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GUYANA

NATIONAL ENVIRONMENTAL ACTION PLAN

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GLOSSARY OF ABBREVIATIONS

AEC	Advisory Environmental Council
BOD	Biological Oxygen Demand
CARICOM	Caribbean Community
CDB	Caribbean Development Bank
CEMCO	Caribbean Engineering & Management Consultants Ltd.
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species
CLICO	Colonial Life Insurance Company Limited
cu. m.	cubic metre
CZM	Coastal Zone Management
DDIA	Declared Drainage and Irrigation Area
D & I	Drainage and Irrigation
DTL	Demerara Timbers Limited
DO	Dissolved oxygen
ECTF	Edinburgh Centre for Tropical Forests
EEC	European Economic Community
EIA	Environmental Impact Assessment
EMCU	Environmental Monitoring and Control Unit
ERP	Economic Recovery Program
FAO	Food and Agricultural Organization
FL	Forest Lease
FMP	Fisheries Management Plan
G\$	Guyana dollar(s)
GAHEF	Guyana Agency for Health Sciences Education, Environment and Food Policy
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEMCO	Guyana Environmental Monitoring and Conservation Organization
GFC	Guyana Forestry Commission
GFSU	Guyana Forestry Support Unit
GGMC	Guyana Geology and Mining Commission
GIS	Geographic Information System
GUYSUCO	Guyana Sugar Corporation
IAST	Institute of Applied Science and Technology
ICZM	Integrated Coastal Zone Management
IDB	Inter-American Development Bank
MMA/ADA	Mahaica Mahaicony Abary Agricultural Development Authority
NGO	Non Government Organization
PEU	Project Execution Unit
TED	Turtle Exclusion Device
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WB	World Bank

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NATIONAL ENVIRONMENTAL ACTION PLAN

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MAP OF GUYANA

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NATIONAL ENVIRONMENTAL ACTION PLAN

I. INTRODUCTION

The Focus of the NEAP

1. The Government has prepared a National Environmental Action Plan (NEAP) to identify the major environmental problems in Guyana today and to formulate appropriate policies to address the causes and effects of these problems. The most serious current environmental problems are to be found in the relatively small area of the coastal zone where most of Guyana's population and physical assets are concentrated, although there is now increasing concern about the need to preserve the hinterland and protect the rights of the indigenous peoples. Some of the problems stem from natural factors such as the coastal plain lying below high-tide levels, but others are directly related to Guyana's poverty and stage of development and the consequence of this for resource use and management. Past economic policies entailed the domination of the public sector and severely distorted incentives for the private sector, with resulting declines in economic performance, provoking neglect and deterioration of infrastructure and a heavy debt overhang. The Economic Recovery Programme, launched in 1988, constituted a major and fundamental reversal of government policies, which, *inter alia*, has created a more favorable environment for foreign investment. As a consequence, Guyana's largely undisturbed and extensive rain forest is the focus of exploitation, by large-scale private interests. A second focal point of the NEAP is, therefore, the preservation of tropical rain forest which is a valuable economic asset for Guyana.

The Process

2. The Government prepared the NEAP based on the findings of the National Forestry Action Plan, the Environmental Profile, existing studies on special issues and with assistance from consultants financed by the U.K., and managed by the World Bank. A multi-disciplinary Government team, joined by representatives of the University of Guyana and local NGOs worked on the final document. Drafts were circulated for comment to a wide range of Government agencies, private sector investors, and representatives of various interest groups in Guyana. The Government held a previously advertised "Public Forum" to discuss the NEAP with interested parties in Guyana and incorporated their views in the final document. The Government will progressively include the investment requirements identified in the NEAP into its public sector investment programme and in its requests for external assistance. Macroeconomic and sector policies will incorporate the findings of the NEAP in order to ensure that the country follows sustainable development policies. The Government considers the NEAP to be a dynamic document that will require constant updating as circumstances change, and it will involve the general public, private sector interests and local NGOs in that updating.

II. NATIONAL ENVIRONMENTAL POLICY

A. Background

3. There is now general agreement that meaningful development means the rational use of natural resources in such a manner as to improve the quality of life for present and future generations, especially the vulnerable groups. Implicit in this is the need for increased popular participation, more equitable distribution of benefits, the efficient and effective use of resources and sustainability of the development process over the long term. It has been widely established that meaningful and sustainable development cannot be achieved without the integration of sound environmental management into the socio-economic development process. Sound environmental management requires a holistic multi-sectoral approach to the use of the nation's resources and implies the formal adoption of an environmental policy backed up by legislation and education.

4. The need for a national environmental policy is rooted in the Constitution of Guyana, which states *inter alia* the following:

- Article 2:25 Every citizen has a duty to participate in activities to improve the environment and protect the health of the nation.
- Article 2:36 In the interest of the present and future generations the State will protect rational use of its fauna and flora, and will take all appropriate measures to conserve and improve the environment.

5. The Government of Guyana is committed to adopting and implementing a national policy for environmental management and sustainable development. The national policy is guided by, and gives consideration to, the United Nations Environment Programme, which represents the multilateral framework within which international environmental issues will be pursued at the global level, in keeping with the "Environmental Perspective to the Year 2000 and Beyond", as adopted by the United Nations General Assembly in December 1987. Additionally, it takes into consideration the several regional declarations on sound environmental management and sustainable development. These include the Caribbean Environmental Health Strategy (1978), the Action Plan for the Caribbean Environment Programme (1981), the Declaration of Brasilia (1989), the Amazon Declaration (1989) and the Port of Spain Accord on the Management and Conservation of the Caribbean Environment (1989).

6. The policy acknowledges that, as expressed in the report of the World Commission on Environment and Development, "Sustainable development is not a fixed state of harmony but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are made consistent with future as well as present needs. The process will not be easy or straightforward. Painful choices will have to be made. Thus in the final analysis, sustainable development must rest on political will."

B. National Environmental Policy

7. In order to conserve and improve the environment, the Government of Guyana will endeavour to:

- Assure all people living in the country the fundamental right to an environment adequate for their health and well-being
- Achieve a balance between the use and conservation of the nation's resources to meet the needs of economic development and improved standards of living
- Institute punitive measures to deter possible violations of environmental norms
- Ensure that, where environmental damage occurs, remedial action will be taken with the cost being covered by those responsible for causing the damage
- Conserve and use the environment and natural resources of Guyana for the benefit of both present and future generations, based on the principle of the exercise of sovereignty
- Maintain ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity and to observe the principle of optimum sustainable yield in the use of renewable natural resources and ecosystems, both on land and the sea
- Rehabilitate damaged ecosystems where possible and reverse any degradation of the environment
- Ensure prior environmental assessments of proposed activities which may significantly affect the environment
- Ensure that conservation is treated as an integral part of the planning and implementation of development activities
- Promote the pursuance of international co-operation on environmental issues
- Raise consciousness of the population on the environmental implications of economic and social activities through comprehensive education and public awareness programmes
- Involve the population, including indigenous peoples, women and youth, in the management of the environment and natural resources

III. THE ENVIRONMENT AND THE ECONOMY

A. Overview of the State of the Environment

8. Guyana's natural resource inheritance is dominated by its forests, mostly rainforest, which cover 80% of the country's 215,000 square kilometers and which constitute a very significant resource not only for Guyana but also for the world. The forests contain a rich variety of plant and animal life including several unique species and 144 endangered wildlife species. The country's resource inheritance also includes substantial mineral deposits, notably bauxite, gold and diamonds. These mineral and timber resources that exist within the interior of the country are extensive, but access is limited because of undeveloped infrastructure. Thus, with a population of only 700,000 occupying mainly the narrow coastal plain, the vast hinterland of the country remains largely unexploited.

9. While the forests have remained practically intact to date, the population faces critical problems of environmental health primarily as a result of the low level of public services provided through the severely deteriorated levels of economic and social infrastructure. Ninety per cent of the population lives on the coastal plain where there are good soils for agriculture. However, clean water provision and safe waste disposal systems are practically non-existent, at great cost to the physical well-being and quality of life for most of the population, particularly the one third who live in urban areas. The critical issues to be addressed relate to the sustainable exploitation of the country's natural resource base, with the natural resource rents accruing to the government in the form of enhanced revenues, and so contributing to the public investments necessary to improve the environmental health infrastructure. Development of the legal and institutional framework for this purpose is a key task for policy makers now and one which they are beginning to address.

B. The Economy

10. Guyana's economy has yet to attain the development potential offered by its abundant natural resources. The economy is based primarily on the production of sugar, rice and bauxite, which are also the country's main foreign exchange earners. Processing of bauxite into alumina was terminated in the 1980's, but the country continues to produce the premium calcined bauxite, of which it is one of only two producers worldwide.

11. For a decade and a half during the 1970s and 80's, Guyana's economy operated under a regime that expanded the role of the public sector into practically all areas of economic activity, including manufacturing, trading and financial services, along with the main foreign exchange earning sectors mentioned. Weak public sector management in combination with the periodic weaknesses in the international markets for bauxite and sugar in those years set the economy on a downward spiral. By 1988, the GDP was 32% lower than in 1976.

12. In 1988 the Government embarked on a major change in the orientation of economic policy. The main thrust was to increase the opportunities and incentives for private sector investment in the economy. The new government which emerged out of the elections of 1992 has set itself the task of rebuilding the economy on the basis of the rational utilization of the resources of the country.

13. A major thrust of economic strategy lies in the promotion of growth in the agriculture, forestry and mineral sectors. These are all sectors with very significant implications for environmental management. An important concern of the Environmental Action Plan therefore must be to develop a regulatory framework which will provide clear guidelines for the monitoring and control of private sector investment in these sectors. The other major area of concern is the environmental health of the Guyanese people.

14. Public sector investment will emphasize rehabilitation of the economic and social infrastructure and the improvement of social conditions. It is anticipated that over the next 4 years, the investment program will be divided as follows: agriculture, 22%; infrastructure, 24%; social sector 35%; and others 19%.

15. This represents a substantial shift in investment priorities in support of infrastructure and social services, both of which had declined in significance as the public revenue crisis deepened. Both sectors also carry significant environmental implications in Guyana's context. The emphasis on social sectors will help to address a major area of environmental concern, that is the environmental health of the Guyanese people. Due to neglect of the social sector infrastructure and reductions in current expenditure there has been a marked deterioration in the provision of clean water and of effective solid waste disposal. The Government currently has public investment plans to begin to address these issues but does not have sufficient resources yet to meet the range of very urgent needs. Identifying priorities in this sector and seeking financing to meet them will be a major concern of national environmental management in the short to medium term.

C. Poverty and the Environment

16. The protracted economic decline Guyana experienced in the 1970s and 1980s was accompanied by an intensification of poverty in the society. Some studies on the extent of poverty put as much as 67% to 75% of the population below the poverty line in 1989, and others contend that some 86% of the population do not earn enough to purchase minimum nutritional requirements.

17. To some extent the standard poverty-environment link exists in Guyana. The most obvious examples are the cutting of trees for charcoal and the reaping of mangroves for household use and cottage industry (tanning). It has also found expression in the way the gold mining industry has developed. The proliferation of itinerant mining of gold has been associated with destruction of river banks and pollution of rivers from the chemicals used in the extraction process and by the diesel fuel used to run the dredging machines. However, in the context of the vast scale of Guyana's natural resources (some 80% of the country is covered by rain forest and of that less than 1% has been deforested) and the relative isolation of the mining activities from major population centers, the environmental impact for the country as a whole has until now been negligible. These activities do, however, have long-term destructive potential, and will require the adoption of effective regulatory measures to curb their uncontrolled expansion (See Section V).

Public Poverty: Its Dimensions and Environmental Consequences

18. The more telling poverty-environment link, however, is to be found in the impact of the poverty of the state on environmental degradation. The sharp decline in fiscal viability associated with the economic crisis led to a severe deterioration of the social and economic infrastructure, with grave consequences for environmental health and protection.

19. With ever fewer financial and manpower resources, the capacity to maintain and expand the social infrastructure eroded. The financial constraints at the Government and City Council levels have, over time, led to a near total collapse of the vital infrastructure for protecting the population from the sea, disposing of waste and providing social services. The evidence of collapse of the social and economic infrastructure is everywhere - in the sea defence breaches and their consequences, the malfunctioning of the drainage and irrigation systems, the breakdown of the management of solid and liquid waste, the deterioration in water supply and (until its recent privatization) electricity systems, the unavailability of affordable housing and consequent rise in squatting.

20. Breakdown of the Social Infrastructure and its Consequences. Under-funding of the municipal authorities has resulted in a near total breakdown of solid waste management in Georgetown, and in a lack of maintenance of the drainage canals in the city. Frequent breaches of the sea defenses together with non-functioning drainage systems mean frequent flooding, with implications for economic losses, but also for public health risks. The concentration of the population on the coastal strip below sea level means that most of the solid and liquid wastes of the country are generated in a watery area which is not well drained. Malfunctioning of the drainage and waste disposal systems has therefore particularly perilous consequences for the population. These have taken the form of high incidence of water- and vector-borne disease.

21. Resource scarcity is the cause also of the severely deteriorated water supply infrastructure. Inadequate maintenance, leakages, and the breakdown of water pumps due to power failures together severely restrict the population's access to potable water, and in turn lead to acts of sabotage, further restricting the availability of piped water. In recent years, squatter settlements are an expression of the unavailability of affordable housing to large numbers of the working population. Squatting along the embankment of established waterways like the Lamaha canal which convey water to the public water supply system is cause for concern. The uncomfortably high levels of typhoid and gastroenteritis point to the possibility of this situation contributing to water contamination.

22. Poverty and Public Health. One manifestation of the profound socio-economic crisis, inadequacy of the social services and physical infrastructure in Guyana is extraordinarily high levels of communicable diseases which have their source in the environment. Morbidity statistics reveal high levels of environmentally related diseases. Cholera, filaria, dengue, malaria, tuberculosis, gastroenteritis, typhoid, hepatitis and even cancer are associated with pollution of the environment by chemical and bacteriological agents attendant on the breakdown of potable water and waste disposal systems and poor and crowded housing conditions. There has also been an increase in the contribution of poverty-related illness to causes of death. The life expectancy declined from 70 years to 64.9 years during the period 1985-1992. The latter figure is about the same as that which obtained in the late 1950's or early 1960's. With the

neglect and breakdown of medical facilities and shortage of staff and drugs and increase in poverty levels, epidemiologically over the last twenty eight years, Guyana has reached the highest levels of infant, child and maternal mortality rates in the English speaking Caribbean.

Poverty and Population Issues

23. Slow Population Growth with Increased Locational Density. The country's impoverishment has had significant adverse consequences for the well-being of the population. Poor systems of public health and nutrition increased death rates and reduced birth rates. Declining employment opportunities propelled massive emigration of skilled as well as unskilled members of the work-force. Preliminary estimates of the 1991 population census indicate a growth rate of -0.1% per annum over the last decade. The components of this decline are falling birth rates, high mortality and the movement of substantial numbers of persons out of the country.

24. On the other hand, the locational density of the population is quite clearly a factor making for the environmental vulnerability of parts of the coastal plain. Estimates of population density in Region 4 range from 360 to 700 persons per sq.km. By contrast, the density on the coastal plain as a whole is estimated at 40 per sq.km and the density in the country as a whole is only nine persons per sq. km. Thus the population has remained concentrated on that small section of the coast that harbors the traditional economic activities, with very limited outward movement away from the coast. The historical pattern of intensive land settlement, focused almost exclusively on the narrow coastal region of the country, and ignoring the natural wealth of the interior, has persisted.

D. Economic Policies and the Environment

25. Many of the present environmental problems originated from lack of maintenance of most environmental services in the past. This problem in turn has been rooted in the weak overall fiscal situation and inadequate cost recovery from the users of public services. Remedial economic policies are critical to reversing the deteriorating trend in the environmental services. While cost recovery is important for maintaining environmental infrastructure adequately, revenue collections will be difficult in the absence of some rehabilitation of facilities and services. As rehabilitation is completed, user charges will need to be set so as to permit adequate management of solid and liquid wastes, ensure the quality of potable water, and to maintain the sea defenses. A combination of regulatory and economic policies will be required to (i) address the problems of environmental health; and (ii) promote environmentally-sound economic development based on Guyana's vast natural resources.

26. A new direction has been taken to recover the costs of public services and at the same time promote efficient use of natural resources. These strategies are, however, only at their initial stage and their full implementation will take time to be effective.

27. As the Government reviews its economic policies in a number of areas, there is ample scope to apply cost recovery and 'user pays' principles which will have the dual effect of raising revenues and encouraging conservation and environmental protection. Pricing policies for the use of government lands and for extraction of resources can be improved. Lease rates are

extremely low, with rates for land development schemes, for example, ranging from G\$2 to G\$15 per acre. The costs of collection often easily exceed the value of rentals and, with little risk of attempted payment enforcement, leaseholders are not inclined to pay. Royalty rates for timber bear no relation to the value of the resource or operating costs. Low logging fees and tax exemptions encourage subletting and inefficient use of the forestry resources.

28. The collection and disposal of solid waste, which is limited to the Georgetown area, is provided free of charge. However, the service at present needs improvement. Households improperly dispose of solid wastes owing to lags in collection times and non-maintenance of collection schedules for residential customers. In addition, an estimated 37 percent of garbage in Georgetown remains uncollected. The necessary improvement in solid waste management can be combined with introduction of collection fees. This would be a critical step in providing environmental services at a level that prevents grave public health hazards.

29. As with other public services, an inadequacy of operating budgets has also troubled the water and sewerage sector. Yet there is abundant scope for recovering costs in this sector through applying appropriate charges. The prevailing picture is one of low water tariffs and low collection rates across the board for all uses of water. The water rate is as low as US\$ 0.60 per year for some consumers. Outside of the municipalities, the Regional Water Departments (RWD) manage to collect only from those who are willing to pay, and since the proceeds are deposited in the general revenue account and the RWDs' operations are funded out of block grants from the central government, there is no incentive for financial self sufficiency on the part of the RWDs. They therefore have no interest in undertaking proper billings or strengthening collections performance. In 1992, cost recovery excluding depreciation, was as low as 3.4% in regions 2 to 7.

30. Similarly, irrigation water is supplied without metering; and farmers pay a low charge for irrigation water. Changes in the trade and exchange rate regimes of Guyana beginning 1991 have led to increased cultivated acreage for rice and sugar. This has placed additional demands on the drainage and irrigation infrastructure that has been in need of extensive rehabilitation for some time. The general lack of funds has prevented proper maintenance and operation of all social service systems, let alone expansion of the services to meet increasing demands over the years. As the economic and social infrastructure is rehabilitated with external assistance, adequate pricing policies will be put in place.

E. The Role of the Private Sector

31. In recent years the private sector in Guyana has begun to emerge as an important force in natural resource management and environmental protection. In part this has grown out of a tradition of direct public corporation involvement in environmental management. In the agricultural sector, for example, GUYSUCO has long been responsible for management of the East Demerara water conservancy, which provides water both for local drinking water supplies and for irrigation of the cane fields. In the mining sector, LINMINE operates the water supply system for the city of Linden as well as for its bauxite mining operations. More recently, however, this involvement has grown out of international public and institutional pressures on Governments to stimulate private sector operations in developing countries.

32. As a result of both the increased public scrutiny given private sector developers and the environmental requirements of the international lending institutions, the multinational corporations obtaining the large forestry and mining concessions are leading the way, in many cases, in setting sustainable policies and environmental protection standards in Guyana. For example, one company is pioneering a "Green Charter" for sustainable forestry management. It also is funding independent scientific research and monitoring to inform its forest management practices. In the mining sector, another company has completed a comprehensive environmental impact assessment before beginning mining and is committed to attaining international mining standards for environmental protection in its mining operations.

33. Much remains to be done, however, to enhance the role of the small scale private sector in environmental protection. Georgetown's business community, for example, may be able to assist the city's solid waste management efforts through their own city clean-up campaign. Private sector initiatives in this area have worked well in other CARICOM countries. Additionally, even in the absence of regulatory controls, major sources of industrial wastewaters can take simple, cost-effective measures to reduce the adverse environmental impacts of their wastewater discharges. Increasing the contribution from the emerging private sector in this way can only add to the effectiveness of Government efforts to improve environmental management.

34. Finally, the role of non-governmental organizations (NGOs) interested in environment cannot be overlooked. The birth and expansion of environmental NGOs has proved to be one of the more promising developments in recent years.

IV. RATIONALE FOR ENVIRONMENTAL ACTION

35. The most serious current environmental problems in Guyana relate to the relatively small area of the coastal zone where most of Guyana's population and physical assets are concentrated. The frequent flooding of the coastal plain, with its concurrent serious pollution and public health consequences, has occurred mainly because of lack of maintenance of the sea defenses, of the coastal plain's drainage and irrigation systems, and of water supply and sewage infrastructure. The density of population on the coast, which at 360 people per square mile, compares with a density of 9 people per square mile for the country as a whole, also strains the capacity of the waste disposal systems to service the intense demand generated in this small area with its high water table. The Government appeals to the donor community for financing for a programme of environmental mitigation and prevention in the coastal zone to address public health issues that have reached crisis proportions. This combined developmental and environmental programme will eradicate pollution and reduce erosion on the coast through the short- and long-term actions identified in the NEAP.

36. The continuation of Guyana's traditional pattern of economic development, consisting of a concentration of human and physical assets in Guyana's narrow coastal strip, may be unsustainable in the long-term, particularly if sea-level rise is a reality. The chief costs of this coastal concentration are:

- the high investment and maintenance costs of sea defenses to protect people, land and economic assets from tidal flooding;

- crop losses and rapid depreciation/destruction of infrastructure from flooding of coastal areas, whether from the sea or from freshwater floods;
- the costs of maintenance and operation of the drainage and irrigation schemes, and the costs of their environmental impacts.

37. At a time when areas of economic activity are opening up away from the coast in mining, forestry and eco-tourism, the Government intends to seize the opportunity to create inducements for coastal residents to move farther inland and thus reduce the pressures on the coastal environment. The government expects that this long-term programme of dispersion of the population, will, eventually, reduce the costs of maintenance of the sea defenses and temper the related problems of coastal erosion.

38. Guyana's natural resources are critical for the country's future economic development, but they are also important in the global environmental context. Guyana is one of only thirteen countries in the world that still retain the tropical forests virtually intact. There is some evidence that the vast untapped tropical rain forest influences temperature, precipitation and air turbulence and serves as an important carbon sink to mitigate global warming. Large areas of tropical forests protect essential life processes, such as watersheds, they stabilize soils, and are breeding grounds for wild species and nurseries for fauna. While science cannot yet quantify the critical minimum size of protected areas, prudence dictates that such areas be large rather than small so as to ensure high levels of genetic variability for species survival. Despite minimal inventories of tropical forests, wild species already contribute billions of dollars annually to agriculture, medicine and industry, thus justifying the retention of species diversity for potential future uses world-wide. The rain forest in Guyana also shelters areas of remarkable beauty such as the waterfalls of the Kaieteur national park, which are five times higher than the Niagara falls and where nearly 20 percent of the 500 species of orchids recorded are endemic.

39. The Government of Guyana recognizes the value of its rain forest as a national resource of global importance and, in 1989, dedicated an area of 360,000 ha. for conservation purposes. The resulting "Iwokrama Rain Forest Programme" is internationally funded under Commonwealth auspices, and is designed to use the conservation area for research, dissemination and training in the sustainable utilization of tropical rain forest resources.

40. Guyana does not itself have funds or the trained manpower to protect its rain forests. The country's per capita income is the lowest (\$330) in the western hemisphere. Public sector infrastructure has deteriorated severely; real wages in the public sector have declined far below the low levels of 1986 and amount to one-third to one-fourth of wages paid in the private sector. Natural resources in Guyana have been conserved so far mainly because of low population pressures and the concentration of that population on a narrow coastal strip. Significantly, the Government owns 90 percent of the land area.

41. According to the World Bank: "Guyana remains a country with much potential, including a productive agricultural sector, vast timber resources, and mineral resources that include bauxite, gold and diamonds. With recent massive devaluations, the relative cost of labour is one of the lowest in the world. With some improvements in public infrastructure, the country could be attractive to substantial foreign investment." (Guyana from Economic Recovery to Sustained Growth, 1993). If the rain forest is to be preserved and if Guyana is to benefit now and in the

long-term from the sustainable use of its natural resources, a major programme of **environmental protection** must accompany the economic recovery programme.

42. An effective programme of environmental protection in a country with severe poverty, paucity of data, effective institutions and trained people, and competition for scarce talent from the private sector, will take time to build up. The new Government is currently struggling with intractable social and economic issues and will be unable to design and administer, let alone finance, a complex environmental protection programme without considerable external assistance. Interim measures need to be put in place urgently because investors, both domestic and international, large and small, are interested in the development of Guyana's timber and mining resources. These measures must ensure that all investments are subject to environmentally sound practices and benign methods of exploitation.

43. In this context, the government will require technical assistance in negotiating the terms and conditions of contracts with potential investors in mining, timber and industrial sectors. Guyana needs to obtain financial compensation for exploitation of its natural resources, in particular its non-renewable natural resources, that is commensurate with comparable contracts elsewhere. High economic returns from each contract will allow the Government to limit investment to a rate of development that is within the capabilities of its institutions to manage and monitor, and, consequently, that protects its resource base. Such contracts should also include internationally accepted standards of environmental protection and mitigation.

44. To a considerable extent the smaller entrepreneurs, particularly in gold mining but also in logging and sawmill activities, and the people in illegal settlements will drive up the costs of monitoring and regulation, because of their number and dispersion. Contrary to general assumptions, the impacts from such small-scale activities are neither localized nor minor. The Government is currently examining the impacts of these small-scale dredges and the use of mercury by small-scale miners, with its subsequent impact on water and in the food chain, as a matter of urgency.

45. If the interim and long-term environmental protection programme is to be successful, the Government will require massive aid from the international community and from private sector interests, particularly the NGOs. The costs of establishing a command and control system will be enormous, i.e., recruiting and training personnel from Guyana and abroad, establishing data collection and collation systems and technical laboratories, designing appropriate monitoring systems, creating new institutions and accompanying legislation, designing conservation systems, planning and administering scientific research, plus regulation and compliance enforcement. Given the time lag before the environmental protection programme can begin to function effectively, interim actions that will require technical assistance, equipment and funds have been identified in the NEAP. While the costs of the environmental protection are, indeed, substantial, they must be met in order to ensure the preservation of the resource base for sustainable development, to protect as yet unquantifiable biodiversity resources and equally invaluable scenic beauty. Hence, such an investment is essential in order to realize Guyana's commitment to the preservation of the world's intricate climatic and ecological systems.

46. The Actions listed in the NEAP incorporate the findings of the National Forestry Action Plan, studies and surveys by donors and NGOs, national proposals, and the assistance provided

by the World Bank. The Government wishes to assure the international donor community, as well as the national community, of its commitment to sustainable development and environmental protection programmes. To this end the Government is requesting substantial donor assistance in order to manage and maintain the invaluable natural heritage within its territorial borders.

V. MAJOR ENVIRONMENTAL ISSUES

A. Coastal Zone Management

Overview of the Coastal Zone

47. Guyana's coastal plain occupies approximately 7% of the total area of the country and extends along the entire 430 km of the Atlantic coast. It varies in width from 26 to 77 km. The fertile plain consists of surface clays underlain by clays of the Demerara and Coropina formations. Extending for as much as five miles inland, much of the coastal plain lies between 0.5 meters and 1.0 meters below high tide levels. The shore zone consists of coastal works, mud banks, a mangrove belt and sand flats, all of which serve to protect the plain from flooding by the sea. Five major wetland systems are distinguished in the coastal plain: the marine ecosystem of the sea coast, the estuarine ecosystems of tidal wetlands of the river mouths, the riverain, palustrine and lacustrine ecosystems.

48. Some 90 % of the estimated 751,000 people in Guyana, reside in the coastal zone, mainly in Georgetown (which has a greater-area population of 200,000), where the main port is located, and which is the seat of government. Agriculture is the major economic activity accounting for 24% of GDP and 35-40% of employment, and except for forestry, all the products (sugarcane, rice, other crops, livestock and fishing) come from the coastal area. Most of Guyana's industry is located in Georgetown and along the remaining coast, with only a small concentration in Linden and north of Linden along the Demerara river. Other major economic activities and investments outside Georgetown and the coast, consist mainly of large- and small-scale mining and are located on major rivers that flow into the sea at Georgetown and the surrounding coast. Groundwater provides 90% of the potable water supply and is extracted mainly from the coastal artisan basin. The skewing of populations and investments towards the coast is common in the island economies of CARICOM, but the imbalance in Guyana, with its large hinterland, is unusual by any standards.

Major Environmental Issues in the Coastal Zone

49. A complex of inter-linked coastal zone issues threatens the viability of Guyana's intensely concentrated economic base. They center on coastal erosion and flooding, and stem from a number of factors, many related to the fact that the coast lies below sea level and must be protected against sea water intrusion in order to support the extensive human settlement that it carries. The system of sea defenses constructed to protect the area from sea water flooding has not been maintained in many years. Sea-level rise and possible coastal subsidence add to the pressures on the sea defenses and, inevitably, lead to greater coastal erosion and flooding. The shore zone, which serves as the natural line of defence against coastal erosion, is subject to erosion from floating mud shoals in the Atlantic that originate in the Amazon, and also to

destruction of mangroves for fuel-wood and the tanning industry, and to some minor removal of sand for construction. The water conservancies and drainage and irrigation works in the coastal plain, which have also suffered from lack of maintenance, cause periodic fresh water flooding.

Coastal Erosion

50. Coastal erosion has been taking place at a relatively rapid rate. A comparison of the 1783 and 1970 coastlines around Liliendaal shows a regression of almost 1 km. (i.e., erosion rates of -4 to -5 meters annually). Evidence of this retreat can be seen all along this coast – old sluice gates form islands far out to sea, and old shore lines and sand ridges run parallel to the present shoreline.

51. There are many causes of coastal erosion, some natural and some man-made, and distinguishing between the effects of each is not always possible, particularly given the paucity of baseline data in Guyana. Mud shoals have had and continue to have an unquantifiable impact on coastal erosion. The mud shoals move along the Brazil, Suriname, Guyana coast from east to west in a series of waves and macroripples at an approximate speed of 1.3 km per year. The shoals are in constant motion and the refraction and concentration of wave energy between ripples greatly increases the capacity of the shoals to erode coastal area. On the eastern side of the shoal, the coast accretes the mud which is colonized by mangroves, but as the mud shoal moves westward, the mangroves are unable to survive the wave attack and erosion takes place. Thus the mangroves, which are themselves a first-line shore zone defence against intrusion by the sea, are also subject to destruction from the movement of the mud shoals. Mangroves are also destroyed for fuel wood and for use in tanning. The alteration of drainage systems (discussed below) for agricultural production projects in the coastal zone, may also have hurt the mangroves. No clear picture of the extent of the degradation of the mangroves is available but prudence dictates that they should be protected from further erosion where this is controllable. Besides coastal defence, the mangroves provide a habitat for juvenile fish and shrimp.

52. Both the EC and FAO undertook studies into mangroves in 1990. The studies used aerial photography and field measurements to map the changes in mangroves between 1973-5 and 1990 and made recommendations for replanting the field trials.

53. Sea-level rise is another possible cause of coastal erosion, and there are indications that this global phenomenon, may be occurring on the Guyana coast. Tide gauge readings in Georgetown from 1960-1981 indicated a rise of 9 cm. in the relative level of the sea and engineers in the Hydraulics Division have observed water levels reaching higher up the sea walls. The observed rise in relative sea level may be partly attributable to subsidence of the coastal zone, which may, in turn, be influenced by the extraction of fresh water from the coastal aquifers. At present, water is extracted from two main aquifers, the "A" sand (typically between 500 and 800 feet) and the "B" sand (below 800 feet), which have no apparent hydraulic connection between them. The recharge conditions of these aquifers are not known, but falling artisan pressure, particularly in the "B" sand, suggests that the aquifer is not recharging as quickly as the water is being withdrawn, and the land may be subsiding as a consequence.

54. With the coastal zone already below the level of mean tide, accelerated sea level rise could obviously have a major impact on the sea defenses and on the coastal plain, in general, by exacerbating seawater flooding. At present, the data are inadequate to determine how much of the observed sea level rise might be due to subsidence and how much is due to actual sea level rise. Given the critical condition of the sea defenses, this needs further investigation, for while there is little the country can do about global sea level rise, alternative sources of potable water and technical solutions to the aquifer recharge may be available to resolve man-induced land subsidence. For example, the upper sand aquifer, which is recharged, may be able to supply most of Georgetown's water needs if the coastal brackish area of the aquifer could be avoided.

Flooding

55. The coastal plain is subject to flooding from both sea water intrusion and from fresh water overflows. Flooding destroys the value of the country's physical capital, most of which is located on the coastal plain. Agricultural land normally remains out of production for at least a year once it is flooded with saline water. Floods also have serious public health consequences in the coastal areas. In Georgetown, sewage is discharged untreated through an outfall into the mouth of the Demerara river, which is returned during high tides and flooding. Other areas use septic tanks and pit latrines, which may contribute to pollution of ground and surface waters during flooding.

56. Sea defence breaches have been a major cause of coastal flooding. In 1991 there were more than 25 breaches of the sea wall which flooded agricultural land and residential areas. One breach at Cornelia on Leguan Island resulted in over 1000 acres of rice land being flooded. For the past two decades, lack of maintenance, mainly because of budgetary constraints, has seriously weakened the sea defenses. The system of natural and man-made sea defenses has for centuries permitted the concentration of people and capital on the country's most fertile plain. Originally constructed by the Dutch and British colonists, the system of seawalls, empolderments and kokers was expanded and maintained by Guyana following Independence. Since the beginning of 1993 responsibility of maintenance of the sea defenses was transferred from regional authorities to the Hydraulics Division, but the pervasive lack of funding and staff affects this Division too, and these critical defence works have not been maintained.

57. The Government recently obtained funding from four multilateral donor agencies for critically needed sea defence works, i.e., from the IDB, CDB, EC, and IDA. However, the funds provided these agencies will cover the costs of works on only two-thirds of the sea-defence strengthening assessed to be urgently needed.

58. For similar reasons of financial and institutional capacity, malfunctioning of the drainage and irrigation (D&I) systems has been another source of flooding. An intricate system of water conservancies and drainage and irrigation has been constructed to control flooding and overcome the seasonality of rainfall for coastal agriculture. However, for lack of maintenance, drainage ditches are often silted up or clogged with garbage, the mechanical pumps fail and sluice gates that control the flow of water often do not function properly, leading to frequent fresh water flooding. The flooding is exacerbated at high tide when gravity drainage seaward has to be blocked.

Other Impacts of Drainage and Irrigation

59. The D&I systems have profoundly altered the natural surface water regime and, as such, might be expected to have significant environmental impacts. No structured monitoring of D&I effects is conducted except in the MMA-ADA Project. Essentially a large river control project, the MMA has resulted in dramatically improved production levels for agriculture, particularly rice, but environmental monitoring reveals that it has also had adverse environmental impacts. The most serious is the widespread growth of the water hyacinth, stimulated by increased nutrients and the reduced flow of the Abary River, which clogs the drains and waterways and further slows water movement. The reduced river flow has resulted in siltation, particularly at the mouth of the river, where a large mud-bank has formed that will require dredging. Other impacts of the MMA project have included eutrophication and loss of trees.

60. The MMA project has an Environmental Monitoring and Control Unit, charged with the responsibility for monitoring the effects of the development and promoting environmental protection and management. The monitoring program is well structured and detailed. Because the project is well documented with annual environmental monitoring reports, mitigation of the environmental impacts has often been possible.

61. Actions

- During the next year the Government will seek donor assistance to carry out the remaining critical sea defence works and will institutionalize the management structure for emergency sea defence works.
- During the next two years the Government will begin a programme of field trials for replanting mangroves in selected areas along the coast. The Government will seek donor assistance for financing this mitigation exercise. In addition, the Government will approach the IDB to include in the IDB-financed Shore Zone Management Project, aerial photography of coastal areas immediately seaward and landward of the shoreline, in order to enable the Government to resolve shoreline management issues in an integrated and environmentally sound manner.
- During the next two years, the Government will initiate a study, as part of the IDB Shore Zone Management Study or independent of it, to monitor quantitatively the movement of mud-banks so as to predict spatial distribution of erosion and to manage sea defence maintenance programmes accordingly. The IDB study will also be widened to include the study of the role of communities in the management of coastal resources.
- During the next three years the Government intends to address the various issues entailed in reducing the negative environmental impacts of drainage and irrigation schemes by (i) adopting measures for the efficient operation and management of the D&Is; to this end, the Government will also pursue participation of the private sector through, for example, water users' associations; (ii) ensuring that the environmental lessons learned from the MMA project are applied to other large- and small-scale drainage and irrigation projects; and (iii) requiring an

environmental impact assessment (EIA) for new D&I projects as well as management plans and budgetary provisions for prevention and mitigation before they are undertaken.

- During the next three years, the Hydro-meteorology Department will undertake a study to investigate the ground-water resources of the coastal aquifers, including their recharge potential, to determine the long-term sustainability of potable water supply and reduction of possible land subsidence. The Government will seek donor funding and technical assistance for this study.

Fisheries

62. Prawn landings declined from 1973 when the number of trawlers decreased, but have now stabilized at a lower level and appear to be near the maximum sustainable yield. Some trawlers turned to a smaller species, the seabob, which is found further in shore, and now in turn, may be overexploited. Aerial spraying with pesticides in the coastal zone may have affected the hassar fish populations. The Government is currently reviewing a Fisheries Management Plan (FMP) which provides for management of the fisheries over ten years. The plan will require an overhaul of fisheries legislation that dates back to 1957.

63. Action

- Within the next two years the Government will revise the fisheries legislation, approve and implement the FMP.

Improved Coastal Zone Management

64. The Government recognizes that improved coastal zone management (CZM) depends on an integrated approach to CZM, availability of baseline data and data collection systems, adequate monitoring and regulation, appropriate institutions and legislation, and public awareness and participation. The Government has demonstrated its intention to improve the management of the coastal zone as well as its commitment to improved environmental management in general, as set out in the country report to the United Nations Conference on Environment and Development: "Development Trends and Environmental Impacts in Guyana", February 1992. While the actions described above will reduce the degradation of the coastal zone, a coordinated strategy to manage this environmentally fragile area in the future will be required.

65. Integrated Approach. Integrated coastal zone management requires a coordinated strategy for the allocation of environmental, socio-cultural and institutional resources to achieve the conservation and sustainable multiple use of the coastal zone. As an indication of its commitment to integrated CZM, the Government established a sub-committee on CZM in 1991 that comprises representatives from the major agencies dealing with the coastal zone to address issues related to CZM. The sub-committee has proposed an administrative structure for CZM in Guyana, which the Government will put in place and is committed to seeing work.

66. Institutional/Legal Base. A number of agencies have CZM responsibilities in Guyana at present, including the Environment Unit, the Hydraulics Division, Hydro-meteorology

Department and Fisheries Department, and the Central Planning and Housing Department, which is responsible for planning and zoning in urban and rural settlements, the implementation of standards and regulations and development control. The dispersion of responsibilities among so many agencies makes integrated CZM difficult to implement in practice. Previous attempts to coordinate the activities of these agencies, through the Inter-Agency Committee on Environment and Development and the Advisory Environmental Council, have not been successful. The Government is considering establishing a lead environmental agency with authority to coordinate agency activities and review private sector actions in the coastal zone. (This proposal is contained in an institutional action in Section V.)

67. Information and Analytical Base. The causes and impacts of coastal zone degradation in Guyana are difficult to evaluate, mitigate and manage because of the lack of a data base, and the lack of data collection through monitoring, as also the lack of a well equipped laboratory for analysis of water and soil samples. For example, no quantitative information is available on the impact of flooding, sea level rise, or status of ground-water resources, because the network of river gauging stations and climate recording stations has deteriorated over the past years, so that very few stations are now working. Because of the evident public health problems it is essential to obtain sufficiently detailed information so as to identify major sources of pollution and remedy these. Without a good data base and without the capacity to monitor pollution, effective management of the coastal zone will be impossible.

68. Action

- During the next three years the Government will refurbish the hydrological and climatological control stations to working order and will add additional stations in the coastal zone, so as to be able to manage water resources and obtain scientific data to help assess the impact of climate change and sea level rise on the coastal zone. The Government will seek donor assistance for this project.

B. Waste Management and Pollution Control

69. The environmental degradation and public health impacts resulting from improper management of liquid and solid waste in the coastal plain of Guyana is a significant environmental issue. Nowhere is the deterioration of the infrastructure for managing sewage and solid waste in Guyana more evident than in Georgetown, but improper management of these wastes poses serious environmental and public health problems nationwide. Furthermore, industrial activities in the coastal plain discharge wastewaters untreated into rivers and coastal waters, the environmental impacts of which are currently unknown.

Current Situation

70. Solid Waste. Solid waste disposal practices in Guyana have not kept pace with the demands posed by increases in population and waste generation. Municipal solid waste management in Georgetown, more than elsewhere, suffers from years of under-funding and public neglect. According to recent data, Georgetown generates approximately 50 tons of solid waste per day. Recently the city has had to use contractor vehicles for waste collection because of a lack of city garbage trucks. When contractor fees go unpaid for lack of funds, however,

waste collection is often interrupted. A common practice throughout the city is dumping waste in nearby public areas and vacant lots rather than at official dump-sites. The resulting waste pollution and open decomposition, as well as drain clogging, are common sights in all city districts. Georgetown has an old waste incinerator, used principally for disposal of hospital wastes, which is currently operating at only 10% capacity. Because of its location in the city and the costs of rehabilitation, it may be necessary to abandon the incinerator and simply use the site as a transfer station. Otherwise, most of the city's solid waste is disposed in temporary, poorly designed and operated landfills sited at various locations around the city. These makeshift urban landfills are shallow excavated trenches, back-filled with solid waste, and covered with soil by earth-moving equipment. Their current operation gives rise to foul odors and problems of wind-blown waste, and landfill leachate is entering into the high water table underlying the city.

71. In the communities of Linden and New Amsterdam, municipal waste disposal is handled by open dumping and burning. No facility design or operating procedures are followed for these sites. Both air and ground-water pollution are causes for concern, however, no monitoring in these media is currently being conducted. In rural areas, the solid waste situation is not as severe as in the municipal areas with their higher population and commercial density. Waste generation is lower and a higher percentage is organic (e.g., food wastes). This waste is generally disposed of by composting or burial by the individual generating the waste.

72. Liquid Waste. Proper disposal of sewage is the primary liquid waste management issue in Guyana, although current disposal practices for industrial effluents pose environmental hazards as well. Georgetown is the only city in Guyana served by a communal sewerage system. The main sewerage system, built between 1924 and 1929, services some 648 ha. in central Georgetown, approximately one-third of the city's population (about 80,000 people). The old gravity-piped sewerage system discharges to 24 pumping stations around the city. Power outages, aging pumps and solid waste dumping interfere with continuous flow through the system, which discharges an estimated 3.9 million gallons of untreated sewage per day through an outfall into the mouth of the Demerara River. The University of Guyana and Tucville area outside of Georgetown also have sewer systems, but neither has an operating treatment plant at this time. The remaining population of greater Georgetown and the other major communities (i.e., New Amsterdam, Linden, Corriverton, and Rose Hall) are served by septic tanks and pit latrines, which overflow from time to time to ditches and storm channels and give rise to foul odors, unsightly conditions and severe endemic mosquito problems. More seriously, there is also the potential for contaminated surface water from storm channels to enter drinking water mains at times of low or negative pressure and during flood conditions.

73. In rural areas, septic tanks and pit latrines are commonly used for proper sewage disposal. Septic tanks, which are generally approved by the regional Environmental Health Officer, employ a filter box for dispersing tank effluent into the soil to a depth that depends on the level of the water table. Pit latrines, if properly covered and maintained, can provide adequate sewage disposal for rural areas without a pipe-borne water supply.

74. Industrial Wastes. Guyana does not have a great deal of industry and currently there are no reliable data available on the quantity, characteristics, and management practices for industrial liquid and solid wastes. GAHEF has only recently begun to examine the sources of

industrial pollution and has recently assembled some information on industrial waste generators and their potential pollutants of concern. This information is shown in Table 1.

Table 1. Sources of Industrial Waste in Guyana

INDUSTRY	NUMBER	POTENTIAL POLLUTANTS
Sawmills	66	BOD, dust
Food Processing	47	BOD, phosphates, solids, dust, pathogens
Detergents/Soaps	9	BOD, phosphates, caustics
Metalworking/Foundry	8	Heavy metals, solids
Sugar Refinery	7	BOD, solids, caustics, phosphates
Chemical/Pharmaceutical	6	acids, alkalis, phosphates, solids
Distilleries/Breweries	5	BOD, phosphates, thermal
Plastics	4	CFCs, solids

75. **Agricultural Wastes.** Animal wastes from pigs, cattle, and poultry are good for soil conditioning if properly managed, but may present pollution problems if allowed to run off into streams and rivers or to percolate into groundwater, as may be the case in the coastal zone. As livestock farms continue to develop in Guyana, proper measures will have to be encouraged for the lagocning of animal waste, the use of solids to condition soils, and the use of properly treated effluent to irrigate the fields.

76. **Special Wastes.** Ship-generated wastes are not the problem in Guyana that they may be in the small Caribbean islands with a strong tourism industry and regular visits from cruise ships. The port in Georgetown handles mostly cargo liners. Solid waste is removed from ships in bags and trucked to the Georgetown disposal site. Of greater concern is hospital waste (e.g., pathological waste, chemical waste, infectious waste, sharps and pharmaceutical waste), which is currently bagged in plastic after separation and is collected and trucked to the Georgetown incinerator. Industrial solid wastes, which may include hazardous waste constituents, are generally trucked to the land disposal site in Georgetown. There is currently little monitoring or control over this industrial waste disposal situation, therefore, further work needs to be done on the characterization and proper management of these wastes.

77. **Agricultural Chemical Pollution.** Agricultural chemicals are a prime cause of water pollution in the coastal zone. Although fertilizer use is lower than in other countries because of economic constraints, urea and phosphates lead to nutrient loading and lime is used to counteract acidity in the soils during sugar planting. Pesticide and herbicide use leads to dangerous chemical loading, particularly since local farmers are untrained in their use. With the introduction of a market economy, private sector chemical firms are providing extension

services to farmers that include sales of pesticides and other agricultural inputs, which is likely to increase their use. Aerial spraying of pesticides in both sugar and rice fields is believed to have drifted to other areas of the coastal zone and may have affected the population levels of the hassar fish. Because of the lack of monitoring, no qualification of the extent of agricultural pollution is possible. Enactment and implementation of the Pesticides and Toxic Chemicals Control Bill, discussed in Part VII, will address these issues.

Environmental and Public Health Impacts

78. An assessment of the impacts of improper waste management practices in Guyana reveals a number of areas that have potentially high negative impacts on human health and the environment. One primary concern is the increase in diseases carried by rats and vermin found in improperly managed solid waste dumps. Improper dumping has also resulted in extensive contamination of surface water in drains and sewers clogged with solid waste. Where solid waste is burned as part of the disposal process, air pollution may pose a threat to the surrounding area. Finally, there is reason to believe that contamination of ground water by leachate from solid waste dumps is occurring.

79. There are serious threats as well resulting from current liquid waste disposal practices. Among them is the increase in sewage contamination of drinking water sources. But general contamination of surface and ground-water resources, as well as soil, is also a cause for concern. The resulting water pollution has serious impacts on fisheries and other resources in coastal and marine waters, much of which enters the food chain for the human population in coastal areas.

80. In addition, the untreated industrial effluents discharged from plants in the coastal area into nearby canals and rivers may contribute potentially significant pollution in the form of biochemical oxygen demand (BOD) and nutrient enrichment. Such pollution may have serious impacts on aquatic and marine life, such as fish-kills or significant reduction in the carrying capacity of surface waters. Sawmills that dump sawmill waste directly into neighboring rivers and streams can present similar BOD pollution problems.

81. The best overall indication of water pollution from improper management of liquid wastes is obtained through surface and ground-water quality monitoring. Routine water quality monitoring, however, is not performed on rivers and coastal waters, and only limited water quality monitoring is done for drinking water sources (i.e., surface and ground waters). The limited water quality monitoring data available, however, indicate the extent of water contamination in the surface and coastal waters of Guyana.

82. One significant indicator of the environmental health problem in Guyana is the increase in the incidence of environmental diseases. Health data indicate that the population in Guyana suffers from six enteric diseases. These environment-related diseases, identified in Table 2, are transmitted to humans from contaminated water, food, or soil.

Table 2. Enteric Diseases in Guyana

TRANSMISSION	DISEASES
Water-borne	Cholera, dysentery, gastroenteritis, and typhoid
Food-borne	Dysentery, gastroenteritis, and infectious hepatitis
Soil-borne	Hookworm

83. Another five diseases that afflict the population are transmitted by common vectors that are directly influenced by environmental conditions. These are presented in Table 3.

84. Recent health statistics show increases in the number of reported cases of malaria and a high mortality rate, especially in the interior of the country. The increases in cases of gastroenteritis reflect poor conditions in water supply and sanitation, as does the outbreak of cholera along the border with Venezuela. In total, water-borne diseases are estimated to have risen about fourfold over the last decade, from 140 cases per 100,000 population in 1980 to 670 per 100,000 in 1988. In addition, the infant mortality rate of 42.9 per 1,000 live births is the highest in the CARICOM countries in 1993. A reduction of diarrheal diseases was recorded from 21000 to 12000.

Table 3. Vector-Transmitted Diseases in Guyana

VECTOR	DISEASES
Mosquito	Dengue, filariasis, malaria, and yellow fever
Snail	Schistosomiasis

Current Government Actions

85. The Government, particularly the Ministry of Health's Environmental Health Unit, the Guyana Water Authority (GUYWA), and various municipal water and environmental health units, are taking actions to address the problems associated with potable water supply and liquid and solid waste management. These efforts are constrained, however, by the severe lack of financial and trained human resources, as well as by the institutional situation that operates in the water supply sector.

86. Two major Government efforts are currently receiving external assistance. A World Bank-financed project is supporting institutional strengthening and human resource development in GUYWA, as well as rehabilitation of water and sewerage facilities and improvement of operations and maintenance programs. An Inter-American Development Bank (IDB) Urban Rehabilitation Project is undertaking basic studies of the potable water, sewerage, and drainage

needs of Georgetown and preparing a master plan for addressing these needs. The IDB effort also will identify priority projects in these areas and will analyze project feasibility for funding.

87. The recent involvement of private contractors in solid waste disposal is an encouraging first step towards a possible private sector role in all future collection of solid waste, initially in Georgetown and then in the other municipalities. As of now in Guyana solid waste management makes no attempt to separate recyclables. Yet, given the concentration of Guyana's population on the coastal belt, it may be cost-effective to separate solid wastes into recyclables and non-recyclables. The private sector could be encouraged to recycle wastes as a commercial activity. The Government will consider the feasibility of privatizing all solid waste collection, of increasing the frequency of solid waste collection from residences and of introducing a levy for solid waste collection, with the payments then passed on to the private contractors.

88. Actions

- During the next year the Government will seek donor assistance to rehabilitate the solid waste management programmes in the cities of Georgetown, Linden and New Amsterdam. The project will include: (i) development of solid waste management plans for the cities; (ii) rehabilitation and proper operation of existing landfills, and construction and operation of properly sited and designed sanitary landfills; (iii) strengthening institutional capacity; (iv) development of waste minimization programmes for homes and offices; (v) collection and disposal of special wastes; (vi) introduction of worker incentive programs to improve worker productivity; and (vii) introduction of cost recovery measures.
- During the next two years the Government will inaugurate a water pollution control programme, which will include the following activities: (i) water quality monitoring in Guyana's main rivers, with special reference to sewage disposal, mining activities, and industrial wastewater disposal; (ii) water quality monitoring in coastal waters near river mouths and industrial/domestic developments; (iii) institutional strengthening in the area of water quality monitoring for the Environment Unit, GUYWA and local environmental health units; and (iv) development of water quality criteria and effluent discharge standards, with technical assistance from CEHI and PAHO/WHO.
- During the next three years the Government will begin a rural water and sanitation programme to improve water supply and sanitation systems in rural areas. The programme will include the following activities: (i) studies and pilot projects in low cost water supply and sanitation facilities for small communities and scattered housing in rural areas; (ii) design of improvements to water and sanitation systems using appropriate technologies; and (iii) implementation of extensions and improvements to rural water supply and sanitation systems on a cost-benefit basis.
- The Government places high priority on rehabilitating water and sewerage systems and ensuring adequate future maintenance. In the context of the World Bank supported Water Supply project, over the next three years the Government

will address the following issues, amongst others: (i) the structure and levels of water tariffs; and (ii) the organization of tariff collections.

C. Natural Resources Management

Overview of the Natural Resource Base

89. Guyana, with 215,000 sq. km. of land area, is richly endowed with natural resources, consisting of a fertile coastal plain, substantial water resources, abundant rain forests and mineral resources, and diverse flora and fauna, much of it endemic. Rain forests cover some 80% of the total land area, and only some 1 % of that is estimated to have been deforested. Low population and the concentration of that population on a narrow coastal strip and the ownership, until now, of the means of production by a state that was financially constrained have prevented the exploitation of natural resources on a sizeable scale by either the state or private sector interests.

90. Within recent years Guyana's plentiful natural resources have increasingly being targeted for exploitation by private investors. The need to ensure that these resources are used sustainably is important to Guyana, but is also important to the rest of the planet. Guyana's rain forests are of benefit to the world at large because of their value in global climate control, their contribution to the world's stock of biodiversity of endemic flora and fauna, their protection of natural ecosystems such as watersheds that safeguard water resources and soils, their value for research by physical scientists, and their scenic beauty. Guyana has recognized its stewardship role for the rain forest, by dedicating 366,000 ha. for a pilot project to study the sustainable uses of tropical forest resources. If the larger areas of the rain forest are to be preserved for global benefit whilst Guyana is to benefit, now and in the long-term, from the sustainable use of its natural resources, a major programme of **environmental protection** must accompany the economic recovery programme and will require substantial assistance from the international community.

Major Natural Resource Management Issues

Watersheds

91. Forest cover in the watersheds facilitates the infiltration of rainwater into the ground and thereby protects against flash flooding, inadequately charged aquifers, and erosion.

92. Problems. The watersheds in the coastal plain and in the sandy rolling lands that supply the conservancies have not been protected or managed for water production and some of the forest cover there has been lost to competing activities, such as bauxite mining, agriculture, and harvesting of fuel-wood and poles. The forests nearest to urban centres and the coast, have been heavily exploited for fuel-wood by household and industrial users and have also suffered repeated wildfires from charcoal and agricultural production. The wallaba (eperua) forest of the White Sands penplain, which has been harvested for telephone and electricity poles, has been

degraded to such an extent that regeneration of the original dry evergreen forest is virtually non-existent. As much as 200,000 ha. are believed to be unable to regenerate spontaneously.

93. Most of the water courses from the watersheds are also subject to competing demands: for drinking water and as receptacles for domestic and industrial waste. As a consequence much of the coastal plain's supply of potable and irrigation water is believed to be polluted. Deforestation may also explain the more frequent and less predictable flooding of the coastal plain. While no clear picture emerges of the extent of the deforestation, potential development pressures could have serious consequences for these critical watersheds unless preventive measures are taken ahead of time.

94. Actions

- Under the National Forestry Action Plan 1990-2000 (NFAP), the Government is initiating, with assistance from Germany, a project to investigate the cause of water shortages from the Canje, Berbice and Tapacuma rivers in order to improve the condition of the watersheds and thus enhance food production by downstream users dependent on each watershed.
- The Government also is undertaking the reforestation of significant watersheds through the development of multiple-use tree plantations. With assistance from Germany and CIDA, the Guyana Forestry Commission (GFC) is undertaking a multiple-use tree plantation project in the coastal plain and in the sandy rolling lands. The project should develop information about the performance of multiple-use tree species that will be useful in assessing the feasibility of a large-scale energy plantation to be undertaken in the future. The project has the dual objective of reforestation of the important Demerara watershed and provision of low-cost fuel to the local population.

Forestry

95. Guyana's forests occupy more than 16 million ha. and contain more than 1000 different tree species. Approximately 2.5 million ha. are considered to be not exploitable with present technology. The total volume of standing timber in the exploitable forest area is estimated at over 350 million cu.m., of which hardwoods account for just under 90%. An area of 3.6 million hectares of forested land is accessible for exploitation, and approximately 2.4 million ha. has been allocated for harvesting. Many of the rivers that could provide access to the forests are not navigable because of waterfalls and rapids; the forests that are closest to navigable water have been logged.

96. The forestry sector employs about 12,000 people, produces some 218,000 cu. metres of timber annually and accounts for US\$ 4.5 million in export earnings per annum and 2 percent of GDP. However, as discussed earlier, the sector is poised for an expansion of production. The potentially exploitable forests, for which access has to be constructed, extend over 10.4 million ha. in the rain forest, and in seasonal and in dry evergreen forests. Some 6.4 million ha., about 65% of this total area, is currently leased for exploitation.

97. The Government of Guyana is committed to sustainably utilizing the country's forest resources for the benefit of the national economy and society. Unfortunately, monitoring of forestry operations by the GFC is only nominal because of shortages of staff and equipment, limited funding and absence of a good data base. Forestry activities are pursued by large-scale concessionaires, small-scale loggers and minor forest products operators.

98. Eleven large scale concessionaires operate under Timber Sales Agreements (TSAs). The TSAs are issued to larger concessionaires with significant investments in plant and equipment and convey exclusive harvesting rights for a period of 15-25 years over an area exceeding 20,235 ha. Most of the concessionaires concentrate on logging the endemic greenheart (*Ocotea rodiaei*), and eight of the eleven concessionaires export regularly. All the concessionaires have integrated logging and sawmill operations, located in the interior, which are concentrated in the Essequibo and Demerara areas.

99. Small-scale loggers operate with State Forest Permissions (SFPs), that are generally one year in term and grant rights to a specified volume of timber within a prescribed area. SFPs are usually issued to smaller operators who produce for the domestic market. About 1.2 million has. are covered by SFPs and most of the log production flows to small sawmills concentrated in the Berbice and Demerara areas. Minor forest operators also work with SFPs in the dry evergreen forests of the Demerara area close to Georgetown, Linden and the populated coastal settlements.

Environmental Impacts of Logging

100. The impacts vary with the size of the concession and the conditions attached to the logging permits, and each stage of the logging activity has a separate impact on land, soil and water. Because of lack of monitoring and regulation, the environmental impacts of logging activities can only be described in qualitative terms, and there is often disagreement between sources as to the seriousness of the various impacts. The following are perceived to be the main impacts from logging activities.

101. Exploitation of the Greenheart. Greenheart is the best-known Guyanese timber species and is of such intense commercial interest that foresters do not harvest other species in those areas where the greenheart is most concentrated and of best quality. It accounts for only 1.5% of the stand merchantable volume but provides nearly 40% of the total volume of round-wood production. According to the NFAP, greenheart "is almost certainly being severely overharvested." Where reported, extraction rates of $1\text{m}^3/\text{ha}/\text{yr}$ are in line with the general growth rate for lowland tropical forests, but exceed the growth rate for greenheart, which is thought to be nearer $0.13\text{m}^3/\text{ha}/\text{yr}$. Because of lack of monitoring by the GFC, there is no conclusive evidence of over-harvesting of the greenheart, but ongoing studies may reveal the true status of this species. The concessionaires maintain that drastic opening of the canopy is never done.

102. Until recently, efforts to commercialize other species in export markets to take the pressure off the potentially dwindling greenheart resource have not been effective. Only smaller producers selling on the domestic market have harvested a significant proportion of other species. Exports of species other than the greenheart are constrained by the high cost of shipping

from Guyana to North America, which is higher than shipping these products from Africa and the Pacific. Port facilities are also inadequate which causes costly delays in loading and only small vessels can take a full load. In the case of greenheart, strong market demand overcomes these factors.

103. Recently, certain private sector initiatives suggest that marketing possibilities for other species and for non-tree forest products may have improved. The largest and most recent concessionaire, the Barama Company Limited, has established an integrated logging and plywood production system based on harvesting about 12 plywood species. The Barama operation represents a technological and commercial breakthrough for the utilization of large quantities of lesser known species and an opportunity for more intensive, though sustainable, utilization of Guyana's forests. The company has contracted the Edinburgh Centre for Tropical Forests (ECTF) to undertake monitoring of its environmental impacts and research to benefit its operations.

104. Impacts on Forest Ecosystems. Concessionaires are required to submit Forest Management Plans (FMPs) as a condition of the TSA, but this requirement has not been strictly observed in the past. The long term sustainability of the selective harvesting system used is unknown. Careless felling and extraction due to under-skilled, poorly supervised chain-saw operators and skidder drivers can result in unnecessary damage to the remaining stand, which is likely to result in lower harvests next time around. Seed trees are not usually retained, animals important to seed dispersal are not safeguarded, protective buffer strips along watercourses are not always respected and production demands can mean that quality is overruled by quantity. With one exception, there are no restricted areas within logging concessions which conserve representative areas of productive forest types in their unlogged condition, so there will be no way to compare the ecological condition of the logged forests with the unlogged, once the first full cutting cycles are completed.

105. Impacts on Rivers. The main impacts of forestry exploitation on rivers and streams are: increased turbidity caused by soil erosion from logging, increased BOD from the discharge of organic waste from sawmilling, and oil pollution from the discharge of petroleum products.

106. The GFC is addressing these problems through the FMPs. For example, GFC has already issued regulations to protect rivers from the effects of logging wastes. The regulations require the maintenance of 50-metre buffer strips of forest along the river banks. These banks, however, are often demolished by the missile dredges of goldminers who are largely unregulated. As a consequence, the logging waste often slips into the river causing turbidity, with consequent adverse impacts on aquatic life and on the navigability of the rivers. On the other hand, GFC has not yet recommended procedures for the safe storage of oil and fuel away from watercourses nor does it have the capacity to monitor such storage effectively.

107. Proper disposal of sawmill waste has long been an intractable problem. About 60 percent of the average sawlog remains in the mill as waste in the form of slabs, ends and sawdust. Most mills heap this waste on the riverbanks and it eventually spills over or is pushed into the water, raising BOD levels and hampering aquatic life. The Essequibo area is estimated to generate 50-60 thousand cu. m. of sawmill waste each year. Recently, some concessionaires have started exploring the possibility of utilizing the waste as a source of energy. For example,

the Willems Timber and Trading Limited mill at Kaow Island is powered by two steam producing boilers that are fuelled by sawmill waste. The company has also experimented with producing charcoal from sawmill ends in portable kilns. The A. Mazaharally Sawmill Limited has acquired a turbine generator to produce electricity from its sawmill wastes. Current efforts at using sawmill waste as a fuel have made little impact on the problem of river contamination, but there appears to be scope for the conversion of sawmill waste into briquette manufacture using wood densification technology. Any economic assessment of such an enterprise should include the benefits to the economy of the prevention of river degradation, as also the benefits from substituting this source of fuelwood for the dry evergreen forests that protect the watersheds.

108. **Impacts on Soil.** Forestry exploitation, as practiced in Guyana, does not tend to lay bare large expanses of soil or lead to serious soil erosion and land slides. For economic reasons concessionaires avoid logging in excessively wet conditions, when the soil is most prone to erosion. The forestry research programme at the Barama concession includes studying the impact of forest operations on soil properties, with a specific focus on soil compaction, erosion and loss of fertility. Similarly, the Government expects to receive the results of the broader independent scientific research being done by SGS Silviconsult for Demerara Timbers Limited (DTL). DTL is operating under an approved FMP and is pioneering a "Green Charter" which limits harvesting to an average of 20 cu.m/ha. over a 20-year harvesting cycle. The Government intends to ensure that such research is made available to the GFC and that the findings are incorporated, as appropriate, into the national forestry policy so that GFC can apply the results to the forestry sector as a whole.

Management of the Forests

109. The management of the forests of Guyana has not been sufficiently studied to generate a proven silviculture system. In-depth inventories are lacking as are data on growth either in the undisturbed natural forest or in logged-over areas. The Government is aware also that the scale of the forestry exploitation that is currently envisaged will need to be carefully designed, regulated and monitored if Guyana is to avoid the plight of so many countries where the rain forest has been degraded and, even, destroyed. Destruction of the rainforest could have climatic effects and would destroy valuable biodiversity resources. Although there is no comprehensive listing of medicinal plant species, Amerindian customs and practices indicate that maybe as much as 10% of the plant species may have medicinal properties. Furthermore, the forest provides a habitat for wildlife, is a potential source of income from eco-tourism and is becoming of international significance for scientific and tropical forestry research.

110. The Government emphasized its interest in promotion of sustainable forestry development in Guyana through the preparation of the NFAP in 1989. The NFAP focusses on design and implementation of programmes and activities in such areas as forest inventory, management and other aspects of forest industry development, on conservation and protection of vulnerable areas and species, and on the strengthening of regulatory agencies to manage forestry development. The implementation of projects in the NFAP will greatly assist the Government and its agencies to improve their management of the forestry sector. The Government attaches high priority to the implementation of projects that will provide data about methods to ensure sustainable development of Guyana's forests in future.

111. A roundtable meeting of the donor community in February 1992, resulted in donor pledges for ten priority projects from the NFAP, totaling US\$8.6 million. Implementation of the NFAP has proceeded with the appointment of a national coordinator. CIDA agreed to fund an Interim Forestry Project (IFP), which began in 1989, as a bridge between NFAP preparation and implementation. In the meantime, with assistance from the German Government, the Government is proceeding to formulate and implement a forest land-use policy, related legislation and an appropriate administrative structure to ensure the sustainable use of its forest resources.

112. As a further expression of Guyana's own commitment to protection of the tropical rain forest, the Guyana government advised the Commonwealth Heads of Government Meeting in October 1989 that the country would set aside 360,000 ha. of its Amazon rain forest for a pilot project under Commonwealth auspices. Since then the Commonwealth Secretariat and the Global Environment Facility have begun to finance the establishment of an International Centre for Research and Training for the Sustainable Management of Tropical Forests in the Iwokrama rain forest. The research will seek to demonstrate that the tropical rain forest can maintain desired levels of biological diversity while supporting economic activity.

113. Actions

- In the next year the Government will proceed with implementation of the NFAP priority projects identified at the 1992 roundtable.
- During the next year the Government will establish a national forestry policy to protect the greenheart from over-exploitation and promote the export of other forest species and products in order to obtain full value from its forest resources. To inform its forestry policy, the Government will closely follow ongoing studies by concessionaires.
- In support of this policy, the Government will closely monitor existing and future private sector forestry initiatives for their environmental impacts and will establish a unit within GFC to strengthen its monitoring and regulatory capacity for this purpose.
- The Government will ensure that all new concessionaires submit an FMP prior to approval of a TSA. The FMP will include a thorough EIA that adequately identifies the likely adverse impacts of the operation at each stage of the logging activity and that specifies the measures that will be taken to mitigate such impacts. The FMP will also identify, in the inventory of the concession area, key ecosystems and habitats for protection. Harvesting intensity, methods and timing will be based on these findings.
- Existing operations, which were initiated without an FMP, will be allowed a one-year phase-in period, after which they must produce an FMP with an EIA for review by the GFC.

- In the management of its forest resources, the Government will review the economic return on forestry and mining concessions, and will adjust charges to appropriate levels.

Wildlife

114. Guyana's forests have abundant wildlife. Wildlife exports were valued at some US\$800,000 in 1992, mostly from the sale of birds, particularly parrots and macaws. Guyana is the fifth largest exporter of birds in the world. In addition to the 17 authorized exporters of wildlife, the trade is a major source of income for thousands of trappers (most of whom are Amerindians), middlemen, carpenters who build holding stations, cages and export boxes, and farmers who provide food for the birds and animals. Operating without the benefit of population or biological surveys, the Government devised, in conjunction with CITES and the World Trade Monitoring Unit, an empirical export licence formula to set export quotas.

115. The Wildlife Services Division, which regulates the wildlife trade, is understaffed, ill-equipped, and inadequately funded to carry out this responsibility effectively. Its current mandate is only concerned with the harvest and export of wildlife and not with sustainable management of wildlife. Enactment of the Government's Conservation of Wildlife Bill will make needed improvements in the legislative framework. The scientific work to be done through the Iwokrama Rain Forest programme will eventually provide invaluable scientific data. The presence of scientists in that programme, together with existing scientific centres in Guyana, will provide a sound advisory body for the wildlife and other conservation services in Guyana.

116. In December 1992, the Government decided not to issue any licences for wildlife exports in 1993 as a prelude to passage of the Conservation of Wildlife Bill. Despite a general lack of public awareness about wildlife issues, there is a strong lobby in and outside Guyana against the wildlife trade, a trade which generates considerable export revenues as well as domestic income and employment. The Government has this issue under consideration and is aware that whether it decides to continue the ban on wildlife exports or not, wardens will have to be recruited and trained, be it to monitor the main wildlife habitats against smuggling or to ensure compliance with the Conservation of Wildlife legislation. Ideally the same persons who currently work as trappers could be retrained to become wardens.

117. The sand and shell beaches between the Moruka river mouth and Waini Point on the north-west coast are the nesting grounds for four species of marine turtles: the leatherback, the hawksbill, the olive ridley and the green turtle. Despite legislation to protect the turtles, intensive exploitation of the turtles and their eggs for food has resulted in ever decreasing populations and the threat of their extinction. To protect the turtles, the Government has required that turtle exclusion devices (TEDs) be installed on shrimp nets.

Biodiversity

118. Guyana is one of 157 countries that signed the UN Convention on Biological Diversity during the Earth Summit of 1992. The Convention requires signatories to adopt regulations to conserve their biological resources. In this context, the Government is committed to saving biodiversity, studying biodiversity and using biodiversity sustainably and equitably. Government

is also aware of the need to ensure that the ownership of intellectual property rights, including knowledge and customary and traditional practices of local people, is adequately and effectively protected. However, to date, Guyana lacks specific legislation to facilitate such actions.

119. Although Guyana's wealth in biological diversity is unquestionable, there is a general paucity of information on its exact nature and extent. However, some 8,000 species of flora, of which half are endemic, have been identified in the biogeographic Guiana region. Guyana provides habitat for a variety of fauna and is deemed to have one of the richest mammalian faunas of any comparably-sized area in the world. There are nearly 1200 vertebrates, of which 728 are birds, 198 mammals, 137 reptiles and 105 amphibians. Of these, 144 are currently listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as in danger of extinction. The avifauna in its habitat in the widespread rain and seasonal forests is known to be rich. However, there is a paucity of data about the country's reptiles, amphibians and fish; only three surveys approved by CITES have been done in the past ten years: two for caimans and one for boid snakes.

120. Studies on various topics related to biodiversity have been conducted in specific areas by the World Wildlife Fund (WWF), Conservation International, the Smithsonian, Global 2000 and the U.K. Natural Resources Institute. Most of these studies emphasize the need for an established system of national parks, by which Guyana's extensive biodiversity resources could be nurtured and protected.

121. Actions

- In the next two years the Government will initiate an expanded wildlife protection programme, based on the Conservation of Wildlife legislation and commitments under CITES, and will seek technical assistance, equipment, and funding from donors and/or international NGOs to strengthen the Wildlife Services Division.
- During the next three years the Government will seek assistance from donors and NGOs to undertake, in conjunction with the expanded wildlife protection programme, ecological and enumerative studies to determine the populations and uses of Guyana's flora and fauna and to establish systems for their protection and sustainable use.
- Wildlife professionals in Government, the university and local NGOs will be incorporated into the research on the presence of or migratory use by endangered species of habitats in Guyana.
- Government will work speedily to enact legislation to protect the intellectual property rights including knowledge and customary and traditional practices of local people.

National Parks and Protected Areas

122. The Government is committed to ensuring the integrity of forest systems, the conservation and protection of selected forest areas with high species diversity as genetic

reservoirs for the future, the allocation of outstanding natural areas for recreational purposes, and the preservation of the country's historical and cultural heritage. The establishment of a functioning system of national parks is hampered by the lack of funds, qualified people and effective institutions. The National Parks Commission Act of 1977 gives management authority to the National Parks Commission (NPC), but the NPC is under-funded and more orientated to urban recreational parks.

123. The Kaieteur National Park is the only legally established protected area in Guyana. Legislation establishing Kaieteur was passed in 1929 and the Kaieteur National Park Act of 1973 provides the legal framework for its constitution and management. With no land-use planning in Guyana, the park is not demarcated on the ground and there is only one park ranger to safeguard the ecological integrity of the protected area. As presently constituted, the park comprises the falls, the greater part of the gorge below, and part of the Potaro river above the falls to the south, occupying less than 300 ha. Currently there is only minimal infrastructure within the designated area.

124. The World Wildlife Fund (WWF) developed a proposal in 1991 for expansion and management of the Kaieteur National Park. At its current size, Kaieteur is much too small for sustainable management of its biological diversity and high endemism. However, the greatest threat to Kaieteur is caused by miners located in a settlement above the falls and operating dredges in the Potaro river upstream from the falls. The WWF proposal stated that Kaieteur National Park should include the entire upper watershed of the Potaro river with all its tributaries, and all forest lands bordering the savannahs to the southwest, the Kurungiku mountains to the southeast, Ebini mountain to the east, the Ayanganna mountain to the northwest and the upper watersheds of the Kuribrong and Amaila rivers. The proposed area covers an estimated 400,000 to 450,000 ha. of some of Guyana's most diversified lifezones with one of the highest levels of endemic species found anywhere in South America. The area is relatively inaccessible because of the mountainous terrain. The proposed boundaries would maintain the major ecosystem in the greatly enlarged area. The inclusion of all the upper watersheds will ensure good water supply for Amerindian and other communities in the generally degraded savanna area to the west of the Ayanganna and Wokomung mountains.

125. The Government has decided at this stage to embark on the expansion of the Kaieteur National Park from its present size of 45 square miles (11,655 ha) to 222 square miles (57,498 ha) which would incorporate the watershed leading into the falls. This area can be substantially managed and staffed over the next year with training and technical assistance in park management. Two Amerindian villages fall within the proposed expanded area. At present a broad Committee is assessing the possible positive and negative impacts of such an expansion. The Protected Areas project in the NFAP was given high priority and pledges of funding at the international round table in February, 1993. The EEC, Germany and the WWF have agreed to design a system of National Parks and Protected Areas for Guyana, which will incorporate ongoing work to identify places of special natural, scientific and historical and cultural interest. The NFAP calls for the protection of Kaieteur and 14 other natural areas, including a Biosphere Reserve in the south-west (for which a Guyana Biosphere Reserve Bill has already been drafted) and a World Heritage Site at Mt. Roraima. Conservation International completed a rapid assessment of the Kanuku mountains and the EEC financed a study for the creation of a protected area in the Kanuku Mountains and adjoining savanna areas of the Rupununi region.

Consultations with those Amerindian Communities in these areas will be ongoing as their involvement and agreement will be critical to the success of these protected zones.

126. The Government is currently reviewing the preliminary and coincident conclusions of both studies, noted above, recommending that the Kanuku mountains should be developed as a second National Park. Effective management of these national parks will require technical assistance as well as funding.

127. Actions

- In the next three years the Government will establish a system of national parks and protected areas. To that end, the Government will seek further assistance from the donor community and NGOs for pilot projects to establish and protect an enlarged Kaieteur National Park and a Kanuku Mountains National Park. Specifically, assistance will be needed with land-use planning, demarcation of reserves, training in park management, staffing with rangers and construction of scientific facilities and design and construction of eco-tourism facilities.
- Additionally, an expanded programme of rapid assessment will be undertaken, with international assistance, to systematically evaluate the resource base and ensure that the planned system is adequate to protect representative areas of all the major ecosystems, as well as specific areas of special interest.
- The Government will also explore the use of debt-for-nature swaps to help fund the establishment and protection of the pilot national parks and the system of protected areas.

Cultural Resources

128. The National Trust Act of 1972 legislates the preservation of historical and cultural areas. A National Trust Committee (NTC) has functioned sporadically since 1972. The NTC receives no funds from Government and has no funds of its own. The NTC is assisted, though, by the Guyana Heritage Society (GHS) which has just completed a list of the material and immaterial heritage of Guyana, some of which is located in the putative national parks. The unprioritized list comprises buildings in the city of Georgetown, items of archaeological and zoological interest in the Rupununi, places of beauty, nesting places of birds, burial mounds, graves and domains of pioneers, churches and missions, and Amerindian burial urns.

129. Action

- Within the next year, Government will formalize the appointment of the members of the NTC and will provide general support for their programme.
- During the next three years the Government will assist the NTC and the GHS to seek funding and other forms of help from local corporate and private donors, as well from Guyanese and others abroad, to preserve the cultural assets identified by these organizations.

Eco-tourism

130. Guyana's vast eco-tourism potential is yet to be tapped. The Government is aware that eco-tourism facilities must be designed with care if they are not to destroy the assets to which tourists are attracted. Guyana's natural resources compare favorably with those in competing destinations and the historical value of rock engravings and paintings from the pre-Columbian era enhances the natural assets. But the physical infrastructure required to transport and house tourists is virtually non-existent. Such services are generally best provided by the private sector, but that sector will require incentives and some institutional support if it is to succeed financially.

131. Action

- In the next two years the Government will seek technical assistance from organizations like the Caribbean Tourism Organization (CTO), WWF, EEC, the Eco-tourism Society and others to help the private sector establish appropriate guest accommodation and supporting infrastructure in areas of high eco-tourism potential.
- Further, Government will examine means, such as license fees, user charges or otherwise, whereby income generated from an eco-tourism industry can help to fund the national park system.

D. Mining

Overview of the Mining Sector

132. Bauxite is the most important sub-sector in Guyana's mining industry, contributing about 8 percent of GDP and 38 percent of merchandise exports. The previously privately-owned Linden and Berbice bauxite operations were nationalized in the mid-seventies, but with the recent change of policies towards a market-oriented economy, the Government has begun to enter into joint venture operations and to encourage private investment in the sector. The mining sector has potential for further development and could be a source of enhanced revenues and employment in the future.

133. The exploitation of economic minerals is currently limited to bauxite, gold, alluvial deposits of diamonds, and some silica sand. Two licenses for off-shore and inland petroleum prospecting were issued, but, because previous wells have been dry, further exploration is uncertain. Other gold mines, a manganese mine and an alumina refinery are no longer in operation. Private sector mining in Guyana consists mostly of small operators exploiting limited tracts for gold and diamonds. Despite their considerable potential, gold and diamond exports amounted to only US \$15 million in 1990, or 6 percent of official exports. The recent improved policy regime for foreign investors and the establishment of a more realistic price for gold purchased by the Gold Board, has resulted in several agreements with large firms for increased exploitation and in a higher level of declared gold production by small-scale miners.

Environmental Issues in the Mining Sector

134. Environmental issues are different for each of the mining sub-sectors and impacts vary between large- and small-scale gold projects and between early and more recent bauxite projects. The large bauxite projects were initiated without an EIA and, in general, have been operated without any constraints imposed by environmental regulation and inspection. The small-scale gold and diamond mining activities are not subject to any regulatory controls through the licensing system. Both the large and small operations have the sole objective of maximizing profits, without concern for the natural resources consumed or impacted by the activity. Standard techniques to prevent pollution have not been applied and mitigatory measures have largely been bypassed.

135. Data with which to quantify the extent and severity of the impacts are lacking for every activity. There has been no monitoring - and, therefore, no quantification - of environmental impacts. Where an EIA has been submitted by the investor and approved by the Government, environmental impacts can be prevented or mitigated appropriately, but the Government has limited capacity to monitor compliance. The following discussion of issues is based on qualitative judgements about the extent and severity of the pollution.

136. Air Quality. A great deal of particulate matter is released from bauxite calcining burners and drying processes via the stacks and, at Linden, is blown by prevailing winds directly over the resident population which numbers some 50-70,000 people. In addition, the fuel used for the calcine burners at LINMINE has a high sulphur content resulting in the release of sulphur dioxide. In Linden the frequent incidence of lung diseases and asthma is almost certainly related to the emissions from the stacks.

137. The mined out pits, excavated lakes and ponds, and silica sand dumps have not been rehabilitated or revegetated at either LINMINE or BERMINE and these increase the ambient dust levels. Quantities of fugitive dust are also produced from the general movement of the bauxite.

138. Land Degradation. Land degradation from the mining operations takes several forms. Around the bauxite mines, there are high levels of acidity in the waste dumps, residual lakes, and tailings dam, which could be releasing acid leachate into ground and river waters, and which prevent natural revegetation that would contain the dust. The bauxite tailings dam at LINMINE needs to be stabilized and revegetated to prevent acid drainage into ground and river waters. In addition, during its operating life, the alumina refinery at LINMINE discharged approximately three million tonnes of red mud (the waste product from the pressurized vats) that contain large quantities of caustic soda, which is still stored in a tailings or settling pond adjacent to the refinery. No information is available about leachate from the stored red mud, but fear that contamination has occurred is realistic.

139. Water Pollution and River Degradation. Degradation of rivers and streams and pollution of surface and ground waters result from all the mining activities in Guyana. Several different point sources of water contamination and river degradation can be identified, but, given the absence of environmental monitoring, other point and non-point sources of pollution could well exist. Because of the absence of environmental controls, the extent and severity of the

pollution and degradation cannot be quantified or, even, always qualified. Examples of water pollution and river degradation that cause concern include: (i) the tailings dam at LINMINE, which discharges decant water with a pH of 4.5, via the local stream, into the Demerara river; (ii) the release of mercury via the washing process in small-scale gold operations; (iii) the discharge of residual cyanide from the extraction process at the Omai gold project; (iv) sedimentation in the Berbice River from the canal at the Aroaima project; and (v) the use of "missile dredges" in the Essequibo River basin, which have a devastating effect on the forest and river areas in which they operate.

140. Regular sampling and analysis of areas where mercury and other potential contaminants could affect the water supply is a necessity to ensure that rapid mitigatory measures can be taken once the pollution is identified. Government agencies are not equipped to monitor and analyze water samples, particularly for chemical contamination, and lack institutional and regulatory capacity to ensure compliance with water quality legislation.

141. **Health Issues.** The potential health risks to miners of mercury poisoning from "flour gold" mining is very high, both from absorption through the skin and inhalation of the volatile fumes.

Current Government Efforts

142. The ongoing environmental audit at LINMINE will identify the actions required to mitigate the pollution caused by the bauxite operation. At issue will be the cost of those mitigatory measures, which will need to be incorporated into the ongoing feasibility study. Should that study recommend a continuation of operations, an EIA will be required which should define the preventative and mitigatory measures to be incorporated in the bauxite activities. The findings of the audit should be largely applicable to both BERMINE and Aroaima, though any special features there would require specific study, and the Government will require these operations to undertake similar environmental audits and institute monitoring and mitigatory measures.

143. The Government recognizes that the proximity of the defunct alumina refinery to a substantial population at Linden dictates that an environmental audit be done as soon as possible, followed by implementation of appropriate mitigatory measures. The Government has agreed that the World Bank would conduct this audit in conjunction with its environmental audit and feasibility study of the LINMINE bauxite project.

144. Regulation of small-scale mining is difficult because of the number and mobility of operators, and because of the limited resources of Government agencies. Currently, however, GGMC is working on a draft "Environmental Management Agreement" (EMA) for medium and small-scale operations, which aims at "promoting environmentally safe mining" by minimizing all disturbances to the environment, and restoring the same, following the termination of mining. The EMA would cover all aspects of mining, including the use of equipment, sedimentation control, vegetation removal, excavation holes, the storage and disposal of chemicals and fuel, and the handling and use of mercury. No activity will be started until an Environmental Management Plan has been approved by the Commissioner. The Agreement must be signed when the license is issued and requires a bank guaranteed deposit as a performance bond.

Introduction of EMAs could substantially reduce the negative environmental aspects of small-scale mining, providing government agencies also have the capacity to monitor and regulate the operations.

145. Also, the Government is giving serious consideration to controlling the use of missile dredges, either by setting an overall limit on the permissible numbers, or limiting their use to specific areas where the impacts can be contained, or by an outright ban on their use. As shown by the threat to the Kaieteur Falls, the impacts of the missile dredges are neither localized nor minor.

Actions

- In the next year the Government will review the findings of the environmental audit of the alumina waste, and will seek donor assistance, as may be necessary to implement urgent remedial measures indicated by the findings. The Government will also require that an EIA be undertaken prior to initiation of any new bauxite operations.
- During the next year the Government will initiate, with donor assistance, a study of the environmental impacts of small-scale gold mining activities, in particular from the use of missile dredges and mercury, and to recommend measures to minimize these impacts.
- The Government will seek donor assistance, on an as-needed basis, with the review and negotiation of new contracts in the mining sector. This will help ensure that the country obtains financial compensation for the commercial exploitation of its non-renewable natural resources commensurate with standard international terms, and that these contracts comply with internationally accepted standards of environmental protection and mitigation.

E. Public Awareness

147. In Guyana today the level of public awareness about environmental issues is not very high. In fact, the general lack of environmental consciousness is often cited as a fundamental environmental problem in the country. This is largely because the usual sources for increasing public environmental awareness, i.e., public education and community outreach efforts by both Government and non-governmental organizations (NGOs), have just begun to be put in place.

Current Government Efforts

148. The Government recognizes the need for environmental education, particularly in light of the threat that existing environmental conditions (especially in the urban areas) pose to human health. The Environment Unit has a limited but active environmental education programme, which functions under the supervision of a trained Environmental Officer. The programme has

included a 20 minute television programme, daily radio broadcasts on environmental issues, and two-day seminars on environmental awareness for primary and secondary school teachers. The Environment Unit has drawn up a five-year, multi-faceted environmental education programme for Guyana, including school curriculum changes, public outreach campaigns, etc., but has not been able to begin implementation for lack of financial resources. The Health Education Unit of the Georgetown City Council, assisted by the Environment Unit, is also very active in this field, arranging lectures and competitions between schools, etc. The personnel working in this area are knowledgeable and doing the best they can with limited resources.

149. The Ministry of Education is keen on including environment in public school education and intends to incorporate environmental issues into the regular social studies programme of the schools. It is currently in the process of redesigning the primary and secondary school curriculum for the country. The Ministry is receiving assistance in this effort from the Georgetown office of UNESCO, which has prepared an Education Action Plan and Environmental Profile of Guyana. The Ministry also collaborates with the University of Guyana on developing the programme of the Institute of Adult and Continuing Education (IACE). While the IACE programme does not currently address environmental issues, the Ministry is interested in investigating ways to do so.

150. The University of Guyana (UG) provides a number of environment-related courses within programmes in the Faculty of Physical Sciences. UG also offers an Environmental Health Officers Diploma, a three-year programme that includes courses in environmental studies, epidemiology, public health, water, sewerage, and solid waste management. In addition the university has an Amerindian Research Unit, which was established to study Guyana's indigenous peoples. With support from the European Community, UG is preparing to establish an Environmental Studies Unit, which will provide a four-year undergraduate, and a two-year post graduate programme in environment. Implemented jointly with the University of Utrecht in Holland, the new programme will establish physical facilities and provide a core of trained staff for UG to undertake teaching, environmental research, and consultancies.

The Role of Environmental NGOs

151. The NGO movement in Guyana is still in an embryonic stage and is only beginning to play a role in public education on environment and advocacy on environmental issues. There are currently fewer than ten NGOs with an interest in environmental matters. Though limited in number, the local NGOs have been involved in monitoring the actions of developers, especially companies involved in the areas of forestry and mining. In one specific case, an NGO gives advice on and arranges tours to historic sites and also in compiling an inventory, with the assistance of UNESCO, on the material and immaterial heritage of Guyana. The most common contribution of all the NGOs is in the area of public awareness and environmental education.

152. Actions

- During the next year, the Government will begin implementation of its five-year National Environmental Education Programme.

- Within the next two years, the Government will provide assistance for the strengthening of the Environmental Studies Unit at the University of Guyana. The Unit will provide a four-year undergraduate, and a two-year post graduate program of study for students beginning in the January 1994. Active consideration will be given to introducing Environmental Studies as an examination subject in schools.
- During the next three years the Government will seek with the assistance of NGOs, schools and other volunteers, and bilateral and multilateral agencies, to revitalize the zoo and botanical gardens as a focal point for environmental awareness. The Government will work towards the creation of a new and larger Zoological Park with natural habitat for its residents and the devotion of a section of the Botanical Gardens as a repository for scientific botanical research.

VI. AMERINDIAN PEOPLES

153. Guyana has nine tribes of indigenous peoples, Amerindians, comprising some 43,000 persons (5% of the national population). They live largely in rural villages in the northwest and interior districts of the country.

154. The Government has carefully guarded against the potentially negative social and cultural impacts on Amerindians of forestry and mining development. For example, the Amerindians Act reserves lands totalling about 1.4 million hectares within the potentially exploitable forested area for the exclusive use of the Amerindian people. This land, held in communal ownership, is distributed among 65 Amerindian villages located throughout the interior of the country. Most of these areas support the Amerindians in their traditional pursuits of hunting, gathering, farming and handicraft manufacture. The lands are administered autonomously by the Amerindian communities.

155. For the most part, the Amerindians still live a tribal life, speak their own languages and preserve their own culture. From their forest reserves, the Amerindians extract materials such as posts, boards, wattles and palm leaves for housing; canoes and paddles required for river transportation; nibbi and rattan for furniture; wood for fuel; cotton and dyes for hammocks and clothing; special wood for axe handles; arrows and blowpipes for hunting and fishing; vines, tibusiri, mukru, beads and suitable wood for making ropes, bags, baskets, and other useful articles; and various barks for medicinal purposes. Most importantly, the Amerindians obtain food, particularly cassava, plantains and some vegetables by shifting agriculture .

156. As noted above, the Amerindian population has long made extensive use of the natural resources of the reserves as a traditional means of subsistence. The vastness of the interior of the country has historically allowed the Amerindians to practice shifting agriculture and the harvesting of wildlife and forest resources over extensive areas without apparent adverse effects. To an increasing extent, however, contact with outsiders has led them to change their lifestyle

from one in which they found adequate subsistence from the resources of the forests and rivers to one which involves commercial exploitation of these resources.

Impact of the Formal Economy

157. Amerindians have entered into commercial relationships with non-Amerindian timbermen, selling trees off their reserves for cash. In some cases, Amerindian forest reserves have been seriously depleted of commercially valuable species. Moreover, the immunity that Amerindians enjoy under the Wild Bird Protection Act is being abused on behalf of commercial wildlife traders to provide exotic species for the international market. Unchecked commercial exploitation of their natural surroundings represents a threat to the sustainability of Amerindian lands and resources. It also renders the Amerindians less able to provide for their basic sustenance, which leaves them open to exploitation by outsiders and brings them into potential conflict with the commercial mining and timber interests on the state lands which often surround their reserves. Where they have not been entirely successful in their adaptation to the cash economy, in many instances they have fallen victim to malnutrition and disease.

158. As a result of their increasing absorption into the formal economy, the Amerindians are also being exposed to modern technology, medical care, primary education, and other societal advances. Many Amerindians are gainfully employed in the forest and mining industries. They traditionally have served as tree spotters and Wallaba debarkers, but lately they have begun working as chainsaw operators and millhands as well. Amerindians also are heavily involved in the small-scale gold mining taking place in the Essequibo River basin, where as many as 60% of the miners working on the dredges may be Amerindians.

Amerindian Research

159. Much remains to be learned about the relationship between the Amerindian peoples and their natural surroundings. An Amerindian Research Unit has been set up in the University of Guyana for this purpose. This unit is studying the traditional relationship between the Amerindians and the environment, including their socio-cultural patterns of behavior in the management of environmental resources. One area of particular concern is the impact of mining and logging activities on the lives and livelihood of Amerindian communities.

160. On the basis of Amerindian customs and practices, it is estimated that some 10% of the plants in Guyana may have medicinal properties. However, the chemical composition of less than 1% of these has been analyzed. In this context, legislation protecting the intellectual property rights of the Amerindians in their ethno-botanical knowledge should be considered. Consideration also needs to be given to regulating the use and exploitation of Amerindian lands since the subsistence use of these lands is being replaced by the commercial exploitation of forest resources, including wildlife.

161. Actions

- During the next year the Government will ensure the effectiveness of the Ministry of Amerindian Affairs by providing an adequate budget and appointing a Permanent Secretary to strengthen its administrative capacity.
- During the next three years the Government will address the need for infrastructure for secondary education in the Amerindian areas, which are far distances from other communities.
- Additionally, the Government, in consultation with the Amerindian Councils, will develop a training programme to formally equip Amerindians to play a leading role in environmental management and monitoring.
- A system for vetting of contracts between the Amerindians and timber and mining interests will also be developed.

VII. LEGAL INSTRUMENTS AND INSTITUTIONS

162. The Government has put in place a body of legislation and a number of institutions for environmental management. A review of the legislation reveals that the law is relatively up to date only in the area of the management of non-renewable natural resources. Work remains to be done on legislation for the protection of wildlife, the control of municipal and industrial pollution (particularly in the coastal zone), and the requirement of environmental impact assessments (EIAs) for development projects. The major legal problem, however, in environmental management in Guyana is in implementation and enforcement of the law. The lack of institutional capacity for environmental management in terms of personnel, financial and material resources is virtually fatal to implementation and enforcement of environmental laws. Additionally, the institutional arrangements for environmental management are characterized by problems of sectoralism and hierarchy which impair an integrated management approach to the environment.

A. Legal Instruments

163. Guyana has no general legislation addressing natural resource management and environmental protection, but a number of laws address specific aspects of environmental management (e.g., mining, petroleum, forestry, wildlife, fisheries, and land use planning).

164. Natural Resources. The basic Forests Act is 40 years old and many of its provisions, including penalties, are outdated. Guyana's wildlife legislation needs modernizing; the only law governing the terrestrial wildlife of Guyana is the Wild Birds Protection Act. Furthermore, Guyana is in need of modern legislative authority for establishing national parks and protected areas. Guyana has no specific legislation directed to coastal zone management. However,

various measures exist which relate to the management of coastal and marine resources, particularly fisheries (i.e., the Fisheries Act), aquatic wildlife (i.e., the Aquatic Wildlife Control Regulations), and the shoreline (i.e., the Sea Defenses Act).

165. Environmental Protection. Recent laws governing exploitation of non-renewable natural resources contain general authority for environmental protection. For example, under the Mining Act, the Guyana Natural Resources Agency (GNRA) is developing "environmental management agreements" for mining licensees. Also, the Petroleum Act imposes waste management and clean up requirements on polluters. There is no legislation governing pollution control, regulation of pesticides and toxic chemicals, or waste management in Guyana. The main measures dealing with air and water pollution and solid waste control are the antiquated water supply, drainage, sanitary and nuisance provisions of the Public Health Ordinance. The Georgetown Sewerage and Water Commissioners Act provides for the disposal of sewage and prohibits the disposal of anything other than sewage and paper into the city's sewers. However, the term "sewage" is not defined in the Act so that it is unclear whether industrial wastewater may be disposed of in the sewers.

166. Land Use Planning. The Town and Country Planning Act provides machinery for physical development planning and land use control. Under the Act, development schemes may be prepared for cities, towns and other areas. Such schemes may provide for preservation of areas of natural beauty, forest, trees, and plants, and for regulation of waste disposal. Provision is made in the Act for public participation in the planning process before any scheme is approved. However, Georgetown is the only area with an approved scheme. The Act also provides for the interim control of development in declared planning areas. To date, seven areas have been declared. However, at present there is no requirement that EIAs be carried out for proposed developments.

167. Implementation and Enforcement. The deficiencies in the legal framework are aggravated by the severe limitations in implementation and enforcement of the law. There are problems in every aspect of implementation and enforcement, including in many cases the failure to enact subsidiary legislation/regulations to facilitate implementation; the inability properly to monitor and detect breaches of the law; and the difficulty in apprehending offenders, prosecuting offences, and imposing meaningful penalties.

168. Draft Legislation. The Government recognizes the existence of deficiencies in the environmental laws. Steps have been taken to remedy some of these deficiencies by the preparation of new legislative measures. The new measures under preparation include:

- (i) the Guyana Biosphere Reserves Bill, which authorizes the establishment and management of biosphere reserves in Guyana;
- (ii) the Conservation and Wildlife Bill, which provides for the establishment of wildlife sanctuaries and the protection of listed wild animals and birds;
- (iii) the Pesticides and Toxic Chemical Control Bill, which provides for regulation of the importation, sale, and use of pesticides and toxic chemicals;

- (iv) the Environmental Assessment Act, which requires that an EIA be submitted and reviewed for new undertakings, and
- (v) the Environmental Protection Act, which creates an Environmental Protection Agency with powers to establish a regulatory regime for pollution control.

169. **Action**

- During the next year the Government will develop a legislative programme for the revision and consolidation of existing environmental laws and the enactment of new laws. The Government will set priorities among current initiatives in this area, schedule target dates for enactment of the legislation, and allocate resources for drafting, including identification of technical assistance requirements. The legislative programme will address the proposed new environmental laws as well as revisions to the Forests Act, the Fisheries Act, the Guyana Water Authority Act, the State Lands Act, and the Town and Country Planning Act.
- Within the next two years the Government will update all fines, penalties, royalties, and like charges, provided for in natural resources/environmental legislation and, where feasible, will introduce fiscal incentive (tax/subsidy) mechanisms into such laws to supplement the existing punitive measures.
- Over the next three years the Government will bring the necessary environmental legislation to Parliament for enactment, in order of priority.

B. Institutions

170. Responsibility for environmental matters is not vested in any one agency but is divided among a number of line ministries and special agencies of the Government, and between the national and local levels of government.

171. National Institutions. At the national level, the Ministries of Health and Agriculture share environmental responsibilities. The Ministry of Health has authority over environmental health and pollution control, which it exercises through the Environmental Health Unit and the Regional Environmental Health Services. It also has jurisdiction over the National Parks Commission (NPC). The Ministry of Agriculture exercises management responsibility over much of Guyana's natural resources through its Lands and Surveys Division, which administers State lands; Crops and Livestock Division, which is responsible for wildlife protection; Fisheries Division, which oversees fisheries and aquatic wildlife; Hydraulics Division, which is in charge of sea defenses, drainage and irrigation works; Hydrometeorology Division, which monitors surface and ground water resources; and the MMA-Agricultural Development Authority, which manages and monitors the agricultural development of West Coast Berbice.

172. A number of special agencies have been created to deal with specific environment matters:

- (i) the Guyana Natural Resources Agency (GNRA), which is charged with development of Guyana's natural resources and has supervisory jurisdiction over the Guyana Forestry Commission (GFC), the Guyana Geology and Mines Commission (GGMC), the Guyana Gold Board (GGB), the Guyana National Energy Authority (GNEA), and the Petroleum Unit;
- (ii) the Guyana Agency for Health Sciences Education, Environment and Food Policy (GAHEF), whose Environment Division is charged with environmental monitoring and education, review of EIAs, and coordination of the Environmental Management Committee for the Coastal Zone. GAHEF has now been dissolved and its functions have been transferred to the Environment Unit attached to the Office of the President;
- (iii) the Guyana Water Authority (GUYWA), which works with regional councils and municipal authorities to provide water supply and sewerage services in Guyana; and
- (iv) the Central Housing and Planning Authority (CHPA), which exercises development planning and control authority.

173. Regional and Local Institutions. At the regional and local levels, a number of counterpart institutions perform environmental management functions. For example, the ten Regional Environmental Health Services and local health authorities have been delegated authority for implementation and enforcement of Public Health Ordinance provisions, and the Regional Democratic Councils and local government authorities carry out the water supply and sewerage responsibilities of GUYWA. In Georgetown, the Georgetown Water and Sewerage Commissioners are responsible for the water supply and sewage disposal systems of the city. In Linden, GUYMINE performs these functions.

Institutional Capacity

174. Personnel Resources. Attracting and retaining qualified personnel is a serious problem for the Government. Vacancy rates in the public service are very high, particularly in the professional grades. Examples of this are numerous in the field of environmental management. At one point the vacancy rate at the GFC was 40% overall, but 70% in the professional grades. The CHPA has three posts for professional town planners, all of which are vacant. The Georgetown City Council's Environmental Health Unit has posts for thirty Environmental Health Officers but is unable to recruit persons qualified to fill these posts and employs fifteen Environmental Health Assistants instead. The causes of this situation have been examined many times. The World Bank's Public Sector Review identified the failure to provide adequate and transparent incentives to performance as a major problem. Real wages in the public service declined by about 40% in the five-year period from 1987-1992, particularly affecting salaries in the high level administrative and technical positions.

175. Financial and Material Resources. Guyana's GNP per capita is estimated to be among the lowest in the western hemisphere. This grave economic situation, as it translates into revenues available to Government to meet capital and recurrent expenditures, is undoubtedly the fundamental constraint on institutional capacity for natural resources and environmental management in the country. Strategies for cost recovery on government services are also very inadequate. These financial constraints affect the material resources available to institutions, as well as the recruitment of professional and technical staff as discussed above. Programmes for the routine acquisition and maintenance of material and equipment are virtually non-existent. For example, the Cleansing Unit of Georgetown has been entirely dependent upon gifts of equipment since 1976 and when these vehicles break down no spare parts are available for their repair. The capacity for the necessary laboratory analysis to support a pollution control programme is also inadequate. The MMA Environmental Control Unit's laboratory capability is limited, and the laboratory at the Institute of Applied Science and Technology (IAST) has fallen into serious disrepair.

176. Efficiency of Resource Utilization. Local Government administration in Guyana is based on ten Regional Democratic Councils and five municipal organizations. Operational responsibility for education, health, and infrastructure is delegated to these bodies. The existence of this number of parallel bureaucracies in a country with severe constraints on personnel, financial, and material resources aggravates the problem of institutional capacity.

177. Integrated Management. Effective environmental management requires coordinating mechanisms to ensure that integrated management will take place. Current environmental management suffers from both sectoralism i.e., the division of responsibilities between issue-oriented agencies, and hierarchy i.e., the division of responsibilities between national and local governments. In order for these to be overcome, the coordinating agencies i.e., GNRA in the area of natural resources and GAHEF in the area of environmental protection, must be effective. In the case of GNRA, the Agency does not have adequate legal powers to compel coordination among the statutory authorities under its jurisdiction, nor does it have jurisdiction over the natural resources management functions of other agencies (e.g., the Ministry of Agriculture). To date, the effort to coordinate environmental management through GAHEF has used two approaches: the creation of inter-agency committees and the identification of focal points in line ministries/ agencies. Unfortunately, the inter-agency committee mechanism has functioned well only in the case of coastal zone management, and there has been little success with the identification of focal points, other than in the Ministry of Foreign Affairs. This should not be unexpected since such mechanisms do not work well where personnel are over-stretched and give secondary weight to inter-agency functions. Neither GNRA nor GAHEF has adequate supervisory jurisdiction or coordinating mechanisms to direct environmental policy or effect integrated management.

178. Management of environmental activities in the coastal zone of Guyana, in particular, requires an integrated approach. As discussed above, integrated CZM will require a lead environmental agency with sufficient authority to coordinate agency activities and review private sector actions in the coastal zone.

179. Actions

- During the next year the Government will strengthen the Inter-Agency Committee on the Environment and Development, giving it a statutory mandate to ensure effective inter-ministerial communication and coordination on environmental management. The new Environmental Protection Agency will serve as chair of the Committee.
- In the next year the Government will establish an Environmental Protection Agency with specific statutory authority to coordinate the environmental management activities of Government, review EIAs for development projects, establish pollution control standards and requirements, monitor and enforce such standards, and promote environmental awareness and public education.
- Within the new Environmental Protection Agency, the Government will establish a Coastal Zone Management Programme responsible for design, management, and maintenance of the sea defenses; environmental monitoring and enforcement in the coastal zone; and review of EIAs and other land use applications in the coastal zone.
- During the next two years the Government will seek donor assistance to establish the laboratory capacity needed to perform environmental monitoring for its pollution control programme. The Government will determine whether to refurbish the IAST laboratory for this purpose or to establish a new laboratory within the Environmental Protection Agency.
- Over the next three years, existing industries should be given a grace period to comply with new environmental standards. Government will seek to secure technical and financial assistance to alleviate the burden of regulatory compliance for these industries.
- During the next three years the Government will undertake a programme (e.g., the proposed UNDP Project) to strengthen the institutional capacity of agencies with environmental management responsibilities.

C. Regional and International Cooperation

180. Guyana is a party to a number of multilateral treaties. However, the country has not been aggressive in bringing its domestic law into line with its international obligations, except as regards UNCLOS III (the Third UN Convention on the Law of the Sea). This deficiency is particularly notable with regard to CITES. Additionally, Guyana is not a party to several multilateral treaties which are relevant to its circumstances. Notably these include the Ramsar Convention on wetlands of international importance, the London Guideline for the exchange of information on chemicals in international trade, the Cartagena Convention on the marine

environment of the Wider Caribbean Region and the Kingston Protocol on Specially Protected Areas and Wildlife (SPAW).

181. The Government is actively involved with all the relevant United Nations bodies, including UNEP, IMO, UNIDO, FAO, PAHO/WHO and UNESCO, as well as the World Bank, IDB, CDB, and bilateral agencies. Guyana's most notable international cooperation effort, however, is the unprecedented Iwokrama Rain Forest Programme, under which Guyana has set aside 360,000 hectares of forest lands as an "Amazonian Rain Forest Wilderness Preserve" and an "Area for the Sustainable Utilization of Tropical Forest Resources."

182. Guyana played a lead role in coordinating the regional preparations for UNCED 1992. The President of Guyana was appointed by the Heads of Government of the region to oversee CARICOM's inputs into UNCED and the related negotiations for the Climate Change Convention, the Convention on Biodiversity, and the Convention on Forestry.

183. **Action**

- During the next year the international environmental conventions ratified by Guyana should be reviewed in order to begin the process of implementation. This exercise should form part of the development of a legislative programme.

VIII. SUMMARY OF ENVIRONMENTAL ACTIONS

184. The situation analysis outlined above presents Guyana with an extensive agenda for environmental action. In light of the severe constraints on available human, financial and material resources, the Government of Guyana will have to focus its energies, over the next three years, on achieving the priorities it has set itself in the NEAP. This programme of action is summarized in the accompanying matrix. Fuller project profiles for the proposed actions, indicating the objectives, scope and financial/technical assistance requirements, are included in the background papers to the NEAP. By the implementation of these actions, the Government of Guyana will make evident its commitment to the discharge of its constitutional duty to the present and future generations of the people of Guyana.

SUMMARY MATRIX OF ENVIRONMENTAL ACTIONS

ENVIRONMENTAL ISSUE	YEAR ONE	YEAR TWO	YEAR THREE
Coastal Zone Management	Seek funding for remaining critical sea defence works Implement Fisheries Management Plan	Begin programme to replant mangroves Initiate study of movement of mudbanks	Address environmental impacts of D&I schemes Study groundwater resources of coastal aquifers Refurbish hydrological and climatological monitoring stations
Liquid and Solid Waste Management	Rehabilitate solid waste programmes for Georgetown, Linden, and New Amsterdam	Begin water pollution control programme	Begin rural water supply and sanitation programme Review water and sewerage tariffs
Natural Resources	Develop national forestry policy and establish monitoring unit in GFC Begin NFAP implementation Implement watershed reforestation project Appoint NTC members	Initiate expanded wildlife protection programme Seek technical assistance to develop eco-tourism potential Ensure FMPs including EIAs for all concessions	Establish system of National Parks and Protected Areas Undertake population studies of flora and fauna Assist NTC and GHS in preserving cultural resources Review royalties and other charges, earmark funds
Mining	Review audit of alumina waste and take necessary remedial measures Initiate study of small-scale gold mining impacts	Introduce EIA requirements for all new bauxite operations	Seek donor assistance in review and negotiation of mining contracts as needed
Public Awareness	Begin implementation of National Environmental Education Programme	Expand Environmental Studies Unit at the University of Guyana	Seek NGO help to revitalize the zoo and botanical gardens
Amerindian Peoples	Strengthen Ministry of Amerindian Affairs by appointing a Permanent Secretary and providing adequate budget	Develop training programme to involve Amerindians in environmental monitoring	Improve infrastructure for secondary education in Amerindian Communities
Legal Instruments	Establish legislative programme for revision of environmental laws and enactment of new ones	Revise all penalties and incentives in existing laws Enact highest priority environmental laws	Continue enacting environmental legislative programme
Institutions	Establish the Environmental Protection Agency, including Coastal Zone Management Programme Strengthen Inter-Agency Committee on the Environment and Development	Establish laboratory capacity to perform environmental monitoring	Strengthen technical capacity of institutions

MAP OF GUYANA

