Analysis

Of The Energy Sector of Rural Guyana

Project: Rural Electrification

Date: July 2007

GUYANA ENERGY AGENCY

Canadian International Development Agency

olade
Organización Latinoamericana de Energía

UNIVERSITY OF CALGARY

The author of this document is Patrick Ketwaru, consultant.
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Abbreviations

BEAMS -	Basic Education Access and Management Project
CARICOM	Caribbean Community
CDB -	Caribbean Development Bank
CDO -	Community Development Officers
CHP -	Combined Heat and Power
CIDA -	Canadian International Development Agency
CIG -	Conservation International (Guyana)
CPCE -	Cyril Potter College of Education
CREDP-	Caribbean Renewable Energy Development Programme Development
DE -	Decentralized Energy
DFID -	British Department for International Development
ERP -	Economic Recovery Programme
ESRA -	Electricity Sector Reform Act 1999
EU -	European Union
FAO -	The Food and Agriculture Organisation
GBET -	Basic Education Training Project
GDP -	Gross Domestic Product
GEA -	Guyana Energy Agency
GECOM-	Guyana Elections Commission
GNBS -	Guyana National Bureau of Standards
GoG -	Government of Guyana
GPL -	Guyana Power and Light Inc.
GT&T -	Guyana Telephone & Telegraph Inc.
GWh -	Giga-Watt Hour
HDI -	Human Development Index
HIES -	Household Income and Expenditure Survey
HIPC -	Heavily Indebted Poor Country
IAST -	Institute of Science and Technology
IDB -	Inter American Development Bank
IFI -	International Financial Intuitions
IIC -	Iwokrama International Centre for Rainforest Conservation and
IMF -	International Monetary Fund
IPED -	The Institute of Private Enterprise Development
IPP -	Independent power producers
LSMS -	Living Standards Measurement Survey
MDG -	Millennium Development Goal
MOAA -	The Ministry of Amerindian Affairs
MOH -	Ministry of Health
NARI -	National Agricultural Research Institute
NDC -	Neighbourhood Democratic Council
OPM -	Office of the Prime Minister
PAHO -	Pan American Health Organisation
PNC -	Peoples' National Congress

PPP	-	Peoples' Progressive Party
PRCSSP	-	The Poor Rural Communities Support Services Project
PUC	-	Public Utilities Commission Act 1999
R&D	-	Research & Development
RAM	-	Remote Area Medical
REO	-	Regional Executive Officer
SHS	-	Solar Home System
SIMAP	-	Social Impact Amelioration Programme
STD	-	Sexually Transmitted Disease
TH&D	-	Transport and Harbours Department
UG	-	University of Guyana
UNDP	-	United Nations Development Program
UNDP	-	United Nations Development Programme
WWF	-	World Wildlife Fund

Executive Summary

This report titled "Analysis of the Energy Sector of Rural Guyana" was prepared as part of a "Rural Energy Project" that is being implemented in Guyana by the Latin American Energy Organization (OLADE) with assistance of the University of Calgary and with in-country oversight by The Guyana Energy Agency. The scope of the report is to prepare a review of the poverty situation of the country especially the rural areas, energy utilization and access, projected expansion plans, indigenous community participation, women's role, proximity to energy sources, current development plans, supporting social infrastructure as the key areas of interest .

The Co-operative Republic of Guyana or Guyana, is the only English speaking South American country is found on the northern coast of South America its size is 214,999 square kilometers. Its neighbors are Suriname, Venezuela and Brazil. Geographically Guyana has four geographically distinct land forms; the narrow clayey coastal belt which is approximately 1.4 metres below seal level at high tide, the sand and clay belt which consists forested hills and a grassland region, a central peneplain that is over half of the country's land mass and the rocky highlands found in the mid-western section of the country. The rivers are not navigable to large oceangoing freighters and also inland due to rapids and waterfalls. The coastal plain has rich clay soils used mainly for agriculture. It has a population of 750,000 most inhabit the coastal belt where the majority of the economic activities occur. Culturally Guyana is West Indian, with strong ties with UK, Canada and USA. It is part of Caribbean Community (CARICOM).

Gold and diamonds are mined in the hinterland regions, bauxite is mined in the sand belt along the Demerara and Berbice Rivers, some forestry-based activities are carried on the forests found on the peneplain and the sandy belt. The economy is based on exportation of sugar, rice, fish, shrimp, timber, gold, diamonds, bauxite and fruits and vegetables.

Guyana, a democracy is subdivided into ten administrative regions. The President and the Parliamentarians are elected at national elections. Region Four where the capital is, has the highest population density. Most rural settlements are along roads or river banks. The coastal rural communities are predominantly farming communities. The interior is very sparsely populated; Regions 1, 7, 8 and 9 have approximately 4.9% of the population.

The Hinterland Rural communities found on the peneplain can be easily accessed easily via roads and rivers. The Remote Hinterland Rural communities are cut off from easy road or river access, they are found mainly on the western highland and deep south. Guyana's population consists of Africans, Portuguese, Indians Chinese Europeans and Amerindians. The Africans and Indians are the bulk of the population and inhabit mainly the coastal regions; the Amerindians inhabit the hinterland regions where they constitute two thirds or more of the population. The Ministry of Amerindian Affairs is responsible for Amerindian social and economic development. Amerindian advocacy groups act as watch dogs for Amerindian interest.

The service sector in 2006 contributed 45.7% to GDP, agriculture and mining combined provided approximately 44.3%. Agriculture and mining are the major employers in the rural areas. Guyana's two major ethnic groups are Afro Guyanese and Indo Guyanese.

Ethnic insecurity deters national development; steps to modify the laws of governance to ensure equity for all Guyanese are in train. Guyana is a medium income country with a Human Development Index (HDI) of 0.725, per capita GDP is UD$918. It has already achieved two MDGs, universal primary education and the reduction of children under five suffering from hunger. The hinterland has the highest level of poverty; Amerindians are the poorest group. Coastal rural communities' standard of living is similar to the urban centers. Rural hinterland communities have greater levels of health problems. The major illnesses are malaria and some HIV/AIDS and other STDs

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Amerindian women are taking leadership roles within their communities. A number of women were elected village captains. Programmes funded by both government and NGOs are geared to empower Amerindian women. Many Amerindian girls become sexually active at young ages, the resulting early pregnancies hinder development. Amerindian experiences a high rate of cervical cancer.

Guyana is subdivided into ten administrative regions. The regional bodies are the means of implementation of the administrative policies and control. The Regional Democratic Councils (RDC) are elected every five years at general elections, the Councils elect a Chairman and a Deputy Chairman. Elected members are responsible for the routine administration of the Region. The administrative head of the region is the Regional Executive Officer (REO). The Councilors in the NDCs are elected at National Local Government Elections every three years. Amerindian villages are governed by a Village Council comprising of the Village Captain and Councillors who are all elected.

Potable water, electricity, telephone, health, education and social services are very readily accessible to most of the coastal residents. The near hinterland residents have reduced access especially to electricity, health and social service. The hinterland and remote hinterland communities have much less access to these services. Since Amerindian communities are randomly arranged it is difficult of distribute utilities to individual dwellings. Some hinterland communities get limited electricity via solar systems.

Guyana's developmental plans are contained in two comprehensive strategy documents; the National Development Strategy (NDS) and the Poverty Reduction Strategy Paper (PRSP). Both of these documents were prepared after extensive stakeholder participation. The NDS sets out priorities for Guyana's economic and social development for the ten year period 2001 to 2010, while the PRSP gives support in poverty alleviation over the period to 2015. These strategies require substantial financial support and the government has been able to garner a great amount of donor support in addition to NGO support.

The energy sector comes under the purview of the Office of the Prime Minister (OPM). This office regulates and determines the direction of the energy sector. Most of the funding for the electricity sector is channeled through the OPM. The laws that directly

influence the energy sector are; Electricity Sector Reform Act 1999 (ESRA), Guyana Energy Agency Act 1997 (GEA), Public Utilities Commission Act 1999 (PUC), Hydro-Electric Power Act 1956, Energy Sector (Harmonisation of Laws) Act 2002, Environmental Protection Act 1996, Petroleum (Exploration and Production) Act 1986, Guyana Forestry Commission Act 1979.

The national energy policy is towards self sufficiency in energy, it is believed that Guyana has petroleum reserves; however, the drive is towards the utilization of renewable sources for domestic consumption and exportation of the petroleum products whenever it is found in commercial quantities. The institutions that support the energy sector are government or international donors such as UNDP and IDB.

To extend the national grid the government developed the Unserved Areas Electricity Programme (UAEP). The UAEP was developed by the OPM, GPL and IDB, and is being funded by the IDB and GOG to a value of UD$34.4M. The project is being implemented over a five year period from 2004 to 2009. Since the UAEP was focused on the GPL grid GOG developed the Hinterland Electrification Strategy and IDB was approached for funding. This Hinterland Electrification Strategy details the rational behind the strategy, the communities to benefit and the type of electrification system to be implemented. It also detailed cost and cost analyses, cost recovery systems, operation and management of the systems, etc. This document is the blueprint for the hinterland electrification over the next 3 years. Cabinet decided that the funds earmarked for the projects should be used to establish some reasonable minimum amount of electrification in more hinterland communities than those chosen.

Many barriers to utilisation of energy in rural communities are due to the nature of rural geography and population density. The barriers found on the coastal regions are less difficult to overcome since the communities are close to the coastal grid of GPL. The hinterland regions are much more challenging due to the distance from the coastal services and the ruggedness of the terrain. In the remote communities access and small much dispersed population are the major challenges to utilization of electricity.

Guyana's topography and its geographic location with a large part of the country being covered with tropical rainforest give Guyana many natural advantages with respect to the availability of renewable sources. The locally available renewable sources are wind, solar, biomass and hydropower. Solar energy is the most widely utilized source of renewable energy in Guyana. It is used both for heat (drying & heating) and electricity in many communities. It is the best option for electricity in the remote communities. Wind, hydropower and biomass are still to be effectively harnessed. Plans are in various stages of implementation for the utilization of these locally available renewable energy sources.

1. A General Framework of Guyana and Its Rural Regions

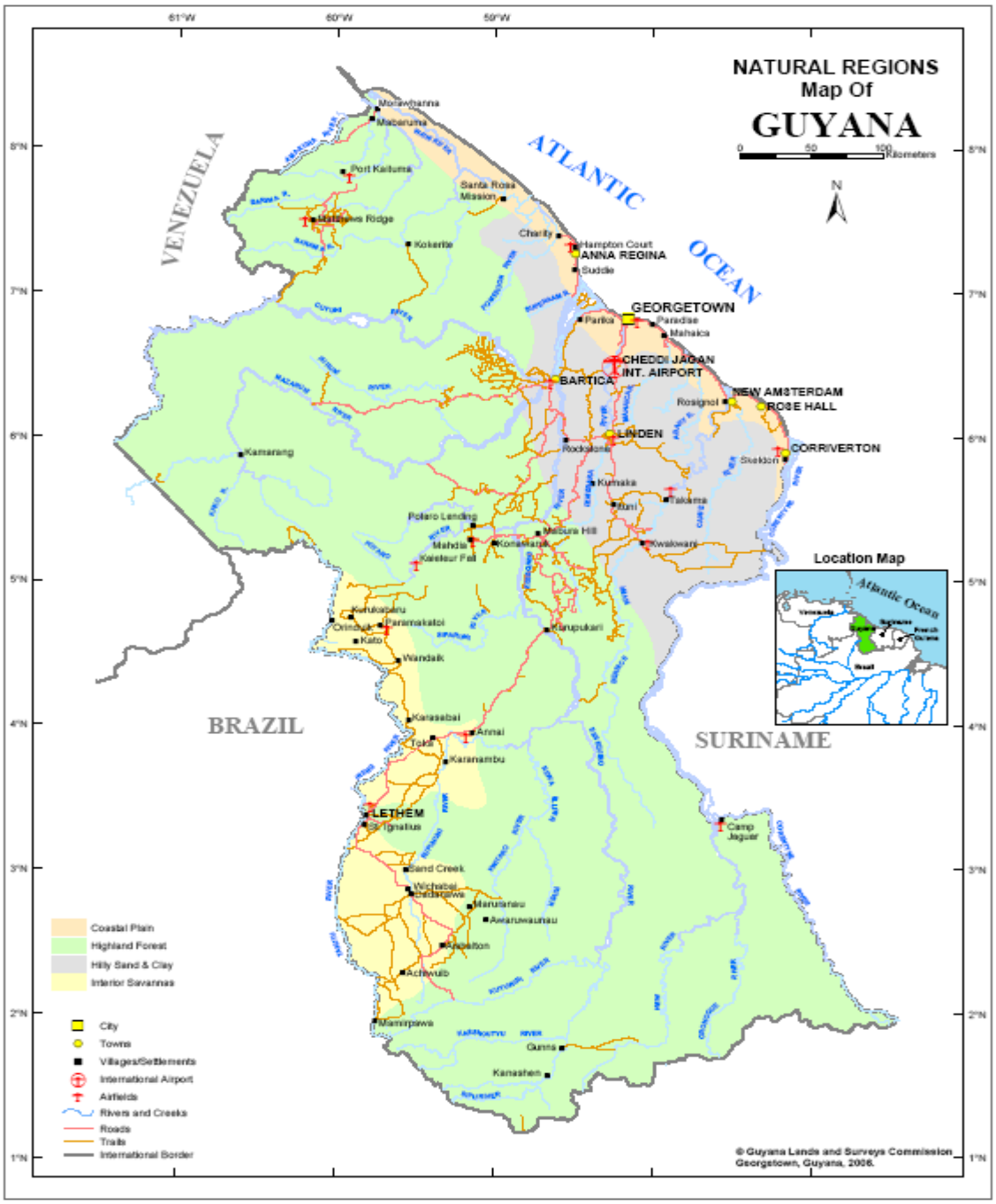
1.1 *Guyana – An Overview*

The Co-operative Republic of Guyana or Guyana, which is the commonly used name for this English speaking South American country, is found on the northern coast of South America, it is located Between 1^o & 9^o North Latitude and 57^o & 61^o West Longitude Its size is 214,999 square kilometers approximately the same as Idaho. Its neighbors are Suriname on the East, Venezuela on the west and Brazil on the south and the west. Guyana can be divided into four geographically distinct land forms. The coastal belt (or Coastal Plain), which is predominately clay, varying in width from about 8 to 65 km is approximately 1.4 metres below seal level at high tide. This coastal belt is protected from the sea by a series of earthen or boulder dams and concrete dikes. South of this belt is the sand and clay belt which consists of rolling forested hills and includes a grassland region called the Intermediate Savannahs. Beyond the coastal plain is a central peneplain that encompasses over half of the country's land mass. This clayey undulating region stretches right to the southern and western borders and includes another large stretch of grassland called the Rupununi Savannahs. The fourth region is a massive outcrop of rocky highlands found in the mid-western section of the country. This region reaches its maximum elevation at Mount Roraima which is 2,875 meters high. As a result of the ruggedness of this highland most rivers here have rapids and waterfalls, the most spectacular being Kaieteur Falls with a single drop of 226 meter, on the Potaro River. This is considered the highest single-drop waterfall in the world. With the exception of the coastal belt, all of the other regions are sparsely populated and is predominately untouched by man's activities. Theses regions consist of mainly of lush tropical forests with significant levels of biodiversity and minerals.

Guyana's landscape is carved up by numerous rivers, streams, lakes and swamps. Actually the name Guyana has its origin in the Amerindian language and means "land of many waters". On the coastal belt numerous man made drainage and irrigation canals can be found along with a few large water conservancies. A number of the rivers and streams meet the Atlantic Ocean the four major ones being the Essequibo, Demerara,

Berbice and Corentyne which is the border with Suriname and is considered as Surinamese territory.

Figure 1: Natural Regions of Guyana



Unfortunately none of these rivers is very navigable to large oceangoing freighters due to sand bars in the estuaries and lower reaches and rapids and waterfalls beyond. Guyana has significant natural resources, the coastal waters are very abundant fishing and shrimping grounds. The coastal plain has very rich clay soils that are used mainly for agriculture. Most of the population, approximately three quarters of a million (751,223 at the 2002 census), can be found on this narrow coastal belt. The majority of all the major economic activities are found here. A rather large number of small miners mine for gold and diamond in the hinterland regions with a few larger scale mine being operated. Bauxite is found in the sand belt and mining is done on a relatively large scale at sites along the Demerara and Berbice rivers. Also, some amounts of forestry-based activities are being carried out utilizing the forests found on the peneplain and the sandy belt.

Currently, Guyana is considered one of the poorest nations in the western hemisphere even though Guyana's available natural resources are considered significant. It is agreed that these need to be harnessed to promote economic growth and the concomitant human development that is desired. The Guyanese economy is mainly based on the export of primary products, sugar, rice, fish, shrimp, timber, gold, diamonds, bauxite and other agricultural crops such as fruits and vegetables. For there to be growth in the economy, it is recognized that[1] there has to be a rapid diversification of the economy with a very strong bias towards more value-added production and services.

Culturally Guyana is West Indian, with strong cultural ties with UK, Canada and USA. It has a very large expatriate population in these countries. It is one a member of the Caribbean Community (CARICOM) being a former British colony it is a member of the British Commonwealth. With its fellow CARICOM neighbours it is part of the Caribbean Basin Initiative (CBI). Guyana is also involved in a number of other international organisations and is currently building very strong ties with its South American neighbours especially Brazil.

[1] National Development Strategy

1.2 *Political Organisation*

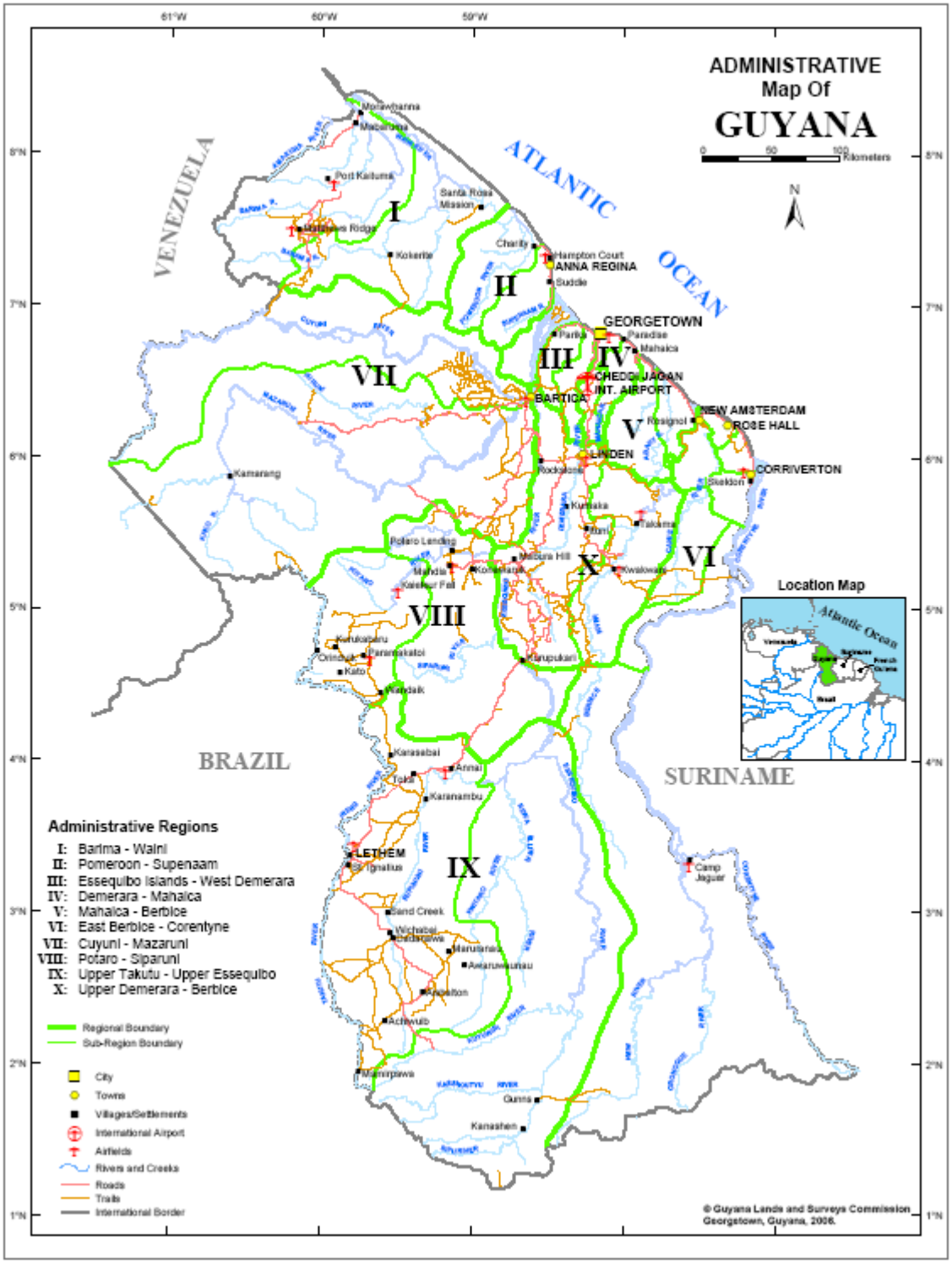
The Central Government is based on three supreme organs of democratic power, the Parliament, the President and the Cabinet. The Members of Parliament and President are elected at national elections which are constitutionally due every five years. The Cabinet consists of the President, Prime Minister and Ministers who are appointed by the President.

Guyana has a political administrative system that is based on the subdivision of the country into ten regions. Historically before the regional system was introduced in 1980 Guyana was subdivided into three counties called Essequibo, Berbice and Demerara. These names and the counties are still used in describing the location of places throughout Guyana.

The current system of governance is controlled by the Local Democratic Organs Act (Chap. 28:09 of the Laws of Guyana). The country is divided into ten (10) administrative regions headed by a Chairman. The members of the governing Regional Democratic Council are elected at regional elections. The regional government has representatives in the Parliament; the number of representatives is loosely related to the population of each region. According to the Local Government Act (Cap.28.02, Sect. 19) any area outside the boundaries of a town or city is considered rural

The Law provides for the subdivision of each region into various levels to allow representation and organization to very basic units of the population; sub regions, districts, communities, neighbourhoods and people's co-operatives. However in most instances this subdivision only involves the Neighbourhood Democratic Council (NDC) These play the role of the local authority (equivalent to the village or district councils) and would usually encompass a few contiguous villages. As such it is the regional administration and the NDCs that are usually tasked with most aspects of rural development. The Regional Administration comes under the ambit of the Ministry of Local Government. This ministry coordinates with all other subject ministries to implement any projects.

Figure 2: Administrative Regions of Guyana



1.3 *Demographic Data*

1.3.1 Overall National and Rural Population Overview

The general pattern of the population distribution of the country has not changed significantly over the years, as with most countries there is the usual trend of rural to urban migration. This trend has led to some increases in the urban populations of the towns, with the capital city, Georgetown being the most affected. Four of the ten regions, (Regions 2, 4, 6and 10) have urban centers. According to the 2002 census these urban areas including the capital city Georgetown is home to some 213,705 persons or 28.4% of the population. Most of the remaining 71.6% (537,518 persons) can be found on a narrow belt along the coast, mainly in the stretch of coastland from the village called Charity on the Pomeroon River east to the Corentyne River.

The smallest region, Region Four, where Georgetown is located has the highest population density of 139 persons per sq km. However this population density figure is rather deceptive since Georgetown and its suburbs were occupied by some 64,500 persons at the 2002 census. Since large tracts of land in Region Four are unoccupied it is very likely that the actual population density of Georgetown is well above this average figure.

This pattern of very high population densities in relatively small areas is common to all of the regions of Guyana. As a result, with the exception of the land along the coastal roads, communities tend to be isolated form each other by vast tracts of uninhabited land.

Only one urban centre, the town of Linden is not on the coast and is found in Region 10 approximately 100 km from Georgetown. Linden is a bauxite mining town on the Demerara River and has now become one of the main gateways to the hinterland.

Table 1: Regional Population Distribution

Region	Name	Area sq km	Population	Population Density (pop/sq km)
Region 1	Barima/Waini	20,339	24,275	1.2
Region 2	Pomeroon/Supenam	6,195	49,253	8.0
Region 3	Essequibo Islands/ West Demerara	3,755	10,3061	27.5
Region 4	Demerara/Mahaica	2,232	310,320	139.0
Region 5	Mahaica/Berbice	4,190	52,428	12.5
Region 6	East Berbice/Corentyne	36,234	123,695	3.4
Region 7	Cuyuni /Mazaruni	47,213	17,597	0.4
Region 8	Potaro/Siparuni	20,051	10,095	0.5
Region 9	Upper Takatu/Upper Essequibo	57,750	19,387	0.3
Region 10	Upper Demerara/ Berbice	17,040	41,112	2.4
Total		214,999	751,223	3.5

Source: Bureau of Statistics 2002 Census

Most of the rural settlements can be found along roads or on the banks of rivers. The traditional coastal rural communities tend to be predominantly farming communities. Due to the presence of the sugar industry and other nearby economic activities a number of new, relatively low cost, residential communities (called Housing Schemes) have been recently (after the1992 change of government) developed by the government to facilitate home ownership by the low and middle income earners. The potential home owners are sold the house lots at costs below the market cost and are required to build their homes. These Housing Schemes are usually within easy commuting distance to one of the urban centers, as such, a large number of coastal rural residents would have jobs in the urban centers. Since 1992 some 70,000 house lots have been allocated to mainly low income citizens.

As stated earlier, most of Guyana's population is found in coastal urban and rural communities. As a result the interior is very sparsely populated, for example, Regions 1, 7, 8 and 9 consist of approximately two thirds of Guyana's land mass but have approximately 4.9% of the population. Using the 2002 Census reports it is possible to get a fairly good approximation of how much of the population lives in non coastal rural communities, this figure is approximately 51,000 persons or 6.8%. This very low population density and, in many instances, extreme isolation of these rural hinterland communities present some very unique problems with respect to administration and development.

Guyana's geography plays a very critical role in the access to and therefore the ultimate development of the rural communities. Rural communities may be subdivided into four broad sets based on the ease of access. There are the Coastal Rural communities which are found in very close proximity of the urban centers. These have very easy access to urban facilities. Next, the Near Coastal Rural communities which are those that are found along rivers in the hilly sand belt which allow easy access to these communities from the coast either via river or trails. The Hinterland Rural communities are those that are found on the peneplain and can be accessed fairly easily via hinterland roads and rivers. Finally are the Remote (or isolated) Hinterland Rural communities these are those communities that are cut off from road or easy river access and are found mainly on the western highland outcrop and in the deep south and are only accessible by aircraft, foot trails or by rivers which require numerous portages at rapids or waterfalls.

It should be noted that the growth in the Guyanese population is rather small, 3.8% from the1980 census value. The survival ratios is also rather small with the largest being 0.6 for the 22-26 years age group at the 2002 census. This survival ratio is not supported by the mortality rate, so it is very probable that this high attrition is due to the ongoing migration.

Guyana has very high migration rates to North America and the English speaking Caribbean. Extensive migration occurred during the eighties as Guyana experienced a period of totalitarian rule while the government of that era experimented with socialism and one party state control. These experiments led to economic and social collapse.

It was only after democratic rule was restored in late 1992 that some confidence in the local economy started to return. However many persons are still not happy with the rate of economic growth and migrate to countries that are economically and socially stronger than Guyana. Additionally, since many persons have a very large portion of their immediate family abroad there is now the family pull factor that compounds the migration issue.

There is no significant difference in the proportion of the sexes in the overall population, 50.1% females to 49.9%. In the urban communities females slightly outnumber males, 51.7 % females to 48.3% males. The situation is reversed in the rural areas, 49.2% females to 50.8% males.

Guyana has a much checkered history being a colony that had been controlled or influenced by the French, Dutch and British. The Dutch and the British had the greatest impact on the colony. During its colonial period Africans, mainly from West Africa, were brought as slaves to work on the plantations. After slavery was abolished, Portuguese from the Madeira Islands, Indians from India and Chinese from southern China were bought at various periods as indentured servants to replace the Africans slave on the plantations. These various races along with the Europeans and the indigenous Amerindians have left Guyana as a multi racial and multicultural society. The largest groups are the Indians (sometimes referred to as East Indians) 43.5% of the population and the Africans (also called Blacks) 30.2%. The Amerindians are the third largest racial group with 9.1%.

Since the races have been coexisting for so many years there have been a fair amount of intermarriages. However since each race has distinct cultural norms and values the degree of intermarriage is still relatively low. Persons still identify with their racial stock and this is captured in the census data. While there are local terms for the offspring of mixed unions there is no official name given to persons of mixed origin based on racial origins, they are all referred as persons of mixed race or Mixed. It is important to note that while there are issues of racial discrimination (and the perception of inequality) especially between the Indians and Africans, except for politically motivated racial violence, usually at elections, there is no genuinely strong animosity between the various races.

Table 2: Ethnic Distribution Within Each Region

Background/ Ethnicity	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10	Total Guyana
African/Black	2.3	13.4	21.2	41.7	32.5	21.1	11.6	7.0	1.2	55.0	30.2
Amerindian	62.2	16.3	2.0	1.7	2.0	1.6	41.7	75.9	89.2	7.1	9.1
Chinese	0.0	0.1	.02	.03	0.1	0.2	0.0	0.0	0.0	0.2	0.2
East Indian	1.4	47.9	65.5	37.5	57.8	68.7	8.9	2.2	0.5	3.1	43.5
Mixed	33.9	22.1	11.0	18.4	7.6	8.4	37.6	13.9	8.9	34.5	16.7
Portuguese	0.1	0.2	0.1	0.3	0.0	0.0	0.1	0.9	0.1	0.1	0.2
White	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Total	100	100	100	100	100	100	100	100	100	100	100

Bureau of Statistics 2002 Census

As a result of social and other cultural issues, each race has gravitated to geographical areas that tend to reflect cultural preferences. The Africans are found more in the urban centers, the Indians while they have a high presence in the urban areas are also found in the coastal agricultural belt, mainly in the sugar and rice industry and as independent cash crop farmers. The Amerindians are found mainly in the hinterland regions, on their ancestral lands or in the gold mining and forestry sectors. These preferences have resulted in levels of inequalities which sometimes adversely affect the economic development of the various races.

Table 3: Regional Distribution of each Ethnic Group

Background/ Ethnicity	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10	Total Guyana
African/Black	0.2	2.9	9.6	57.0	7.5	11.5	0.9	0.3	0.1	10.0	100
Amerindian	22.0	11.7	3.0	7.6	1.5	2.9	10.7	11.2	25.2	4.3	100
Chinese	0.5	3.3	12.1	58.8	4.1	15.6	0.4	0.2	0.5	4.6	100
East Indian	0.1	7.2	20.7	35.7	9.3	26.0	0.5	0.1	0.0	0.4	100
Mixed	6.5	8.6	9.0	45.4	3.2	8.2	5.3	1.1	1.4	11.3	100
Portuguese	1.3	7.0	4.6	70.8	0.1	4.1	1.6	6.3	1.1	3.2	100
White	4.5	4.1	7.5	61.8	0.0	11.3	1.8	1.1	3.6	4.5	100
Other	1.9	0.0	1.8	79.5	0.0	1.8	1.9	0.0	1.8	11.3	100
Total	3.2	6.6	13.7	41.3	7.0	16.5	2.3	1.3	2.6	5.5	100

Source: Bureau of Statistics 2002 Census

1.3.2 Indigenous Population

Members of the indigenous population of Guyana are called Amerindians, which is the official name of all indigenous persons of Guyana, regardless of their individual tribal grouping. Amerindians are the fourth largest ethnic grouping in Guyana at some 9.1% of the national population. Strictly speaking they should be considered as the third, since the mixed ethnicity group is not of homogenous ethnicity. Amerindians are the fastest growing ethnic group in the country, 46,722 at the 1991 census and 68,819 at the 2002 census, approximately 47.3% increase. Their population as a percent of the national population has also increased. It was 5.3% of the national population in 1980, 6.5 in 1991 and 9.1 in 2002[2].

The Amerindians occupy mainly the hinterland regions which are, in most instances, their ancestral lands. They are found in all regions of Guyana but are more prominent in Regions 1, 7, 8 and 9. In three of the regions (Regions 1, 8 & 9) they constitute two thirds or more of the population. There are four (4) main tribes in Guyana, the Warraus, Arawaks, Caribs and Wappisianas. The Carib group has five related sub-tribes, the Arecunas, Akwawaios, Patamonas, Macusis and Wai-Wai[3].

[2] Bureau of Statistics, *Population & Housing Census 2002 - Final Summary Results*, Oct. 12, 2005
[3] M.N. Menezes (RSM), *Amerindians and Europeans*, Red Thread Women's Press, 1993

Table 4: Amerindian Population Distribution

Region	Percent of Amerindian Population	Percent of Region's Population	Number of Recognized Villages	Villages with Demarcated Boundaries
Region 1	22.0	62.2	20	16 (2 in Progress)
Region 2	11.7	16.3	9	9
Region 3	3.0	2.0	1	1
Region 4	7.6	1.7	1	1
Region 5	1.5	2.0	1	1
Region 6	2.9	1.6	1	1
Region 7	10.7	41.7	12	0
Region 8	11.2	75.9	14	0 (10 In Progress)
Region 9	25.2	89.2	24	16 (1 In Progress)
Region 10	4.3	7.1	10	6
Overall Guyana	100	9.2	89	51 Demarcated
				13 In Progress

Source: Ministry of Amerindian Affairs (Jan. 2007)

Amerindian rights are legally protected in Guyana by The Amerindian Act (Act No.6 of 2006). This Act replaces the old Amerindian Act which was very outdated and discriminatory. The new legislation deals with all aspects of community governance control of village lands and how the villages will interact with external national institutions, groups and individuals both Amerindian and non Amerindian. The Act reinforces the constitutional rights of the Amerindian to self determination and self administration. It also recognized the unique cultural requirements of the indigenous village lifestyle of the Amerindian.

A major bone of contention between Amerindian leaders, their lobbyist and central government was the issue of community lands. Many Amerindians villages felt that the land allocated to them was insufficient to support their lifestyle and did not reflect their ancestral claim to the lands. When the current Peoples' Progressive Party/Civic (PPP/C) government regained the leadership of Guyana in 1992 they immediately implemented policies to improve the well being of the Amerindian population. One key move was the formation of a Ministry of Amerindian Affairs with direct responsibility for Amerindian development. This ministry focuses on all aspects of Amerindian development with a strong bias towards achieving social and economic equity for Amerindians.

To date there is an ongoing policy to ensure that all Amerindian communities have legal title to their ancestral lands. The government has embarked on a process of formally demarcating the boundaries of all communities. To date some fifty one (51) communities have been demarcated and these boundary lines accepted by the communities. Should the community dispute this demarcated boundary they can request additional lands on the

condition that they provide evidence that the land being requested is part of ancestral lands or that due to growth the community requires additional lands.

1.3.3 Amerindian Advocacy

There are currently three NGOs which are considered as spokespersons for the Amerindian population. The groups are the Amerindian Peoples Association (APA), The Guyana Organisation of Indigenous Peoples (GOIP) and The Amerindian Action Movement of Guyana (TAAMOG). All there groups claim to have the largest following of the Amerindian peoples. However in reality their support is relatively small since most Amerindians are not inclined to be hard-line supports of any organisation even national political parties. The fact that Amerindians tend to have mixed alliances including political, is reflected in the voting patterns in the predominantly Amerindian regions.

However the Amerindian advocacy groups play an important role as watch dogs for the Amerindian interest. Of the three groups the APA appears to be more organized and vibrant. The GOIP sometimes finds it self in some difficult situations and accused of being partial to the PNC because one of its leading personalities is closely affiliated to the PNC. TAAMOG position is sometimes questioned by the public since the group has only a few persons in the public. As result, there are questions about the level of support that TAAMOG has amongst the Amerindians.

1.3.4 Economic and Social Factors

Guyana experienced very harsh economic hardship during the eighties due to the failed economic policies of the then government. Real GDP growth contract sharply during the period 1982 to 1984and remained stagnant through to 1987. During this period the per capita income dropped from US$600 to US$350, making Guyana one of the poorest nations in the Western Hemisphere.

At this time the IMF had declared Guyana ineligible for further loans and credit. This led to a cessation of credit from the International Financial Intuitions (IFI). This extreme state of poverty forced the Government to make an about turn in economic policy and adopt an IMF funded recovery programme called the Economic Recovery Programme (ERP) in 1989. An indication of the rapid decline in the local economy can be seen in the exchange rates for the Guyana dollar. The value of US$1 was G$ 4.37 in 1986 and became G$125 in 1991 around which time the currency started to stabilize. At the beginning of the ERP government controlled over 80 % of imports and exports and some 85% of all investments. Even though the ERP was supposed to stabilize and improve the economy, there was still continuous contraction in the economy and by 1991 inflation was over 100%.

The ERP required very harsh economic measures, these included currency devaluation, with resultant price increases, the imposition of a wages increase ceiling, an increase in

the prime lending rate from 14% to 35% and removal of price controls. These stringent requirements led to major dislocation and hardship at all levels of society.

At the end of 1991 Guyana external debt was some US$2.1B with debt service payments being approximately 105% of current revenue. Due to this high debt burden Guyana was classified as a Heavily Indebted Poor Country (HIPC), it is part of the Enhanced HIPC initiative. In 1992 there were general elections which saw a change in the ruling party. The new government aggressively addressed the economic and social issues with the help of the major multi lateral financial intuitions, IDB, World Bank and IMF. Significant bilateral assistance was also accessed from EU, UK, Canada, Japan, China and USA.

Guyana's aggressive approach to debt write off/forgiveness has resulted in Guyana's debt burden being reduced to very sustainable and manageable. In 2005 the IMF announced that it would grant 100% debt relief to through the MDRI, Guyana was one of the countries benefiting from this. IMF and IDB are Guyana's largest creditors. As recent as July 13, 2007 Guyana's debt was at US$673M[4] due to the recent write offs by IDB and the Chinese Government. As a result Guyana's debt is now approximately 35% of its GDP and the annual debt service will be below US$30M per annum. It is believed that these recent events would have removed Guyana from it "heavily indebted" status.

As a result of the poor economic performance during the late 80s and early 90s the population experienced very extreme hardships. The rapid devaluation of the currency decimated savings and the middle class suddenly found itself in poverty. This led to public servants, teachers, nurses, police and other service oriented professionals being unable to maintain their standard of living. This led to severe social dislocation.

While this impoverishment of the middle class was taking place a new economic group was emerging. This was made up of the huskers, traders, black marketers, money changers, etc. All of these activities were either illegal or bordered on the illegal or supported concomitant illegal activities such as bribery and other forms of corruption. Since these persons were now wielding economic power, they quickly became the role models for the young children. Guyana is still suffering the effects of this role reversal in which the time honored professions were relegated to undesirable since they were not economically viable.

Another serious problem that the country is facing is that of tax evasion. Currently it is believed that a very large part of the private sector entities and professionals are evading taxes. As such it is the salaried workers who pay the largest amount of income tax, approximately 33% of all earnings above G$25,000 per month. The public service minimum wage for 2007 is G$26,070 per month. In an attempt to widen the tax net the government has introduced a Value Added Tax (VAT) from January 1, 2007. This VAT replaces a number of not so visible taxes.

The service sector is the major contributor to Guyana's GDP; in 2006 its contribution to the GDP was 45.7%. This figure has been slowly increasing over the years. However,

[4]Ministry of Finance- Debt Management Division

although the service sector makes such a large contribution, Guyana's economy is heavily dependent on agriculture and mining. These sectors are the key foreign exchange earners for the economy. Sugar especially has been the single largest individual contributor with approximately 14% of the total GDP[5]. Agriculture and mining combined are also the major contributors being responsible for approximately 44.3% of the GDP in 2006.

Agriculture and mining are the major employers of labour especially in the rural areas. Of the total labour force of 232,409, 48% of the population, at the 2002 census these sectors employed approximately 75,000 persons. The Sugar Industry is employs approximately 18,500 persons directly and is responsible for indirect employment of approximately 100,000 persons[6].

The social implications of the country's economic and political fortunes for the people of Guyana are manifold. Guyana has two major ethnic groupings, the descendants of the African slaves (called Blacks, Negroes or Afro Guyanese) and the Indian indentured servants (called East Indians or Indo Guyanese). Due to historical situations the two races have been pitted against each other in the colonial past in the classic divide and rule scenario of the colonial masters.

This ethnic insecurity has been the major deterrent to all aspects of national development. While all the political parties have recognized these ethnic issues as the major stumbling block to development, historically no serious attempt was made to address this problem. It was only on the run up to the 1992 national elections that there was any serious attempt to address these issues at the constitutional level. Since then there have been a very concerted attempt to modify the legal framework of national governance to ensure equity for all Guyanese regardless of ethnicity, gender and political affiliation. This process was encouraged and to a great extent driven by the former president Jimmy Carter via his Carter Center which played a very major role in returning Guyana to the path of democratic governance. This constitutional reform process is an ongoing process, to this end a Constitutional Reform Committee which has broad national representation has been empowered to review and modify the constitution as is deemed necessary.

This competition for national resources and administrative favours has been preserved to a great extent. This insecurity is especially exploited by the two major political parties, Peoples' Progressive Party (PPP) and Peoples' National Congress (PNC). This undercurrent of racial distrust is exploited to garner votes at elections. As such Guyana has cycles of racial tension and in some instances even violence. This cycle of racial tensions results in periods of reduced economic development. This economic down turn due to election related tensions was very pronounced immediately after the 1997 general elections. There was a three year period of almost continuous protest by the opposition PNC. This led to the intervention by CARICOM and early elections. The PPP once again won the elections.

[5] Bureau of Statistics, National Accounts & Prices – Table 5.2 , *Statistical Bulletin* Vol.15, No. 1, 2007
[6] Guysuco Dept of Communication, June 2007

It has been found that most Indo Guyanese tend to vote for the PPP and the Afro Guyanese vote for the PNC. Due to the numerical majority of the Indo Guyanese within the country's population the PPP appears to have a built-in advantage at elections. This issue is one of the main causes of concern by the PNC which has its power base in the Black community and as such feels that unless there is some dramatic change in the voting pattern the PNC is doomed to remain out of government. This issue is one of the main areas being addressed by constitutional reform. There are legislation passed in parliament and being developed to ensure that every Guyanese gets an equitable share of the national pie.

As a result of these legislative developments and a surprising level of political maturity exhibited by the competing parties the last general elections held in August 2006 was very peaceful and there was no social and economic disruptions after the polls.

1.4 *Demographic Characteristics of Poverty*

1.4.1 Background of Poverty

There have not been any recent studies to determine the levels of poverty in Guyana. The most recent surveys done were in 1993 by the GoG with assistance from UNDP and World Bank using a head count HIES/LSMS surveys. This revealed that of the population lived below the poverty line and 29% lived in extreme poverty. A Living Conditions Survey done in 1999 indicated that poverty had been reduced to 35% living under the poverty line and 19% living under extreme poverty. The poverty line at 1999, stood at G$251 per day (or around US$1.40) while the extreme line poverty was G$180 per day (around US$1.00). (Ref World Bank) Using the GDP as an indicator for the improvement of living conditions it can be seen that there has been a steady drop in the poverty levels over the years.

Guyana is now considered a medium income country with a Human Development Index (HDI) of 0.725 at 2004 as reported in the UNDP Human Development Report 2006. This ranks Guyana at 103 and places Guyana in the Medium Human development category. The per capita GDP is UD$918 at 2006[7] with a gross disposable income of US$1032. Guyana has already achieved two MDGs, the achievement of universal primary education[8] and the reduction of children under five suffering from hunger.

The Poverty Gap which measures the depth of poverty shows a reduction of the poverty gap 1993 to 1999 from a value of 16.2% to 12.2%. These figures show the rural interior having the highest level of poverty with a poverty gap over 44% in both years[9].

[7] Bureau of Statistics, Annex 5, 2007
[8] Bureau of Statistics, *Population & Housing Census 2002 - Final Summary Results*, Oct. 12, 2005
[9] *Guyana Poverty Reduction Strategy Paper*, 2002, p.6.

Table 5: Guyana Poverty Gap, 1993 & 1999

General Area	1993 Gap (%)	1999 Gap (%)
Georgetown	8.7	5.4
Other Urban	6.3	3.0
Rural Coastal	14.4	11.3
Rural Interior (Hinterland)	46.1	44.9
Overall Guyana	16.2	12.4

Source PRSP

It is significant that the highest levels of poverty are found in the rural interior regions of Guyana. Since the majority of the population in these regions is Amerindians and the majority of the Amerindian population is also found in these hinterland regions it can be deduced that the Amerindians as a group face the highest levels of poverty.

Since the coastal rural communities are in very close proximity to the major urban centers they tend to enjoy a standard of living that is very similar to that of the urban centers. This is especially true for the rural residential areas where most of the residents are employed in the urban center. A number of rural residents also find employment in the rural public service, mainly in administration, health and education. There is a rather high level of remittances from family members who are based in the more developed countries, USA, UK, Canada, etc. These remittances in some instances are very vital to the welfare of a number of persons in Guyana especially older folks, wives and children. However the hinterland rural especially, Amerindians do not get high levels of remittances.

However farming communities especially the cash crop and rice farming communities do experience a greater level of isolation from the urban centers. This results in pockets of high levels of poverty mainly due to the lack of social services and public utilities such as potable water and electricity. Cellular telephone has made telephone communications available to most coastal rural communities even though land line facilities are not always accessible. With the recent introduction of the GSM platform it is also possible to access the internet via the cellular phone in areas without land line facilities.

From Table 5 it can be seen that the reduction of poverty levels was more pronounced in the coastal rural areas while there was a rather smaller reduction in poverty for the Rural Interior. This shows a certain amount of disconnect of the economy of the rural interior from that of the general macro economic impact on the rest of the economy. This disconnect has can be attributed to the general isolation of these communities from the rest of the country. This isolation is both physical and cultural.

The physical isolation has to do with the geography of the country. The communities that experience the greatest degree of isolation are those in the highland areas in the Pakaraimas mountain range in the middle western regions of Guyana or Kaieteur plateau in central to western areas of the country. These two areas tend to converge on each other and are very rugged, hostile terrain. Due to the rugged nature of the terrain vehicular

access by road is very difficult and in most instances impossible. Also because the rivers have many rapids and waterfalls access by boats is also extremely limited and dangerous. Thus the main means of access is via foot trails or via small aircraft which due to the small amount of customers is very costly. These communities can be classified as the Remote Rural Hinterland Communities.

These factors immediately enforce the isolation of the communities. Since these communities are isolated, there is very little exchange with other communities. This results in small sized populations which cannot sustain any viable commercial/economic ventures by itself. As such most households of these communities survive by utilizing traditional subsistence activities such as agriculture, hunting and fishing. Also family members (mainly the males) seeking employment outside of the communities, usually in mining, logging or manufacturing. Since most of these persons do not have high levels of education they tend to acquire the low paying jobs which do not help them to significantly raise their standard of living.

The external employment by individuals in the mining and logging sectors is slowly transforming these communities to cash communities. Also there is now a trend of adapting technology to make life and work more comfortable. As a result a number of the larger hinterland communities now use TVs, DVDs, VCRs and music systems. This drives the need for energy sources to power these items.

Another serious impact of this isolation on these communities is the issue of exposure to new ideas and technology. This greatly slows down the social and material development of the community. Therefore the small population and lack of cultural infusion leads to these communities remaining economically and culturally stagnant, this stagnation facilitates high levels of poverty.

Commercial ventures in these isolated communities would become viable if the production was geared toward the sale of the products to external communities. This immediately raises the question of cost of primary inputs such as fuel, raw materials and subsequent transportation to market. To date the major factor that has a very negative impact on these ventures is the cost of transportation. Currently inland air cargo rates range between G$287 – G$286 per kg and passenger rates are between G$29,000 – G$45,000 return per passenger. Additionally, air transportation is usually severely hindered by bad weather in the rainy seasons. These factors play a very key role in preventing any major commercial activity and the concomitant development in these remote inland communities.

The rural communities that are more economically viable are the ones that can be easily accessed either via road or river that is the Near Rural or Hinterland Rural communities. Some of these communities such as Santa Mission or Moraikobai which are found along small coastal rivers and St Cuthbert's or Annai are easily accessed by road. As a result of the rather easy and less costly access, these communities interact more fully with the larger national economy and there are higher levels of transfer of ideas and technology

from the wider society. These communities also have larger populations which help to sustain some level of local industry and services.

These communities also tend to have larger numbers of its population working outside the community. These larger communities have a number of their members working in forestry industry where the forest on the community land is harvested for timber and other forest based materials. This leads to some changes in the village culture with higher level of cultural penetration by the coastal culture.

It is expected that even as the economies of these larger villages change, there will also be significant changes in the traditional lifestyles. There will be smaller numbers of persons practicing the traditional substance agriculture and hunting. This would entail that the village develop services to provide for the importation of large quantities of foodstuff and retail outlets. This supply of food stuff and other household consumable has already evolved in a number of these villages.

This change in culture also creates changes in village value systems, this leads to some levels of conflict. Another consequence of this new value system is one of equity, especially for the women and older persons who would have less opportunity to acquire sufficient income to properly maintain themselves.

According to the 1993 HIES, the size of the average Amerindian household was 5.5 persons while the national average is 4.28 persons[10]. A recent study that was limited to approximately 20 Amerindian villages throughout the country has indicated that the average household size was 6.6[11]

Table 6: Village Population and Average Number of Persons/Household

Village	Region	Population	No. of households	Ave. household size
Sebai	1	348	48	7.3
Yarakita	1	692	110	6.3
Red Hill	1	255	34	7.5
Port Kaituma	1	2200	432	5.1
Mabaruma	1	2000	500	4.0
Capoey	2	311	51	6.1
St Deny's	2	405	65	6.2
Orealla	6	1604	229	7.0
Kurukubaru	8	852	110	7.7
Monkey Mtn	8	710	126	5.6
Kopinang	8	700	100	7.0
Yupukari	9	642	80	8.0
Annai	9	470	80	5.9
Nappi	9	560	94	6.0
Sand Creek	9	800	143	5.6

[10] NDS

[11] Projekt-Consult GmbH, *UAEP Hinterland Electrification Study Final Report* , 2007

Shulinab	9	555	76	7.3
Shea	9	370	80	4.6
Muritaro	10	408	55	7.4
Rockstone	10	375	50	7.5
Wikki Calcuni	10	470	75	6.3
Paramakatoi	8	2000	220	9.1
Aishalton	9	1000	250	4.0
TOTAL		**17,727**	**3,008**	**6.4**

Source: *UAEP Hinterland Electrification Study Final Report*, 2007

Rural hinterland communities where there are a number of the villagers working in gold mining industry tend to have greater levels of health problems. The major illness is malaria and there are also some incidences of HIV/AIDS and other sexually transmitted diseases. This is due to both non-villagers infecting the locals and villagers who would have left the community returning with the infections. Villages that are close to the mine site also tend to experience higher incidences of water borne diseases due to pollution of water sources.

1.4.2 Amerindian Gender Issues

In traditional Amerindian communities are male dominated with the leadership role usually taken up by the males. The women play a very critical role in the maintenance of the family both as home makers as well as the maintenance of the farm plot. Women are now taking on more significant leadership roles within the communities, especially since more men are away working. A number of women were elected village captains (or Toshao). There are programmes that are geared to empower Amerindian village women that include training them to create their own business such as craft manufacture, sewing groups and agricultural ventures. These programmes are funded by both government and NGOs. Amerindian women also play a very important role in the rural public service as health workers and teachers.

The educational system does not discriminate against girls acquiring a full education. However it has been found that many young Amerindian girls become sexually active at very young ages, in some instances pre-teen. This combined with the limited access to fertility control knowledge and facilities such as condoms, birth control pills, etc. a number of them be come pregnant at very young ages. These early pregnancies tend to seriously limit their personal development. Another major issue that is of grave importance to Amerindian women is the high rate of cervical cancer amongst them. They as a group have the highest incidence of this cancer in Guyana. The Ministry of Health is currently implementing programmes to educate women of this risk and how to reduce the risk; however vaccines have not been introduced.

Rural Amerindian women also face various levels of discrimination and exploitation when they move away from their village communities to seek employment in the more populated rural centres. A number of these women have turned to prostitution as a means of sustenance in these new environments. This high risk behaviour has led to increased incidences of STDs amongst these women. The government through the Ministry of

Human Services and Ministry of Amerindian Affairs are investigating reports of possible instances of human trafficking of Amerindian women.

Previously a large number of Amerindian children and even adults did not have any birth certificate. The Ministry of Amerindian Affairs (MOAA) has installed a system that facilitates easy processing of the applications. Under the new system the applicant can do all the paper work in the community and send the application to Georgetown via the MOAA for processing. When the birth certificate has been completed it is sent to the community by the ministry, thereby avoiding costly and difficult travel.

1.4.3 Rural Economic System

Agriculture, fisheries, forestry, mining and government services provide the bulk of the employment opportunities in rural areas, with agriculture being the largest contributor. As outlined before the majority of the rural population is found on the coastal belt. This coastal rural population comprises mainly of Afro and Indo Guyanese. The inland or hinterland rural communities comprise mainly of the indigenous Amerindian.

The rural economy first has to be separated into the coastal rural hinterland rural communities. The economies of these two classes of rural communities are significantly different. The economics of the costal rural communities is much stronger than that of the hinterland communities. The economy of rural coastal communities is strongly linked to commercial agriculture and the provision of services.

The main agricultural activities of these communities are sugar production, rice cultivation and processing, forestry and its related industries, seafood harvesting and processing. Of recent coastal aquaculture farms have been developed, this venture is strongly supported by the government. There is a growing trend of diversification to non-traditional agricultural cash crops. This diversification is fueled by rather lucrative export markets in the Caribbean and North America.

1.5 *Governance in Rural Communities*

1.5.1 Introduction

Administratively Guyana is subdivided into ten administrative regions. The regional bodies are responsible to the parliament. The regional bodies are the means of implementation of the administrative policies and control. Usually the policies and programmes of the various ministries are implemented through the regional bodies.

1.5.2 Regional Administration

The governance of the rural communities is layered; the administrative functions are under the Ministry of Local Government. The ten Administrative Regions are governed

by The Regional Democratic Councils (RDC) which are elected every five years at general elections. These elections determine the numerical distribution membership according to political parties. The number of councilors of each region is loosely dependent on the population of the region as such the coastal regions have the most councilors (e.g. Region 4 has 35 while Region 8 has 15). The members of the council are appointed by each political party. These Councils would elect both a Chairman and a Deputy Chairman who are full-time employees. All elected members are responsible for the routine administration of the Region, it is usual for each councilor to be responsible for a particular geographic area with in the region. The administrative head of the region is the Regional Executive Officer (REO). This officer along with the Chief Accounting Officer and the Clerk of the RDC are appointed by the Ministry of Local Government, usually with the blessings of the RDC membership.

The Regions are subdivided into smaller geographic areas called Neighbourhoods; these are administered by Neighbourhood Democratic Councils (NDC). The Neighbourhoods are further subdivided into Cooperative Units. However there is no apparent devolution of any administrative functions to the Cooperative Units.

Councilors in the NDCs are elected at National Local Government Elections which are supposed to be held every three years. The last Local Government Elections are very overdue they were last held in 1994. However due to proposed plans to hold the next local government elections under new constitutional regulations these elections have been postponed for over 10 years since there has not been any agreement between the main parties PPP and PNC as to the constitutional reforms to be implemented. There is now some level of optimism based on some recent agreements that these elections will be held early next year. The required legalisation will be brought to parliament in a few months. With this in mind the Guyana Elections Commission (GECOM) are preparing for these elections. As can be imagined this lengthy turn in office of these officials has led to many conflicts especially of a political nature, fortunately, these conflicts do not adversely affect the day to day operations of the NDCs.

1.5.3 Governance of Amerindian Villages

The governance of Amerindian villages and lands are subject to the Amerindian Act 2006(Act No. 6 of 2006). This is a very recent legislation that was drafted to address mainly the issues of equity, governance and land ownership of Amerindians. The Village Council is established to govern the village. The Village Council comprises of the Toshao (Village Captain) and Councillors. The number of councillors on the council is depends on the population of the village and the method of determining this number is stipulated in the Amerindian Act.

The Village Council has the authority to impose rules and regulations to govern village life and property. The Minister of Amerindian Affairs has overall oversight function for all Amerindian Villages.

The Village Toshaos are all members of the National Toshao Council. This council is administered by an executive committee which comprises of Toshaos who are elected by the members of the National Toshao Council where each region has a representative and any others who may be elected but not exceeding ten additional members. This national council has oversight functions for discipline of the Toshaos and development of plans and strategies for the improvement of the quality of life of the Amerindians throughout Guyana.

While the Act gives the villagers control of activities within the village lands this control is rather limited in certain aspects. The Ministers responsible for Mining and Forestry can overrule village decision regarding the granting of permits for large scale mining and forestry operations.

There is no actual legal relationship between the Village Council of the communities and the RDC. However, since most of the major developmental work for the communities is channelled through the RDC there is a very strong informal relationship between the Village Council and the RDC. At the national level the Ministries of Local Government, Health, Education and Amerindian Affairs tend to work very closely to ensure that projects the Amerindian communities get the maximum benefit of any projects being done by the line Ministry.

1.6 *Rural Public Utilities and Services*

There is a general trend in the access to public utilities and services in the rural areas. This is so since the same issues of access, cost and scales of economy due to the size of the population affect the installation of the service, be it; water, telephone, electricity, health or education.

1.6.1 Potable Water

Generally access to potable water is relatively high since most of the population is concentrated on the coast it is possible for the infrastructure to reach most of the coastal population. Based on the 2002 Census report, some 80% of the population has access to potable water, 10% gets their water from streams, springs or ponds and 3 % through public stand pipe. Provision of potable water throughout Guyana is the responsibility of one public entity, Guyana Water Inc. which is a semi-autonomous government organization which falls under the control of the Ministry of Housing and Water.

Most of the Coastal Rural communities have a high level of public service and utilities. However in the areas that were recently developed as housing schemes tend to lag behind the older settlements in their access to the utilities and services, the two key services being potable water and electricity. As a result there are pockets of residents who do not have easy access to potable water piped to their community. This issue is alleviated by the use of plastic water tanks approximately 1900L capacity. These tanks are usually filled by rainfall collected from the roof gutters of the houses. Also water can be bought

from vendors who transport water in trucks. This situation can even be found in some of the newer sections of urban centers.

Table 7: Regional Water Supply to Households by Main Source

Source	Region									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Private, Piped into Dwelling	75	955	3350	7140	654	2594	206	14	69	1855
Private Catchments/ Rainwater	465	2052	1835	2427	225	705	546	239	189	146
Private Piped into Yard	115	365	2012	5209	650	2234	67	6	21	496
Public, Piped into Dwelling	366	1279	7361	27919	3354	8501	510	3	71	3592
Public, Piped into Yard	384	1021	7963	27795	6099	14640	463	30	122	1125
Public Standpipe/ Hand Pump	157	58	823	2897	276	908	6	17	208	599
Public Well	93	53	143	680	70	280	6	7	443	21
River/Stream/ Pond/Spring	2477	5351	1890	1666	725	652	1814	1533	1123	2155
Other	13	86	580	2200	721	955	23	22	1297	63
Total	4145	11220	25957	77937	12774	31469	3641	1871	3543	10052

Source: 2002 Census

Currently GWI has a billing system that is based on a multi rate system. The rate system is divided into metered and the un-metered customers. Residents in the urban centers are billed at G$19,160 (US$95.80) per year, this value may be adjusted depending on the value of the property and if the water is used for commercial purposes. Rate adjustment is based on a rate calculation method. Un-metered Coastal rural residents are billed at a fixed rate of G$8,160 (US$40.80) per year. Metered residents pay the same G$58 (US$0.29) per cubic meter of water, regardless of their location. Pensioner who are over 65 years old are entitled a rebate, however the pensioner must not be using water commercially and should not have other non-pensioned wage earners in the home. The government refunds GWI the value of the usage by listed pensioners. It should be noted that in the hinterland rural areas no residents are asked to pay of water supplied by GWI.

The issue of Utilities and Services becomes more difficult as the villages be come more removed from the coastal regions. Most of the communities in the near inland areas are close to rivers and a large amount of domestic water is sourced from these rivers or nearby springs. In some instances the community may have a shallow well from which water is pumped by hand pump or small electric submersible pumps powered either by a small generator or solar power. In a very few instances old direct drive wind powered pumps are still being used.

Three communities have very good working examples of solar powered water supply systems. They are Mara on the East Bank Berbice, Paramakatoi in the high savannas of Region 8 and Moraikobai on the Mahaicony River in Region 5, Paramakatoi and Moraikobai are Amerindian Villages. All three systems supply the whole community with potable water. These systems were installed and are being maintained by GWI.

Amerindian communities tend to have the houses randomly located and in many instances there are a number of house that are remote relative to the rest of the community. As a result many homes cannot be easily connected to any grid. This random arrangement also affects the supply of piped water to households; instead stand pipes are located in strategic spots to facilitate easy access to the houses in that part of the community.

It is suggested that the Amerindian communities will have to attempt to arrange the homes in a more organized manner before utilities can be installed in each residence. To date based on the haphazard arrangement of residences it will be very costly to take utilities from a central generation point to each residence. This is true for landline telephone, potable water and electricity.

1.6.2 Telephone Service

The fixed telephone service or (landlines) is available on the coast, mainly in Regions 2, 3,4,5,6 and Region 10. The main telephone service provider Guyana Telephone & Telegraph Inc. (GT&T) has recently stated that it has approximately 300,000 mobile and landline customers. In 2004 the company had 98,245 landline and 143,945 mobile accounts. In addition it has installed 74 Rural Area Wireless Booths in some 52 rural locations spread in all the regions of the country.

Generally telephone communication along the coast and in Region 10 is fairly accessible and reliable. The high usage of mobile phones has made the access possible even in coastal areas where land lines are not available.

In addition to GT&T there is one other mobile provider Digicel Guyana, this company has approximately 100,000 accounts. Based on this it is possible to say that approximately 400,000 persons have access to telephone service even though most of them are on the coast. There is very little telephone penetration in the hinterland regions. The emphasis by both service providers is to extend the wireless service to the other un-served rural region since this is the more cost effective alternative to landlines taking the ruggedness of the terrain to be covered.

1.6.3 Electricity

The law provides for the Guyana Power and Light Inc. (GPL) to be the only company to provide electricity, this company has the first right of refusal to any request for distribution to any new area. GPL is based on coastal Guyana and is responsible for all the electricity provided in the coastal grid which encompasses regions 2,3,4,5 and 6. It does not provide electricity to any of the other regions. GPL is wholly owned by the GoG It supplies all electricity sold to consumers from fossil fuels. With the exception of the community of Bartica, this company does not play any role in supplying power to the more remote communities.

Electricity supplied by GPL is all based on the use of imported fossil fuel. Most of the electricity is generated by internal combustion engine driven generators. There is one steam turbine that is in use but that is scheduled to be taken out of service. In 2006 Guyana generated some 5364.6 GWh of electricity, while GPL has projected a 5% growth there has been declining use mainly due to the larger consumers taking the option to self generate, which is more reliable and cost effective. Another large producer of electricity is the sugar industry in 2006 it generated approximately 61.6 GWh of which 41.1 GWh were generated using bagasse as fuel.

The generators are relatively small; the largest unit has a capacity of approximately 6.5MW. There is significant inefficiencies in the delivery of electricity to the customer it is estimated that the combined technical and commercial losses is approximately 40% of generation. Given this high loss factor, the small size of the generators and the price of oil; electricity supplied by the GPL grid is rather expensive with residential rates being G$49.38 per kWh for residential usage and as high as G$60.71 for commercial usage. Some relief is given to small consumers who use a maximum of 100 kWh per month this rate is G$45.68 per kWh Since GPL is using imported fuel for generation, in recent years it has seen a sharp increase in the cost of generation. In 2003 fuel cost was some 45% of total revenues at present it is 85%[12].

Like the situation with water some coastal rural communities are not connected to any electricity grid. While most of these un-served areas are the new housing schemes, some of these areas were without electricity for many decades since they were deliberately ignored by the former government. The issue of electricity is addressed by the wealthier residents by the use of small domestic electricity generators fueled by gasoline or diesel. Some residents also install small photovoltaic (solar) systems for lighting and powering TV and music systems. Wind powered generators are also used to a lesser extent to provide electricity, this source is some what unreliable. A large number of residents also utilize automotive batteries for this purpose and would have them recharged within the community. The recharging cost is dependent on the capacity of the battery and ranges between G$500 to G$1,000 (US$0.25 – US$0.50).

[12] GPL CEO, Press Conference, July, 2007

In these Near Inland Rural communities electricity is supplied either by small individual generators which may provide power to a single household or supply multiple households. In some instances communities have the households connected to a mini electricity grid which is powered by larger capacity generator. This system would usually provide power on a fixed daily schedule which is determined by the residents and the community leaders. The day to day operation of this mini grid system usually maintained by funds collected from the customers on the grid. They are usually charged a fixed fee which has to be paid on a weekly or monthly basis.

Table 8: Electricity Supply by Mini-Grids in Selected Communities

Village	Region	No. of households	No. of connections	Average connection capacity (kW/connection)
Santa Rosa	1	1000	29	0.41
Mabaruma	1	500	360	1.39
Port Kaituma	1	432	370	0.59
Lethem	9	500	400	1.25
Mahdia	8	410	n.a.	n.a.

Source: UAEP Hinterland Electrification Study Final Report, Projekt-Consult GmbH

In the Hinterland Rural communities where petroleum fuel is available small generators are utilized or in a number of instances small solar systems are used to provide lighting and entertainment. In a few instances especially in the savannas wind generators are also used. In a few of these communities medium sized solar electric systems were installed to power the health centers, community centers and schools.

Table 9: Examples of Tariff Systems for Domestic Consumers

Community	Region	Type of tariff	Domestic Use (G$)	Pensioners (G$)
Port Kaituma	1	Flat rate	4500/month	2000/month
Mahdia	8	Flat rate	5000/month	5000/month
Santa Rosa	1	Per Watt connected	5.9/Watt	5.9/Watt
Mabaruma	1	Per type of appliance	Bulb 100 Refrig. 500 Freezer 800 Radio 50	Same

Source: UAEP Hinterland Electrification Study Final Report, Projekt-Consult GmbH (US$ 1 = G$200)

In the Hinterland Rural communities where petroleum fuel is available small generators are utilized or in a number of instances small solar systems are used to provide lighting and entertainment. In a few instances especially in the savannas wind generators are also

used. In a few of these communities medium sized solar electric systems were installed to power the health centers, community centers and schools.

The community of Lethem in Region 9 has a grid which is power by a 500 kW diesel generator. This community at one time used to be powered by the Moco Moco Hydropower station; however this facility was damaged due to a land slide which badly damaged the penstock.

The inhabitants of the Remote Hinterland Rural communities do not have much access to any electricity due to the difficulties to obtain fuel for generators. However a few individuals do have solar powered system or use appliances powered by dry cell batteries. In a number of these remote villages the Health Centre is usually equipped with a solar powered system to provide lighting and radio communication.

1.6.4 Health

The Coastal Rural communities have ready access to health facilities with a health facility in almost each NDC. Along the coast there are fairly well equipped hospitals and other health centers. The hinterland regions all have District Hospitals, Health Posts and Health Centers.

There has been a steady rise in the doctor patient ratio over the last 20 years. Factors that may have lead to this are the establishment of the medical school at the University of Guyana and the influx of specialized doctors from other countries. These expatriate doctors mainly from Cuba and China as a result of bilateral arrangements may account for this outcome. Over 80 percent of these doctors are located in Region 4. This raises serious issues of quality of care and access to doctors, especially in hinterland regions.

Table 10: Regional Distribution of Health Centers (2004-2005)

Type	Region										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Health Post	36	19	21	11	1	4	19	14	53	16	**194**
Health Center	3	11	10	36	15	21	3	4	3	10	**116**
District Hospitals	3	1	3	0	2	3	2	2	2	2	**20**
Regional Hospitals	0	11	1	0	0	1	0	0	0	1	**14**
Private Hospitals	0	0	0	7	0	0	0	0	0	0	**7**
National Hospitals	0	0	0	1	0	0	0	0	0	0	**1**
Geriatric Hospitals	0	0	0	1	0	0	0	0	0	0	**1**
Total	**42**	**42**	**35**	**56**	**18**	**29**	**24**	**20**	**58**	**29**	**353**
Hospital Beds	64	112	198	560	80	611	63	12	47	140	**1887**

Source: 2002 Census

The health situation in the hinterland is rather difficult to manage due to the poor supporting infrastructure of power, water and transportation. While there is the need to

provide health care the level of care required on a daily basis is rather minimal. As such the Ministry of Health has developed a system of locating small health centers in most hinterland communities with trained medical practitioners. The Amerindians are the group who are in greatest need for this type of intervention. To ensure that basic health care is provided Amerindians have been trained as Community Health Workers, Medex, Dentex, Community Dental Therapists and nurses to improve health care in Amerindian communities.

The Medex is trained to provide primary health care and is capable of handling the usual simple illnesses. In the instances of more severe cases the Medex refers the patient to one of the district hospitals. The general practice is to train persons from the community to serve as the Medex or other health workers in that community. It is sometimes difficult to provide resident doctors or Medexes in all the communities. As such, the Ministry of Health has conducted medical outreach programs to fill this gap. Government also encourages other institutions such as the Remote Area Medical (RAM) to provide the much needed medical services.

These health centers are equipped with basic but vital equipment among which is a microscope for Malaria testing. Malaria has been a prevalent disease in hinterland communities. The Ministry of Health's Vector Control Sector, has been working with communities to control this disease. A new drug, Coartem, which is an effective anti-malaria drug was launched and has proven effective. Insecticidal bed nets are now being distributed free of cost to families with children and pregnant women to help prevent mosquito borne diseases. Additionally doctors have been allocated to hospitals and several hinterland students are currently studying medicine in Cuba. It is expected that these students will return to the hinterland community to provide a higher level of care.

As a result of the number of women seeking medical treatment in Georgetown for Cervical Cancer, the Ministry of Amerindian Affairs in collaboration with the Ministry of Health and CIDA has commenced a Cancer Research Project to determine the prevalence of Cervical Cancer in Amerindian women; over 1100 Pap smears were conducted in Regions 1 and 9.

Persons who are referred to Georgetown from the various health clinics in the interior are usually accommodated free of cost at the Amerindian Hostel in Georgetown. The Ministry of Amerindian Affairs pays the return transportation costs for the referred patients to their communities.

1.6.5 Education

Education has been identified as national priority. The National Development Strategy (NDS) the Poverty Reduction Strategy Paper (PRSP) contains clear statements to this effect. There is the national consensus that national development can only be achieved education and hard work. The ministry of Education has embarked on a Strategic Plan 2003-2007 which has detailed a number of initiatives to develop the sector.

During the last 15 years a large number of schools, dormitories and other educational facilities were built in rural, especially Amerindian, communities to ensure each child is provided with a better quality education. These schools were mainly to cater for nursery and primary students to facilitate universal primary education. Additionally, hundreds of teachers have been trained annually to deliver quality education. Every year there is a large intake of hinterland teachers at the Cyril Potter College of Education (CPCE).

Teacher training institutions have been decentralized to facilitate the training of teachers without them having to leave their schools in outlying areas. Also, to facilitate teachers who cannot get to these formal training facilities, there are also Distance Education Programmes through which teachers receive professional level training. The Guyana Basic Education Training Project (GBET) is one of these programmes. Distance Education Programmes reach out to Amerindians and more of them are now being qualified in various areas.

Rural hinterland students, though mainly Amerindians, are benefiting from the Hinterland Scholarship. This scholarship allows hinterland students to attend the better secondary schools, University of Guyana and other training institutions. There is an increasing number of Amerindian students studying at the University of Guyana enrolled in various fields. Amerindians are benefiting from the emphasis being placed on the Education system throughout the country. The government has set aside a fixed amount of scholarships to be utilized only by hinterland student who desire to study in Cuba, the subject areas are mainly medicine, agriculture and engineering.

To facilitate the people of Berbice the government opened a Berbice Campus of the University of Guyana. This campus has been slowly growing. However one of the major problems there is the availability of full time lecturers. A large number of the Lecturers from the Turkeyen campus are required to do part time teaching at the Berbice Campus.

Other education programmes include:

- Guyana In-Service Distance Education Programme (GUIDE) used to upgrade hinterland teachers to attain entry level for enrolment at Cyril Potter College of Education.

- Escuela Nueva, This model was successfully used in Colombian Amerindian communities. Schools that benefited included Aishalton and Santa Rosa Primary.

- Secondary Schools Reform Project (SSRP) which is aimed at upgrading education in the first three grades of secondary schools. It was piloted in 12 schools including Amerindian communities such as Port Kaituma Community School, Paramakatoi Secondary School and St. Ignatius Secondary School.

- Basic Education Access and Management Project (BEAMS). The objectives include; sustained, improved literacy and numeracy attainment through the

primary cycle and to expanded secondary access in underserved areas and poverty zones.

- The Education for All Fast Track Initiative; this focuses heavily on the hinterland regions which comprise mainly Amerindian communities. It is aimed at improving the quality of the teachers in the hinterland.

The government has also introduced a system to encourage trained graduate teachers to teach in the hinterland schools. Graduates who have tuition loans with the loan agency of the University can have their loans cancelled after they have worked for one year at a rural hinterland school. To date a few teachers have taken up this offer. As a result of this exposure some of the teachers have decided to temporarily relocate to hinterland regions and have stayed longer than the required one year.

1.6.6 Transportation Systems

Guyana's main form of transportation is by the use of roads. The coastal roads are well developed. There is a rather well developed road network along the coast both rural and urban. The main roads are surfaced with asphalt throughout their length. Quite a large number of roads within villages are also paved with asphalt based surface of a lower quality. However in some of the older rural communities and new housing schemes the road are unpaved and can become very unpleasant during the rainy season. The other road that is asphalted is the Linden Highway which connects the coast to the mining town of Linden. Beyond Linden the road becomes an all weather laterite road. Most of the rural interior roads are of this nature. These laterite roads need significant maintenance. The Ministry of Works and Communication has overall responsibility for the roads. However the regional authorities are usually responsible to ensure that the roads in each region are kept in a fair state of repair. It is usually a very difficult task to keep these roads maintained especially during the rainy season. At these times there is usually very significant erosion of the protective surface. Roads can become almost impassable after a heavy downpour. This has been occurring more often in recent years due to high intensity rainfall which is becoming more frequent. In some instance major timber and mining entities take the responsibility for the maintenance of the roads that are of interest to them.

As a means to facilitate trade with Brazil the government is improving the road from Linden to Lethem. The Brazilian government is building a heavy duty bridge across the Takatu River which will ensure easy crossing of the Takatu River at all times. During the rainy season the river can become very difficult to cross.

Most of these roads cross the many streams and rivers that are so prevalent across the country; this entails the construction of hundreds of bridges countrywide. However, the larger rivers such as the Essequibo and Berbice rivers have not been bridged. These rivers are crossed using ferries. On the coast land the Ferry Service is controlled by the Transport and Harbours Department (TH&D). In the hinterland private firms have the franchise to provide ferry services at specific locations. These rates tend to be rather high

and does act as deterrent to hinterland travel in some instances. There are well developed plans to bridge the Berbice River by the end of 2008.

Another important means of transportation in the rural areas is water transport. All of the major rivers have rather large communities somewhat upstream. Travelling to these communities has been by boat for many years and is quite likely to remain this way for a long time to come. However the size of the ferry can at times be somewhat inadequate for the current need of the consumers. Also the amounts of trips in and out of the rural communities by these vessels are most of the times inadequate for the amount of persons and cargo utilizing the ferry service.

1.7 *General Energy Usage in Rural Communities*

By far the major consumption of energy in rural areas is in the industries. The major consumers are agriculture, forestry, fishery and mining. The largest sector is agriculture since this includes sugar which is rather energy intensive. It should be noted that most of the energy utilised in the rural areas is used on the rural coastal areas, with the larger part being utilised in Regions 2, 3, 4, 5 and 6 which has sugar and rice as the main activities. Agriculture is done to some extent in Regions 1 and 9 however this in not very energy intensive.

Next comes mining this includes the bauxite, gold and quarrying operations. These activities are concentrated mainly in Regions 1, 7, 8, and 10. It should be noted that Region 6 also has bauxite mining and there are relatively small amounts of gold and diamond mining occurring in certain parts of Region 9.

Based on records provided by the Guyana Energy Agency (GEA) for the period 1994 to 2006 Guyana's fuel consumption peaked in 1999 and has steadily decreased to a minimum in 2006. The cost of importation of fuel has moved from US$72,067,912 in 1994 to US$251,594,083 in 2006. Fuel purchases now utilise 36% of Guyana's revenue[13]. This ongoing increase in fuel purchases could eventually destabilise the economy if prudent fiscal measures are not implemented.

[13] President Jagdeo, Bio-fuel Seminar, June 11, 2007

Table 11: Petroleum Consumption by Sector ('000 BBLS)

Sector	1994	1999	2000	2001	2002	2003	2004	2005
Commercial/ Services	17	30.8	26.5	29.7	32.8	41.7	45.0	40.3
Residential	199.5	246.9	252.7	216.4	229.3	236.9	229.3	224
Industry	405.4	574.	470.7	411.4	421.6	435.5	471.0	343.5
Transportation (Road& Marine)	559.3	841.9	867.7	851.4	801.5	806.7	915.0	893.7
Air Transport	76.5	57.5	64.4	47.4	49.6	52.3	56.5	53.3
Agriculture/ Mining	694.9	709.3	456.3	543	545.7	451.4	370.5	329.3
Fishing	164.4	165.5	152.9	197.2	228.3	158.5	187.2	157.7
Electricity	1338.8	1647.5	1765.6	1617.4	1652	1674.4	1717.3	1516.5
Total	**3455.8**	**4123**	**4056.8**	**3913.9**	**3960.8**	**3857.4**	**3391.8**	**3558.3**

Source: GEA, 2007

The main fossil fuels being use in Guyana are gasoline, diesel or gas oil and fuel oil. Gasoline is used chiefly for vehicles, generators, small two stroke engines such as outboard motor and chain saws. Diesel is used for heavy trucks and other agricultural and mining equipment as well as electricity generators. The fuel oil is used primarily for electricity generation by GPL in its larger generation units. Kerosene is used both in the aircraft sector and for domestic cooking and lighting.

Table 12: Petroleum Consumption by Product ('000 BBLS)

Product	1999	2000	2001	2002	2003	2004	2005	2006
AvGas	11.2	13.3	7.4	8.6	8.5	8.3	5.7	10.1
Kerosene	231.8	255.3	197.0	204.7	201.0	192.5	190.4	163.4
Gasoline	727.6	717.0	749.0	723.5	744.8	748.4	730.1	724.8
Fuel Oil	906.5	944.5	873.2	927.2	941.3	946.7	673.9	608.1
Diesel	2152.7	1950.9	1997.2	1902.4	1839.1	1965.2	1836.1	1584.3
LPG	93.2	75.7	90.0	99.3	122.7	130.6	122.1	128.1
Total	**4123.0**	**3956.7**	**3913.8**	**3865.7**	**3857.4**	**3991.7**	**3558.3**	**3218.8**

Source: GEA, 2007

As can be seen from Tables 9 and 10 Guyana is very dependent on imported fossil fuels, however, indigenous biomass fuel sources are also utilized to some extent. The two main local fuels are bagasse, which supplies a substantial amount of energy for sugar production, and fuel wood. There is also a rather small amount of charcoal being produced.

Table 13: Biomass Utilization

Product	2000	2001	2002	2003	204	2005	2006
Fuel Wood (BOE)	38171	20124	23976	24319	27610	19630	---
Charcoal (BOE)	2312	2556	4480	1899	1026	1088	---
Bagasse (L. Ton)	1081742	1136770	1341285	1243440	1378540	1132988	11447599

Source: GEA (Guysuco's & GFC's Reports), 2007

1.8 *Energy Utilization in Rural Hinterland Communities*

The information available on the access to energy resources and its utilization in rural hinterland communities is rather limited. This information can only be estimated from general consumption data. With the exception of the hydropower data there is no data base of the amount of indigenous energy resources found within these areas. However a general idea of the type and the amount of some sources of energy used can be derived.

In the Coastal Rural communities with access to grid electricity, which electricity is used for lighting and to a lesser extent for other household activities such as entertainment and some light duty chores. Cooking is done with either with kerosene, LPG or fire wood, depending on the location and the economic status of the household. In the areas where no grid electricity is available kerosene, generators, solar or automotive batteries are used for lighting.

The Rural Hinterland and Remote Rural Hinterland communities have a rather different energy mix from the Rural Coastal communities. This is primarily due to the difficulty of access of more convenient forms of energy such as electricity, diesel, gasoline, LPG and kerosene in these areas. However these are general assumption from observations and not based on any detailed study. No detailed study of this nature has been done within recent years. This lack of information on the utilization of energy was recognised by a previous study[14] and they attempted to gather some empirical data from the hinterland communities they studied.

That study indicated that approximately 71% of the hinterland households used firewood as the fuel for cooking. This fuel is usually collected from in and around the community. There is usually no requirement of any financial input for the collection so the only cost factor is the time spent collecting the material. While collection of firewood does not usually lead to any degradation of the environment in the forested areas it has been found that in areas with limited forest resources such as the savannas deforestation could occur. This scarcity of wood in the immediate vicinity forces the villagers go further away from the village to gather fire wood. This was reported as one of the issues at the Region 8 community of Kurukuraru.

[14] Projekt-Consult GmbH, UAEP Hinterland Electrification Study Final Report, 2006

Table 14: Average Expenditure and Consumption of Lighting Fuels

Village	Main Lighting Fuels			
	Type	%	Consumption (gallons/mth)	Average Expenditure (G$/mth) (2006 Prices)
Kopinang	Kerosene Other	38% 58%	1.5	3,033
Kurukubaru	Kerosene Other	67% 30%	1.0	2,125
Monkey Mountain	Kerosene Other	63% 30%	1.3	1,733
Paramakatoi	Kerosene Other	76% 13%	1.1	1,876
Sand Creek	Kerosene	97%	1.3	963
Shulinab	Kerosene	99%	1.4	815
Orealla	Kerosene	98%	2.0	1,653
St. Deny's	Kerosene	98%	1.8	1,120
Capoey	Kerosene	98%	2.4	1,490

Source: UAEP Hinterland Electrification Study Final Report US$1 = G$200

Of interest is should be noted that villagers along the East Coast Demerara (a Coastal Rural area) have stated that one of the reasons for the loss of the mangrove from the coastline is due to over harvesting of the mangrove for firewood during the period of economic hardships during the mid eighties. Since all types of petroleum fuel were very difficult to obtain the villagers took to cutting the mangrove for cooking fuel.

It should be noted that in the Near Rural Hinterland villages where access to more developed centres is rather easy there is the tenancy in the more affluent households to replace firewood as a primary cooking fuel and using kerosene and to a lesser extent LPG instead. However fire wood is still used in situations where large amounts of fuel are required for cooking.

Table 15: Selected Villages by Cooking Fuel Type

Village	Fuel				
	Charcoal	Firewood	Gas	Kerosene	Electricity
Muritaro	6%	12%	6%	71%	6%
Rockstone	5%	10%	8%	78%	0%
Orealla	0%	29%	4%	66%	1%
Annai	0%	75%	19%	5%	0%
Sand Creek	0%	78%	21%	1%	0%
Port Kaituma	0%	14%	29%	56%	1%
Mabaruma	0%	23%	37%	39%	0%

Source: UAEP Hinterland Electrification Study Final Report

2. Rural Development Initiatives

2.1 *Introduction*

Guyana as a country has experience extreme underdevelopment during the eighties and early nineties in all ten regions. This was much more pronounced in the regions with large rural populations, that is effectively all regions except region 4. During that period essential service such as health, water, sanitation, electricity and telephone were very limited. In addition to that there was the constant shortage and rather high cost of essential items, such as flour, peas, potatoes, milk, etc in addition petroleum fuel, LPG, gasoline, kerosene and diesel were difficult to obtain. As a result of all of this scarcity most items were black marketed.

These issues along with very strict foreign exchange control led to high levels of corruption amongst public servants and police. The economy slumped as the value of the local currency decreased steeply. As a result of this by the time the new government came to power in late 1992 there was the dire need to rebuild the economy. Not just the economic and administrative structure was in trouble but the physical infrastructure was badly run down. Schools, hospitals, clinics, roads power generation facilities, all state owned entities, office buildings; everything was in dire need of refurbishment.

This desperate state that Guyana found itself in had to be quickly addressed to maintain social stability. The previous PNC government had started to implement had started to implement some degree of corrective measures, but they were very harsh. The in-coming PPP government to continue with short term fixes. One of the main things was the total freeing up of the Guyana dollar exchange rate and all This allowed the currency to quickly settle to a market determined value which lent some stability to the local economy.

2.2 *National Development Strategy*

Apart for the broad macro economic goals of the ERP there were no other coherent strategy for the holistic development of the country. With this in mind the new PPP government with very strong support from the Carter Center formulated a draft National Development Strategy for Guyana. This draft was criticized as not being representative of the interest of the stakeholders of the Strategy and that it was really a “Carter Center” document. Based on these concerns this draft was used as the base document for extensive national consultations aimed at producing a development strategy that reflected the interests of all stakeholders within Guyana. While the Carter Center was still very involved, the Ministry of Finance played the key role in coordinating the production of the final document. The final document was completed and laid in parliament in August 2000, however due to elections issues; it was re-tabled in August 2001.

The NDS sets out priorities for Guyana's economic and social development for the ten year period 2001 to 2010. As such it can be considered as the overarching blueprint of Guyana's developmental thrust for the first decade of the new millennium.

The overall objectives of the National Development Strategy are[15]:

- to attain the highest rates of economic growth that are possible;
- to eliminate poverty in Guyana;
- to achieve geographical unity;
- to attain an equitable geographical distribution of economic activity; and
- to diversify the economy.

2.3 *Poverty Reduction Strategy Paper (PRSP)*

While the NDS provided the general plan for overall development of the country it to a greater extent defined objectives and polices for this development. There was no actual detailed work plan that indicated how to address the issues of poverty in head-on manner. To achieve this objective the government developed an interim Poverty Reduction Strategy Paper (I-PRSP). This I-PRSP was presented to the Boards of the World Bank and International Monetary Fund (IMF) and accepted by them in December 2000. The Government then conducted a very intensive review of this interim paper by a process of very comprehensive national consultations with the objective of capturing the concerns of all stakeholders. This process took approximately a year before a widely accepted document could be finalized. The final document became the Poverty Reduction Strategy Paper (PRSP). This PRSP is supposed to define the policies and strategies to be utilized to reduce Guyana's poverty by 50% of its 2000 level by 2015. In effect it can be considered a 15 year poverty reduction plan.

Both the NDS and the PRSP are sometimes criticized as being to broad in its objectives and policies. As a result the documents cannot really be used as actual plans for developments but more as policy guides to the goals. More detailed projects have to be developed to fulfill the spirit of these documents. However a number of long term projects/programmes were developed and implemented to support the objectives of the NDS and PRSP.

[15] NDS

2.4 *Social Impact Amelioration Programme (SIMAP)*

One key programme developed to foster development and alleviate poverty is the Social Impact Amelioration Programme (SIMAP). This programme was implemented to cushion the harsh social and economic impact of the structural adjustments required by the ERP. SIMAP was created in 1991 with a US$2.8 million grant from the IDB to finance locally sponsored small-scale infrastructure projects to benefit low-income people and also create short-term employment. Due to the dire need for this type of funding the IDB provided an additional $30.5 million in low-interest loans.

As noted earlier the Amerindians are the most affected by poverty especially in the hinterland regions. As a result of the special needs of the Amerindian population, SIMAP launched a program specifically targeted at Amerindians in 1994. This was one of the first mainstream IDB programs that specifically benefited indigenous peoples. The programme has countrywide reach with Community Development Officers (CDO) in each region.

One of the key requirements of any project was that is that the community propose the projects themselves. They are required to set up a project management committee, contribute labour and/or materials, assist in the supervision of construction, and later maintain the facility. In this manner the community has a greater sense of ownership for the facility and thereby pay more interest in its proper upkeep. The CDO is responsible for helping the community to develop and document the project and follow through during the implementation phase. Each project SIMAP approves must be sent to the IDB's office in Georgetown to obtain a "no objection" approval from the Bank.

To get funding approval projects must comply with some rather strict regulations. These include:

- Projects must address an emergency need where individuals are in physical anger or the access or use of a vital facility is jeopardized.
- There must be a responsible group or committee to implement the project.
- The Community must contribute at least 25% of the total project cost.
- Total project cost excluding the community contribution cannot exceed the equivalent in Guyana dollars of US $5,000
- The benefits of the project must be widely shared by the community.

While SIMAP is open to projects from all regions and communities it is much less demanding on its requirements for Amerindian Projects. As such, almost all types of infrastructure, income generating and social improvement projects are open for consideration if they originate from an Amerindian community.

2.5 *The Poor Rural Communities Support Services Project (PRCSSP)*

PRCSSP is a CIDA funded agricultural/rural community development project. It goal is to reduce poverty in Regions 2 and 3 two coastal regions of Guyana, namely Regions 2 & 3, by increasing rural household incomes. It targets poor rural households, Amerindian communities and households headed by women.

2.6 *The Institute of Private Enterprise Development (IPED)*

The Institute of Private Enterprise Development (IPED) is a company registered under the Company Act, Chapter 89:01 of the Laws of Guyana, and is a not-for-profit and limited by guarantee institution. IPED provides and supervises loans and Business Development Services to groups and individuals of the Micro and Small Business Sectors countrywide. IPED is one of the leading institutions that provide financial and non-financial services to the neediest sector of the economy. IPED provides these services for the underprivileged, micro and small entrepreneurs.

IPED's Head Office is in Georgetown, there are five branch offices in Port Mourant Corentyne, Cotton Field on the Essequibo Coast, Parika East Bank Essequibo, D'Edward West Bank Berbice and Lethem in Region 9 respectively and five sub-offices that are open at least once per week. These are Linden, Corriverton, New Amsterdam, Charity and Wakenaam. An estimated 80 per cent of loans are initiated at these offices. IPED operates in each Administrative Region in Guyana. In 2003 a hinterland development outreach programme was launched.

2.7 *International Developmental Organisations*

There are a number of international organisations which play very important roles in the development of the social and economic infrastructure of both urban and rural regions of Guyana. The one mentioned here are the one that have made the greatest impact in the reduction of poverty in the rural areas of Guyana.

2.7.1 United Nations Development Programme (UNDP)

UNDP has been playing a leading role in many aspects of the development of infrastructure, both physical as well as in capacity building. Over the years the range of involvement of UNDP in Guyana's development is all encompassing. UNDP has a country development plan that spans the period 2006 -2010. Currently the main areas being addressed are:

- Democratic Governance
- Poverty Reduction
- Crisis Prevention and Recovery
- Energy and Environment

With respect to its involvement in the energy sector UNDP has given GOG a grant of US$50,000 to implement a project titled Capacity Building and Demonstration Projects for Hinterland Unserved Areas Utilizing Renewable Energy Sources. Two projects were implemented. One was in Paruima in Region 7, where a 1500 W photovoltaic (PV) system was installed at the Multipurpose Hall. The PV system was used to supply lighting and power for economic activities. These activities include sewing, milling and packaging.

The other project was at Kato in Region 8 where a 1500W PV system was installed to provide power for the Kato Hospital. This power is being used to provide lighting, vaccine storage and utilization of other equipment. The systems were designed by IAST.

2.7.2 Inter American Development Bank (IDB)

The IDB has been one of Guyana's supporters and largest creditor. It has been involved mainly in physical infrastructure works, such as, roads, the electricity sector, urban development, etc. It is the largest player in the energy sector and has been responsible for the significant improvement of the quality of electricity supply to of GPL. It is currently funding the UAEP including the Hinterland Electrification programme.

2.7.3 Canadian Development Agency (CIDA)

CIDA is one of the most loyal supporters of the Guyanese people. CIDA was one of the few aid organisations that maintained its presence in Guyana during the difficult period during the 80s. CIDA has been involved mainly in capacity building projects, these projects include the provision of equipment, personnel and other facilities required to build capacity of the targeted area.

Currently CIDA is funding the NGO CHF (formerly Partners in Rural Development), "Building Community Capacity Project". This project includes a number of smaller in a number of regions. The CHF programmes are poverty reduction projects that are based on meeting the goals of the PRSP.

2.7.4 British Department for International Development (DFID)

DFID has been involved in infrastructure development; they have been very involved in the development of the potable water sector and have been one of the major donors of funds to GWI. DFID has also played a very great role in the funding Iwokrama.

2.7.5 The European Union (EU)

EU is also one of the key donor agencies to Guyana; EU has been involved in the potable water sector as well as in sea defenses. Since most of Guyana is usually below sea level at high tide the battle against the sea is a constant one. Maintaining the current sea defenses is very costly. The challenges become more difficult with the recent trends in climate change.

2.7.6 The Food and Agriculture Organisation (FAO)

Even though its presence appears to be low keyed, FAO plays a very important role in Agriculture in Guyana. It has been supportive of numerous projects of this ministry. The support is more in the nature of technical support with some degree of capacity building.

2.7.7 Pan American Health Organisation (PAHO)

PAHO and the Ministry of Health (MOH) have a very strong relationship. PAHO has been working closely with the MOH for a number of years to develop the health delivery in Guyana. PAHO plays a very important role in capacity building within the health sector. During the massive floods of 2005 and the lesser one in 2006 PAHO played a very key role in preventing major health disasters and was responsible for the prevention of numerous due to timely interventions.

2.7.8 Caribbean Development Bank (CDB)

CDB has been providing Guyana with quite a lot of assistance as a single country Guyana is one of the largest borrowers from CDB. A significant amount of the local drainage and irrigation works is funded by CDB.

2.7.9 Caribbean Renewable Energy Development Programme (CREDP)

CREDP was formed to facilitate Caribbean countries working together to prepare a regional project to remove the barriers to the use of renewable energy and to foster its development and commercialisation.

The objectives of the project are to:

- Reduce greenhouse gas emissions by removing barriers to renewable energy development
- Establish the foundation for a sustainable renewable energy industry

- Create a framework under which regional and national renewable energy projects are mutually supportive

CREDP is still to get its feet on the ground properly. It is currently providing financial support for developmental work for renewable projects. However the funding available US$1.6M would limit its assistance to smaller projects.

3. Regulatory and Institutional Framework for Energy

3.1 *Introduction*

The energy sector comes under the purview of the Office of the Prime Minister (OPM). This office is also responsible for mining and communications. Through this office the government regulates and directs the direction of the energy sector. This office is also the focus point for all developmental works in the sector especially electricity Most of the funding for the electricity sector is channeled through the OPM.

The OPM is directly coordinating the current expansion of the national grid to enable the un-served areas to obtain grid supplied electricity. In addition to this project there is a smaller project to enhance hinterland electricity.

The Guyana Energy Agency is the executing agency for the policy directives of the government. The GEA has an overview and control function for all aspects of energy in Guyana. Apart from the control functions of this agency is also the research and development aspect of energy usage. This R&D function is strongly biased toward the utilization of renewable energy and energy efficiency.

Prior to 1999 the energy sector especially the electricity sector was rather loosely organized. During the latter part of the 90s the government decided to divest itself of the control and administration of the sole national electricity supplier. However before control could be handed over to a private company a number of legal issues had to be ironed out. At the same period there was a very strong interest in developing the hydropower site at Amaila Falls by another private investor. This led to competing interests between the proposed new power company GPL and the developers of Amaila Falls Hydro. As a result of this the Hydropower Act had to be reviewed and the laws governing the sector had to be harmonised to finitely define the roles of all the stakeholders in the electricity sector.

The regulatory framework for electrical energy is now rather very simple. The whole sector is controlled by five pieces of legislations (Acts of Parliament) these are:

- Electricity Sector Reform Act 1999 (ESRA)
- Guyana Energy Agency Act 1997 (GEA)
- Public Utilities Commission Act 1999 (PUC)
- Hydro-Electric Power Act 1956
- Energy Sector (Harmonisation of Laws) Act 2002

3.2 *Regulatory Legislation*

3.2.1 Electricity Sector Reform Act 1999

This Act is the core of the electricity sector; it is built around the new national power company, Guyana Power and Light Inc (GPL) which was created by this Act. This Act was developed by the GoG as a requirement for the privatization of the power company. Most of the Act addresses all aspects of generation and distribution of electricity by any entity within Guyana. This includes fixing of tariffs which is finally approved by the PUC and how independent power producers (IPP) operate in the delivery of power to the grid.

Of great importance is the fact that GPL has the first right of refusal for the distribution of electricity to any customer. Even though anyone can generate electricity for their own consumption it is illegal for any entity to sell electricity to any individual or organisation without the prior approval of GPL. This has significant implications for rural electrification since GPL has stated that it is in no position to currently develop distribution grids in the hinterland.

3.2.2 Guyana Energy Agency Act 1997 (GEA)

This Act establishes the GEA and defines its administration and functions. The functions of GEA are manifold. The GEA is an advisory body to the Minister. The Minister can call upon the GEA to develop policies regarding energy and its utilisation. The GEA can commission relevant studies as required by the Minister or as is required for the development of the energy sector. To this end the GEA may implement any research and development exercise including the commissioning of pilot plants.

GEA can recommend and changes or modification to systems and plants to enhance efficiency or alignment with stated policies. In addition GEA will review studies and project proposals and make recommendations to the Minister.

One of the more important roles of the GEA is the policing of the energy sector. They are empowered to maintain quality of all energy related products and have the power to remove any substandard or illegal product from the market as well as follow up with the prosecution of the offender. This role is very vital currently, as Guyana is attempting to stem the high levels of fuel smuggling that is occurring in Guyana. GEA coordinates all petroleum fuels into Guyana.

3.2.3 Public Utilities Commission Act 1999 (PUC Act)

The Public Utilities Commission Act brings into being one of the most important public entities, the Public Utilities Commission (PUC). The main functions of the PUC are regulatory, investigatory and enforcement. The PUC is responsible for the regulation of the functioning of the three major public utilities; electricity, water and telecommunications. These services are provided by; Guyana Power and Light Inc (GPL) which is responsible for electricity, Guyana Telephone and Telegraph Inc (GT&T) and Digicel Guyana Inc, which are responsible for telecommunications and Guyana Water Inc (GWI) which is responsible for water distribution.

The PUC has the authority to fully investigate all operations of any of the utilities to ensure that it is operating in a just and efficient manner. To this effect the PUC can hold public hearings at which the utility will be required to present evidence that it is working in a manner that is beneficial to the consuming public. In its investigations the PUC has the authority to demand information from the utility.

The PUC is responsible for the approval of the rates that are fair and but sustainable. This is important since in the telecommunications sector the two companies may want to engage in a price war which may cause them to under cut the rates to levels that are unsustainable just to hurt the competition.

The PUC entertain complaints from the public regarding the way the utility behaves towards them, either in the quality of service, over billing or any other perceived unfair practice.

As part of its regulatory functions, the PUC can impose fines and any other sanctions on any utility. The PUC can also demand the introduction or removal of any service being provided by the utility.

3.2.4 Hydro-Electric Power Act 1956

The Hydro- Electric Power Act is a very comprehensive act which attempts to control and regulate all aspects of hydro power production. The entities through which this control is implemented are the GEA, the Minister responsible for energy and the President of the country.

This Act deals with all the stages of the development of a hydro power facility in Guyana. This includes agreements with the GOG and the developers, pre-feasibility and feasibility studies, land use, water usage, user fees, construction and licensing for production. The Act details statutory control and sanctions of the developers and operators of any hydro power facility. It also protects the developers and operators from unfair treatment by the government.

3.2.5 Energy Sector (Harmonisation of Laws) Act 2002

The Energy Sector (Harmonisation of Laws) Act 2002 became necessary when it was discovered that the GEA Act, the Hydro-Electric Power Act and ESRA were in some degree of conflict or subject to misinterpretations. This Act attempts clarify the functions of the GEA with respect to the Hydro Electric Act and ESRA as well as detail additional functions of the GEA. One of the main objectives of this Act was to reduce the possibility of conflict between the functions of the GEA and the other entities involved in the energy sector.

When the energy sector is viewed in totality to include other aspects of energy such as petroleum exploration and exploitation, and the utilization of the other renewable sources that exist in the country some other laws and regulation are required. These regulations are:

- Environmental Protection Act 1996
- Petroleum (Exploration and Production) Act 1986
- Guyana Forestry Commission Act 1979 (This Act recently revised and passed on July 26, 2007)

3.2.6 Energy Policy of Guyana

The Energy Policy of Guyana is not a binding document and currently it is rather dated, the last revision being published in 1994. However, the broad policy directive that is presented in this document is still valid. The general thrust of the national energy policy is towards self sufficiency in energy. While it is believed that Guyana has petroleum reserves, the drive is towards the utilization of renewable sources for domestic consumption and exportation of the petroleum products whenever it is found in commercial quantities.

With this in mind the Government is very supportive of all renewable energy proposals that are economically and environmentally sound. The policy indicates that Guyana should harness its hydropower potential to supply the base load for national consumption followed by bagasse in the sugar industry and immediate environs. The utilisation of other forms of biomass from agricultural and forestry waste in smaller decentralized grids or stand alone systems should also be pursued. Vehicles should be powered by bio-diesel and/or ethanol. This policy directive was confirmed by President Jagdeo in a recent seminar on bio-fuels[16].

[16] President Jagdeo- Bio-Fuel Seminar, June 11, 2007

3.3 *Institutional Capacity*

There are not many intuitions that are actively involved in the energy sector. These institutions are mainly government or international donor developmental agencies such as UNDP and IDB. In most instances the international agencies provide the financial support foe a local government agency or NGO to implement the energy programme. In most instances assistance for rural energy projects tend to be renewable energy (photovoltaic) projects.

3.3.1 Institute of Science & Technology

The Institute of Science and Technology (IAST) has been playing a significant role in the use of energy in the rural sector. This intuition is intended to be the government research arm in science and technology; it was initially funded by UNDP. During the early 80s it was involved in a number of renewable energy projects throughout the country regarding the use of renewable energy sources. It was also involved in collecting energy related data such as wind, solar radiation, and biomass information. Unfortunately during the late 80s the funding for this institution had dried up and as a result it lost most of its staff left. Apparently, due to poor record keeping most of the data collected cannot be found.

IAST was instrumental in setting up a number solar dryers, biogas and photovoltaic systems during that early period. The Photovoltaic systems were installed in hinterland villages. Of recent form the late 90s is has restarted work in the implementation of photovoltaic systems in rural Amerindian Villages. A number of these projects were funded by SIMAP.

Of recent IAST has been championing the cause of bio- fuels in Guyana and has set up a pilot plant to produce bio-diesel from waste cooking oil and fresh coconut and palm oils. This plant produces sufficient bio-diesel to power a small fleet of vehicles for demonstration and public sensitization. It is also doing some field trials of *Jathropa curca* in conjunction with NARI as a source of vegetable fats for conversion to bio-diesels.

IAST has recently been able to attract an investor who has committed to refurbish an abandoned palm oil estate at Wouna in Region 1. The investor has built a bio-diesel plant to process the palm oil into bio-diesel. The investor has brokered an agreement with the regional authority (RDC) where the bio-diesel plant will supply all of the regions diesel requirements. This plant will definitely help to improve the local economy.

3.3.2 University of Guyana

The University of Guyana (UG) is currently playing a rather small role in Guyana's energy sector. The Faculty of technology carries a few courses in renewable energy which is the only major input into the rural energy scenario. However, the GEA has recently developed a relationship with the University for the production of anhydrous ethanol which will be used in the manufacture of E10 gasohol blends for a pilot programme.

3.3.3 Iwokrama

The Iwokrama International Centre for Rainforest Conservation and Development (IIC)

In 1989 by then President of Guyana, Desmond Hoyte, made an offer on the occasion of the Commonwealth Heads of Government Meeting in Malaysia to set aside a section of Guyana's territory for research in sustainable forest management. This joint mandate between the Commonwealth and the Government of Guyana to manage Guyana's Iwokrama Forest was formalized in 1996 with the passing of the Iwokrama Act.

The 371,000 hectare Iwokrama Forest covers and area of approximately 371,000 hectare adjacent to the North Rupununi Wetlands. This land comprises of a very varied ecosystem consisting of a wide a range of habitats which include many lake and rivers, mountains, lowland tropical rain forests, palm forests, and seasonally flooded forests and savannahs. The area contains very rich biodiversity, including over 475 species of birds and the highest recorded number of species of fish (over 400) and bats (over 90) in the world, for an area of comparable size.

The area is also the homeland of the Makushi and Wai Wai Amerindians who continue to live in the area and use the forest and wetland resources from the area, the main communities being the Amerindian Communities of Surama and Annai. Iwokrama's management and the indigenous community have developed a very important partnership. This partnership plays a very important role in the social and economic development of the villagers. The relationship has caused significant development of tourism within the community.

3.3.4 Conservation International (Guyana)

Conservation International (Guyana) (CIG) is another NGO that plays a significant role in rural Amerindian communities. The Wai Wai indigenous community of the Konashen District, is found in the remote rain forest in the deep south of Guyana that is part of the globally important Guyana Shield. The land has deep cultural meaning for the Wai Wai. Although forest remains largely intact, there is potential form modern economic activity such as illegal hunting, logging, mining and possible oil drilling since it is believed that commercial deposits of oil is in that region.

To help protect the land, the Wai Wai partnered with CI to assist in their efforts. In 2004, a Memorandum of Understanding was jointly signed by the Wai Wai, CI, and the Government of Guyana creating the Wai Wai Community Owned Conservation Area. Under this agreement, the Wai Wai maintains ownership of the planning process, setting priorities for conserving and managing their lands. CI's input being the provision of technical training, scientific knowledge, and various administrative resources to assist the

Wai Wai to attain their objectives. Below are the key aspects of the CI and Wai Wai partnership[17].

- working together to jointly evaluate the impact of traditional land uses on biodiversity and the ecosystem;
- helping to increase the local, national, and global awareness of the importance of the Konashen District's biodiversity and the contribution of community conserved areas to conservation;
- assisting with identifying and developing income-generating projects;
- developing a management plan for their lands and long-term funding mechanisms; and
- working toward the inclusion of the Konashen Community Owned Conservation Area as part of a system of protected areas in Guyana.

Today, the Wai Wai Community Owned Conservation Area is considered a model of how an indigenous community ensures that their community is developed in sustainable manner that yields benefits for its people. The partnership can be used as an example of how to successfully managed indigenous lands in an attempt to develop a protected area system.

CIG had also become involved in the facilitation of energy systems for the residents. They were able to assist the Amerindian Wai-Wai people of Konashen in the deep south of Guyana to install home solar system in each home. This was a jointly funded project by the community and CIG.

3.3.5 Guyana National Bureau of Standards (GNBS)

The goal of GNBS is to improve the quality of life of the people of Guyana through the process of standardisation. The Guyana National Bureau of Standards was established in March 1984 under Act No. 11 of 1984. The Bureau has the legal status of a statutory corporation. It is governed by a National Standards Council, which is appointed by the Minister of Tourism, Industry and Commerce. The work of the organisation is executed through Technical Committees appointed by the National Standards Council. The Chairman of each Committee is a member of the Council.

The objectives of GNBS are:

- to promote standardisation in industry and commerce;
- to encourage or undertake educational work in connection with standardisation;
- to establish, form, furnish and maintain information systems and laboratories for the purpose of furthering the practice of standardisation;
- to provide for the testing, at the request of the Minister and on behalf of the Government, of locally manufactured and imported commodities with the view of

[17] CI Pres Release

determining whether such commodities comply with the provision of the Standards Act or any other law dealing with standards and quality;

- to assist in the rationalisation of industries by coordinating the efforts of producers and consumers for improvement of appliances, processes, raw materials and products;
- to prepare, frame, modify or amend specifications and codes of practice;
- to make arrangements and provide facilities for the testing and calibration of precision instruments gauges and scientific apparatus to determine their degree of accuracy;
- to make arrangements or provide facilities for the examination and testing of commodities and any material or substance from or with which, and the manner in which commodities may be manufactured produced, processed or treated;
- to control, in accordance with the provisions of the Standards Act, the use of standardisation marks and distinctive marks; and
- to provide for co-operation with any person, association or organisation outside Guyana having objects similar to those for which the Bureau is established.

GNBS is a regulatory body with powers to sanction persons and organisations that run foul of any national standards. It is also responsible for the development and policing of national standards. It is currently developing a new National Building Code which includes standards for electrical installation and the installation of Photovoltaic and solar heater systems.

3.3.6 World Wildlife Fund (WWF)

WWF is very in conservation activities, it is one of the leading advocates for the implementation of National Protected Areas System (NAPS). WWF's mandate includes:

- Sustainable Forest Management
- Gold Mining Pollution Abatement
- Protected Areas
- Wildlife Conservation
- Marine Turtle Conservation

WWF would usually partner with an NGO or community to implement any project it is interested.

4. Rural Electrification Programmes

4.1 *Overview of the National Situation*

The Guyanese government is the key player in the development of the Energy Sector in Guyana. It currently owns the main power company GPL and most of the lesser electricity generation entities scattered around the country. GPL is responsible for all the grid supplied electricity on the coast, where the largest amount of the population is found. Other smaller grids exist in the town of Linden in Region 10, Bartica in Region 7, and Lethem in Region 9.

The Linden grid is currently the responsibility of the Government but it is operated by the Bauxite Company, BOSAI. The power is heavily subsidized (approx G$5/kWh) since the government recognized this area to be a depressed community in need of economic support. At one time the Linden grid was connected to the coastal grid by a 69 kV transmission line to GPL sub-station at Garden of Eden (GOE). However during the eighties the bauxite company started to experience difficulties and reduced generation so there was less dependence on the transmission line. As the maintenance of the line became more problematic the line was de-energized. This resulted in extensive vandalism of the conductors, eventually the entire line disappeared with just a few support structures remaining

The Lethem grid was developed by the GEA to distribute power from the Moco Moco Hydropower Plant and run by a local entity, Lethem Power Company. On the loss of generation from the Hydropower plant diesel generation was put in place. The grid in Bartica is owned and operated GPL since its inception. There are a few smaller limited community grids that are run by the local government authority to provide limited service in a few communities in Region 1.

The coastal grid in the early nineties had bypassed a number of communities. As a result, though there was a continuous transmission line from the East Bank of Essequibo in the west to the Corentyne Coast in the east there were numerous rural villages that did not benefit from electricity. This situation became even more pronounced with the regularization of squatter settlements and development of housing schemes. The government recognized that there was a great need to provide grid electricity to these communities.

To do this the government had to do two key things first stabilise the generation capacity of the power company. At that time the company operated under the name Guyana Electricity Corporation (GEC). The government with IDB funding and Japanese grant aid installed approximately 55 MW of new diesel and heavy fuel oil powered plants over a four year period. Also during this period the costal transmission line was also rehabilitated. Also some limited extensions was done to the grid so nearby communities could be powered. During the period 1996-97 some 4,000 new connections were done in East Berbice, however lack of funds led to a significant decrease in the connections.

4.2 *Unserved Areas Electricity Programme (UAEP)*

Provision of electricity was part of the NDS and is supposed to be one of the key factors for social and economic development in the rural and peri-urban communities of the country. After GEC was privatised and became GPL in 1999, the government revisited the need to extend electricity to a wider community. Part of the agreement with the new owners of GPL was the provision for the extension of the customer base to the unserved areas along the coast. The government would provide the bulk of the funds with GPL providing 25% or a maximum of US$1.0 M/yr from revenues generated from the current customer base.

This initial programme to extend the grid led to the later development of a more sophisticated electrification programme called the Unserved Areas Electricity Programme (UAEP). The UAEP was developed by the OPM, GPL and IDB, this project was able to attract funding from the IDB. The total project value is UD$34.4M with IBD providing a loan of US$27.4M and the GOG providing equivalent of US$7.0M in counterpart funding. The project is being implemented over a five year period from 2004 to 2009.

The UAEP is focused mainly on the connection of coastal rural communities, with smaller amounts in the coastal urban centres. The estimated number of these connections to new customers is 40,000. Using that each new customer would use 60kWh to 100kWh per month, this would require an increase in generation of approximately 20MW and an additional energy usage of 58GWh/year after all customers are connected.

Since most of the customers expected to be connected under UAEP are poor, with monthly household incomes of around G$30,000 (US$150) per family, they would not be able to pay the actual connection cost, which was estimated to be on average US$695 per connection. To facilitate this initial connection the GOG decided to subsidise this cost and pay the bulk of it (93%). Instead the customer is only expected to pay the equivalent of US$50 per connection. As the project got underway it was found that some were experiencing difficulties in finding this US$50, as a result the GOG allowed them to pay in instalments.

One of the problems the UAEP is currently experiencing is the low rate of up take of connections by customers in the unserved areas. GPL has a policy that it will only commence connecting the homes when 50% of the potential customers in any block have paid the connection fee. Even though the entire projected grid extensions have been completed for Phase 1, which would enable a possible 12,000 connections, however, only 4,740 or 35% of the potential customers have been connected. This low level of connections is also related to the level of occupancy of the housing area.

There is currently a very high incidence of illegal connections since a number of persons rather make illegal connections to avoid paying any rates. IDB has warned the GPL to ensure that this theft is reduced significantly or funding would be stopped since at this rate the programme would not be economically viable.

Table 16: Losses in the GPL Network

Non Technical Losses as % of Net Generation	
Illegal Connections	11.04
Billing Problems	6.46
Metering Problems	11.29
Subtotal non-technical losses	**28.79**
Technical Losses as % of Net Generation	
Sub-transmission and primary transformers	1.8
Distribution Network	3.0
LV Network	5.4
Subtotal technical Losses	**11.60**
Total Losses	**40.39**

Source: OPM

4.3 *Hinterland Electrification*

4.3.1 Hinterland Electrification Strategy

As can be seen from the UAEP the households that would be able to get access to new connections from the GPL grid would be the coastal residents. However hinterland residents are in much more greater need for some form of affordable sustainable electricity. As described earlier, most of these hinterland communities have relatively small sizes, are difficult to access to and do not have very strong local economies. These factors militate against the setting up of any extensive power generation system. Since the UAEP did not address the issue of Hinterland Electrification the GOG had to make a special case for its inclusion in the UAEP.

The IDB was approached and after months of negotiation the OPM and IDB agreed on the Hinterland Electrification Strategy. There was no commitment for extensive funding of the hinterland communities. Instead funding was approved for the commencement of the demonstration projects. The project details were submitted to Cabinet in September 2006 for approval however Cabinet was concerned that the approach outlined in the might fuel unrealistic expectations by hinterland communities. Cabinet decided that the funds earmarked for the projects should be used to establish some reasonable minimum amount of electrification in more hinterland communities than those chosen.

To ensure that an effective programme for the hinterland electrification was put in place, OPM used the Hinterland Project Preparation Component of the UAEP to finance a study to develop a comprehensive hinterland electrification programme. This study was done by the consulting firm Projekt Consult and the report presented in 2005.

The main objectives of the study were[18]:

- To implement level some electrification in each village, before electrifying some of the villages completely. The initial stages would to provide electricity for social services and communal buildings, such as health posts, libraries and school buildings that could be used in the evenings for other activists or lessons, etc., that are used in the evenings. Additionally, other buildings where community work or group-work, such as craft and sewing, is being done would also be powered.

- To encourage private generation of electricity to supply neighbours or the whole community, at reasonable rates.

- To investigate and coordinate the various assistance programmes so as to optimize their combined effect.

The study divided the hinterland communities into three groups based on the layout and level/type of activity of the community. The communities fall into one of three groups.

Group 1
Communities with existing mini-grids, relatively high amount of households and government institutions with some amount of productive activities.

Group 2
These are communities with some potential for development; they have secondary schools, hospitals and other Government institutions.

Group 3
Are small communities, with less than 1000 residents, which have primarily subsistence economies. They may have nursery and primary schools, small medical clinics and usually, no other major Government institutions.

As can be seen from earlier information the three groups also closely reflect relative level of poverty of communities. Group 1 tend to have the lowest level, while Group 3 has the highest level of poverty. The information gathered from this study was utilised to develop a comprehensive strategy for the hinterland electrification.

In 2007 the OPM issued a document that detailed the hinterland programme, this document is called "Government of Guyana Hinterland Electrification Strategy". This document details the rational behind the strategy, the communities to benefit and the type of electrification system to be implemented. The document details cost and cost analyses, cost recovery systems, operation and management of the systems, etc. In effect this document is the blueprint for the hinterland electrification over the next 3 years.

Table 17: Classification of Communities

[18] GoG UAEP Hinterland Electrification Strategy, Jan.2007

Group	Characteristics of village	Issues	Proposed electrification supply model	Village
1	Large village in transition to a town	Existence of productive sectors; Major government installations.	(Existing) mini grid Power company existent or in transition	Santa Rosa Port Kaituma Mabaruma Madia/Campbelltown Lethem
2	Communities with sub-regional importance and/or economic development potential	Sub-regional government installations; Potential for minor productive activities. Domestic consumptive use of electricity	Demand for limited grid electricity and/or existing government generator - Power company or other suitable institutional set-up	Orealla Annai Paramakatoi Aishalton St.Cuthbert
3	Small Communities	- Basic government installations. - Mainly domestic consumptive use of electricity	- Grid probably not viable - Individual supply of different sizes and technologies	Sebai Yarakita Red Hill Capoey St.Denys Kurukubaru Monkey Mtn. Kopinang Ypukari Nappi Sand Creek Shulinab Shea Muritaro Rockstone Wicki/Calcuni

Source: UAEP Hinterland Electrification Study Final Report

4.3.2 Overview of Group Implementation Strategies

From the study it was decided that each class of community would have a different approach to the electrification process.

Group 1

In Group 1 communities the existing grid would be improved and where possible (and cost effective) extended. In addition the generation capacity would be improved to accommodate the demand of the entire customer base of the grid. Where it is possible to include large renewable generation e.g. wind, bio mass or hydropower, into these grids it would be done.

The entity responsible for the generation and distribution will be formalised and all permits and licenses required for these operation will be granted to the entity. In the situations where a privately owned entity is involved the entity will be regularised and duly licensed.

Since all hinterland communities' households tend to be rather scattered it was suggested that the dwellings which are too far from the grid to be economically connected would be given standalone photovoltaic systems which are also called solar home systems (SHS). Based on the financial it is expected that in these communities the majority of the residents have the ability to, and would be willing to pay for the power.

Group 2

Group 2 communities tend to have a core area where most of the important buildings are clustered in a general area of the village. It is proposed that these communities should have a small grid installed to power the core and any nearby households. SHS are to be installed for remote users, and a battery charging service for the small remote dwellings who cannot afford the SHS. Once again it is assumed that the persons will be able to pay for the cost recovery of the system and service.

It is assumed that these communities have an easy and relatively cheap transportation system for fuel. The generation system recommended in these instances for generation for the grid is diesel. There is one instance where a community (Paramakatoi) that could be classified as a Group 2 community and currently in possessions of a generator and a small central grid cannot utilise it effectively due to the high cost of transportation of fuel to the community. In this instance Paramakatoi is a very remote village in Region 8 that is rather isolated from any nearby commercial centre from where the fuel could be easily transported.

Group 3

Group 3 communities are communities that do not have any large concentration of dwellings. As such, they do not have the critical mass to have any effective local economic activity also the households tend to be rather scattered. The recommendation is that the household be provided with small SHS systems to provide primarily lighting and some entertainment.

The system recommended here is based on an 80Wp solar panel operating at 12VDC and storage battery along with compact florescent lamps (12VDC) for lighting. In instances where the person cannot afford the cost of the SHS then that individual could purchase or rent a battery and just pay for the coat of charging the battery at a central location.

Base on the excellent performance of over 100 installed systems built around a 35Wp or 45Wp solar panel and including 600W or 700W inverters to convert 12VDC to 120VAC, the 80Wp SHS system recommended by the study for the Group 3 communities can be replaced by the 35Wp or 45Wp SHS for the low income users. The inclusion of the inverter allows significant flexibility in the application of the system for the customer[19]. Also if the initial system is designed with expansion in mind these smaller SHSs can be easily and relatively inexpensively expanded as the energy requirements is increased.

It is ironic, that based on the economic and other factors, such as, easy accessibility the Group 1 communities get recommendations for higher levels of spending in these communities relative to that of Group 3 communities. This situation does not really address the problem of poverty reduction for the communities that need the greatest level of intervention, the Group 3 communities. The Hinterland Electrification Strategy should take other non economic factors into consideration when allocating resources. These should include the improvement in the quality of life for the children, making it easier for them to study and participate in other self improvement activities. Also, women tend to be the most affected by absence of electrical power; in this instance the women (as well as the men) would have greater opportunity to do productive work after dark.

4.4 *Barriers to Rural Electrification*

The barriers to rural electrification are manifold. A number of the barriers are as a result of nature of our rural geography and population density. The barriers found on the coastal regions are less difficult to overcome since the communities are close to the coastal grid of GPL. The issue in most instances is one of extending the grid to the community and getting the customers to take up the service. The hinterland regions are much more challenging due to the distance from the coastal services and the ruggedness of the terrain.

[19] Discussions with customers of Synergy Holdings Inc

4.4.1 Barriers in Coastal Rural Areas

Attitude Towards Payment

On the coastal rural areas the issue is mainly economic. The rural coastal households tend to have similar consumption patterns to that of the urban populations and have approximately similar spending ability. So in this instance it not the ability of pay for the service is usually the barrier to electrification in these areas. It is generally the ability of the distribution company to fund the extension of the grid to supply the customers in the unserved area.

Another issue is the unwillingness of the customer to pay the connection fee. Based on current trends in the new coastal housing schemes it has been found that a large number of persons are unwilling to pay the connection fee for legal connection but instead make concealed illegal connections to avoid paying monthly consumption. The generally accepted complaint is that the connection fees are too onerous. However, even with structured payment plans the householders claim that they cannot afford the additional expenses. Yet a number of these individuals can be seen spending similar quantities of money on entertainment and luxury items on a very regular basis.

While the citizens would not admit this, there is still embedded in the psyches of a number of Guyanese the belief that they should not be required to pay for utilities, instead the government is obliged to foot these charges. This attitude toward the payment for electricity and water utilities may be a throwback form the period when the country experimented with socialism. During that period the cost of utilities were heavily subsidized and corruption allowed many to totally avoid any payments.

Apart form this unwillingness to pay is the haphazard manner in which the house lots in new housing areas are taken up. As a result of this, in most housing schemes there are pockets of dwellings but not sufficient overall for it to be economically viable to commence large scale individual connections to the low voltage network of the community.

4.4.2 Barriers in Hinterland Rural Areas

Isolation

The key barrier to hinterland is the fact that most of the communities are isolated and as a result cannot be easily be connected to any existing grid system. This isolation means that the entire infrastructure for electricity generation and distribution has to be installed in the community if none already exists. This isolation also adds a significant cost factor to the operation and maintenance of the system. Since to date the most effective means of generation in most of these is by the use of diesel generators there is the high cost of transportation of fuel to the community due to the isolation.

This isolation will also in many ways determine the type of generation method utilized. In some of the remote rural hinterland communities it is just not possible to use diesel generator since it would be too costly to ship fuel to the community. This is the situation of many of the communities in Region 8. As such other sources of energy have to be investigated such a solar and hydropower. However, these technologies have very high upfront cost outlays and as such are not readily pursued because of the difficulties in justifying the expenditure using accepted economic arguments.

Physical Layout of the Communities

Most of the rural hinterland communities have been in existence for a number of generations and home were built in a rather random manner over the years. Apart from the randomness of layout was also the issue of rather large spaces between dwellings. Both of these factors increase the difficulties and cost of getting power to individual dwellings from a central generation facility. The main issue is the layout of the grid network and length of supply lines from the low voltage distribution network. Both of which would be very costly when the community is randomly organised. This randomness also has implications for operation and maintenance of the distribution, maintenance cost as well as technical losses would be rather high relative to the customer base.

Low Energy Demands

The rural hinterland communities currently have very low energy demand with very few electrical appliances being used in the communities where there is some form of grid supplied power and even smaller amounts in the communities without grids. The average consumption of individual customer in the rural hinterland rarely exceeds 30 kWh per month while the coastal customers average over 100 kWh per month[20] (Ref). This low consumption in the hinterland communities militates against the installation of grid systems since the levels of revenue collection would not be sufficient to cover the cost of operation of the system.

This low consumption levels also manifests itself in the situation of low load factor for the installed plant. In most instances the demand is only required for short periods of a few hours usually in the mornings and the evenings. This consumption pattern tends to indicate significant under utilisation of the installed capacity. However it should be noted that the current consumption patterns are usually reflective of current supply capability. The general trend with the installation of reliable cost effective power supply is that it is quickly taken up as the consumers find more ways to utilise it for productive ventures.

[20]Projekt-Consult GmbH, UAEP Hinterland Electrification Study Final Report

Table 18: Household Appliances in Hinterland Communities

Appliance	Average	Appliance	Average
Radio/Stereo	37%	Washing machine	1%
TV set	6%	Microwave	1%
VCR/DVD	4%	Phone (land)	1%
Personal Computer	1%	Cell phone	1%
Refrigerator/Freezer	5%	Water pump	1%

Source: Projekt-Consult GmbH, UAEP Hinterland Electrification Study Final Report

There is the argument that consumption and availability can be a chicken and egg situation, which comes first. This question has significant implications when considering the economics of any power generation system. Some persons, usually, the developers argue that consumption will increase if power is supplied in a reliable and affordable rate to the customers. The financers and administrators usually want to see that there is an economically viable demand for the power before any generation project is approved.

This is a question that the developers of rural electrification would have to face in Guyana in almost all instances of new supply of electricity. To properly answer the question detailed studies of projected energy consumption and the ability of the consumer to pay, both current and projected, would need to be thoroughly analyzed and considered before any firm decision is made. This issue is very pertinent since some of the benefits to the communities and in some instances to the country as a whole many not be captured in the regular economic analysis and the lost opportunity is not figured into the whole equation.

Administrative Cost

The hinterland report indicates that one of the barriers is the high cost of administration of the system. However apart from the cost of transportation of the fuel, the cost of the administration can be made manageable. The use of software to handle the accounts and other administrative issues can significantly reduce the personnel required. Meter reading and maintenance can be subcontracted out thereby reducing the amount of full time personnel.

Awareness of Alternative Power Generation Technologies

Experience in the supply and installation of alternative sources of power has indicated that there is a significant level of ignorance or misunderstanding of alternative power sources, both with in the general consuming public and senior decision makers. This ignorance and misconceptions leads to a very high level of skepticism by both the decision makers and consumers, this immediately makes the acceptance of any novel solutions difficult.

This situation can be improved by exposing the decisions makers to credible information and examples. Also, there must be the opportunities given to install viable demonstration projects to prove the effectiveness of the technology and design concepts.

Additionally since there is insufficient data about the supply of the energy sources, wind, insolation, hydrology and biomass data. It is very easy to question the reliability of any proposed project since the energy supply data is usually extrapolated from a very small data set. It is imperative that this type of data be collected to lend strong support for financial approval of future projects.

4.5 *Summary of the Hinterland Strategy*

The demonstration projects are intended to test the feasibility of using specific technologies and energy resources for hinterland electrification. Feasible options will be replicated in other areas at a later stage.
The strategy for hinterland electrification and the programme for demonstration projects are summarized as follows:

- Solar electricity demonstration projects are to be implemented in selected Group 3 villages using an appropriate photovoltaic system in each home, building (or cluster of building) to provide lighting for after-dusk reading, studying and productive work, and to provide power for small radios for information and entertainment.

- Development of a micro- or pico-hydro electricity system at an appropriate location, preferably on the Chiung River, using run-of-the-river technology during 2007 - 2009, and hydro-power pre-feasibility and feasibility studies to be done on several sites, sufficiently close to villages, which show potential for small hydropower schemes over a medium to long term period.

- Based on past analysis of wind energy, a wind-diesel hybrid electricity generating demonstration project is proposed for Orealla with diesel being the reserve energy source. Additional instruments will be installed with the wind generator to collect data for any future consideration of increased wind generation in Orealla. In addition, A programme of long term wind data collection in several communities that show some wind energy potential is proposed. For this, several anemometers, data logger, 60M tower and installation kit are to be acquired.

- The GOG proposes to demonstrate biomass and bio-fuels as energy sources for hinterland electrification, and is allocating a sum of money for one or more test installations. The Office of the Prime Minister will continue its search for:

    (1) re-emerging technologies and equipment for small scale energy and electricity generation utilizing wood, other types of biomass and bio-fuels;

    (2) ways to improve burning of wood by villagers - improved methods would save wood to fuel electricity generation;

(3) technology and equipment for small scale production of various vegetable oils and small-scale modification / processing to produce bio-fuel on site to fuel a diesel engine in whole or in a blend with diesel.

- Improvements to and expansion of existing electricity generation (diesel) and distribution systems in Groups 1 and 2 hinterland villages are proposed. The distribution networks are to be upgraded, and generation optimised by providing new generators of suitable sizes and by relocating generators to other targeted areas based on the present and future energy demand.

- Legal entities will be established (where they do not currently exist) to manage these electricity systems. Private participation in electricity generation and distribution in these areas will also be encouraged and permitted.

5. Local Renewable Energy Sources

5.1 *Introduction*

Guyana's topography and due to its geographic location with a large part of the country being covered with tropical rainforest give Guyana many natural advantages with respect to the availability of renewable sources. The locally available renewable sources are wind, solar, biomass and hydropower.

The Hinterland Study found that when compared with diesel for the supply of small communities current renewable sources are more costly where diesel can be taken overland to the community. However if the fuel has to be transported via air then solar home systems (SHS) are competitive.

5.2 *Solar*

Since Guyana is located near the equator it and receives a very high and rather intense level of radiation. While there is no readily available data on the actual amount of energy received in Guyana it is estimated that this is approximately 5kWh per square meter per day. (Hinterland study) However GEA and other systems designers have been using 5.5 peak sun hours in their designs which resulted in reliable system performance. This indicates that a 100Wp solar panel would supply an average of 550Wh of energy per day at the panel terminals.

In addition to provision of electricity solar is also used for heating and drying. There are numerous applications of solar drying throughout Guyana. Many agricultural processes depend on crude solar drying. These include drying of fish and shrimp, fruits, un-milled rice (to improve quality before milling) and lumber. Dried fish and shrimp play an important role in the coastal rural economy most of the locally consumed salted fish and shrimp are made by solar drying. Additionally a number of these producers also export to markets in the Caribbean and North America. To capture the effect of utilization of solar energy a comparison of the drying of clothes by solar heat against the energy the more developed countries use for similar drying can be done. This gives an indication of the savings tropical countries give to the world with respect to carbon emissions.

The Hinterland Study indicates that solar home systems (SHS) would be one of the most effective means of providing electricity to the hinterland communities especially the Group 3 communities. The SHS would facilitate the dispersed population since individual units could be installed for each dwelling. Also for those individuals who cannot afford a complete system they can use small rechargeable deep cycle batteries to provide power for lighting and small radio. These batteries could be charged at a dedicated battery charging solar facility where the user will pay a small fee for the charging. One of the

major challenges for the installation of SHS is the acquisition of high quality relatively inexpensive deep cycle batteries.

5.3 *Hydropower*

Due to the very rugged topography of Guyana's hinterland, there are numerous potential hydropower sites. Earlier studies during the 70s by the Canadian firm Monenco have identified some 67 sites with a gross capacity of approximately 7000MW. It should be noted that Regions 2, 3 & 5 have no sites Region 4 just on site of 10.0 kW Regions 7 and 8 having the greatest number of sites and capacity.

This raw capacity is somewhat deceptive; this is due to the fact that a number of sites will not receive approval for development for various reasons. The current environmental requirements on dams and man made reservoirs would rule out a number of sites in Region 7 and two sites Kaieteur and Takwari would not be developed because of their cultural and environmental importance. Kaieteur is believed to have the longest single drop of some 714 feet and Takwari reservoir would flood approximately one half of the Iwokrama reserve.

There is some very strong interest in the development of a few sites. These sites are Tumatumari, Turtruba, Eclipse and Amaila. Currently the 100MW Amaila project is the most developed. The developers had already done all of the feasibility studies including a detailed EIA. They were given an Environmental Permit to proceed with construction and the GOG through the OPM had granted them a construction license. However the project was stalled on them not being able to get GPL to enter into a Power Purchase Agreement (PPA) for the sale of the power to the national grid. However since the steep increase in the price of oil the government has become involved and is attempting to facilitate the project. It is scheduled to start supplying the grid in 2010.

Although Guyana has so much hydropower potential the sites are usually in very inaccessible terrain. To develop most of these sites requires extensive infrastructure work on access the site for any extensive study. Since they tend to be very far from load centers the cost of transmission is not very attractive. Since the major load centre is on the coast there is not need to develop many sites. On the other hand in attempting to develop sites for the hinterland load centers only very capacities are required since most of the communities are rather small or scattered.

As a result it is advisable that only communities that have easily accessible small capacity micro or pico capacity should be developed for rural hinterland communities. There are some off the shelf hydro units with capacities as low as 200W to 1,000W and can be easily installed with a head requirement of only 1.5meter. These can be tried in some villages that have fast running streams for battery charging and other community utilities.

5.4 *Wind*

Guyana's coast is blessed with the north east trade winds, these winds are very constant but do not have the velocities that facilitate the optimization of the output of the wind turbines. There is no reliable wind data for coastal Guyana except that collected at Hope Beach on the East Coast Demerara by the developers of a wind farm. There has been a number of small wind turbines (AIR 403) installed along coastal over the last five years but the owners report that the output is not close to what they had expected. One of the problems here is that the turbine is rated at 400W at wind speeds of 28 mph while coastal wind speeds are more in the range of 12 mph.

These same turbines tend to perform much better in the Rupununni savannahs in Region 10 where there are higher wind speeds during the dry season. Additionally Orealla in Region 6 has been identified in the Hinterland Studies for further studies in its wind regime in the hope of installing a wind-diesel hybrid system.

5.5 *Biomass*

Biomass in Guyana can be seen as coming from two sources, natural from the forest and as agricultural by-product. The biomass produced from the agricultural industry is found predominantly on the coastal regions. When viewed from an overall country volume, Guyana produces a large amount of biomass (as agricultural by-product). However, with the exception of the sugar industry, all of the agricultural biomass that is produced by any entity is relatively small. For example, though 300 tonnes of rice was produced last year this overall production was the sum of a number of mills scattered along the coast of the country. As such, the amount of biomass from any one mill would be relatively small. The same problem is found in the sawmilling sector, many mills with small individual throughput.

The biomass from agricultural processes is much more accessible than the biomass in the forest. With the exception of the sugar industry where the bagasse is utilized for heating, electricity and motive power most of this biomass is being dumped and eventually converted by natural or man induced processes, to carbon dioxide, methane and heat without any useful energy being captured from these processes. This fuels the issue of pollution and global warming in a very wasteful manner.

This issue of small amounts of biomass means that with the current technology that is readily available these small quantities of biomass are neglected. In most instances it is either burned or just dumped close to the site or into the river, as occurs in some instances here in Guyana. In a few instances it is burned inefficiently to provide heat for processing.

The current trend in energy efficiency is toward combined heat and power (CHP) systems and decentralized energy (DE). This trend is easily supported by the situation of Guyana's economy which does not have the internal demands to support large scale production. The installation of CHP systems are ideal since most of the plants that produce biomass have some need for electrical power and heat for the processing of the primary product. The by-product waste such as sawdust or rice husk, chicken litter, etc. can all be easily utilised with existing technologies to power CHP plants.

Previously, volume of biomass used to be the problem, however there are now many off the shelf solutions for small biomass systems (60 to 150 kWe) available in the developed countries (Europe, Japan, North America). However, the cost of these systems is very prohibitive for small producers in the developing world. So there is the need for a creative approach to the acquisition and financing of these plants so they can be readily accessible to the small producer.

There are a number of ways this situation can be handled. The first would to be to disassemble the power package into essential or critical technology sections, this would include the boilers, micro turbines, engines, etc. and non critical elements. The proposal is that the critical components which require sophisticated production and quality control to be produced by the current producers and the other sections such as support, housing, feed handling equipment, etc. be manufactured in the country utilising technology. As such the cost of production would be reduced, since the process of manufacturing the non essential components and assembly is now done in the country of use. Also, as these plants will be stand-alone plants, much of the high tech (high cost) electrical control systems will not be required further reducing the overall cost.

When timber is harvested in Guyana's forest a fair amount of waste is left in the forest from the trimmings. This waste can be rather substantial relative to the fuel requirements of some of the smaller Group 1 and 2 communities. Since a number of these communities also participate in forestry activities on their own lands it may be possible to collect this waste and utilize it in a micro turbine CHP system for the production of electricity and drying of lumber. While the large amount of wood available in the forest is an attractive proposition there should be a very cautious approach to any attempts of harvesting for fuelling a community generator. This kind of harvesting could lead to environmental problems resulting from over-cutting.

Bio-fuels can be considered as a subset of the wider energy from the biomass equation. The Guyana government has made a very clear statement that Guyana will pursuing the development of bio-fuels both bio-diesels and ethanol. IAST in conjunction with NARI and the Ministry of Agriculture is developing the mechanism via which Guyana can produce and utilize bio-diesels on a commercial scale.

On the other hand GEA in conjunction with UG is developing the mechanism of introducing gasohol on a pilot plant scale for demonstration purposes. Additionally GEA under its non-conventional division has a project which is dealing with fats producing

tree species for the development of Energy Farms. An area of 1,200 acres is set aside to be used to test suitable species for the white sand region.

A small nursery has been established at Yarrowkabra along the Soesdyke/Linden Highway near the project area. Presently, seedlings of *Acacia mangium* and *Leucaena leucouphala* are cultivated. Plants such as *Jathropa curca* which has great potential as a fuel substitute is also being cultivated for planting. Indigenous species will also be investigated. The project hopes to demonstrate that fast growing species suitable for firewood and charcoal can be grown on the white sands, especially along the Soesdyke-Linden Highway. This could eventually lead to the highway lands being commercially utilized for energy farms.