occupants  
• Allocation of spaces to businesses for prioritisation  
• Distribute transit information leaflets to car park users  
• Ensure safety and security of vehicles |
| Full occupancy and Transit service in place | High | • Parking reserved for three or more occupants to encourage car sharing  
• Verification by management that user home location does not have suitable public transport alternatives for commuting  
• Ensure safety and security of vehicles |

4.5 Parking Enforcement

The parking authority would include enforcement. For enforcement to be effective, it requires:

- High level of enforcement by dedicated traffic wardens  
- A ticketing system that streamlines the processing of cases  
- Support by the Courts, and  
- Appropriate fines for convictions

Legislative changes will be required to effect the above proposal. For example:

- Amendment to Summary Courts Act, Chapter 4, Section 20, to permit Traffic Wardens to issue summons  
- Amendment to the Motor Vehicle and Road Traffic Act (MVRTA) to treat a ticket as a summons if not paid in 14 days  
- Amendment to MVRTA, Chapter 48:52, to include Traffic Wardens so they can issue tickets  
- Amendments to MVRTA, Section 2, to include Traffic Wardens in the “Definitions.”
In addition to the above, it is proposed that consideration be given to change the basic vehicle licensing system so that registration is based on “plate to owner” as opposed to “plate to vehicle.” This would greatly facilitate ticketing illegally parked vehicles since the parking offense would then be registered against the owner, who is identifiable and responsible, and not the vehicle (that is, the driver), who may be unknown. This would also provide an easier way to track repeat offenders and would allow government to tie the renewal of licenses to the payment of all outstanding fines.

Enforcing parking restrictions helps improve the throughways and circulation of the street system. Illegal on-street parking reduces the capacity of a roadway and creates unnecessary delays and hazards to motorists and, often, pedestrians. Ticketing is one method of enforcement, by simply placing the ticket on the windshield of the vehicle and a specific penalty is indicated, with a specific time periodic to contest the infraction or pay the penalty. Towing illegally parked vehicles on critical road sections is another option in relieving the congestion, and impounding these vehicles in a secured area until the owners pay the required charges.

4.6 Types of Parking Restrictions

**No Parking** – during specific days of the week, or during periods of the day. It permits the temporary stoppage of a vehicle for loading / unloading of passengers or goods. Its purpose is to reduce the impedance of parked vehicles on the safe and efficient flow of traffic.

**No Stopping or Standing** – prohibits any vehicles from stopping at the kerb for any purpose during a specified time. Vehicles standing to pick-up / drop-off passengers are prohibited as well. This restriction requires a high degree of enforcement in order to be effective.

**Time Limited Zones** – permits the use of kerb parking spaces for a specified time limit. Its main purpose is to maximise the use of the individual spaces through turnover. Parking meters can be very useful in these zones.

**Loading and Special Purpose Zones** – are often necessary in urban areas for the temporary loading and unloading of passengers and goods. Rigorous enforcement of these zones will prevent them from becoming “private” parking for store owners, managers, or employees.

5. **Walking and Cycling**

Table 5 sets out the key detailed requirements in providing high quality walking and cycling alternatives to users.
### TABLE 5  WALKING AND CYCLING - DETAILED REQUIREMENTS

<table>
<thead>
<tr>
<th>Mode</th>
<th>Objective</th>
<th>Measures</th>
</tr>
</thead>
</table>
| Cycling    | Promote cycling            | - Provide Region-owned bicycles with bicycle locks and racks at key locations including the Transit Hub, Educational Institutions, and businesses  
- Provide adequate promotion on cycling, with emphasis on a healthy lifestyle, zero emission/environmentally friendly mode, free and quick  
- Distinctive branding of bicycles  
- Provide additional bicycle racks at prominent key locations for private bicycle parking  
- Encourage tenants to provide shower facilities for cyclists  
- Well and regularly maintained estate bicycles to ensure good condition. Free basic maintenance services to private bicycles for tenants |
|            | Ensure safety and security of cyclist | - Dedicated, clearly marked and distinguished and step-free cycle paths adjacent to main roads, preferably alongside pedestrian footpath  
- Cyclists have priority over vehicles at road crossings  
- Well lit and patrolled streets at night  
- Free hire of cyclist helmets on request at Transit Hub |
| Walking    | Promote walking            | - Ensure a clean and well maintained environment along footpaths  
- Priority to pedestrians over vehicles and cyclists at road crossings  
- Crossings clearly marked as zebra crossing at intersections and provide step free crossing, either by dropping the kerb or raising the road at crossing to promote access for mobility impaired  
- Avoid footpaths which are obscured from the main roads  
- Well lit and patrolled streets at night |