GUYANA
Natural Resources Management Project
PN 93.2243.9-03.100

LAND USE PLAN FOR A PILOT AREA
IN GUYANA

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
Herrn Klaus Lengefeld - OE 3050
Dag-Hammarskjöld-Weg 1 – 5
65760 Eschborn

January 2003

RECEIVED
SEP 16 2003
Your contact person at GFA Terra Systems is

Dr. Elfriede Maussner
Tel: 0049-40-60306-184

GUYANA

Natural Resources Management Project

PN 93.2243.9-03.100

LAND USE PLAN FOR A PILOT AREA IN GUYANA

Prepared by:
Land Use Planning Unit and Holger Diedrich

Georgetown, Guyana

January 2003

Address

GFA Terra Systems GmbH
Eulenkrugstraße 82
22359 Hamburg
Germany

Telephone 0049-40-60 30 6-184
Telefax 0049-40-60 30 6-189
E-Mail: latein@gfa-terra.de
TABLE OF CONTENTS

ANNEX: LIST OF MAPS

GLOSSARY AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>PURPOSE OF THE LAND-USE PLAN</td>
<td>2</td>
</tr>
<tr>
<td>2.1</td>
<td>Plan Objectives</td>
<td>2</td>
</tr>
<tr>
<td>2.2</td>
<td>Development Goals</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ACTUAL SITUATION</td>
<td>4</td>
</tr>
<tr>
<td>3.1</td>
<td>The Pilot Area</td>
<td>4</td>
</tr>
<tr>
<td>3.2</td>
<td>Institutional Policies and Responsibilities</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>ANALYSIS OF POTENTIALS AND CONFLICTS</td>
<td>11</td>
</tr>
<tr>
<td>4.1</td>
<td>Land-Use Potentials</td>
<td>11</td>
</tr>
<tr>
<td>4.1.1</td>
<td>Ecological Vulnerability</td>
<td>11</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Socio-economic Vulnerability</td>
<td>12</td>
</tr>
<tr>
<td>4.1.3</td>
<td>Ecological Value</td>
<td>13</td>
</tr>
<tr>
<td>4.1.4</td>
<td>Recreational Value</td>
<td>14</td>
</tr>
<tr>
<td>4.1.5</td>
<td>Potential for Forestry</td>
<td>16</td>
</tr>
<tr>
<td>4.1.6</td>
<td>Potential for Agriculture</td>
<td>17</td>
</tr>
<tr>
<td>4.1.7</td>
<td>Potential for Mining</td>
<td>19</td>
</tr>
<tr>
<td>4.1.8</td>
<td>Potential for Inland Fishing</td>
<td>20</td>
</tr>
<tr>
<td>4.1.9</td>
<td>Potential for Hydropower</td>
<td>20</td>
</tr>
<tr>
<td>4.2</td>
<td>Stakeholders' Interests</td>
<td>21</td>
</tr>
<tr>
<td>4.2.1</td>
<td>The Interests of Major Stakeholders</td>
<td>21</td>
</tr>
<tr>
<td>4.2.2</td>
<td>The Interest of Small Stakeholders</td>
<td>25</td>
</tr>
<tr>
<td>4.3</td>
<td>Identifying Constraints</td>
<td>27</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Constraints to Protect the Ecological Value</td>
<td>27</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Constraints for Tourism</td>
<td>27</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Constraints for Agriculture</td>
<td>28</td>
</tr>
<tr>
<td>4.3.4</td>
<td>Constraints for Forestry</td>
<td>29</td>
</tr>
<tr>
<td>4.3.5</td>
<td>Possible Conflicts by Overlapping Potentials</td>
<td>29</td>
</tr>
<tr>
<td>5</td>
<td>LAND-USE OPTIONS</td>
<td>30</td>
</tr>
<tr>
<td>5.1</td>
<td>Introduction</td>
<td>30</td>
</tr>
<tr>
<td>5.2</td>
<td>Scenario Development</td>
<td>30</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Scenario 1 – The &quot;No Plan&quot; Scenario</td>
<td>31</td>
</tr>
<tr>
<td>5.2.2</td>
<td>Scenario 2 – The Regional Efficiency Scenario</td>
<td>32</td>
</tr>
<tr>
<td>5.2.3</td>
<td>Scenario 3 – The Sector-Led Scenario</td>
<td>35</td>
</tr>
</tbody>
</table>
### 6 RECOMMENDED LAND USE FOR THE PILOT AREA

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>General land-use policy</td>
</tr>
<tr>
<td>6.1.1</td>
<td>Forestry Sector</td>
</tr>
<tr>
<td>6.1.2</td>
<td>Mining Sector</td>
</tr>
<tr>
<td>6.1.3</td>
<td>Agricultural Sector</td>
</tr>
<tr>
<td>6.1.4</td>
<td>Fishery Sector</td>
</tr>
<tr>
<td>6.2</td>
<td>Proposed Land Units</td>
</tr>
<tr>
<td>6.2.1</td>
<td>Land Unit 1: Settlements and Mines</td>
</tr>
<tr>
<td>6.2.2</td>
<td>Land Unit 2: Agriculture</td>
</tr>
<tr>
<td>6.2.3</td>
<td>Land Unit 3: Agriculture – Mining</td>
</tr>
<tr>
<td>6.2.4</td>
<td>Land Unit 4: Fishing</td>
</tr>
<tr>
<td>6.2.5</td>
<td>Land Unit 5: Commercial Logging</td>
</tr>
<tr>
<td>6.2.6</td>
<td>Land Unit 6: Regeneration Forest</td>
</tr>
<tr>
<td>6.2.7</td>
<td>Land Unit 7: Conservation forest</td>
</tr>
<tr>
<td>6.2.8</td>
<td>Land Unit 8: Eco-tourism</td>
</tr>
<tr>
<td>6.2.9</td>
<td>Land Unit 9: Transportation network</td>
</tr>
<tr>
<td>6.3</td>
<td>Land-Use Systems</td>
</tr>
<tr>
<td>6.3.1</td>
<td>Settlements, Roads and Industrial facilities (LU 1,9)</td>
</tr>
<tr>
<td>6.3.2</td>
<td>Rain-fed Agriculture and Irrigated Agriculture (LU 2,3)</td>
</tr>
<tr>
<td>6.3.3</td>
<td>Organic farming (LU 2)</td>
</tr>
<tr>
<td>6.3.4</td>
<td>Livestock (LU 2,3), Aquarium fishing and Inland fishing (LU 4)</td>
</tr>
<tr>
<td>6.3.5</td>
<td>Agroforestry Systems and Social Forestry (LU 2,6)</td>
</tr>
<tr>
<td>6.3.6</td>
<td>Eco-tourism (LU 7,8)</td>
</tr>
<tr>
<td>6.3.7</td>
<td>Protection forest (LU 6,7,8)</td>
</tr>
<tr>
<td>6.3.8</td>
<td>Production Forest (LU 5)</td>
</tr>
<tr>
<td>6.3.9</td>
<td>Mining (LU 3)</td>
</tr>
<tr>
<td>6.4</td>
<td>National Policy Developments</td>
</tr>
<tr>
<td>7</td>
<td>PLAN IMPLEMENTATION</td>
</tr>
<tr>
<td>7.1</td>
<td>Regional Level</td>
</tr>
<tr>
<td>7.2</td>
<td>The Role of the Planning Team</td>
</tr>
<tr>
<td>7.3</td>
<td>The Role of Participants</td>
</tr>
<tr>
<td>7.4</td>
<td>Ongoing Projects in the Pilot Area</td>
</tr>
<tr>
<td>7.5</td>
<td>Underlying Assumptions and Conditions</td>
</tr>
<tr>
<td>8</td>
<td>BIBLIOGRAPHY</td>
</tr>
</tbody>
</table>
ANNEX: LIST OF MAPS

Map 1: Location of the Pilot Area
Map 2: Present Land Use
Map 3: Ecological Vulnerability
Map 4: Ecological Value
Map 5: Recreational Value
Map 6: Forestry Potential
Map 7: Agricultural Potential
Map 8: Mining Potential
Map 9: Recommended Forest Zones
Map 10: No Plan Scenario
Map 11: Regional Efficiency
Map 12: Sector Lead Scenario
Map 13: Recommended Land Units
GLOSSARY AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDC</td>
<td>Community Development Council</td>
</tr>
<tr>
<td>CHPA</td>
<td>Central Housing and Planning Authority</td>
</tr>
<tr>
<td>CIDA</td>
<td>Canadian International Development Agency</td>
</tr>
<tr>
<td>CRL</td>
<td>Caribbean Resources Limited</td>
</tr>
<tr>
<td>EEZ</td>
<td>Ecological-Economic Zoning</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation</td>
</tr>
<tr>
<td>FPA</td>
<td>Forest Products Association</td>
</tr>
<tr>
<td>FSC</td>
<td>Forest Stewardship Council</td>
</tr>
<tr>
<td>GEA</td>
<td>Guyana Energy Agency</td>
</tr>
<tr>
<td>GFC</td>
<td>Guyana Forestry Commission</td>
</tr>
<tr>
<td>GGMC</td>
<td>Guyana Geology and Mines Commission</td>
</tr>
<tr>
<td>GINMIN</td>
<td>Guyana Industrial Minerals Incorporated</td>
</tr>
<tr>
<td>GLSC</td>
<td>Guyana Lands and Surveys Commission</td>
</tr>
<tr>
<td>GoG</td>
<td>Government of Guyana</td>
</tr>
<tr>
<td>GVC</td>
<td>Guyana Volunteer Consultancy</td>
</tr>
<tr>
<td>HIRC</td>
<td>Hangzhou International Regional Centre</td>
</tr>
<tr>
<td>LEAP</td>
<td>Linden Economic Advancement Programme</td>
</tr>
<tr>
<td>LIDCO</td>
<td>Livestock and Dairy Development Company</td>
</tr>
<tr>
<td>LINMINE</td>
<td>Linden Mining Company</td>
</tr>
<tr>
<td>LU</td>
<td>Land Unit</td>
</tr>
<tr>
<td>LUP</td>
<td>Land-Use Plan or Land-Use Planning</td>
</tr>
<tr>
<td>m.a.s.l.</td>
<td>Metres Above Sea Level</td>
</tr>
<tr>
<td>NARI</td>
<td>National Agricultural Research Institute</td>
</tr>
<tr>
<td>NBAP</td>
<td>National Biodiversity Action Plan</td>
</tr>
<tr>
<td>NDC</td>
<td>Neighbourhood Democratic Council</td>
</tr>
<tr>
<td>NFP</td>
<td>National Forest Plan</td>
</tr>
<tr>
<td>NPAS</td>
<td>National Protected Areas System</td>
</tr>
<tr>
<td>NREAC</td>
<td>Natural Resources and Environment Advisory Committee</td>
</tr>
<tr>
<td>NRMP</td>
<td>Natural Resources Management Project</td>
</tr>
<tr>
<td>NTFP</td>
<td>Non-Timber Forest Products</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>PA</td>
<td>Pilot Area</td>
</tr>
<tr>
<td>PRA</td>
<td>Participatory Rural Appraisal</td>
</tr>
<tr>
<td>PRCSSSP</td>
<td>Poor Rural Communities Support Services Project</td>
</tr>
<tr>
<td>PSP</td>
<td>Permanent Sample Plot</td>
</tr>
<tr>
<td>RASC</td>
<td>Refractory 'A' Grade Super Calcined</td>
</tr>
<tr>
<td>RDC</td>
<td>Regional Democratic Council</td>
</tr>
<tr>
<td>REPAHA</td>
<td>Regional Agricultural Programme for Animal Health Assistants</td>
</tr>
<tr>
<td>SFP</td>
<td>State Forest Permission</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UG</td>
<td>University of Guyana</td>
</tr>
<tr>
<td>TSA</td>
<td>Timber Sales Agreement</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

The Governments of Guyana and Germany have collaborated to produce a Regional Land-Use Plan for a Pilot Area (PA) in Guyana. This was done within the framework of the Natural Resources Management Project (NRMP). In November 1998 the Government of Guyana defined the PA for Land-Use Planning (LUP) (Map 1). The pilot nature of this plan also meant the testing of a methodology for future LUP. The planning process covers all steps extending from the collection of data and information through its processing, analysis, discussion and evaluation right up to stakeholder consultations to achieve a consensus on the form of Land Use to be practised in the next 5-10 years.

LUP is a partially integrating and sector-overlapping process. The planning objects are the land resources. Thus, LUP is not suitable to solve all local problems, nor can it replace the overall planning for an area. The basic technical strategy in LUP is to plan Land Use according to suitability in combination with the various needs in the area.

Presently, LUP is used at all planning levels. LUP at the regional level has a linking function between implementation at regional level and national strategic planning. One of its major tasks is to provide information for subordinate and superior planning levels.

With respect to the implementation at local level, regional planning has the tasks of mediating in conflicts between stakeholders, of identifying Land-Use objectives of regional interest, promoting disadvantaged groups which are not sufficiently integrated into local planning and defining simple criteria by means of which the needs of regional interests and of disadvantaged groups can be included into local discussion and decision-making processes. Plans at regional level are not absolutely clear-cut as far as delimitation of the areas are concerned. They provide an orientation without excessively restricting the opportunities for local action.

This plan presents possible future developments in Land Use that are socially desirable within the PA. Boundaries of land units are usually expressed by straight lines or are slightly curved. In reality, these boundaries do not match the inherent complexity of the different ecosystems. At the local level the planning area, including boundaries within which the activities will take place, have to be clarified in cooperation with competent regional entities.

The Ecological-Economic Zoning Methodology proposed by the Treaty of Amazonian Cooperation has been tested by the LUP team. The experiences of EEZ application are described in a separate document.
2 PURPOSE OF THE LAND-USE PLAN

LUP creates the prerequisites required to achieve a type of Land Use which is sustainable, socially and environmentally compatible, socially desirable and economically sound. It sets in motion social processes of decision making and consensus building concerning the use and protection of private, communal and public areas. On the basis of this central idea, a number of objectives and the development goals for the Regional Land-Use Plan of the PA have been identified.

2.1 Plan Objectives

These are as follows:

- Economic efficiency.
  The measure planned should be designed to contribute to the long-term security of the economic basis of the local population. Therefore, the measures should be self-financing and at the same time economically justified. In this way, they will contribute to improving the standard of living and to overall economic development of the PA.

- Sustainable use of resources.
  The land-utilization type must be designed to ensure that the natural basis of living is sustained in the long-term, i.e. the use of the land should correspond to its natural potential. Existing environmental damage should be minimised and damaging developments avoided by the support and development of sustainable approaches.

- Environmental protection.
  Avoid further damage where possible and ensure prior environmental assessments of proposed activities which might significantly affect the environment. Conservation will be treated as an integral part of the planning and implementation of development activities and public consciousness and awareness on environmental implications of economic and social activities will be raised.

- Social equity.
  When considering the effects of planning measures, attention should be paid to both the distribution and the kind of benefits. These should be spread in such a way that socially weak parties will participate in the process.

- Regional equity and spatial diversification.
  Ensure the best possible supply to each Region with productive, social and infrastructural facilities and the most efficient possible use of available means. The key question is which functions are required in a specific region and how can they best be distributed in the area.
• Social acceptance/benefits.  
The measures applied are to be desired, accepted, supported and largely carried out by those affected by them. The effects of such measures can only be sustainable if they are socially compatible and culturally suitable, and if they take into account local knowledge and capacities.

• Guidelines on multiple land uses/competing land uses.  
Land-Use conflicts are to be avoided or settled in connection with competing stakeholders and in cases of unclear land-right situations.

• Poverty alleviation.  
To reduce poverty and to contribute to improving the standard of living of the inhabitants of the PA.

2.2 Development Goals

Taking into account the above-described main objectives for the Regional Land-Use plan of the PA, the following concrete development goals were identified:

• To make the best use of the existing potentials in the area.
• Regularisation of the land.
• Creation of employment.
• Development and improvement of civil infrastructure (roads, wharves, etc.).
• Improvement of living conditions (quality of life) for local population.
• Implementation of environmentally sound practices in mining, forestry and agriculture.
• To identify value-added products.
• To improve the access to, and the quality of health centres and education facilities.
• To improve technical training and education (access to facilities).
• Introduction and use of appropriate technologies.
• To establish and strengthen local organisation.
• To establish access to and conditions for small credit facilities.
3 ACTUAL SITUATION

This section presents a brief synopsis of the baseline data on the PA. The base line information forms the basis for the identification of Land-Use potentials and the subsequent creation of LUP scenarios for the PA. Detailed information on the present land uses, available resources and present stakeholder activities are found in: "Baseline Document for Land-Use Planning of the Pilot Area".

3.1 The Pilot Area

The PA was identified by the Government after considering several factors. Firstly, it considered the presence of land uses in the PA representative of those found in Guyana. Secondly, it considered the various land potentials and opportunities and the conflicts they present. Thirdly, it considered the logistics of interacting with local government agencies and communities given that the project's base is in Georgetown.

The PA includes parts of the Administrative Regions III, VII and X. It covers an area of approx. 4,800 km². The maximum north-south extension is 130 km from Lanaballi to Ituni. In east-west direction the maximum distance is 75 km (Map 1).

The part of Region III between the Essequibo and Bonasika Rivers comprises the north-eastern part (approx. 10%) of the PA. The part of Region VII between the Mazaruni and Essequibo Rivers (referred to as the Bartica Triangle) comprises the western part (approx. 22%) of the PA. The part of Region X, extending from Goshen in the north to Ituni in the south and limited by Moblissa in the east and the Essequibo River in the west, comprises the southern and eastern part (approx. 68%) of the PA.

Administration

In the PA there is one NDC - Bartica - the Regional Administrative Centre of Region VII; one municipality - Linden - the Regional Administrative Centre of Region X; and four CDCs (Ituni, Moblissa and Rockstone Region X and Lanaballi Region III). Thus, unlike the other regions in the PA, the Regional Administrative Centre of Region III (Vreed-En-Hoop) is located outside of the PA.

Population and Major Settlement Areas

The PA has approx. 51,000 inhabitants. This population is mostly concentrated in Linden (approx. 30,000) and Bartica (approx. 18,000). Afro-Guyanese comprise the majority of the population in these areas. The remainder of the PA is sparsely populated with the larger settlements in Region X at Ituni (mainly Afro-Guyanese) and at Rockstone (mainly Amerindians) with approx. 1,000 and 250 respectively. In Region III, Lanaballi has approx. 250 inhabitants who are mainly Indo-Guyanese.
Topography and Soils

The PA is mostly flat to undulating with the highest elevation (260 m.a.s.l) at Arisaru Mountain in the south of the PA. The major waterways are the Essequibo and the Demerara Rivers. Less extensive waterways are found in the Mazaruni and Bonasika Rivers and in the dense networks of creeks and streams. The soils in the PA are generally sandy in texture (white and brown sands) and low in fertility. The most fertile soils in the PA are alluvial and are found along the riverbanks.

Climate

The PA falls within the tropical, humid, lowland climate with average annual precipitation of 2,200 to 2,300 mm. Rainy seasons are from April to July and from October to December. Temperatures vary between 19°C (average minimum) and 32°C (average maximum). The climate does not show any significant variation throughout the PA.

Land Cover

More than 85% of the PA is covered with forests which are mainly dry evergreen forest, marsh forest and rain forest. There are also a few patches of grassland and savannah. Subsistence agriculture predominates along the riverbanks and major roads. Larger-scale agricultural crop production is found in the north east at Lanaballi and north west at Moblissa.

Land-Use History

In Region X, the economic activities were centered on the bauxite industry which developed after the discovery of this mineral in the 1920s. This led to the construction of factories by the multinational Alcan Co-operation between 1930 and 1940. By 1960 this part of the PA was very prosperous and the industry supported the families of some 8,000 workers in the PA. In 1970 the bauxite industry in Guyana was nationalised. Declining world market prices and increasing cost of production resulted in the contraction of the industry. At present the bauxite industry only employs approx. 1,300 persons resulting in the declining living standards in this part of the PA.

The contraction of the bauxite industry was accompanied by expansion of agricultural production in Region X. These activities were initially centred at Moblissa with the production of tobacco. Later, they expanded when the Government-owned LIDCO established a thriving dairy farm. By 1982 LIDCO’s operations had declined and were later privatised to Vinelli Industries. This new company failed and ceased operations at Moblissa.

In other parts of Region X, where conditions did not permit agricultural production, forestry (small and large-scale logging) and charcoal burning gained prominence. Others turned to mining operations outside the PA (Omai Gold Mining Limited and Aroima Mining Company) for employment.

Region III of the PA was once covered by dense forest. Thus forestry was the primary Land Use. Human occupation commenced around 1930 with the opening of a quarry at Makouria. The quarry closed in 1979, by which
time several settlements had sprung up along the Essequibo and Bonasika Rivers. Being rich in commercial tree species the area attracted a number of logging companies. Thus, parallel to the phasing out of the quarry operations, logging became the main source of employment in this area.

By 1995 most of the commercial trees had been harvested, resulting in the decline of most of the logging operations in this area. This forced the many homesteads that were established around the former quarry and forest industries to expand to subsistence or commercial agricultural production and inland fishing. Prior to the 16th century, the Region VII part of the PA had been temporarily settled by Amerindians. In the early 17th century the Spanish occupied the Bartica area for a short period. In 1613, the Dutch colonised the area and established the first sugar plantation in 1672. In the late 19th century, 'gold digging' was responsible for a dramatic increase of the population in the area. Bartica became a social and economic centre with telegraph office, police station and post office facilities. The town functioned as the 'door to the interior' as miners and loggers passed en route to their claims. The Bartica-Potaro Road and river crossings at Sherima and Wineperu connected Bartica with speculators and successful miners, all in pursuit of the attractions at Bartica. These activities were the main source of a prosperous Bartica.

After the 1930s, this part of the PA again gained some prominence, now through agriculture. This occurred through the activities of a citrus estate (Lima Estate), located near Agatash village, which exported barrels of lime juice to England. In the 1950s farmers began to grow tobacco and cotton but this soon ceased. By 1970 peanuts and citrus were the main crops produced. However, by the mid 1980s, depleted soils and inaccessibility to fertilizer and other agricultural inputs resulted in the decline of crop production in the area and consequently of living standards too.

In the 1970s the construction of the Georgetown-Linden-Mahdia road resulted in Mahdia bound vehicles using the faster Mabura road route. These vehicles had previously passed through Bartica on their way to the interior. This resulting loss of the revenues especially affected the economic prosperity of Sherima, Wineperu and Bartica.

**Present Land Use**

Presently, in Region X of the PA, the Land Use is characterised by extensive bauxite mining with the presence of LINMINE Bauxite operations (see Map 2). This is especially evident around the area of Linden where dumpsites for bauxite overburden form major landmarks. Large forestry concessions and small chainsaw operations also form an integral part of the Land Use in Region X, which is especially evident in the Ituni area. Agriculture also contributes to the Land Use in this Region. This is especially evident at Watooka, Mobilissa and along the Demerara River e.g. Malali. Commercial aquarium fishing is done at Rockstone and Malali.

In Region III of the PA, commercial and subsistence agriculture and chainsaw logging now characterise the Land Use. Agriculture dominates the area at Lanaballi and Bonasika, while chainsaw logging is dominant along the Del Conte Road. Some tourism sites e.g. Shanklands are present.
In the area. Also, fishing is practiced in the Essequibo River between Lanaballi and Sophia Point. Some dairy farming is done in the area between Dalli and Ampa.

In Region VII a large forest concession, some SFPs, some mining concessions and some small farms characterise the Land Use. Agriculture is dominant around the area of Agatash and along the Bartica-Potaro Road (up to approx. 6.4 km). Some poultry production is carried out along the Essequibo River at New Found Out and Bidrabu. Quarrying also forms part of the Land Use in Region VII. This is evident with operations at Teperu and Wineperu. Bartica, White Water and Baracara are the centre of tourism activities in Region VII. Also, fishing is done in most waterways in the Essequibo and Mazaruni Rivers.

Additionally, in the PA there are a number of other (natural) resources being used. These include:

- Scenic beauty, wildlife, plants and heritage sites for tourism.
- Bodies of water for recreation and water sport

**Land Tenure Situation**

The vast majority (73%) of the PA is under State Forest Land. These lands are leased mainly as State Forest Permits (SFP) in Region X and mainly as Timber Sales Agreements (TSA) in Region VII.

Agricultural leases appear on 5% of the PA, mostly along the Essequibo River and the Linden–Rockstone road. These leases are valid for 25 years.

Prospecting permits for mining exist on the right bank of the Mazaruni River (south west of Bartica) and south of Ituni. These permits cover 1.3% of the PA. The extent of LINMINE's holdings is presently unclear but LINMINE is known to have an exclusive permission of approx. 29,000 acres.

**Infrastructure and Services**

In the PA rivers form an important transport line, in addition to the existing roads. The socio-economic infrastructure is limited except for the urban centres of Bartica and Linden. Secondary and business schools, hospitals, banks and most government services are located in these centres.

**Employment and Income Situation**

In the PA, LINMINE in Region X employs the greater part of the workforce (1,300 workers). Other major employers in Region VII are, in the forestry sector (Willems Timber Ltd.) 220 persons, and in the quarry sector (Mazaruni Granite Ltd.) 110 persons. In Region III's part of the PA, there are no employment opportunities for its inhabitants. Thus, self-employment and exchange labour is practised. No detailed figures on self-employment and public servants are available for the PA.

As was mentioned above, a more detailed account of this section can be found in the publication "Baseline Document for Land-Use Planning of the Pilot Area".
3.2 Institutional Policies and Responsibilities

Institutional policies at the national level have to be taken into account, in order to ensure a coordinated approach for the plan. In Chapter Six, further policies planned for implementation will be defined.

In order to guarantee that the development of the forestry sector occurs in a structured and focused manner, the GFC developed a National Forest Plan in 1997/98 (NFP). Key programmes within the NFP include Forest Resources Planning and Allocation, Forest Operation Monitoring and Regulation, Forest Industry Investment, Forest Products Marketing, Forest Research, Forest Sector Information, Forest Sector Education and Training and a Social Development Programme. Each of these programmes will be translated into a set of actions that impact on the entire sector. Two of these programmes deserve more attention here: Forest Resources Planning and Allocation (the forest zoning component) and the Social Development Programme (the community initiatives component).

A process was initiated by the 1997 National Forest Policy Statement to ensure sustainable forestry development within Guyana. An important objective is to support the development and implementation of a National Land-Use Policy and Plan. The 1997 National Forestry Policy Statement and the Draft National Forest Plan, 2000, describes the zoning and classification of State Forests. The zoning process involves two stages. Firstly, identifying the land area to be alienated for long-term forestry development within State Forest. Secondly, classification of such lands that needs to be done in accordance with their potential. Major forest zones are proposed. Economic inputs are required to ensure that the proposed zones are aligned with broader land-use considerations. Finally, support of all stakeholders in the natural resources sector is required if the zoning process is to be formalised and made meaningful.

The GGMC is the regulatory and monitoring body of the mining industry within Guyana. Their mandate is to care for, explore and promote the mineral endowment of the country. Existing laws provide a good framework for holding and administering mining titles and overseeing activities in the mining sector. However, there are issues that need to be addressed in order to reduce conflicting claims amongst titleholders and to remove other uncertainties that affect investor confidence. Specifically, investors are concerned that their exploration efforts, if successful, are not challenged by competing claims. Also, the possibilities of conflicts e.g. between mining, forestry and agriculture require addressing and resolution.

At present there is no established protocol between GGMC and other sector agencies and their stakeholders to prevent multiple land uses. The system in place is of a reactive nature and GGMC can only take action when it has been notified of such a situation. The agencies would then communicate with each other to resolve the issue through the Natural Resources and Environment Advisory Committee (NREAC). Multiple Land Use is quite prevalent since all lands that fall within the mining districts or State Forest may be used for mining and logging as well, in which case GFC has control over the latter. These lands may also be used for agriculture, housing and
Traditionally, tourism has not been an important industry for Guyana. However, since the latter part of the 1980s Guyana has adopted a deliberate policy to designate tourism a major priority in its economic development strategy. To this end, the Ministry of Tourism and Industry was mandated with the specific objective to "Develop and promote a sustainable tourism sector in Guyana, within the wider context of tourism development in the Caribbean, and to promote tourism products and the tourism industry with the goal of increasing net foreign exchange earning from tourism."

To achieve the above objective, the Government of Guyana initiated two major feasibility studies on Guyana’s potential to develop a viable tourism industry. In addition, the recently drafted National Development Strategy 2001-2010 contends that tourism development is "an important opportunity for Guyana’s economic development". It continues "the broad objective of the sector is to contribute to the sustainable development of Guyana by earning foreign exchange and providing job opportunities, while conserving the national environment and multifaceted culture of the country".

The Central Housing and Planning Authority (CHPA) has the legal mandate to make provision for the orderly and progressive development of land, cities, towns and other areas, whether urban or rural. This gives them the overall responsibility for settlement and planning matters. Areas which do not fall within the scope of the Municipality and District Councils Act, and for which the Central Housing and Planning Authority does not exercise any planning control, are classified as unorganised areas. The work of CHPA is inextricably linked to the Local Government system (Municipality and District Councils, RDCs and NDCs). This is the case because local authorities are also tasked with overseeing development within areas that fall under their jurisdiction. At the National Level the CHPA plays a pivotal, co-ordinating role for the orchestration of plans and policies for the sector. The CHPA prepares Settlement Plans for areas that show signs of future, accelerated growth potential, after they have been identified for reclassification to organised areas.

At the regional level, the RDC serves as the link between local and national level authorities. It is the body charged with the implementation of plans for settlement development.

At the local level, the Local Authority is given their mandate under the ‘Local Government and Municipality and District Councils Act’. They are required to manage and control all settlement areas within their jurisdiction and to give feedback to the Central and Regional Authorities on related issues which fall under their purview.

Guyana’s richness in biodiversity and high endemism is recognised as an important national asset by the Government of Guyana (GoG). In 1996, the GoG established the Environmental Protection Agency (EPA). The EPA has the responsibility for monitoring the exploitation of Natural Resources. In addition, it is the national entity to implement Environmental Impact Assessment (EIA) before any new activities in the Natural Resources
Sector can be executed. To this end, the EPA developed the National Biodiversity Action Plan (NBAP) and established the National Protected Areas Secretariat (NPAS), in 1999. The NBAP is a result of National Policy to elevate the subject of biodiversity to the level of planning. It comprises several programme areas, one of which is 'Natural Resources Management'. In the preparation of the NBAP a number of workshops and meetings were held with stakeholders. The result was that a number of areas of biological interest were identified. These areas were categorised according to current and planned status.
4 ANALYSIS OF POTENTIALS AND CONFLICTS

In analysing the potentials of the PA several variables were considered. These included production aptitude, ecological and socio-economic vulnerability, ecological and recreational value, environmental degradation, the state of the civil and social infrastructure, population patterns and land tenureship. Emphasis was placed on forestry, agriculture, mining and the tourism sector, as well as the predominant land-use activities in the area. The potential of inland fishery was only superficially analysed owing to a lack of information. The potential for hydropower was not fully analysed because its implementation is not expected during the next five years.

The potentials for each sector were evaluated, based on the management units which were proposed by the land-use sector institutions present in the PA. The results were matched with the interest of the major and small stakeholders as well as the present land use, to identify constraints and main problems to be solved. Competitive potentials and conflict areas were identified after comparing the potential of each sector.

4.1 Land-Use Potentials

The present land-use activities in the PA are the first indication of the potential of its natural resources. However, degradation processes resulting from a limited knowledge reduce this potential. These processes are intensified by the high levels of poverty in the local communities, the declining of the present economic base and the absence of viable economic alternatives. Thus, the limited potentials decrease further with the continuous misuse and overuse of the natural environment.

4.1.1 Ecological Vulnerability

To evaluate the ecological vulnerability of the PA (Map 3), the following factors were considered:

- Climate
- Soil erosion
- Susceptibility to inundations
- Logging history
- Natural regeneration ability of the vegetation
- Forest dynamics.

The areas of low relief are susceptible to inundation during the rainy seasons. This restricts agricultural activities during these periods. These lands are also susceptible to erosion as they are located near to rivers and have no defence against waves. They are also susceptible to soil-loss owing to surface runoff, as there is no drainage infrastructure. In the higher lands, soil erosion is a consequence of over-logged forests. In these areas soils are generally poor and natural regeneration is slow. Consequently, intense rainfall leads to soil loss.
Practically all the forests in the PA have been or are logged-over. The only area where one is likely to find pristine forest would be on the summit of Mt. Arisaru. In the PA, true degraded forest is practically synonymous with Wallaba/Dakama forest. The agent of degradation is exploitation and fire. Degraded, mixed forest is practically always associated with homesteading/farming. The logging history of the PA reflects areas of intense logging activities in the past and present areas of degradation.

In the North Region X (along the Mabura and Linden-Rockstone roads) and along the Essequibo River, Dakama and Wallaba Forest can be found. These species have high regeneration capacity. Thus, degradation owing to over-exploitation is limited.

**4.1.2 Socio-economic Vulnerability**

To assess the socio-economic vulnerability, the following factors were taken into account:

- Population (growth, customs and knowledge, culture), distribution, migration, external influences, perception of the future)
- Traffic (boats, access to forestry resources)
- Status of legislation
- Accessibility to Markets and Credits
- The land tenure system
- Energy supply
- Comparative advantages (local/global situation)

The main employment centres of the PA are Bartica and Linden. However, there is a severe lack of development, as is reflected in their depressed economic state. The rest of the PA with its low population density has little negative effect on the environment, as the trend of natural degradation is slower.

Emigration tends to occur throughout the PA. This occurs mainly among men who go looking for job opportunities in mining and logging. In the past, LINMINE attracted workers from within and outside the PA. However, the company has cut its staff drastically from approx. 8,000 to 1,300 over the last 5 years. Thus, many former skilled employees left Linden in search of jobs with other companies outside the PA. At the same time, people from smaller neighbouring settlements, e.g. loggers or ex-miners from Ituni, migrated to Linden in the hope of job opportunities in the Regional Administrative Centre. They live away from home as absent residents and return usually only for short-term visits. Women tend to stay at home with the family, raising the children, doing subsistence farming or working as public servants, mainly as teachers and security guards, or in private business. Young people leave their hometown mainly because of a lack of social facilities, especially in the field of education. A high percentage of the remaining population depends on the money relatives send from overseas.
In the Region III section, the farmers receive little or no extension services or support for their operations. Consequently, parents do not encourage their children to continue farming, but rather those who can afford it, send them away to obtain educational and other opportunities. Nevertheless, farmers are interested in improving their agricultural productivity. However, they require more institutional commitment, especially in the area of land tenure.

In the Region X section, around Linden and Ituni, a kind of "receiving mentality" is notable. This attitude was fostered by the bauxite industry, through which communities benefited from free social and civil infrastructure, especially sanitation and energy supply. A similar phenomenon took, and still takes place, in the communities created through and around the stone quarrying and logging activities. Nevertheless, it is evident that this attitude is changing, especially in Linden.

In the Region VII section, the uncoordinated land distribution for mining, forestry and agriculture exacerbates land conflicts and social problems. Farmers, especially along the Bartica–Potaro Road, would like to expand their farmland, but this requires reallocation of land currently under mining and logging concessions. Inhabitants of the townships connected to mining or logging activities in St. Mary's and Wineperu expressed their intention to leave when companies abandon the area.

No comparative advantages could be identified in the PA, over regions or the global situation. For example, notwithstanding the good quality and quantities of the bauxite deposits in Guyana, especially around Linden, this industry faces severe problems in terms of international competition. A major geological problem is the large overburden of 15 to 25 m of white sand that has to be removed at high costs before actual exploitation can commence.

4.1.3 Ecological Value

About 90% of the PA is covered with forests consisting of a wide variety of tree species, e.g. Buruburuli, Greenheart, Kautaballi, Kokoritiballi, Trysil. Greenheart (Chlorocardium rodiei), which has a fairly wide distribution in the centre and north-western portions of the country, is associated with the poor sandy soils of the Berbice formation. The high incidence of endemics in this area, particularly on the white sands, suggests that most endemics in Guyana are habitat specialists. Their occurrence is restricted because their habitat is restricted. To estimate the actual ecological value as far as trees/forest types of the PA are concerned, forest inventories are needed. Taking into account the available information coming mainly from GFC, these could be carried out based on the factors biodiversity and forest quality.

The GFC has the power to declare Forest Reserves. The following areas with conservation value, research opportunities and regeneration potential have been identified by the GFC, EPA, NRMP or a combination of these agencies (Map 4).
- The Moraballi Forest Reserve
  This is the site where P.W. Richards and T.A.W. Davis, ecologists attached to the University of Cambridge, conducted the first major set of research on tropical forests in the 1920s. GFC has established a number of Permanent Sample Plots (PSP) in the reserve and has earmarked the reserve for long-term silvicultural trials due to the mix of virgin and logged-over areas and the large range of forest types and conditions within the reserve. The Moraballi Forest Reserve is the largest of its kind in Guyana. It includes a bufferzone and is part of the National Protected Area System (NPAS).

- The 24 mile Forest Reserve
  This is a virgin parcel of forest (about 2.6 km²) containing exemplary specimens of the major forest types within the Bartica Triangle. GFC has been maintaining a Permanent Sample Plot there since 1963. It is a restricted area where only GFC staff, senior forestry students and scientists can enter.

- The Arisaru Mountain
  One of the few areas where one is likely to find "virgin" forest would be on the summit of Mt. Arisaru. A forest reserve in this area of the Arisaru Mountain should be considered.

- The area at junction Linden-Rockstone/Mabura road
  This is an area of about 24 km² at the northernmost 8 km Mabura Road with a depth of 1.5 km on both sides of the road that is extremely degraded due to intensive charcoal production and subsequent, regular annual fires. This area will be protected in order to ensure the full rehabilitation of the site and the conservation of the ecosystem.

- The Bartica Triangle
  During a workshop on identifying priority areas for protection as part of the National Biodiversity Action Plan (NBAP) held in 1999, the Bartica Triangle was suggested for its scenic and eco-tourism value. However, no borders have yet been identified.

4.1.4 Recreational Value
To estimate the recreational value (Map 5), the following factors were taken into consideration:

- Aesthetics of landscape
- Heritage sites
- Present Land Use
- Creeks
- Footpaths
- Areas with existing tourist facilities including their buffer zones

There are three main tourist resorts in the PA: Shanklands and Baganara in the Essequibo River, and Baracara in the Mazaruni River. Ampa
Investment at Ampa Bay in the Essequibo River is not fully operational as yet and Beacon Beach, south of Bartica, has no overnight facilities. Goldmine, opposite Shanklands, has been added recently for rentals. The resorts offer outdoor-activities like swimming, kayaking, jungle walks, bird and flower watching. However, numbers of tourists have decreased tremendously during the period 1998–2000. In 2001 the business became more difficult, but the numbers had stabilised.

Areas requested for extension of the tourist resorts vary from more than 50 ha to less than 2 ha. Operators promote the creation of zoning (buffer zones) around their resorts. Hence, property leases are necessary in order to use and preserve the land for tourism. The introduction of a fee structure for maintenance and management for scenic sites outside their own leases, as in Marshall Falls, is regarded as crucial for the industry.

Tourist resorts have substantial influence on the development of the area as they attract local and international visitors, create employment, stimulate economic activities and the enhancement of transportation and social infrastructure.

The following sites have the highest potential for tourism in the PA:

- **Heritage sites**
  There are three National Heritage Sites in the PA: the waterwheel in Linden, which is in poorly maintained surroundings; a wooden church from the 19th century on the banks of the Demerara River at Butabu; Kyk-over-all island in the Mazaruni River, which was once a 17th century Dutch fort.

- **Islands in the Essequibo river**
  There is an uncounted number of small and medium-sized islands in the Essequibo River, which might be visited by tourists for bird watching and picnic activities.

- **Moraballi Forest Reserve**
  The Moraballi Forest Reserve, which lies on the riverbank of the Essequibo River, might be used for eco-tourism purposes. A certain constraint occurs with the conservation objective of the area, so that only guided tours should be allowed inside the area.

- **Bartica**
  Bartica town itself, already surrounded by existing tourism facilities, could potentially become the centre of tourism activities. Around Easter every year, a Regatta is held on the Essequibo River at Bartica, which attracts many tourists coming mainly from Georgetown.

- **Rockstone**
  The scenic beauty of the area along the river at Rockstone attracts mainly local tourists at the weekends. They visit to fish or swim in the river, or picnic at the nearby sand beaches of the islands. The existing overnight facilities are the property of LINMINE but are in a
Ituni could offer small budget tourism for people who want to relax in nature and take a swim in the nearby creeks. There are some overnight facilities at Ituni.

4.1.5 Potential for Forestry

To estimate the existing potential for forestry, the following factors were taken into account:

- Commercial importance (forest types are included here)
- Managements units GFC (logging history and stock are included here)
- Present land tenure
- Potential markets
- Production volume (for each concession)
- Applying constraints to potential areas

Before assessing the potential, a list of possible forest uses was identified to define the potential according to the possible uses:

- Logging
- Charcoal and firewood production (key activity in Region X)
- Extraction of non-timber products
- Agro-forestry (with livestock)
- Forest plantation
- Reforestation (GGMC is interested in reforesting mined-out areas for environmental purposes, something which is costly and not yet tested)
- Multiple uses

Combining the above-mentioned criteria, the following four main areas could be identified with different potentials for forestry (Map 6):

- Good Potential
  The forest has a good forestry potential because it has greater species abundance than any other block in the PA. The predominant forest types have greatest to moderate commercial importance. Nevertheless, the forest has been exploited for commercial species and is classified by GFC as over-logged production forest. This area has the largest TSA of the PA.

- Moderate Potential
  This has moderate forest potential because of the predominant forest type (Wallaba), which is suitable for commercial purposes (poles, posts, shingles) and has a moderate commercial importance. Also it has been exploited for other purposes like charcoal and fuelwood. GFC classified it as production forest. The Moraballi Forest Reserve is located in this area.
• Low Potential
Poor Dakama and Wallaba forest has low potential, as a result of forest fire and exploitation. Dakama forest is mainly suitable for fuel wood and charcoal production, but at high environmental costs. The potential for forestry here is low, although GFC still classifies it as production forest. The Arisaru Mountain has a mixed forest type, when classified according to the criteria of the GFC forest classification proposal, which suggests that areas at elevations greater than 500 meters and areas of very difficult access have severe logging restriction. Thus, the Arisaru Mountain is grouped with low potential areas.

• No Potential
These areas have no forestry potential because of the repeated occurrence of fires and over-logging. Parts of 'Low Potential' areas, if used in the same way, will turn into category 'No Potential'.

Recent international concerns about the preservation of tropical forests have pressured the producers to restructure their operation according to international standards, the most prominent at present being the FSC (Forest Stewardship Council). As a prerequisite to obtaining certification and to achieving international acceptance, companies are expected to conduct forest inventories, prepare forest management plans, reduce impact on the environment and diversify their production. Some environmentally sound harvesting techniques, e.g. selective logging, have always been practised in Guyana. However, the process of cutting and extracting the logs can also cause excessive damage to residual trees and seedlings. At present, the GFC and all stakeholders in the industry are discussing the possible introduction of certification in Guyana. These results should be considered for the determination of the forest potential in the PA.

4.1.6 Potential for Agriculture

Soil associations in the PA are generally of low fertility. Hence, cultivation on these soils needs application of appropriate management strategies (e.g. application of fertilisers and the cultivation of suitable crops) to reach satisfactory yields. Owing to the tropical climate characterised by two rainy seasons in April to July and October to December, mainly seasonal, rain-fed agriculture is practised.

The following factors were applied to estimate the agricultural potential:

• Land capability
• Susceptibility to erosion and inundation (land form)
• Areas suitable for rain-fed and irrigated agriculture
• Land tenure agreements
• Customs (culture/knowledge/technology)
• Potential markets
• Accessibility to farm
Based on the land capability, areas with good-to-moderate agricultural land were selected. These lands are mainly located on alluvial plain landform along the main rivers and are vulnerable to inundation and erosion of riverbanks. Using the information of the landforms map, areas susceptible to erosion owing to slope were identified. These are:

- Isolated mountains
- Hills
- Land with degraded vegetation cover.

Using the above-mentioned factors, two categories of agricultural potential were identified in the PA. This was done using land capability according to the FAO classification, to group land into medium, low and no capability for agriculture. The descriptions of these follow:

- **Medium Capability Soils (Al, At and Ry)**
  Located on good-to-moderate agricultural land of alluvial plains landscape along riverbanks and gently sloping, undulating ridges. These soils (low humic gley and alluvial) are susceptible to erosion and inundation. However, with proper management (including application of lime and fertilisers), these soils could produce moderate to high yields.

- **Low Capability Soils (As and Rb)**
  Located on poor agricultural land (red-yellow latosols and red-yellow podzolic soils, regosols and lithosolic soils). These are under minimal forest cover and are very susceptible to erosion if this is removed. This is an association of deep grey and brown, clayey, silty and sandy soils.

- **No Capability Soils (Qr)**
  These white sand soils are regosols and groundwater podzols. This soil unit is found in the greater part of the PA. All soils of this association are deep and excessively drained. Moisture relations are extreme, being droughty even during the rainy season and erosion is minor.

In arriving at the final potential for agriculture in the PA, the areas described above were combined with information on present land use and land tenure to create two categories of Agricultural Potential in the PA (Map 7). These are:

**Medium Potential**
(a) Good-to-moderate agricultural land with leases.
(b) Good-to-moderate agricultural land without leases.

**Low Potential**
(a) Poor agricultural land with leases.
(b) Non-agricultural land with leases.

In determining the above categories, the absence of land titles was recognised as critical to the agricultural potential of the land. This is a major
factor since in the PA leases were often given to farmers on poor and non-agricultural land. In areas, e.g. Moblissa, where agriculture is practised on non-agricultural land, it is not known to what extent agriculture is feasible. Other influences, e.g. illegal marijuana production, are factors to be considered.

There are a number of thriving farms in and around Bartica (e.g. Agatash). These farms have the potential to provide the fresh market needs of their environs.

4.1.7 Potential for Mining

To estimate the mining potential in the PA, the following factors were used:

- Mineral occurrence
- Geology
- Managements units as submitted by GGMC
- Land tenure
- Accessibility for transportation
- Potential Markets

Four different kinds of minerals were examined for their future potential for exploitation in the PA. These are: bauxite, kaolin, stone and sand. There is no potential for gold mining in the PA.

After combining the geological information with mineral occurrences, four major potential areas were identified:

- Bauxite area around Linden (active)
- Bauxite area around Linden (inactive)
- Stone quarrying around Bartica and along the west bank of the Essequibo River (active) with a minor potential for bauxite
- Sand mining (active and inactive) along the main transportation routes, especially in the areas of white sand.

The bauxite resources in the PA exist mainly in Linden, Bonasika, Moblissa and Ituni. Mining operations around Ituni have been halted since 1983. The bauxite mining company LINMINE operates in the Linden area, focussing on the production of highly qualified Refractory A grade Super Calcined (RASC) bauxite. Deposits are estimated to be sufficient for another 20-50 years at the present rate of extraction. The industry is affected by low, international market prices and suffers from low cost effectiveness.

After combining the information on mining concessions with GGMC’s management units, the following classification for potential for mining (Map 8) in the PA could be identified:

- Medium Potential for Stone Quarrying
  This classification is mainly due to the occurrence of stone in amounts sufficient for commercial operations. There is good accessibility due to the area’s proximity to water and road networks. Concessions do exist.
- Medium Potential for Bauxite
  This classification is based upon the existence of the concessions (LINMINE and the occurrence of bauxite deposits). Due to the good road network and proximity to rivers, the accessibility is good.

- Low Potential for Bauxite
  This classification comprises all other concessions for bauxite which are inactive. This is either due to reduced accessibility or reasons that are presently unclear (possibly market inaccessibility). New data could result in the upgrading of the current potential.

- Medium Potential for Kaolin
  This classification is determined by the abundant occurrence of kaolin in its deposits. Leases for extraction of kaolin have been issued and are operable.

- Medium Potential for Sand
  This classification is derived from the occurrence of materials for sand mining and the good accessibility to these areas mainly by the road networks. However, there is no data to show that concessions have been granted for this area though there is evidence of sand pit mining.

- Undefined
  This classification is as a result of CRL’s Reconnaissance Permit. There is a lack of mineral occurrence data for commercial operations. The area has good accessibility to water and road network due to its proximity to same.

4.1.8 Potential for Inland Fishing

This sector has not yet reached its full potential. Extension services on fishery are not available. Some risks could be identified occurring during inland fishing activities:

- Over-fishing (glut and depletion).
- Pollution of waterways.
- Damage and loss of equipment through speedboats because of the absence of fishing zones.

4.1.9 Potential for Hydropower

In elaborating this section, superficial treatment is given to the hydropower potential of the PA. It is recognised, however, that the development of cheap energy sources is critical to the development of the PA. The use of hydropower as the preferred source for the PA is also recognised. There are a number of study activities currently ongoing. These include:

The Hangzhou International Regional Centre (HIRC) for Small Hydropower of China completed a Feasibility Study of the Ikuribisi Falls and expressed an interest to develop it as a private power producer.
Synergy Holdings Inc., in association with Harza International, is currently engaged in pre-investment and environmental impact assessment studies for the development of a 100 MW facility at Amaila Falls. The high-powered transmission line for the proposed development at Amaila will traverse sections of the PA.

The Guyana Energy Agency (GEA), in accordance with its mission and mandate, is vigorously promoting the development of hydropower schemes. The actual implementation will depend on the involvement of the private sector. In the PA, particularly the Ikuribisi and Big Barabara sites are of interest. The Ikuribisi hydropower plant could supply most of the area's electricity needs and appears economical. The Big Barabara site should be of interest to tourist operators since it has the potential to supply energy to the many resorts in its vicinity.

Other potential sites are at Kaburi, Wineperu, Anarika and Tiger Hill. The development of hydropower (or any other form of energy) is also deemed pre-requisite for the development of the isolated communities in the PA.

4.2 Stakeholders’ Interests

The stakeholders comprise the communities, investors, land administrators and policy makers who influence land uses in the PA. Their interests were derived from continuous consultations at all levels within the PA and with the institutions that govern land uses.

To aid in the elaboration of the stakeholders' interests, stakeholders are referred to as Major and Small Stakeholders. The terms 'Small' and 'Major' are used for the convenience of differentiating between community dwellers and investors, land administrators and policy makers, respectively.

4.2.1 The Interests of Major Stakeholders

These interests were derived through consultations with institutions, companies and administrators. The interests of these stakeholders could be best presented based on the land-use sectors they represent. These sectors include mining, agriculture, forestry, tourism, hydropower, housing and settlement and protection and preservation.

Forestry

The GFC proposed that the PA should be divided into three Forest Zones (Map 9): Protection Forests, Production Forests, and Conversion Forests. This is in keeping with policy decisions proposed in the National Forest Policy Statement, the Draft Forest Law and the National Forest Zoning Process.

- Protection Forest

Protection forests are forests managed primarily for the conservation of the natural or cultural heritage of Guyana, in which no commercial utilisation shall be permitted. The Moraballi Forest Reserve and the adjacent buffer zone fall under this category. Protection forests also...
encompass areas that are badly degraded and cannot be managed for any other purpose in the short-term. Protection forests occupy about 8% of the PA.

- Production Forest

Production forests are allocated exclusively for the sustainable, commercial utilisation of timber and non-timber forest products. The majority of the PA will remain under production forest for logging or charcoal production. Production forests occupy some 68% of the PA.

- Conversion Forest

Conversion forests are areas where long-term, sustainable forest management is not possible, as the land in question has been alienated under a law different from the Forestry Act. State forests alienated in this way include areas required for agriculture, mines and mining settlements, roads and industrial schemes. Conversion forests are a transitional category under which the specific area should remain on a temporary basis only. In the event that State forests are given up to other uses, as outlined above, the land itself should also be transferred to the responsible agency.

A substantial part of the PA is de facto under different use than forestry. These and additional areas cover about 24% of the PA. Procedures and mechanisms for transferring areas need to be developed.

The forestry and sawmill operators advanced a number of suggestions for the improvement of the industry. These include:

- The need for a marketing research centre.

It is generally felt that insufficient efforts are made to create infrastructure for the marketing of forest products. Some producers are comfortable in their traditional systems of accessing markets, thus are unwilling to contribute to the creation of such infrastructure. However, it is becoming increasingly obvious that access to global markets requires research and research facilities.

- The need to train more forestry graduates.

Increasingly, the industry is demanding that forestry activities be conducted with a sustainability component. This could be achieved with the appropriate personnel applying sustainable harvesting methods to forest exploitation. Thus, the training and utilising of forestry graduates in the industry will facilitate the transition from ad hoc to sustainable methods.

- The stimulation of tourism (especially eco-tourism).

It is generally felt that eco-tourism and forestry activities are compatible. Thus, there is the need to foster greater collaboration between these sectors for their mutual benefit.
• The promotion of non-timber forest products (NTFP)
  There are a number of NTFPs that can be used in cottage industries to increase the income that is generated from the forest. These include kufa, nibbi, palm heart, sawari nut, awara nut and kuru nut. There is also the possibility for the promotion of tree species suitable for furniture manufacture, thus adding value to the forest product. If these suggestions are implemented it is hoped that the value of the forests will be increased.

• Forest certification.
  International environmental concerns for the preservation of tropical forests have threatened access for Guyana's timber exports to the world market. More countries are demanding certification for access to the world market. This requires environmentally sound and sustainable harvesting of the country's forestry resources. It is hoped that the Forest Producers Association (FPA) and GFC can speedily develop National regulations for forest certification under the aegis of UNDP. This measure would enhance the local industries' chances of surviving international scrutiny by the Forest Stewardship Council (FSC).

• To improve infrastructure (roads, waterways).
  This is of major concern to many in the industry. There is the question, however, of who is ultimately responsible for the upgrading of this facility. It is hoped that some partnership agreement can be facilitated between the users of the facility and Central Government.

**Mining**

GGMC does not manage the mineral deposits as zones, as does GFC for forest resources. However, two categories do exist: Areas closed to mining and areas open to mining. The various minerals and their exploitation require different management systems, as reflected in the Rules and Regulations of GGMC.

The mining companies advanced a number of suggestions for the improvement of the industry. These include:

• To upgrade transportation infrastructure (Bartica–Potaro Road, Delconti Road).
  The above-mentioned roads were earmarked for improvement over the past years. Unfortunately, this remains unrealised, notwithstanding the recognition of the importance of this infrastructure to the industry. However, there is the question, of who is ultimately responsible for the upgrading of this facility. It is hoped that some partnership agreement can be facilitated between the users of the facility and central government.
• Dredging of the rivers.
  This would increase the carrying capacity of the loads as they traverse from the production sites to the markets. At present, much effort is utilised in ferrying small loads in shallow channels out to larger vessels in deeper waters. The dredging of rivers will serve to improve the efficiency of the operations.

• New markets have to be explored.
  Traditionally, markets in mining are concentrated on bauxite, gold and diamond. In the 1990s, markets for stone and quarrying material escalated, while markets for sand continued to be stable. There is now an opportunity to explore markets in dimension stones and other value-added products, which may be by-products of the traditional industries.

• To establish management plans for environmentally sound operations.
  Management plans are now a requirement for most industries. It is envisaged that the economies of these entities will soon be linked to acceptable management plans. The usual degraded state that marks the exit of miners at many locations is unacceptable in current circumstances.

**Agriculture**

The Ministry of Fisheries, Crops and Livestock gives the following guidelines for the agricultural sector:

• **Irrigated Agriculture**
  Here, farming operations range from homesteads for domestic produce to medium-scale commercial production. They should be practised on good-to-moderate agricultural land (Land Capability Class I and II) of clay type soils. The production of farms on clay type soils is constrained by the absence of drainage and irrigation systems.

• **Rain-fed agriculture**
  This should be located on poor agricultural land (Land Capability Class III) on sandy type soils. The production of farms on sandy type soils is constrained by inappropriate farming systems. These systems should be adapted from techniques developed for the Intermediate Savannah ecosystems of Guyana.

**Tourism**

There are three major tourist enterprises within the PA. These are Shanklands Rainforest Resort, Baracara and Baganara Island Resorts. They have advanced a number of suggestions for the improvement of the sector. These include:

• To identify and protect areas with potential for tourism.
These areas fall both in the vicinity of the tourism facilities (e.g. tracts for nature walks) and at heritage sites or recreational sites (e.g. Marshall Falls) away from the tourism facility. These areas should be identified and managed to ensure their continued use. Recreational sites (e.g. Kyk-over-all) that are not owned by the tourist operator should require a fee for entry. This fee should be used to maintain the site.

- To organise fishing trips to Rockstone.
  The tourism activities conducted at Rockstone may soon become organised under the control of the community. It is envisaged that organised fishing tours can then take place more often and for greater numbers of participants.

- To organise tours to sawmills and quarries.
  Locations such as old saw mills and abandoned quarries could become curiosities for tourists. These sites should be evaluated for their potential to create such markets.

- More coordination between the resorts and the RDCs is needed.
  This relates especially to the social and cultural calendar of the regions.

- To establish property leases and buffer zones.
  The areas leased to the tourist operator should be accompanied by a buffer zone to prevent incursion by other land uses. This could prevent incompatible land uses on the same land area.

- To establish cottage industry.
  Tourists often look forward to making indigenous collections during their travels. Pieces made from ceramic or straw are in demand.

- To improve the energy supply.
  The activities of the industry are linked in many ways to the energy supply. Aspects of entertainment and comfort could be enhanced by reliable and cheap energy.

- Studies on eco-tourism and biodiversity are needed.
  Persons operating in the industry need to be properly trained to cater for the needs of the tourists. This would enhance the quality of service offered to the customers. At present such training is facilitated by Iwokrama and UG.

4.2.2 The Interest of Small Stakeholders

In Region III the local population expressed the following needs:

- To assign the whole area for agricultural land.
- To construct the Delconti Road.
This would facilitate accessibility to markets and farms when constructed. Thus commercial agriculture would be enhanced.

- To construct a deepwater harbour near Lanaballi.
  This is a proposal that gained prominence during the 1990s. Then it was recognised that farmers in the vicinity could benefit through being easily able to market their produce.

- To establish fishing and riverain transport zones.
  Fishing for Fresh Market Species occurs in most accessible waterways of the PA. Periodic contamination of fishing grounds by mining activities and waste oil from speedboats hinders this operation. However, it is the constant conflict with speedboat operators who destroy fishing nets, which is of major concern to the fishermen.

In Region VII the local population expressed the following needs:

- To improve employment opportunities.
- To give out agricultural leases along the Bartica-Potaro road.
- To improve the management of the quarries.
- In keeping with the need for management plans for the industry, a component that reflects backfilling should be included.
- To convert the unsuccessful pine plantation.
- To improve the agricultural activities around Bartica.

In Region X the local population expressed the following needs:

- To find an alternative to the bauxite industry and to be prepared for work in other fields.
- To establish an extension service.
- To improve the marketing situation.
- To introduce technical education.
- To clarify the land tenure situation.
- To have equal access to forestry resources for exploitation (forestry communities like Ituni and Rockstone).
- A clarified ownership situation with regard to land titles and leases and Amerindian Reservation status (at Anarika and Rockstone).
4.3 Identifying Constraints

The following main constraints are identified for each sector:

4.3.1 Constraints to Protect the Ecological Value

- The illegal logging activities in the whole PA severely degrade the area.

- The bauxite industry around Linden intensifies the silting of the Demerara River through the dumping of the overburden and thus causes flooding of the river south of Linden.

- The Moraballi Forest Reserve has a partial buffer zone. In addition, the demarcation between the Reserve and buffer zone and adjacent, commercial logging areas is not clearly visible on the ground.

- The plans for a housing scheme and a forest reserve (for regeneration at the junction of the Linden-Rockstone/Mabura Road) overlap in the area.

- The speedboats and ferrying of quarry material on the Essequibo River causes erosion of the riverbanks.

- Non-environmentally sound management of quarries opens up more and more sites, which are left afterwards without any vegetation cover.

4.3.2 Constraints for Tourism

- The pollution caused by the bauxite industry in Linden constraints the development of tourism in the mined-out bauxite area around Linden. It is not clear if and how the area could be regenerated.

- Tourism in Guyana focuses on eco-tourism. Thus, a 'green environment' is important, especially around the existing resorts. Encroaching land use such as agriculture can be conflictive with this effort.

- The added use of the Moraballi Forest Reserve for tourism might be in conflict with the conservation objective of GFC. Guided eco-tourism controlled by GFC might be a possibility.

- Poor production of goods and services to support tourism activities by the local communities.

- Lack of interest in maintaining the existing accommodation facilities in Ituni and Rockstone by LINMINE is evident.

- There is presently no defined land tenure for tourism.
• The awareness, especially within the local communities, about the economic benefits of (eco) tourism is insufficient.

4.3.3 Constraints for Agriculture

• Access to extension services in the PA is very limited and in most areas non-existent.

• The market prices are unstable and farmers do not have access to marketing intelligence.

• Transportation costs are high for producers away from the main access roads or economic centres (Bartica and Linden).

• In the rural areas transportation, storage and distribution facilities are very poor. This makes production processes dependent on timely business transactions.

• In some areas of the PA agriculture is limited by the absence of infrastructure, drainage and irrigation. Also, the fact that non-agricultural land is made available for agriculture, constrains the benefits to the farmers.

• The ongoing trucking on farm-to-market 'roads' by loggers delays access to the market, especially in Lanaballi.

• The destruction of the roads in and around Moblissa by vehicles used by loggers to transport logs hampers the transportation of agricultural products to Linden.

• Poor logging practices in most parts of the PA can hamper agricultural activities through the silting of creeks, which causes inundation.

• Poor disposal of overburden causes silting and flooding along the Demerara River.

• In case additional leases for the mining activities at St. Mary's quarry and Mazaruni Granite should be requested, this could be conflictive with the present agricultural activities.

• Should Shanklands, Ampa Bay and River View expand, they would encroach on agricultural land.

• Military operations expansion may go on to agricultural area (Makouria).

• Dust from the mining activities at LINMINE is polluting crops
4.3.4 Constraints for Forestry

- In general, the ongoing illegal logging activities are destroying the forest potential. Also subsistence farming along the Essequibo River might expand into areas with good forestry potential.
- Charcoal burning on land with good forestry potential affects logging activities.
- CRL with its reconnaissance permit on its TSA might open up the area for mining operators, although there is still good potential for forestry. Also the stone quarrying activities tend to expand into land with good forestry potential (St. Mary's, Teperu, Mazaruni Granite).
- Along the Essequibo River in Region X, there is an SFP on a swampy area with no forestry potential and severe logging restrictions. There is the risk that activities from an SFP on areas with low forestry potential might cause them to become areas of no potential. There are already SFPs on degraded areas without potential.
- The Region III part of the PA is designated as conversion forest and commercial agriculture is already taking place. There is still a moderate potential for forestry.
- There is an SFP in the area of the Arisaru Mountain and mining activities with concessions are ongoing, although the area has severe logging restrictions and is vulnerable to erosion due to its slopes.

4.3.5 Possible Conflicts by Overlapping Potentials

- There is a bauxite mining concession for GINMIN in Region III which is presently not active. In the same area an SFP was given out.
- The kaolin potential around Ituni occurs in the vicinity of good agricultural land.
- The mining potential in the area of CRL's TSA coincides partly with low to moderate agricultural land.
- There is an overlapping potential for agriculture and forestry along the Demerara and Essequibo River.
- In a sand mining area in Bartica the Region, GFC and GGMC want to collect royalties, although the law authorises the local NDC to collect revenues.
5 LAND-USE OPTIONS

Every change in land use, as well as new land uses identified, requires the input of labour and finances. This represents an investment for the future and consequently the economic viability must be estimated before the decision is made to implement the plan.

5.1 Introduction

The allocation of parts of the PA to certain Land-Use Options is made based on their Land-Use Potential. In addition, socio-economic, socio-cultural, logistical aspects and the need to meet the demand for raw materials have to be considered.

Land-Use Options have various requirements and consequently restrictions, with respect to their implementation. In the following, recent and planned policies and the LUP objectives are used to establish possible land-use scenarios. Applying this procedure leads to various Land-Use Options in the sequence of their economic profitability. Also, additional Land-Use Options can emerge and others may no longer exist. A certain Land-Use Option can be implemented in a location with a high potential without having a destabilising effect. To implement an option in a location with a lower potential requires considerable technical and financial expense.

It is obvious that many intermediary forms of cultivation or Land Use are placed 'between' the Land-Use Options described. Also some require quite specific conditions with respect to the location and socio-economic aspects.

The scenarios mainly deal with land which has been degraded in the course of time by long-term use in the sense of overuse from intact (natural forest) to its present status. Prevention of further degradation by stabilising these areas is of utmost importance.

5.2 Scenario Development

The development of scenarios serves to identify various possible Land-Use options, depending on the focus of development which is to be intended. It is a "What if..." analysis starting from the "No-plan" scenario, where it is assumed that actual land use just continues as it is presently. In combining potentials with the current situation, different kinds of scenarios can be developed. The variables which will mostly determine the situation are identified and conflict and priority zones are analysed to elaborate land-use options. The identified land-use potentials and restrictions are then combined with social expectations, institutional viability and development objectives, as well as basic and future needs. For the evaluation of the three scenarios, criteria of socio-cultural acceptance, ecological sustainability, economic competitiveness, political, administrative and institutional feasibility were applied.
5.2.1 Scenario 1 - The “No Plan” Scenario

In the LUP process, the development of a “No-plan” scenario helps one to appreciate the importance of the implementation of a Land-Use Plan. This scenario answers the question, “What if no LUP is done for five years?” by quickly illustrating some of the probable LU problems one may encounter during that period.

The “No-plan” scenario (Map 10) is intended to reflect the situation in the PA in 2007 if no LUP is done. The map presents nine LU categories and describes potential conflicting situations. The map shows an increase in unauthorised and illegal activities (e.g. chainsaw logging and sand mining). Thus, a key consideration in developing this scenario was the distribution of medium and long-term permits and any other land-use permissions in the PA. The scenario for each sector is described below.

**Forestry**

- The over-logging of some areas as a result of harvesting one or a few species will continue because of market demands. The industry is quite prepared to harvest other species as long as markets for these species exist.

- Further degradation will occur in the areas with moderate potential for forestry. The Wallaba forest is used mainly for commercial purposes and to a lesser extent for charcoal production. Both activities will cause a transition from moderate to low potential of the forest in the PA. Unauthorised activities like charcoal burning, logging and the illegal cultivation of marijuana will increase degradation on forestlands.

- Uncontrolled fires will increase forest disturbance.

- More agricultural activities in good forestlands along the Demerara River and an increase of land-use conflicts (agriculture/forestry/tourism within State Forestry Permissions) are probable.

- Degraded areas with SFPs will be closed for recovery. Concessionaires will be granted a 2-3 year extension for harvesting, depending on the status of the SFP.

- The Army Base at the Lanaballi area has requested more land for training. The suggested plan is to relocate the adjacent SFP areas as the license is only valid for one year.

- GFC, GGMC and NARI will investigate the idea of introducing agro-forestry and the use of indigenous species as part of a reforestation program. Reforestation and the planting of mono-crops are difficult in degraded white sand areas. GFC will collaborate with the Intermediate Savannah Project (INSAP) to plant other species such as Acacia mangium, Jacaranda, Eucalyptus and Leucaena for plantation purposes.
**Agriculture**

- An increase of agricultural activities without leases is expected in the PA for the year 2007.
- Soils will become exhausted (decrease in nutrients), if residents continue to cultivate crops without the use of fertiliser. However, this is not applicable to all areas in the PA, e.g. in Lanaballi where the residents practise shifting agriculture, and in Moblissa where they cultivate crops (legumes) that can easily adapt to the sandy soil along with the inoculants bacteria produced by NARI.
- Pollution of crops could lead to health problems, e.g. dust from the mining activities at LINMINE.
- Agricultural areas close to the riverbanks could decrease due to erosion caused by river transportation.
- There will be land-use conflicts between agriculture, mining and forestry especially in the Ituni area and along the Demerara River.

**Mining**

- Conflicts between mining and other land uses will continue to be an issue.
- The mining activities will encroach on good-to-moderate, agricultural land.
- The bauxite industry will remain depressed and continue to pollute and destroy the environment. Unemployment, poverty and migration will increase.
- Erosion of riverbanks will increase due to the constant mining and ferrying of bauxite and stone.
- Sedimentation of creeks will continue.

**5.2.2 Scenario 2 - The Regional Efficiency Scenario**

This scenario is based on the most efficient options for each Region (Map 11). Its aim is to make the optimum use of the existing potential of each Region. The situation for each Region can be described as follows.

**Region X**

Linden becomes an economic centre and a transit point to the hinterland, along with the promotion of cash crops (especially fruits for exportation), eco-tourism and the kaolin industry and the revival of the bauxite industry. A reduced unemployment rate and a business zone in and around Linden with small and medium-scale enterprises are developed.
For the development of this scenario, the following assumptions are made:

- The Region gains access to LEAP funds (Euro 3,000–20,000), training in financial management marketing and the development of business plans in the agricultural and forestry sectors, and any other sectors of interest.
- The access road to Moblissa is rehabilitated.
- The NDC in Ituni is established.
- A forest fire management plan is established by GFC.
- A ceramic industry in Linden and Ituni is established.
- Reliable extension services are in place.

The possibility of the bauxite industry returning to its glory days of the 1970s is unrealistic, given the present state of the global economy for bauxite. There is some movement to secure financing for the restructuring of the LINMINE operations by Omai but there is no concrete evidence that this will materialise. Possibilities such as the use of residues from the bauxite industry for a cement industry and establishing stone crushing facilities at Christianburg must be put into effect.

Service industries are established along the upgraded Guyana-Brazil road. In the area with low forestry potential, trials for agroforestry with fruit trees are established. The area with no potential for forestry or agricultural crop production is left for natural regeneration. Alternatively, the area is used for the development of settlements. Areas along the Demerara River are developed for commercial and subsistence agriculture.

The feasibility study to evaluate the economic efficiency of Moblissa for intensive dairy farming and crop production is completed, the land at Moblissa is developed for agroforestry, crop and livestock production, and illegal marijuana cultivation is discouraged.

At Ituni, the land with good-to-moderate agricultural potential is developed for commercial agriculture. In this area, the land-use conflict with kaolin extraction is solved. If preference is given to kaolin, agricultural leases are given out to guarantee the security of subsistence farming. The area on the east bank of the Essequibo River is proposed for agricultural development, excluding the swampy and marsh forest areas. These areas are protected.

The areas with good to moderate forest potential are used for sustainable forest management. The area around Ituni is leased to the Logger Association (SFP). In general, more SFPs are given out to the local population (community).

No overlapping land tenure (especially for forestry and agriculture) and a clear demarcation between SFP and agricultural land, especially along the main rivers, is implemented. The people have agricultural leases along the Demerara River and at the East Essequibo River bank.

The Moraballi Reserve has a clearly demarcated and complete buffer zone.
In Rockstone, the existing tourist facilities are handed over to the community. Local tourism at the weekends takes place with boats, guides, food, overnight and camping facilities. A buffer zone for this tourism area is established. Overnight facilities at Ituni are rehabilitated.

The heritage sites, the church and the waterwheel are in better condition and are better promoted. The McKenzie/Wismar bridge is recognised as a heritage site.

Farmer organisations supply the communities and the transit passengers to the hinterland with fresh produce. Farmers have access to supplements (outlets and distribution), and storage facilities at primary distribution points are installed.

**Region VII**

This area will be developed through tourism and the ongoing stone quarrying activities. Bartica will become a tourist centre. Ongoing agricultural activities will be encouraged.

The following assumptions are made:

- Improved extension services established.
- Small-scale credit facilities established.
- Employment and training opportunities improved.
- Agricultural inputs are accessible.
- Tourism areas (including buffer zones) in the vicinity of Bartica are demarcated.

The agricultural production will be primarily done for the local market and for the demand resulting from the tourism activities. It is promoted around Bartica along the Bartica–Potaro Road, the west bank of the Essequibo River and the east bank of the Mazaruni River. In the case of overlapping potentials for agriculture and stone quarrying, agricultural leases will be given out to secure subsistence farming on low-to-good potential, agricultural land.

Small-scale industry for value added production on a cottage industry level, e.g. preserving fruits, handicraft, etc, has started.

**Region III**

The area will be developed through the expanding commercial agricultural production and tourism. The following assumptions are made:

- Drainage and irrigation schemes have been developed by the Poor Rural Communities Support Services Project (PRCSSP).
- Access to credit and extension facilities are operational.

The area which can be expanded for irrigated agriculture is limited. The rest of the area has more potential for forestry than for agriculture. Farmers do
not yet use mineral fertilisers and pesticides. Thus, there is a possibility for organic agriculture. Feasibility studies have been conducted.

Promotion of low-budget tourism is ongoing. Involvement of the local population in the tourism industry has increased.

For the entire PA

Inland fishing is promoted in the entire PA as well as the more intensive use of creeks. Regulations which govern inland fishing are in place. Fishing, hunting and trapping grounds are demarcated and protection by law is established. Storage facilities at Rockstone, Lanaballi and Tiger Hill and the fishing technology used have been improved. Extension services for fishing, together with a market information system (fresh water and aquarium) is available in Linden and Bartica. Fishermen 'cooperatives' are established or strengthened. Tourism is developed throughout the PA. Buffer zones for existing and potential tourist sites are in place. The use of the islands on the Mazaruni and Essequibo River has been assessed. Hiking paths have been identified and fishing trips are organised. The recreational value of the creeks has been assessed.

5.2.3 Scenario 3 – The Sector-Led Scenario

This scenario is premised on forestry being the dominant LU in the PA. It is based on the expectation that forestry resources will be developed to lead economic growth through diversification and certification of timber and non-timber forest products. This scenario (Map 12) facilitates secondary activities (e.g. agriculture, eco-tourism) and related activities (value-added products, services industries, etc.).

For the development of this scenario, the following assumptions are made:

- Access to markets and market prices continue to be favourable
- There is increased public awareness about forest value including non-timber forest products.
- Demands of the local population for SFPs are taken into account when giving out leases. Community needs for timber and fuel wood are considered.
- Training on environmentally sound management techniques is offered.
- Promotion for other forest species is done (GFC has a list of identified species).
- Forest inventories are made throughout the PA to provide users with the information.

In the areas with good-to-moderate forestry potential, sustainable forestry management in accordance with FSC regulations is practised. Forest inventories in these areas are completed.
Concessionaires with SFPs are making annual submissions of Operational Management Plans in accordance with GFC's guidelines.

Charcoal production, especially in moderate forestry potential areas is discouraged. GFC monitors all concessions for adherence to established guidelines.

The criteria for the establishment of forest reserves are revised and the "24-mile Forest Reserve" is expanded in the direction of Bartica. In addition, all restricted areas (including mangrove forest) identified by GFC are established as Protected Areas (no harvesting).

Forests in the vicinity of Bartica are declared reserved for activities such as bird watching and are clearly demarcated. Forests in the areas around the communities of Ituni, Rockstone, Bartica and Makouria are declared reserved for the communities' exploitation of timber and non-timber forest products. Local Loggers Associations are established and royalties are paid to GFC.

Harvesting in the areas with low or no forestry potential is discouraged. Areas with agro-forestry trials are established and a forest reserve at Arisaru Mountain is implemented. A forest fire management programme is established and an effective monitoring process is implemented.
6 RECOMMENDED LAND USE FOR THE PILOT AREA

When defining the recommendations, measures and directives from the plan, governmental-level, decision-making directives must be taken into consideration. A LUP can be drawn up on the basis of general agreements on land use or land use zones which have been previously agreed on by the stakeholders at all levels. The land-use options only reflect what kinds of land use are currently appropriate for the land units. The crops a land user cultivates and the rotation depend on several criteria. It is, therefore, sufficient to propose the land-use options and leave it to the user to decide what land-use system they choose. In individual cases, however, additional references and restrictions can be made, either in order to draw attention to special hazard factors (e.g. on condition that erosion prevention measures are put in place) or to specific opportunities.

6.1 General land-use policy

In the following, general recommendations are made related to the different sectors and institutions.

6.1.1 Forestry Sector

For the improvement of the operations in the forestry sector in the PA, the following recommendations are made:

- A broader range of tree/timber species should be further utilised. There is still a heavy reliance on a few species for the main commercial operations. This reliance forces the logger to cover a much larger area to sustain a viable operation. A wider species mix will increase the unit volume per hectare and the viability of the logging operation, providing markets do exist for the additional species harvested.

- Policy decisions on chainsaw operations should be given urgent attention by the government. Chainsaw operators, as a group, are a cause for concern due to the large numbers of individuals involved and the contraction in the area with commercial timber stocks. The GFC should promote community forestry projects and encourage more value-added processing. GFC should increase participation in its environmental education and awareness program.

- In areas where charcoal and wood harvesting for fuel are important economic activities, a community forestry approach is preferred. This approach should not only concentrate on extraction of trees, timber and non-timber forest products but should comprise a comprehensive package dealing also with aspects of afforestation.

- Forestry monitoring by GFC for operators’ adherence to environmentally sound logging methods should be improved. GFC has developed significant capacity for forest monitoring in this area and at the same time has a more structured program. GFC should
encourage forest operators to take on a more proactive role in actually sharing the monitoring responsibility.

- A feasibility study for value-added products (e.g. wooden furniture) should be conducted to assess local and foreign interests. The GFC is currently conducting a Forest Sector Study to partly address this issue.

- Kiln drying should become a standard operation in the wood utilisation process. GFC is exploring opportunities for promoting simple technologies in this respect.

- Attractive incentives to encourage foreign companies interested in joint venture partnerships with local companies should be instituted by the Government. The Forest Sector Study will address this issue to some extent. It is important that the sector itself be very clear as to the exact nature of the incentives it desires.

- Involvement of small-scale loggers as associations into SFP

- Export markets should be assessed to verify the commercial importance of the forest species. There is a need for further information on export prices, volume and species

6.1.2 Mining Sector

It is recommended that:

- The finalising of mining legislation for this sector should be a priority.

- Guidelines for environmentally sound mining exploitation should be established.

- A feasibility study for the dredging and/or rock blasting of the Essequibo and Demerara Rivers (including Omai stone/quarry) to facilitate movement of quarry material should be conducted. The suggested dredging should be preceded by proper environmental studies.

- Feasibility studies on the use of abandoned quarry as landfill sites should be conducted.

- Feasibility studies for a strategic plan to deal with deserted pits in the bauxite mines should be conducted.

- The back-filling of pits should be adopted by the mining industry.

- Transfer of land from LINMINE for other activities should be organised in a faster way.

- Areas demarcated for mining could be used for other activities until the leaseholder is ready to commence mining.
The right to collect revenues for sand mining in Bartica should be clarified among the Region, GFC, GGMC and the local NDC (decision by parliament).

The Ministry of Foreign Trade and GGMC should collaborate with the mining industry in accessing foreign markets for the local produce.

6.1.3 Agricultural Sector

It is recommended that:

- For future agricultural development first priority should be given to lands which are classified as good-to-moderate agricultural land. Studies must be conducted to determine the feasibility of implementing drainage and irrigation infrastructure.
- Agricultural leases along the Bartica-Potaro road should be given out.
- Agricultural leases in Ituni should be given out (suggestion 5 acres/person)
- Soil surveys and land evaluation studies should be conducted for new agricultural enterprises, e.g. organic or natural farm products and aquaculture.
- Soil tests should be carried out if clear interest on the part of farmers in lands identified for agriculture.
- Regional extension services as provided by the Ministry of Agriculture must be improved. Local farmers should actively participate in the research and development of appropriate packages for the improvement of their production system. Improved training opportunities could transform the outlook of the PA.
- Small-scale credit facilities and the availability of inputs like fertiliser and pesticides would permit an improvement of the agricultural situation.
- Farmers' Associations should be promoted and established.
- National efforts to acquire and promote appropriate breeding stock and procedures for livestock are needed. Local agricultural learning institutions, e.g. Guyana School of Agriculture (GSA), University of Guyana (UG) and the Regional Agricultural Programme for Animal Health Assistants (REPAHA) could implement tailor-made programmes for producers to cover production and marketing aspects of the industry. A feasibility study should be conducted to determine the direction of the livestock industry, e.g. meat production, milk production or both.
- Efforts should be made to strengthen extension veterinary service, e.g. regular vaccination campaigns and the planting of appropriate forage, for the maintainence of healthy stock and improved productivity.
6.1.4 Fishery Sector

It is recommended that:

- Educational and infrastructure support should be accessed by the aquarium-fishing operators, e.g. holding ponds for catch and motor boats for midstream fishing.
- Technical support must be given for acquiring and using low cost bait.
- A mechanism for conflict resolution must be established for speedboat operators, fishermen, tourist operators and local governments.
- The EPA must implement mechanism for monitoring water quality of the main rivers and the ponds in the Linden area and make public releases. A mechanism to relay marketing information is needed.
- A feasibility study should be conducted to investigate the potential for aquaculture

6.2 Proposed Land Units

In this section the criteria for the management units, as recorded in the three scenarios, are matched with the requirements of the recommended land use.

In the evaluation for recommended land use, the maps of the three scenarios and of the potentials are overlaid. After a process of rationalisation, boundaries were created and areas described based on their suitability for land use (Map 13).

The following land units are recommended:

6.2.1 Land Unit 1: Settlements and Mines

This unit covers the main settlement areas of the PA including the mined bauxite area around Linden and Ituni. There is little or no vegetation cover.

The areas around Linden and Bartica, which were identified as extensions of these settlements, are to be supported by existing social and civil infrastructure. It would be opportune to reassess existing facilities to determine the extent to which they should be upgraded. In settlement areas classified as unorganised by CHPA e.g. Mobilissa, where homesteads (plot and houses) have assumed permanence, an assessment of the social and civil infrastructure needed to support these communities should be undertaken.

6.2.2 Land Unit 2: Agriculture

This unit covers the areas with medium potential for agriculture (there are no high potential areas for agriculture in the PA). It includes the areas around Lanaballi, along the Bartica-Potaro road (from Bartica up to about 5 miles), the east bank of the Essequibo River (Rockstone) and the areas
along the Demerara River (Linden to Tiger Hill). Presently, there is slash-and-burn subsistence and commercial agriculture ongoing, together with some logging activities. The vegetation cover is being continuously reduced. Here, agricultural production should be given preference over forestry. For successful agriculture irrigation and drainage is needed, especially for the area around Lanaballi. The areas occupied by agricultural production (e.g. Moblissa) should be analysed for their economic feasibility before further investment is made.

6.2.3 Land Unit 3: Agriculture – Mining

This unit covers the riverbanks of the Mazaruni and Essequibo River around Bartica and the area around Ituni. Soil fertility is moderate to low. Presently, mainly stone quarrying and subsistence agriculture are ongoing. There is potential for both agriculture and stone quarrying, and bauxite and kaolin mining. If preference is given to mining, leases for subsistence agriculture should be considered.

6.2.4 Land Unit 4: Fishing

This unit covers parts of the Essequibo River along Region III and the area of Rockstone and parts of the Demerara River from Butabu up to Tiger Hill. Presently, small and medium-scale inland and aquarium fishing are ongoing. Here, fishing zones with regulations should be assigned.

6.2.5 Land Unit 5: Commercial Logging

This unit covers the main part of the Bartica Triangle south of The 24-Mile Forest Reserve, the northern part of Region X, from Rockstone up to Makouria and the areas along the Demerara River south of Linden. The vegetation cover is still dense and potential for commercial logging is good to moderate. Presently, commercial logging is practiced in the form of TSAs and SFPs. Here, sustainable forest management is given preference. Local loggers’ associations should be given preference for SFPs.

6.2.6 Land Unit 6: Regeneration Forest

This unit covers the areas along the Mabura Road south of Linden, the area along the Rockstone Road and the area from Moblissa down to Ituni between the Demerara River and the Ituni Road. The vegetation cover is reduced owing to over-logging, charcoal burning and forest fires. The land capability map classifies the land as non-agricultural land. Presently, logging, charcoal burning and agricultural production are still ongoing. There is almost no potential for commercial logging. Here, preferences should be given to natural regeneration. The Conversion Forest areas which have already been handed over from GFC are not recommended for agricultural development. No more agricultural leases should be given out here.
6.2.7 Land Unit 7: Conservation Forest

This unit includes the Moraballi Forest Reserve, The 24-Mile Forest Reserve, the swampy and marsh forest areas along the Essequibo River and the Arisaru Mountain. The vegetation cover is still dense and a variety of different tree species is present. The site south of the Arisaru Mountain has to be determined. The swampy and marsh forest areas already have severe logging restrictions. Nevertheless, it is recommended to include them in the NPAS.

6.2.8 Land Unit 8: Eco-tourism

This unit covers the area around Bartica, parts of Region III, south of Lanaballi, the islands in the Essequibo and Mazaruni Rivers, and the area at Rockstone, and at Ituni. Its scenic beauty and existing tourism facilities are sufficient cause for the development of tourism to be given preference. Some of the forest southwards of Bartica should be preserved for eco-tourism.

6.2.9 Land Unit 9: Transportation Network

There is no indication of the need for new linkages. However, the present transportation network needs upgrading. This is especially important for the Bartica - Potaro road, the road to Ituni and the road to Moblissa. The level of upgrading should depend on the category of vehicles to be used in the area (as determined by the assigned land uses) and on its vicinity, especially when land uses are being conducted.

6.3 Land-Use Systems

These are management units characterised by common approaches to the utilisation of the resources. Land-Use Systems have different requirements on land and therefore restrictions concerning their suitability for implementation. In order to better allocate Land-Use Systems, each individual land unit must be evaluated in terms of its land characteristics and it must be brought into context with the most important socio-economic and bio-physical criteria.

The next paragraphs are intended to give an overview on the recommended management of Land-Use Systems in form of a rough sequence. If there are land reserves, which should not or cannot be developed directly, an option should be implemented or maintained which is ecologically stable (e.g. natural forest).

6.3.1 Settlements, Roads and Industrial Facilities (LU 1, 9)

There are a number of settlements at different stages of development in the PA. The major issue for these settlements is that of land tenure. One example is the situation that exists at Linden where LINMINE is issuing subleases to the community. A strong co-ordination between CHPA and the Regions is needed. Squatters are occupying the area without planning.
There is a need for urgent and immediate reaction, before the situation becomes uncontrollable.

The construction of new roads needs a feasibility study and an environmental impact assessment. More industrial facilities are foreseen, mainly in the Linden area. Studies for environmental impacts are needed.

6.3.2 Rain-fed Agriculture and Irrigated Agriculture (LU 2, 3)

Seasonal farming with annual and perennial crops on a long and short-term basis, mainly for subsistence farming without any irrigation, is predominant. It is a low-input system. The practice of shifting cultivation is still predominant and should be gradually replaced by permanent agriculture. The amount and distribution of rainfall and the demands of the specific crops play a decisive role. It should be practised as far as possible on the alluvial plain landform. Fallow or fertilisation can improve the nutrient status. Many crops show clear yield limits even with the use of fertilisers. The knowledge of local erosion risks is essential and has to be considered. The topsoil erosion risk varies according to the characteristics of the topsoil. Applying adapted techniques of tillage should prevent erosion. On the sandy soils, excessively fast infiltration of water and nutrients set clear limits for the rain-fed agriculture. The inhabitants generally know suitable elevations. It is a traditionally known Land-Use System. In general, the essential needs for basic food production are covered by rain-fed agriculture. Crops generally correspond to the traditionally consumed foods. Generally, surpluses can be sold without any problem, if there is access to marketing facilities. Storage facilities would lower economic risks.

Irrigated agriculture is not yet found in the PA except for the irrigation through water pumps along the rivers or creeks. Irrigated agriculture should be operated mainly on a commercial level. It allows permanent farming throughout the year. It is a high-input system. Rainfall is relatively unimportant - irrigation water must be available when needed. Temporary irrigated agriculture is comparable to rain-fed agriculture. Topsoil erosion is insignificant, since the land is plain. A drainage system of the soil is needed. It is not a traditionally known Land-Use System in the PA and needs extension inputs. Land preparation requires major investments in terms of money and labour, so the legal status of the land must be especially guaranteed. The motivation value is high, especially when the required food cannot be produced in the area by rain-fed agriculture.

6.3.3 Organic farming (LU 2)

Organic farming can be done on rain-fed and irrigated land. It is a low-input system with respect to the use of fertiliser and pesticides, but it is labour-intensive. Presently, natural farming is done because of the lack of access to the inputs. Local markets for organically produced food must be assessed.
6.3.4 Livestock (LU 2,3), Aquarium fishing and Inland fishing (LU 4)

Rearing of chickens for eggs and meat at all scales (large, medium and small) with an appropriate technology is done in some areas under relatively low production costs for the local market. The availability of water is a prerequisite. Chicken dung can be used for fertilizer.

Rearing of cattle for meat and milk is done at all scales with the technology appropriate for the scale and the investment. The man-made grasslands are very adaptable to the availability of water and soil nutrients due to variable composition of species. It should not be practised on slopes above the locally observed erosion limit. The soil can be protected very effectively by dense sward. The sparser the sward, the more susceptible is the soil substratum to erosion, especially on slopes. Soil drainage greatly affects the composition of species of the pasture grasses. Grazing of animals reduces drainage due to compaction of the soil. Pasture regulations and rehabilitation measures are often necessary. Cattle rearing is not always feasible. The main economic risks are livestock epidemics, drought, excessive grazing and degradation of vegetation cover.

Aquarium fishing is done on a small scale and with very poor capture techniques. Here especially, the input of market information is needed.

Inland fishing is done in the PA on a commercial and subsistence basis. Speedboats destroy the nets at night. Regulations for speedboats to pilot with adequate light at night, or not to permit certain traffic at night should be established.

6.3.5 Agroforestry Systems and Social Forestry (LU 2,6)

Agroforestry can be defined as a combination of agriculture and forestry on the same piece of land. Agroforestry systems require more water than rainfed agriculture. The competition for water between woody plants and crops must, to a large extent, be controlled. The fertility of the topsoil is not decisive, since nutrients are ‘pumped upwards’ from deeper layers of the soil by the trees. It is also suitable on gentle slopes, where the woody plants function as soil stabilisers. The protective effect for topsoil erosion starts only after 3-4 years. Agroforestry systems are traditionally developed almost everywhere by local farmers, although not consciously and not in their pure sense. They should be integrated or further developed and adapted to the special local conditions. The system can make a contribution to the local demand for food, wood, fodder, cash, etc. The economic risk is relatively low.

Social forestry or community forestry is not well known in the PA. The basic idea is that the benefits resulting from the exploitation of the forest stay with the community. In Guyana the forest is under governmental control. It is difficult to distribute land rights to the communities.
Nevertheless, there are the following possibilities for the PA:

- Concessions for local logger associations with the right of exploitation, paying royalties to GFC.
- Forest land given out to NDC (only possible on degraded areas).
- Exclusive rights for the community for non-timber products.

6.3.6 Eco-tourism (LU 7,8)

Concepts for eco-tourism need to be further developed. The heritage sites are part of the tourism attractions and are sites of national interest with their historical/cultural value/significance. These sites should be preserved for other generations and tourism. There is a need for proper management of their surroundings.

6.3.7 Protection forest (LU 6,7,8)

Protection forests are forests managed primarily for the conservation of the natural heritage of Guyana, in which no commercial utilisation shall be permitted. The Moraballi Forest Reserve and the adjacent buffer zone fall under this category. Protection forests encompass areas that are badly degraded and cannot be managed for any other purpose in the short term. Protection forests occupy about 8% of the PA. Buffer zones are needed for protected or reserved areas (size depending on the specific area).

6.3.8 Production Forest (LU 5)

Production forests are forests allocated exclusively for the sustainable, commercial utilisation of timber and non-timber forest products. The majority of the PA will remain under production forest for logging or charcoal production. These forests occupy some 68% of the PA.

In areas where charcoal production and wood harvesting for fuel are important economic activities, a community forestry approach is preferred. This approach should not only concentrate on extraction of timber and non-timber forest products, but should comprise a comprehensive package dealing also with aspects of afforestation.

In the case of multiple uses, e.g. mining and forestry or any other, it is strongly recommended to establish close formal links among the responsible agencies. Results of negotiations on how to administer multiple uses in a phased or simultaneous approach need to become part of the respective lease agreements.

6.3.9 Mining (LU 3)

Guidelines for environmentally sound mining exploitation should be established for all mining activities in the PA. Dredging activities should be preceded by proper environmental studies.
6.4 National Policy Developments

There is an urgent need to prepare and approve a National Land-Use Policy for Guyana as a prerequisite for further LUP efforts. GLSC has been identified as the leading agency for LUP. Inter-agency collaboration must now be further promoted and formalised. The NREAC is the first step towards this. Especially, the Ministry of Local Government needs to be involved more. Regional LUP Committees need to be established and its members trained. Guidelines and procedures for different participation levels have to be established.

A comprehensive land tenure policy which is agreed upon among the major institutions (GGMC, GFC, GLSC and CHPA) is urgently needed to avoid land tenure conflicts and multiple land uses. Land security needs to be strengthened before anything else can be done. Only the respective authorised governmental institution should give out land rights and titles. In the case of multiple uses, e.g. mining and forestry or any other, it is strongly recommended to establish close formal links among the responsible agencies. Results of negotiations on how to administer multiple uses in a phased or simultaneous approach need to become part of the respective lease agreements.

The Regions are not sufficiently involved in land tenure issues. A first step must be to keep them informed on the actual land tenure situation and on future land tenure developments. In the future, the Regions should be involved more in the decision-making process on land tenure.

A critical management unit established by GFC is the Conversion Forest. Conversion forests are forests that have been alienated under a law different from the Forests Act. Such lands involve State forests alienated for mining, agriculture, industrial or residential purposes to the extent that forest management in the short term is almost impossible, because the forest cover has been (or will be) removed in its entirety. GFC has no opportunity to exercise any options over the loss of those lands due to the absence of a National Land-Use Plan and poor coordination among agencies in the natural resources sector. In fact, GFC must be consulted, and areas under extensive mining or over-logged areas should not be excised from State Forests. GFC and EPA should rehabilitate these areas mainly through natural regeneration. It is not recommended to hand over such areas for agricultural purposes, due to the fact that they mainly fall into the category of non-agricultural land.

There are cultivated areas, especially where agricultural production is ongoing due to squatting or past agricultural activities (Moblissa), on non-agricultural land. It would be difficult or even not recommendable to stop such activities. Nevertheless, before promoting agriculture in these areas, detailed feasibility studies are needed to assess their economic viability.

The Guyana Energy Agency (GEA) in accordance with its mission and mandate is vigorously promoting the developments of hydropower schemes. The actual implementation will depend on the involvement of the private sector. The hydropower sites at Ikuribisi and Big Barabara are considered critical to the future development of Bartica and its environs.
The realisation of these developments will be in keeping with the National Energy Policy, which seeks to reduce the use of fossil-based fuels and promote the use of renewable energy. Currently the communities at Bartica and Teperu depend on fossil-based fuel for the generation of electricity.

All the involved institutions and the leading agency for LUP (GLSC) need functioning tools of control. They must be able to accompany, check, evaluate and if necessary, correct the implementation process of the planned measures.
7 PLAN IMPLEMENTATION

The objectives of the LUP process have been to identify beneficial Land Use-Systems for the PA. This is the culmination of three years' efforts on the part of participant stakeholders and the Land-Use Planning Unit. The next step is to activate the plan through the selection of the preferred options and the implementation of those choices. The implementation process should commence within a short period, as the dynamics of land use may render the plan inadequate within five years.

7.1 Regional Level

At this level, implementation is likely to be through policy guidelines and development projects. The responsibility of putting the plan into effect rests with the decision-makers, the implementation agencies and the communities of the PA.

The decision-makers have to release funds, instruct sector agencies and facilitate the work of private sector collaborators. Governments may use incentives such as grants and subsidies and may introduce regulations. Sector agencies such as forestry and agriculture may work directly where they have the necessary staff and experience. Alternatively, they may work indirectly by training, as well as through extension services, field demonstrations and workshops.

7.2 The Role of the Planning Team

The planning team is an essential link between planning and implementation. They have several important contributions to make. These include:

- Ensuring that the measures recommended in the plan are correctly understood and put into practice by the implementing agencies.
- Taking the lead role in coordinating the activities of the implementing agencies and generally maintaining communication between all parties to the plan.
- Explaining the land-use situation and plan to the media, at public meetings and at schools. This forms part of the public relations for the plan.
- Ensuring the comprehension, participation and satisfaction of the people of the area as well as that of the regional and national government authorities.

These activities may require much time and effort. This is clearly the case in more socially-oriented activities such as loggers' association and aquarium-fishing groups, yet it applies at all levels.
7.3 The Role of Participants

The participation of Government agencies, decision-makers and local communities is of the highest importance in implementing the LUP. This may present some difficulties, as Government agencies and budgets are mainly organised by sectors (Agriculture, Forestry, etc.). However, LUP has to cut across these administrative hierarchies, and must do this without appearing to challenge the influence and budget of established institutions.

Attempts to implement plans could be frustrated by:

- Ill-defined responsibilities for coordination of several activities and administration at the regional level
- Lack of involvement of local communities
- Inadequate cooperation with national and regional authorities and with specialist agencies, leading to inefficient use of the available data and expertise
- Lack of experienced staff.

Participants must gather knowledge of the land-use situation and identify important gaps in that knowledge. This will require, on the one hand, strengthening the capacities of local communities and decision-makers to make use of planners' information. On the other, it involves helping decision-makers to focus on land-use goals, the underlying causes of problems and the range of opportunities open to them.

7.4 Ongoing Projects in the Pilot Area

The implementation of the Regional Land-Use Plan is not an isolated activity. At the same time there are other important projects ongoing, in and around the PA, which might influence its implementation:

- The Linden Economic Advancement Project (LEAP) in Region X funded by the GoG and the European Commission which started in 2002 and is scheduled for 7 years.
- The Intermediate Savannah Project outside the PA, funded by the GoG.
- The Guyana-Brazil Road Project.
- The Capacity and Entrepreneurship Building Project for Agriculture in Region X, funded by the GoG and Canadian International Development Agency (CIDA) and implemented by the Guyana Volunteer Consultancy (GVC).
- The rehabilitation of the airstrip at Linden for light aircraft and helicopters.
- The power line through Region X, to be started in 2003.
- Prospective hydropower plant in the Mazaruni River and at Amalia Falls.
7.5 Underlying Assumptions and Conditions

To meet the identified objectives and development goals for the PA and to guarantee the implementation of the Regional Land-Use Plan, the following assumptions have to be fulfilled:

- The GoG will continue to support the process and the implementation of the Plan.
- The private sector and NGOs will accept and support the activities.
- The local population will accept and support the activities.
- There will be financial support for implementation of the plan by the GoG.
- There will be no major migration out of the area.

In the same way that it is assumed that the support of society is ongoing, necessary preconditions were suggested to ensure the viability of the plan:

- Coordinated institutional approach for land tenure.
- Monitoring and assessment of the plan by authorised agency.
- Creation of public awareness about the plan.
- Enhanced research on degraded areas.
- Establishment of Regional LUP Committees.
- Use of socially and economically acceptable technology.
- Accordance with other development plans.
- Sector institutions continue to make information available to the guiding agency.
8 BIBLIOGRAPHY


ANNEX: LIST OF MAPS

Map 1: Location of the Pilot Area
Map 2: Present Land Use
Map 3: Ecological Vulnerability
Map 4: Ecological Value
Map 5: Recreational Value
Map 6: Forestry Potential
Map 7: Agricultural Potential
Map 8: Mining Potential
Map 9: Recommended Forest Zones
Map 10: No Plan Scenario
Map 11: Regional Efficiency
Map 12: Sector Lead Scenario
Map 13: Recommended Land Units
ANNEXES

Maps
Map 1

Location of the Pilot Area
GUYANA INTEGRATED NATURAL RESOURCES INFORMATION SYSTEM (GINRIS)

1: LOCATION

OF THE
REGIONAL LAND USE PLANNING PILOT AREA
Scale: 1:600,000

Boundaries of Pilot Area provided by Government of Guyana through Lands & Surveys Department.

LEGEND
- Pilot Area
- Major Rivers
- Major Road
- Minor Road
- Int. Border
- Regional Boundary

City
Town
Village
Airport
Settlement
Map 2

Present Land Use
2: PRESENT LANDUSE
OF REGIONAL LAND USE PLANNING PILOT AREA

Participatory Rural Appraisal (PRA), 1998.
Regional Administrations, 2000.
1:50,000 Stock Sheets, GFC
1:50,000 Stock Sheets, GGMC
1:50,000 Stock Sheets, L&S
Map 3

Ecological Vulnerability
3: ECOLOGICAL VULNERABILITY OF REGIONAL LAND USE PLANNING PILOT AREA

Scale: 1:600,000

Map 4
Ecological Value
4: ECOLOGICAL VALUE OF REGIONAL LAND USE PLANNING PILOT AREA

Participatory Rural Appraisals (PRA) 1998.
Centre for the Study of Biological Diversity (CSBD) 2001.
Map 5

Recreational Value
5: Recreational Value

Of Regional Land Use Planning Pilot Area


Legend:
* Tourism Potential
★ Tourism Sites
▲ Heritage Sites
- Moraballi Reserve & Buffer

Main Rivers
Pilot Area Boundary
Islands
Major Road
Village
Minor Road
Town/Secondary Town
Map 6

Forestry Potential
Map 7

Agricultural Potential
7: AGRICULTURAL POTENTIAL OF REGIONAL LAND USE PLANNING PILOT AREA


Medium Potential
- Good to moderate agricultural land with leases
- Good to moderate agricultural land without leases

Low Potential
- Poor agricultural land with leases
- Non-agricultural land with leases
- Scattered Agricultural Leases

Main Rivers
- Pilot Area Boundary
- Major Road
- Minor Road
- Village
- Town/Secondary Town
Map 8

Mining Potential
8: MINING POTENTIAL OF REGIONAL LAND USE PLANNING PILOT AREA

Scale 1: 600,000


Legend:
- Undefined
- Medium Potential (Bauxite)
- Low Potential (Bauxite)
- Medium Potential (Kaolin)
- Medium Potential (Sand)
- Medium Potential (Stone)
- Main Rivers
- Pilot Area Boundary
- Islands
- Major Road
- Village
- Minor Road
- Town/Secondary Town

N

58°15'58°30'58°15'
6°30'6°15'6°0'
5°30'5°15'5°0'

Arcena

Sun

Rockstone

Annabell
Map 9

Recommended Forest Zones
9: RECOMMENDED FOREST ZONES
OF THE REGIONAL LAND USE PLANNING PILOT AREA

Source: Topographic Maps of Guyana 1:50,000, 1975-1976
Forest Management Units provided by the Guyana forestry Commission

Conversion Forest    Production Forest    Protection Forest
Main Rivers          Pilot Area Boundary
Islands              Major Road
Village              Minor Road
Town/Secondary Town
Map 10

No Plan Scenario
10: SCENARIO I
NO PLAN SCENARIO
OF REGIONAL LAND USE PLANNING
PILOT AREA

A
1. The official sanctioning of agricultural practices on land with low potential for agriculture
2. Prospecting on land with undefined mining potential and medium potential for agriculture

Conflicts:
1. This situation places farmers on land that is incapable of sustaining their livelihood. The use of such lands further diminishes the quality of such areas.
2. The presence of illegal miners degrades good agricultural land.

B
1. Subsistence agriculture on areas with low potential for agriculture
2. Logging on areas with good forest potential (Bartica Triangle)
3. Quarrying on areas with medium stone potential (Bartica Triangle)

Conflicts:
1. Stone quarry encroaching on agricultural land with a good/moderate potential for agriculture
2. Mining and agricultural activities conducted on areas with good forestry potential (Bartica Triangle)

C
1. Logging on areas with moderate potential for forestry
2. Subsistence agriculture on low potential areas for agriculture

Conflicts:
1. Military and forest concessions
2. Tourism and forest concessions
3. Charcoal burning

D
1. Logging on areas with low forest potential for forestry (over logging)

E
1. Subsistence agriculture on areas with good/moderate agricultural potential
2. Logging on areas with good forestry potential

Conflicts:
1. Logging on areas with good/moderate agricultural potential

F
1. Commercial agriculture on good/moderate agricultural land

G
1. Logging on areas with good low potential for forestry (Ituni area)
2. Kaolin mining on areas with medium potential for kaolin (Ituni area)
3. Subsistence agriculture on areas with good/moderate agricultural potential

Conflicts:
1. Mining encroaching on good agricultural land
2. Land tenure conflicts (agriculture and forestry)

H
1. Commercial agriculture on areas with low potential for agriculture
2. Bauxite mining on areas with medium potential for bauxite
3. Sand mining on medium potential areas

Issues ( Linden )
1. Pollution
2. Bauxite community remains depressed
3. Sand mining on areas with low agricultural potential and commercial agriculture

n/a
Map 11

Regional Efficiency
11: SCENARIO II: 2007 REGIONAL EFFICIENCY SCENARIO OF REGIONAL LAND USE PLANNING PILOT AREA


Extension Services & Market Info
Heritage Site
Improve Existing Tourism Facilities
Storage Facilities
Guyana Brazil Road
Mobissa Road
Powerline from Amalia
Kaolin Mining
Natural Regeneration
Reserved Areas
Expansion of Commercial/Subsistence Agriculture
Expansion of Kaolin
Expansion of Cattle, Livestock & Cash Crops
Agricultural Development
Commercial Agriculture in Region III
Promotion of Agricultural Production
Moraballi Reserve Buffer Zone
Commercial Agriculture
Map 12

Sector Led Scenario
Map 13

Recommended Land Units
GUYANA INTEGRATED NATURAL RESOURCES INFORMATION SYSTEM (GiNRIS)

13: LAND UNITS

OF THE REGIONAL LAND USE PLANNING PILOT AREA

Scale: 1:600,000
