URBAN ENVIRONMENTAL MANAGEMENT STUDY OF JAMAICA

DRAFT

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EXECUTIVE SUMMARY

Background

Over the past four decades, urban expansion in Jamaica has been in response to the rapid accommodation and servicing demands of economic sectors making increasing use of its environmental resources. The exploitation of marine, coastal and landscape assets, mineral and other extractive resources and stocks of fresh water have generated rapid urban growth. In the wake of increasing urbanization, these resources are being exposed to severe degradation.

Although the study originally sought to examine specific projects, especially in the housing sector, and their impacts from the point of view of location and installations, development of the work pointed to broader and more critical issues. Focus was therefore placed on understanding these issues which could provide a more informed basis from which to question the environmental impact of individual developments.

In examining the underlying trends and issues which surround these impacts, the study examined four urban areas which have experienced rapid growth over the past 20 years. The areas studied, Montego Bay, Mandeville, Spanish Town and May Pen, presented a comprehensive base for the study as they represent the areas of major urbanization outside of Kingston. Their urban growth is based on diverse economic activities embracing tourism, manufacturing, bauxite mining and agriculture, which are the country's major income earners.

General Findings

The study found that despite their differences in size, location and economic activities, their environment is being subjected to similar impacts which have major implications for other urban areas, and for the economic development of the country.

1. Key Resources Exploitation

   Environmental resources provide the basis for the location and development of the major economic sectors driving urbanization in Jamaica. Urban expansion is occurring where there is an availability of resources which are important to the economic and human need. The presence of significant deposits of bauxite ore that can be mined economically have influenced the urban consolidation and development of Mandeville.

   The coastal and marine assets of Montego Bay have rooted Jamaica's tourism industry in the city. The natural harbour of areas like Montego Bay and river flowing past Spanish Town are both important assets to their manufacturing

sectors. Similarly, the alluvial soils which are so productive for agriculture, have shaped the settlement of May Pen, a town whose growth continues to be influenced by agriculture on its fringe. The importance of human resources must also be stressed since people make vital inputs into the urban process.

2. Population Impacts

As centres of expanding economic activity the island's towns and cities are attracting increasing numbers of rural people seeking employment and an improved way of life. Urban areas have out-paced the growth of rural areas by a percentage factor of 6:1. A review of independent studies shows that the majority of urban population increase has resulted from a pattern of cross-parish drift, producing a population with great demand and expectation for economic and social improvement.

Another important aspect pf Jamaica's growing urban population is the movement out of the main metropolitan areas. Populations are leaving the Kingston and St Andrew metropolitan areas, and have significantly altered the dominance of the capital as a rural population destination. Major town and cities are growing rapidly and experiencing greater impacts from population increase.

3. Major Environmental Impacts

The physical and ecological pressure being generated in the relatively confined geographic setting of major cities and towns, contributes to the many acknowledged environmental problems facing the country. Apparent increasing rates of air and water pollution; watershed, coastal and landscape degradation point to serious social and economic consequences.

As the areas continue to be built over by hotels, manufacturing plants, houses and roads, the urban watersheds are evidently becoming waterproofed and starved of their replenishment which is converted instead into heavy run-offs, which can threaten the quality and future quantity of the urban drainage basin. Soil loss resulting in the extensive cut and filling necessary for these developments may be comparable to the critical levels resulting in deforestation in rural areas.

The study also point to the adverse effects that urban uses are having on the coastal water quality and marine life. And urban areas need not be coastal to impact coastal resources. Rivers passing through inland May Pen and

Spanish Town, for example, carry urban and agricultural wastes to the south coasts.

Perhaps the most detrimental impact revealed by the study is to the health of the urban population. Jamaica's urban populations are sharing some of the benefits and however suffering many of the consequences of urbanization. Exposure to insanitary conditions created by poor and overcrowded housing areas, open markets and drainage systems have become a feature of urban living, most especially for the poor.

When these are added to the effects of industrial based air pollution, it is evident that for people moving into Jamaica's urban centres, the social and environmental health risks are drastically increased. The risk to the nation as a whole takes on greater significance as official projections indicate that in the next two decades nearly all of the island's increase in population will occur in urban areas.

4. Environment Protection Services

The study revealed the serious shortcomings in the island's capacity to service the development and population demands of urban growth which can protect the environment from the impacts observed.

Four areas of major deficiencies have emerged from the assessment of the urban services provision which are needed to protect the resources base from the impacts of urbanization, Solid Waste Management; Sewage Disposal; Sanitation and Urban Air Control; Land Use Control; Water Resources Management. The study found that the major deficiencies resulted more from poorly directed policies and regulation, poor operations, and limited and inconsistent resources, than from under provision.

At both the local and national level, the agencies with responsibility to service and manage urban development are ill-prepared to respond to the pace and magnitude of the resulting impacts. Parish Councils for example are burdened by operational difficulties, technical weakness and a history of political influence.

The National agencies they rely on for technical and scientific back up are too poorly equipped, understaffed and have too little working scientific data to respond effectively. Nonetheless, it is evident that there is both the will and the enterprise to overcome the severe constraints inherent in their existing institutional arrangements. There is however an overwhelming need to change development assumptions, attitudes and objectives.

Conclusion

The focus of economic development policies which have been to encourage the exploitation of local area resources and assets have direct impacts on their environment base, create increased population pressures, and, in most cases, return very little direct assistance in dealing with these effects.

Without the means of sufficient resources, urban authorities have been unable to provide the level of services which are adequate to protect the environment from the pressures of economic and population growth. The capacity of Parish Councils who carry the major responsibilities, have not kept pace with the demand for effective urban management. As a result urban centres are marked by run down and insanitary commercial premises, poorly maintained public buildings and a lack of public amenities.

An additional weakness in the management of urban growth is the vacuum in which urban land is utilized. There is a serious deficiency in the informational and analytical data needed to establish criteria and standards for enhanced utilization of land. Existing mechanism for land use control are archaic and incapable of preventing the detrimental effects of poor land uses or addressing new demand for land and development.

The study makes five major recommendations which can respond to the current severe degradation which Jamaica needs to begin to address in the long-term need to protect the island's environment resource base from the effects of urbanization.

1. Set up a Land Use Data Base for the most effective collection and dissemination of information to inform economic and urban development policies, programmes and regulations.

2. Prepare an Action Plan to Implement Recommendations of Various Studies on Solid Waste Management.

3. Develop a Comprehensive Public Health Programme Strategy for Spanish Town as a working a model for the establishment on-going public health programmes for Jamaica's urban centres.

4. Prepare an Environmentally Sound Development Strategy for Montego Bay to serve as a policy instrument to guide the proposed development plan for the city.

5. Establish a Urban Management Policy Framework which will enable Parish Council to operate as urban managers.

INTRODUCTION

Urbanization in Jamaica in the twentieth century has reflected an intensification in the development of the island's natural resource base. With the close of the 19th century Jamaica was no longer able to depend on seaborne trades associated with agriculture. Attention then increasingly turned to other natural assets and resources which could be exploited for economic development.

Since the 1940s Jamaica's towns and cities have been growing as a natural accompaniment of new sectors which are making greater use of readily available resources. Most important of these are the coastal and marine assets well placed for tourism, the mineral and other extractive resources for mining and fresh water resources which are vital to economic and human settlement needs.

The past two decades have seen a rapid urban expansion in areas where these resources abound, and there are indications that severe degradation of the island's environment base is resulting. Furthermore, there is growing concern that serious shortcomings in the capacity of the country's institutions to manage the urban growth is contributing to the degradation. Evidence is growing that the extent of the deterioration now pose a threat to the economic development prospects of the country.

This study examines the environmental effects of recent urbanization in Jamaica and the institutionals needs and opportunities for achieving more effective protection of the island's resources. The first section sets the context for reviewing the trend in urbanization and identifies the environmental resources and assets that are most at risk. This section presents a profile of the four fastest growing urban centres in the country, describing the keys features of their demography, economy, environment and level of urban management.

The second section looks at the major environmental impacts of urbanization and the consequences for the future if existing trends continue. Section three presents an analysis of what is seen as the underlying causes of the problems, and the issues which give rise to them. The final section explores the potential and opportunities to better protect the county's environment base from the increasing effects of urbanization.

DEFINING THE URBAN CONTEXT

The starting point for the study was taken from two principal conclusions drawn by two important urban and environment studies which were recently completed.

The first, The Jamaica Environmental Strategy: A Review of Opportunities for Canadian Assistance in Environmental Management, completed for CIDA in 1989, concluded that a major cause of Jamaica's environmental problems are the deficiencies in urban infrastructure. Most especially of poorly managed solid waste and sewage disposal and industrial effluent. Further, that the pollution from contaminated urban run-offs now threatens the coastal and marine resources in which so much of the country's economic development potential lies.

The second study, Urbanization in the Caribbean, Prospects and Management Priorities, prepared by the Urban Institute in 1990, pointed to a notable urban shift in the pattern of Jamaica's population growth since 1970. It pointed out that over the period 1972-82 the island's urban areas accounted for 86% of total population growth, as compared to 40% in 1970. Rural population in comparison grew only 14.3% over the same period. It noted that both the Government of Jamaica and the United Nations have calculated that urban areas will absorb nearly all (between 88% to 100%) of the island's population growth to the year 2020.

Although the study found that the Kingston Metropolitan Area, defined here as urban Kingston and St Andrew, dominated the pattern of urban growth, the island's secondary urban centres grew much more rapidly than the metropolitan area. Further, the study projected that it will be the secondary centres, rather than Kingston, which will bear the brunt of future population increases. While Kingston is expected to grow by around 49%, the island's secondary towns and cities are expected to double their size over the period.

The CIDA study indicated that Jamaica was falling behind in the provision of services to support this level of urbanization. Complaints about the low level of urban maintenance are growing, and indicate that the situation may have worsen in the two years since the study was completed. As these secondary towns expand therefore, the deficiencies in the country's urban management will, if present conditions prevail, severely hamper its environment-based economic development. Focus of these centres can provide some insight into trends and problems which should now be addressed.

This study therefore concentrates on a selection of four secondary urban centres which offer a mix of economic activities and physical settings for the best analysis of how urban growth is presently impacting on the environment. A principal aim was

to enable general statements to be made about urbanization in Jamaica in a manner which could also point to actions on area-specific problems which, though severe, may be less intractable in scale, and more readily dealt with now than in ten or twenty years time.

The review presented below, of the factors which are generating urban growth is based on a summary of the profile of these four areas which sets the context for the study. The areas selected are important political and regional centres with influences which go beyond their parish boundaries. Table 1 shows that they present distinctive urban development cases. Montego Bay for example has developed on the island's north coast. May Pen and Spanish Town are growing centres in the southern agricultural plains while Mandeville is a case of urbanization occurring in the central upland area of the island.

Table 1

Urban Context

Urban Centre	Setting	Economic influence
Montego Bay	Coastal	Tourism/Manufacturing
May Pen	Plain	Agriculture/Food Manufactures
Mandeville	Plateau	Mining/Tourism
Spanish Town	Low Plain	Industrial/Dormitory/Historic

Figure 1

Location Map of Selected Areas

A PROFILE OF URBAN AREAS

MONTEGO BAY

Urban Setting

Population 95, 000
Rank Jamaica's second city and third largest urban centre.

Function Administrative capital of St. James, the seat of the Parish Council and the regional headquarters for a number of Government agencies.

Accessibility At a distance of 120 miles from Kingston, the city dominates access to western Jamaica. It is the western node of the country's rail and road transportation system, and the site of its second major port facilities. The city's international airport also provides regular links to four airfields across the island.

Growth Trend Montego Bay is one of the largest of the areas studied. Its average annual growth of close to 5 percent annually makes it one of three fastest growing urban areas in the country. This high level of growth is attributed to the employment attractions of the city's thriving tourism and expanding manufacturing sectors.

As the smallest parish on the island, St. James contributes little to the growth of its capital. Instead, Roberts and Nam (1) found that Montego Bay's overall growth for 1970-1982 was largely due to internal migration from beyond the parish. Most migrants came from three nieghbouring parishes,Hanover Westmoreland, and to some extent St. Elizabeth.

Physical Setting

Area 8,200 hectares
Location On a narrow coastal plain alongside the well protected Montego Bay. The Bay is dissected by the Pie river and the North and South gullies which drain the steeply rising surrounding hills. The total area includes reclaimed shoreline which has extended the city's available waterfront. Off-shore of the waterfront, a 200 acre Protected Marine Area has been reserved.

Economic Base

Tourism Montego Bay has dominated Jamaica's tourism economy for almost forty years. In a 1990 study on the city Bell (2) estimated that it provided close to one-third of total tourism earnings of US$600M in that year. The city and its environs is the largest of the island's four resort areas, with 45 percent of total tourism accommodation.

Most of these properties (80 %) are laid out in ribbon development along the city's shoreline to take advantage of its ideal setting for the sun, sea tourism market of Jamaica. As a growing cruise tourism centre, recent improvement in its port facilities now allows Montego Bay to receive the largest cruise ship plying the Caribbean. The city is also the home port of the Caribbean Cruise Lines.

Manufacturing Within the last decade the economy has begun to diversify, mainly into export manufacturing. Some 40 firms engaged in light manufacturing and off-shore electronics operations are based in the city's Free Zone. Manufacturing capacity is also well consolidated by factory operations in and around four industrial sites on the southern and western boundaries of the city. These sites locate a further 50 plants and factories.

Trading Trading is focussed on the commercial activities of the port which draw on local and Free Zone export and transhipped imports such as oil and cement from Kingston. The city's trading base is strengthened by its central market and warehouse facilities from which western Jamaica is supplied with produce and goods. In the past decade street vending has become a growing outlet for these goods. A survey conducted in 1988 found 677 vendors trading on the streets (3).

Environment Base

Major Resources

Water The city receives most of its water for domestic, industrial and other uses from acquifers underlying the developed areas and hinterland. The remainder of the watershed and the rivers and streams, which presumably help to recharge the acquifers, serve vital water recycling functions.

Coastal Setting Montego Bay's coastal and scenic resources are its major assets. They are responsible for its rapid expansion as a major resort centre and its natural harbour the basis for the development of its industrial zone. The city also has coastal resources that are important to the

fisheries sector, such as the mangroves of the Bogue Lagoon, which together with the reefs and seagrass in the area provide a primary basis for near shore biological productivity.

The barrier reef running parallel to the land from Montego Bay east along the North coast is another major resource for fisheries and marine tourism, as well as a shield protecting the coastline from complete exposure to high energy waves. Although there are no known major mineral deposits in the area, some limestone is mined for construction purposes.

Major Problems and Impacts.

Vulnerability to Disasters Montego bay is not an ideal site for a large city. Its narrow, low lying and in some parts waterlogged coastal plain is set against a backdrop of steep and occasionally precipitous slopes. Physiographic features lend themselves to rapid drainage even under natural conditions. Urbanization is resulting in increased waterproofing of the city's drainage basin and major alteration to the hydrological regime, which causes periodic flooding of sections of the city.

The intensity of the floods is reported to have increased in recent years and so too has the threat to property and life. A major flood (one that would occur on the frequency of every 50 years) would certainly be disastrous and costly. Property and persons located in the immediate flood zones would be most vulnerable.

The waterfront of Montego Bay may also be prone to storm wave attack. During a trip to the area in early December 1990, the shoreline was observed to be under severe stress from high waves influenced by a storm which developed offshore. It was apparent that despite the presence of reefs offshore some sections of the shoreline, including lands reclaimed on the waterfront, present a grave risk for development because of their relative exposure.

Threat to Water Resources Per capita water consumption is estimated at 190 m<3/yr and for the city 9 million m<3/yr. Water is sourced for the underlying acquifers by a combination of wells, springs, along with pumps and numerous booster/relief stations (shown on a CWC map ?). The range of sources suggest that water production is relatively costly.

Water pressure and distribution from most wells and pumping are regarded as fairly good. The quality of the water is good enough to require only moderate chlorination. The potential to continue to exploit the surface water for future use from

the city's water basin Montego Valley is limited by the low flow capacity.

As a result Montego Bay's water is now sourced mainly from the Queen of Spain Valley (30 miles away) and its extensive tapping of the Martha Brae river. Additional water supply from the Great River, on the Hanover border, to meet immediate future needs has been planned and is expected to come on stream in 1991.

While water supply is not critical at the moment, development patterns point to reduced production from present sources in the future and increased cost of exploiting new sources to meet growing demand. Urbanization of the relatively small drainage basins that comprise the urban watershed of Montego Bay is gradually reducing water recharge to the acquifers at the same time that water demand is growing.

Although the city's water supply seems secure, as development demand rises constriction of water supply could well arise. The study found that over pumping was the reason for saline intrusion affecting the Bogue well which is now closed. Another well (at Tucker) had to be closed because of hepatitis and gastroenteritis outbreaks, due to poorly constructed sewage treatment plant.

Coastal Resources Impacts Urban related impacts on the coastal resources of Montego Bay were described by Bell. When urban development combines tourism, industrial, and residential uses, slope development, dredging and land reclamation, all of which occur in Montego Bay, it creates a complex of environmental impacts.

The Montego Bay experience is further complicated by the presence of rivers and drains which carry sediments and other pollutants into the Bay. These pollutants are often fairly rich in fertilizers and pesticides. Solid waste is often deposited by the open gullies, and one site visit revealed traces of oil spillage from one drain running through the airport lands.

Based on deforestation estimates for Jamaica as a whole, the clearing of trees for hillside development in the city may be resulting in soil loss of between 40 to 120 tons/yr for every acre of land developed. Much of this soil sediment is reaching the harbour, where it exacts both environmental and economic costs. Future periodic dredging of the harbour to maintain required depth for navigational purposes is predictable.

Montego Bay presents a real dilemma (to policy makers and planners) in what must be seen as a major challenge to manage the complex and often conflicting uses along its short

waterfront, notably an international airport, a commercial seaport, an industrial zone, resort tourism and a central business district.

Level of Urban Services

Solid Waste The study found the level of satisfaction with collection in the city to be low. Frequency of collection of varies within the city and may be as frequent as daily in some downtown areas, or twice per week in outlying residential areas.

One landfill site at Retirement services the entire city. The city's large population of close to 100,000 is provided with waste disposal capacity of some 8 acres. The lack of sufficient staffing and equipment severely hamper the proper handling of its heavy load. The site is manned by a staff of 3, and currently the only site equipment is one tractor, which is hired for compacting purposes. Funds however, are sufficient only to cover hireage for some ten hours per week.

So few hours of equipment use do not allow for proper compacting operations, and more often unsorted waste is stockpiled and burnt. A noticeable pall of smoke is a regular sight as polluted smoke drifts across the city. By day drifts are observed over the residential areas of Granville, along to Bogue and westerly to Reading and the Great River, and by night across the Freeport resort and downtown areas.

Sewage Disposal Central System: A central sewage system services only the hotel and downtown sections of the city, and estimates put the level of overload at 300 percent. In addition to its heavy load, the plant suffers serious operational breakdowns. Regular power cuts which reduce pumping capacity, mechanical failure of the pumps, low maintenance and lack of technically trained staff contribute to a poor level of plant operations.

These operational deficiencies combine to produce a high frequency of primary sewage discharge into the Montego River on which the plant is sited, and eventually into the Bay. Consistently high measures of nitrate levels in the Bay is largely attributed to these discharges. Although plans to expand the plant's capacity of 0.18 million gallons daily (MGD) to 4.00 MGD is being actively pursued by the Government of Jamaica, with the assistance of United States Agency for International Development (USAID), operational difficulties of the existing facility remain the core problem at present (4).

Independent Treatment Plants: There are some five of these, mainly servicing hotels, housing schemes and commercial and industrial operation. A Ministry of Health survey of sewage plants conducted by its Environment Control Divisions (ECD) found that these suffer similar operational deficiencies as the central plant. Provision for the majority of the city's hotel and residential properties is however by septic tanks and soak-a-ways with the remainder utilizing pit latrines.

Storm Water Drain: Urban run off is controlled by the number of gullies which drain the surrounding hills. These channels are a major source of solid wastes which they collect from the areas they pass through.

Public Amenities The city is short of amenities. Montegonians complain vigously that three small areas of public open spaces are inadequate for a tourist town, and more so about their poor state. The city centre is also short on other outdoor and recreational facilities. Where sanitary conveniences are provided they are often converted to other uses or lack the level of maintenance to make them usable.

The study found that Montego Bay's waterfront and tourism setting provide ample opportunities for public facilities which are underutilized. 47 acres of waterfront land with extensive public use potential lies undeveloped, while the several sites are variously used for uncontrolled car parking, animal herding and dumping (5).

Public Cleansing and Sanitation The central food market, several of the 22 streets on which vending takes place, and many of the city's thirteen squatter areas have become insanitary environments. Deficiencies exist in maintaining proper sanitary standards in the central and satelite markets, as well as food handling carried on in street vending areas.

Efforts underway have begun to address the need to improve the sanitary condition in the city's squatter areas. One area (Norwood) is being provided with piped water under the USAID assisted GOJ Squatter Upgrading Programme. Sewage management and disposal provision remains the gravest need on sites which mostly lie in the drainage path of the hills around the city.

In addition, Montego Bay's public cleansing services are over-stretched to maintain the gullies, which pass through several squatter areas and the main street vending sections of the city, free of their flow of garbage which eventually reaches the Bay. The services provided are just able to keep most central streets clean and free of daily remains of the

city's heavy street vending activities. In the circumstances the provision and maintenance of public monuments and landscaping receives a low priority, with the result that the city has an unkempt and unattractive appearance.

Land Use Control Monitoring the enforcement of building codes for the proper erection and maintenance of buildings has not kept pace with the rate, level and range of demand for residential and commercial accommodation in the city. The city centre environment is 'scarred' by a proliferation of ad-hoc structures for vending, and existing commercial building which are defaced by unregulated add-on structures. In addition the overall shabbiness of the city reflects the lack of control on building repair and maintenance.

In the absence of adequate land use control and monitoring, large areas of residential squatting have spread over the city's steep and precipitous hillsides. They extend also into the gully beds which drains the slopes. Bell has estimated that three of the thirteen areas squatted in the city occupy 64 hectares of such environmentally fragile areas (6).

Future Concerns

Present development trends and related environmental impacts evoke some worrying prospects for protecting the environment and economy of Montego Bay. Major concerns are:

Unmanaged development in the urban watershed could lead to protracted environmental damage, and rising economic costs for the supply of fresh water, flood control and the conservation of coastal resources, in particular those on which tourism and fisheries depend.

Competition and conflict between uses on the waterfront is expected to present difficulties in maintaining a high quality tourism product and in preserving the mangroves and nearshore habitats of the Bogue lagoon.

Intensification of ribbon tourism development along the coast east of the town is likely to be paralleled by pockets of commercial development south of the highway and residential expansion higher up in the watershed. Unless the existing and expected growth in development and population can be better anticipated, controlled and serviced efficiently, a combination of sediment and sewage pollution and human uses could damage the barrier reef and diminish its capacity to protect the coastline and coastal properties in the future.

MAY PEN

Urban Setting

Population 55,000
Rank Fourth largest urban centre in Jamaica.

Function The administrative and main service centre for the parish of Clarendon, and a regional headquarters for a number of national Government Agencies.

Accessibility The town enjoys a central location on the island, some 35 miles west of Kingston at the junction of two major highways linking the south eastern and south western parts of the island. Its good road access extends its service influence to the eastern part of neighboring Manchester.

Growth Trend May Pen's annual growth rate of 4 percent is due mainly to the attraction of its growing agricultural and related industries, and returning overseas migration. Hard data not withstanding, observers have noted that immigration accounted for most of the town's growth from 1970-1980.

A relatively new town, its initial growth had been stimulated by a land grant in the 1920s, construction of a water supply system and introduction of electricity. In the mid 1940s growth was spurred by the employment attractions of the United States Naval Air Base establishment at Vernamfield, and later by Alcoa's bauxite plant built at Halse Hall.

Physical Setting

Area 4,000 hectares
Location On a relatively large undulating plain on the banks of the Rio Minho river which meanders its way from the north east to the south west across the 92,000 acres of fertile agricultural lands of Clarendon. The town is loosely laid out on the fringes with more dense development at the centre. Here a linear pattern has extended development along the town's main thoroughfare.

Economic Base

Agriculture Produce and Services May Pen is the focus of development in Jamaica's agriculture sector. The Rifkin Report (1983) on the town found that the May Pen market is one of the largest on the island outside of Kingston. It is becoming increasingly important as a centre for the sorting, assembly and transhipment of bulk produce. These activities

draw on the parish's strong agricultural base of sugar, citrus and cash crops production.

Agricultural promotions and development is also a focus of the town. May Pen is host to Jamaica's premier 3-day Agricultural Show which is held each year on the 100 acre 'Denbigh' show ground on the western edge of the town.

Agricultural Processing The island's largest sugar factory, Monymusk is located just south of the town, and the extensive Citrus Development Company of Jamaica is situated in the town. These two large operations utilize the available sugar and citrus capacity of the parish. They have served also to establish the town as a principal centre for food packing and canning, mostly for export. Other agricultural related industries include fruit and vegetable canning, and the manufacture of packaging items such as polypropylene bags.

Bauxite Mining Bauxite rose to economic importance in 1960-1970. Alcoa has brought a new dimension to May Pen's economy with the alumina plant at Halse Hall just south of the town. Though bauxite has contracted somewhat since then, it remains significant in the economic life to the town.

Environment Base

Major Resources

Water A major feature of May Pen is the passage of the Rio Minho, just south of the main business district and northwest of areas developing to the east and south. The river contributes to the recharge and maintenance of the aquifer from which the town gets its fresh water. DOS ordnance maps (1980 data) indicate moderately extensive woodlands to the north of May Pen, which must be seen as an important watershed that is vital to the fresh water cycle, and to the maintenance of animal and habitat diversity.

Agriculture and Mining Soils. Soil is a major resource in shaping urban development pattern of May Pen. The town has grown over a combination of old and recent alluvial soils, which were deposited from slope and river wash and also soils developed from parent limestone. Well-drained soils have supported agriculture in the urban hinterland, mainly to the south. Red soils hold sufficient deposits of bauxite to have good potential for continued commercial mining.

Problems and Impacts

The environmental management of May Pen are not complex, nevertheless problems and impacts do exist.

Air Pollution Bauxite mining and manufacturing are noticeable contributor to the reduction in the quality of the town's air. Although there is no data to substantiate local concerns these are having effects on human health in the town. The regular practice of burning solid waste has generated complain from people living in the Mineral Heights housing area where the municipal landfill site is located.

Water Pollution Contamination of the underground aquifer by domestic and bauxite wastes is theoretically possible, but not documented. Both urban and agricultural wastes find their way to the Rio Minho. In this regard the clayey soils underlying sections of the town are problematic for sub-surface treatment of urban sewage, so that during heavy rains, untreated effluent periodically find its way to the surface.

Agricultural Lands Impacts Residential development onto the parish's good agricultural land, particularly to the west of the town centre and to the south in the Rio Minho basin is occurring at what is seen as a rapid rate. Much of the residential production of 225 units annually between 1970 and 1982 has encroached on prime agricultural lands.

Level of Urban Services

Solid Waste Management Public as well as private satisfaction with the level of service is low and there are general complaints of the level of supervision. The expectation and intention to undertake daily collection is often not met and disposal of the waste is poorly operated and managed.

There is one central landfill site located at Curatoe Hill, close to, as noted above, a large housing scheme. A low level of staffing and limited availability of equipment have created severely polluted condition on the site which include the regular burning of unmanageable amounts of waste and breeding of vermin and mosquitos. Pollution of nearby sites also results from contaminated surface water runoffs into surrounding residential premises.

The generally poor conditions and rising complaints of the local residents have prompted plans to relocate disposal operations onto a new site. The most important aspect under consideration is the location of the new site away from residential areas and in a zone which can reduce the ecological impacts of the operations. The Parish Council with

guidance form the Ministry of Health is making efforts to identify a suitable site in clay soils which offer, through greater filtration, better protection from ground water pollution than the limestone on which the present site is located.

Sewage Disposal Central Systems: May Pen has no central treatment plant (except the package aeration plant facility for the May Pen Hospital) and mostly rely on septic tanks and soak-a-ways to handle disposal from residences and business operations. Where central systems are used as on some of the newer housing schemes, studies and interviews conducted for this study confirmed a high degree of dissatisfaction with the treatment and disposal at these facilities. They are often plagued by poor operation and maintenance.

Cesspool Discharge: There is no facility provided for the disposal of the town's residential cesspools, and Medical Officer of Health (MOH) for the parish express grave concern that dumping is taking place in the Rio Minho. Further dumping in the river is also resulting from inadequate control of industrial effluence. In 1983, the Rifkin report found that the Citrus Company's large industrial plant was discharging waste from juicing operation into the St. Anne Gully which empties into the Rio Minho.

Current investigation found that since then the situation has not improved. The MOH noted that the problem is a perennial one which is due to regular mechanical breakdowns of waste extracting equipment during processing. As late as December 1990 the Parish Council again requested that improvements be made to these operations.

Public Cleansing and Sanitation Proper maintenance of the central market poses a great stress on existing services. The market is overcrowded and the adjacent open area used for vending is seriously flooded during heavy rains. Portable and uncontrolled food handling operations are increasing, especially in and around the market and transport waiting areas.

Public Amenities No public open spaces and outdoor recreational areas could be found in the town. The only provision of sanitary conveniences in the town are located on the market site. The facility is provided for market users but doubles up to service the nearby bus waiting areas. Round-the-clock staffing just manages to maintain them in reasonably good physical and sanitary conditions despite their heavy usage.

Land Use Control It was noted that much of the housing development around the town(mostly in 1960s and 1970s) had taken place prior to subdivision approval and building permits. Uncontrolled areas of squatting have also sprung up on the edges of the town. In 1983 there was only one squatter area at Curatoe Hill. Today squatting is growing in the areas of Glenmuir, Bucks Haven and Jacobs Hut. The land use and building activities on these sites fall outside of the existing building control and regulations, and the increasing rate of development has out-paced the provision for informal monitoring of the situation.

Uncontrolled land use is also having a deteriorating effect on the town centre. The open lots, street and open spaces around the market and bus collection area are populated with uncontrolled make-shift structures mainly used for vending. The overall shabby environment created is added to by the general low level of building repair and upkeep.

Future Concerns

Future concerns for May Pen derive mainly from intentions to transform it into a major secondary town as proposed by the Rifkin Report. Should urban expansion take place as envisaged by that report, it can be expected to:

Further contaminate the underground aquifer and lead to increased costs for water purification, particularly if plans for the implementation of a municipal sewage system do not materialize.

Create additional stressful conditions on the Rio Minho by virtue of increased deposits of sediment and wastes of all kinds that urban expansion will induce.

Increase consumption of prime agricultural lands in fair quantities to accommodate a variety of urban uses most especially of both formal and informal housing.

MANDEVILLE

Urban Setting

Population 54,000
Rank Jamaica's largest hill town and fifth largest urban centre.

Function Administrative and market centre of Manchester.

Accessibility Despite its relatively isolated position, Mandeville is nonetheless well connected to the rest of the island. It is a major stop on the Kingston to Montego Bay railway line and is served by a road network to the major centres of central and south Jamaica and to the northcoast. It provides well maintained highway links west to Negril, Savanna-la-mar, Black River and Montego Bay and east to May Pen and north to Ocho Rios.

Growth Trend Over the past two decades Mandeville has maintained one of the highest growth rates of all Jamaica's urban centres. Population growth has been due mainly to returning residents, and the continuing inflow of people retiring to the town. The latter group were the base of the town's early settlement attracted by its more equable climate and 'isolated' position.

Its location, in the secluded heart of Manchester, has kept Mandeville relatively isolated from most of the social problems associated with population impacts on other urban centres in Jamaica. More noted for its gardens, the town has more schools, and medical centres than any other urban area outside of Kingston, and has been described as 'the only town in Jamaica without a slum'.

Physical Setting

Area 3.5 hectares
Location Spread over a broad plateau at 2,061 feet above sea level, which makes it the highest and smallest area studied.

Physical Pattern Consolidation of the urban centre of Mandeville resulted from the arrival of the bauxite industry (1943). As the mining companies bought up the outlying bauxite lands, its residents were forced to move from these sprawling areas into the town proper. The physical form which its development has followed remains dominantly scattered and irregular resulting in 'checkerboard' sprawling in four directions.

Economic Base

Bauxite Mining Mandeville is the largest of three bauxite mining centre in the island. Its international mining and processing facilities are greater than all the other bauxite centres on the island, and is supported by the massive stocks of available bauxite. Government estimates put the amount of ore underlying the town at a 1987 value of US $300 million. The performance of the bauxite industry is now second only to tourism, and Mandeville is well placed to maintained a key role in the economy of Jamaica.

Nature Tourism An embryonic nature-tourism industry is now being established around the town. The diverse wildlife and landscape of the area is leading its growth as a nature-tourism destination. Official figures for 1988 show that hotels in Mandeville enjoyed a 40.2 percent occupancy rate as compared to 60% in Montego Bay, the leading tourism centre. Local operators expect Mandeville's performance as a tourism centre to increase significantly.

Construction Industry Hard information notwithstanding, there is a high level of building construction taking place in and around the town. Large homes are being built by migrant Jamaicans who are now returning to retire with their saving to an attractive region of the country. The high demand for land being generated may account for the 1500 percent increase in land values which has occurred in the Mandeville area over the last ten years.

Environment Base

Major Resources and Assets

Elevation and Water: At its 2,000 ft elevation, meteorological factors have created for Mandeville a micro climate that is much cooler than the other areas studied. Because of it elevation there are no major surface drains and ground water is stored in aquifers at depths too deep for cost-effective exploration. Fresh water needs are met largely from acquifers below Spur Tree hill, and partially from neighbouring parishes, mainly St. Elizabeth.

Most of the town's water is sourced 2,000 feet below the town in the Pepper valley at the foot of Spur Tree Hill from where water is pumped to a number of storage reservoirs on the Mandeville plateau. The water supply is good inspite of relatively inaccessible sources. The recently completed Greater Mandeville water scheme is designed to meet requirements of the town for another 50 years.

Bauxite: The major economic resource of Mandeville is its extensive deposits of red bauxitic soils. The intense level of mining they support is largely confined to the urban hinterland. These reserves secure Mandeville's position as a centre of major mining activity.

Natural Habitats: The areas around the town are also important to the maintenance of terrestrial flora and fauna of Jamaica, by virtue of existing habitats in the northwest and western urban hinterland. It is estimated that of 27 endemic species of Jamaica's 200 bird species, 25 are found in the Marshalls Pen (7) area in the northwest. Significant populations of the country's 2000 species of flowering plants and 600 species of ferns, are also found in the area.

The abundant wildlife in the area and its equitable climate provide the town its other economically valuable natural resource. They combine with the town's horticultural and farming activities to provide Mandeville with unparalleled potential to be Jamaica's primary nature tourism area. Equally, the rich diversity of the area is also of vital biodiversity value to the island.

Agricultural Soils: Soils around Mandeville are good enough for agriculture. They are mostly categorized as Class 3, in the classification scheme used by the Ministry of Agriculture, which would indicate suitability for (certain types) agriculture.

Major Problems and Impacts

Mandeville's problems and impacts from urban, tourism and industrial growth could be briefly summarized as follows.

Bauxite Mining Related:

Air Pollution A manufacturing plant is located northeast of wider Mandeville and east of the northern most extension of the urban area. Particulate matter or dust can be blown by the wind in the direction where the population could be affected.

Respiratory ailments have been linked to air pollution but are yet to be substantiated. However, the fear of pollution is real enough to convince some residents that living in the northern part of Mandeville is unsafe and so preference is being shown for the growing residential areas south of the town.

Ground Water Pollution Pollution is linked to the red mud lakes with bauxite wastes which is suspected of having the

capacity to contaminate fairly porous limestone acquifers. However, as Mandeville has a very low water table and because most of its water is pumped from wells outside of the urban area, this is not perceived as a real threat.

Landscape Degradation The effect on the landscape from strip mining is a problem which must be viewed in relation to the significant contribution bauxite makes to the economy. In this case, the best that can realistically be expected is that the effects are kept to a minimum and that rehabilitation of the landscape occurs after mines are closed.

Threat to Biological Diversity This is likely from possible expansion of urban development into the forested habitats north and northwest of the town. We cannot substantiate any existing impact on the flora and fauna, but it remains a strong possibility for the future if urban and nature tourism expansion are not carefully managed.

Level of Urban Services

Solid Waste Management: Collection and disposal operations are well staffed and equipped. Regular collection of garbage has resulted in a clean and attractive town environment. Disposal takes place under well controlled operations at a landfill site at Martins Hill, some four miles from the town centre. The site has its equipment by which most of the waste is land-filled.

Sewage Disposal: Mandeville has no central sewage system, and as far as can be ascertained there are no proposals for this provision. Sewage disposal is by means of septic tanks and soak-a-ways. For the present, this solution does not appear detrimental. The town is high enough, the soils of the area sufficiently permeable and the population density low enough to prevent pollution of ground water resources.

Public Amenities: The town have one central open space 'The Greens' which is well maintained although its location has become a virtual traffic round-a-bout which restricts its access.

Public Cleansing and sanitation: The market area is increasingly being crowded with street vendors. This presents an increasing strain on the service capacity of the Parish Council and its operational arm, the Southern Parks and Market.

Future Concerns

The major future concerns for Mandeville are:

Environmental Health Risks to workers and residents from exposure to toxic wastes from bauxite mining and manufacturing. The possibility of new mines being opened close to existing residential areas or future residential development occurring near established mines or manufacturing plants should be viewed quite seriously.

Loss of Biological Diversity This could result from either urban expansion into areas of biological wealth or from the illegal transport of threatened or endemic species as a by-product of nature tourism.

SPANISH TOWN

Urban Setting

Population 105,000 (Estimated)
Rank Largest urban centre after Kingston.

Function Spanish town has been in continuous occupation since the time of the Arawaks, and was the administrative centre of Jamaica for over three centuries. Although overtaken by Kingston as the island's capital, its easy access and proximity to the metropolitan area still gives it a strong identity with the capital.

The Town is the administrative and commercial centre of St. Catherine, the largest parish on the island, and the repository of several national monuments and institutions. These include the seat of the Parish Council, Island Records Office and Archives, Police Academy, nine national monuments of cultural and historic interest, and the most architecturally important urban precinct in Jamaica.

Accessibility Spanish Town is a key traffic point 13 miles along the main A1/2 road linking Kingston to the west and northcoast, at the junction on the national railway system's two major branch lines to Montego Bay and Port Antonio (8).

Growth Influence Spanish Town marks the focal point of three large sugar-cane estates and has historically attracted a rural migratory population. More recently that population has swelled to absorb a spill-over of Kingston's workers for whom Spanish Town serves as a dormitory town. The 1950s, was a period of intense peripheral growth in housing which sparked a massive enlargement of the town's population base.

Physical Setting.

Area 4 hectares
Location On the banks of the Rio Cobre where it opens out from an agricultural hinterland to a low lying plain to the south.

Physical Pattern Physical development has proceeded in linear form along the main roads that radiate from the town. This major thrust of development has largely resulted from the subdivision of large dispersed areas for housing which have create 'nodules ' hanging off the major line of development. This straddling pattern is comprised of an estimated 18 housing schemes which have been developed in the last twenty years.

Economic Base

Increasing Commerce: Spanish Town acts as anchor for the growing dormitory areas of Kingston. New housing schemes have considerably expanded the town's residential capacity. This has led to a commercial boom to cater to the needs of a growing resident market who no longer need to bank or shop in Kingston.

The construction of shopping centres in Spanish Town has seen a recent and strong upswing. (9). The Parish Council is itself developing plans to relocate the town's central market to make way for another shopping mall. In the wake of these developments, banks, shops, supermarkets and offices are now easily accessible in the town.

Industrialization: Industrial capacity has also increased dramatically to make Spanish Town a key anchor for the island's manufacturing industry. In 1960 a thrust of industrialization brought factories to the outskirts of the town to take advantage of the close proximity to Kingston and its port facilities.

Today manufacturing plants are located at two large sites, a lead factory (now closed) and an industrial chemical facility. There are three industrial sites on the outskirts at Twickenham Park, White Marl and Naggo Head to cater for a wide range of manufacturers. There has also been a recent development of Free Zones catering mainly to garment manufacturers.

Bauxite and Agriculture: Spanish town also comes under the economic influence of the bauxite industry, which, although located 28 miles to the east in Ewarton, has a major impact on residential demand in the town. In addition, although manufacturing has overtaken the town's historic agricultural economy (built on the extensive sugar cane and citrus plantations of the southern plains), the sector has maintained its influence through some growth in food processing operations.

Environment Base

Major Resources and Assets

Rio Cobre More than any other natural asset, Rio Cobre has shaped and given character to Spanish Town. The river provides water, goods or services to town and its urban fringes. Its passage through the town follows a deeply incised channel to provide partial water supply and flood protection for the town. Its total provision is 2.7 million

m^3 each year, with the major portion of urban water needs, 12 million m^3/yr, is drawn from the aquifer over which urban development is expanding.

The major resources of the Rio Cobre, which passes through the town before it empties in Kingston Harbour, is a fairly extensive aquifer, due mainly alluvium but with some limestone formation, an urban watershed with woodland cover to the north, extensive flat lands and well drained soils, of which 23% of the non-developed land within the defined urban area can be considered prime (Class 1) productive lands.

The river, aquifer and the rest of the natural forested catchment in the north are all part of a resource package that provide fresh water on which the town and irrigated agriculture thrive. The river must also be recognized for deposits of fine aggregate which are mined for construction, and the convenient depository it provides for industrial effluent from the industrial plants which have located on its banks.

Problems and Impacts

Urban Waste The major environmental problem in Spanish Town derives from the management of urban wastes (sewage, grey water) solid wastes, agricultural wastes and other industrial effluent, and gaseous and particulate pollution as will be discussed below.

It is known that a combination of urban and agricultural wastes increased the BOD of a section of the Rio Cobre from 5 mg/l in 1984 to 40 mg/l in 1989 and that the river discharges pollutants estimated at 20,000 lbs of BOD daily in the wider Kingston Harbour (H. Silva, 1990). We are led to believe from our study that only partial and seemingly inconclusive attempts have been made to document adverse health effects from the pollution of the river, street drains and the air, on the residents of Spanish Town. This is unfortunate, because there is widespread concern among scientists and other professionals over the possible consequences.

Other problems cited during the course of the study include saline intrusion in the acquifer from over pumping of wells for urban and agricultural uses. Spanish Town has some of its most productive wells located in the town and thus the long term protection of these vital assets against further urban expansion is of real concern. So too is the continued urbanization of the wider watershed and drainage basin in respect of long term water security. However, the most grave environmental threat from urban wastes, is to the population of the town from water and air pollution.

Biodiversity Urbanization does not appear as an immediate threat to the biological diversity on the terrestrial side but the pollutants carried by the Rio Cobre pose a serious threat to the resources of the coast, and particularly to the problems of Kingston Harbour.

Level of Urban Services

Solid Waste Management Our investigations reveal a high level of dissatisfaction with collection. There is broad concensus between the public and the providers of the service that the collection system is not keeping pace with the heavy load generated by so large and disperse an urban area. There is general agreement too on the poor state of the landfill site which seem to affect most people in Spanish Town.

The single 20 acre site at Lakes Pen serves Spanish town as well as an overspill facility for Metropolitan Kington when periodic problems at Riverton City prevent disposal on that site. The problems of under-staffing and the lack of on-site equipment are compounded by the inconsistent supply of suitable cover material. Often waste is piled in uncontrolled location on the site as there is no material for covering and compacting. Resort to burning is the usual response to dealing with these problems.

Sewage Disposal The town has no central treatment facility and the majority of urban needs are serviced by independent central collection and treatment plants. Most housing schemes and industrial sites have dedicated treatment facilities. Properties not serviced by a central system use the usual trickle system. The problems of operation and maintenance appear to be affecting the central systems, and most especially those at newer housing schemes.

The Medical Officer of Health for the parish reports that breakdown of systems at schemes such as Eltham is responsible for raw sewage leaking into the Rio Cobre. Improperly designed plants in other cases lead to surface spills and ponding of effluents, providing a breeding ground for mosquitos and a source of communicable diseases. The department sites technical and mechanical breakdowns on-site as well as inadequate supervision from central agencies such as the NWC, NHT, UDC and MOHousing which have responsibility for their operation.

Cesspool Operation: There is no official controlled site for cesspool disposal and information received by the team suggests that contractors may be presently emptying their lorry loads in the Dyke Road Gully.

Provision of Public Amenities The only truly public space available to Spanish Town's large population is the small central historic square.

Public Cleansing and Sanitation Keeping pace with overcrowding, increasing squatting and street vending, and market operations has put a severe strain on the town's limited sanitary control capacity. Commercial activities in the central market, street vending areas in the centre of the town are creating unsanitary environments. There is overcrowding in conditions where sanitary conveniences are overwhelmed. Vending in these area also include food outlets. The Medical Officer of Health figures put the number of food handlers on the street of Spanish Town at 215. The her Inspectorate has little capacity to inadequately monitor the operation of these itinerant vendors.

Air Quality Control

The need for improved facilities for monitoring of urban air quality was amply demonstrated by the closing down of the lead recycling facilities at the Jamaica Metal Refining Ltd plant in 1989. A 1979 study (Thomas and Davis) revealed that airborne lead was being emitted from the recycling operations which contaminated both the atmosphere and the ground. In addition tests done on residents in the surrounding communities revealed elevated levels of lead in the blood, particularly among children.

Sulphuric acid, sulphonic acid, aluminium sulphate and salt are processed by Industrial Chemical Company at their plant in the town. Residents in near-by communities have long complained about the destruction of their roofs. In response, the company has sought to address this problem by increasing the height of the stacks. However, this has only resulted in transferring the problem to another area. The production of these salt is resulting in the contamination in areas in the immediate vicinity of the plant.

Physical and health hazard problems continue to affect the communities living in these areas which has been zoned for industrial development, but being taken over by uncontrolled housing settlements. The inability to maintain air quality monitoring and development control have combine to create severely hazardous living environment for Spanish Town's inhabitants.

Future Concerns

Spanish Town is expected to consolidate its current position as an industrial center, improve on its emerging commercial vibrancy and expand its role as a residential dormitory to Kingston. Future concerns could be expressed as a set of needs, namely to:

- Manage the character of spatial growth in anticipation of the likely merging of Kingston, Spanish Town and Old Harbour into one large metropolitan area within the next 20 to 30 years. Such physical growth would absorb much of the sugar lands along the highway and would shape the future of environmentally sensitive resources to the south in a manner that could be largely negative.

- Limit existing and future risks to human health from industrial and domestic wastes in particular.

- Maintain fresh water supplies at affordable costs through improved management of water resources.

- Improve and maintain the water quality of the Rio Cobre in consideration of human health and possible recuperation of the resources of the wider Kingston Harbour.

B. URBANIZATION TRENDS AND IMPACTS

Consolidated Shift in National Population

Table 2. shows that the four urban areas studied mostly enjoyed an annual average growth rate of 6.6 percent. An important aspect of the growth of Jamaica's second level towns, over the past 20 years, as can be seen from the pattern in these areas, is the influence of internal migration.

As secondary centres of expanding economic activity these areas are attractive to increasing numbers of people seeking employment and an improved way of life. Review of major studies on population growth reveal that the trend is not limited to redistribution in rural parishes but a marked feature is the movement out of major metropolitan areas (5). Indeed there has been the most significant outflow of population from the Kingston and St Andrew Metropolitan Area to areas such as Spanish Town.

Table 2

Urban Growth

	Population ('000)			%
	1972	1982	1989	p/yr
Total Urban Jamaica	748.6	1041.6	1299.1	2.8
Montego Bay	43.5	70.3	95.0	3.9
May Pen	25.4	41.1	55.4	3.8
Mandeville	13.7	34.5	54.0	5.8
Spanish Town	?	89.1	105.0	?

Calculated from STATIN/Parish Council Estimates

Exploitation of Key Environmental Resources and Assets

The study reveals urban growth in Jamaica has resulted mainly from the ready availability of key environmental resources which can be exploited by major economic sectors as shown in Table 2. The intensive development of these natural and physical resources over recent years have created, especially in the past two decades, the conditions for rapid urbanization.

Table 3

Environmental Resources/Assets Contributing to Urbanization, Industrialization and Tourism

Resources/Assets	Mobay	May Pen	Mandeville	Spanish Town
Minerals & Other Extractive Resources				
Bauxite		*	*	
Limestone	*	*	*	
Sand	*	*		*
Fresh Water Resources				
Watershed	*	*	*	*
Aquifer	*	*	*	*
River	*	*		*
Coastal/Marine				
Recreational (water, beach, reef, anchorage)	*			
Harbour	*			
Forest/Wildlife	*	*	*	
Scenic Landscape	*		*	
Soils/Land	*	*	*	*

The presence of significant deposits of bauxite ore has been noted for its influence in the development of Mandeville. Montego Bay's dominance as a tourist resort is built on the island's coastal resources. The natural harbour of Montego Bay and the river passing through Spanish Town are both important assets for manufacturing, the former as a means of transport and the latter as a ready source for the disposal of industrial effluent.

In like manner, alluvial soils which are productive to agriculture have shaped development of May Pen, a town whose growth continues to be influenced by agriculture on its fringe. The good quality and capacity of the island's well dispersed watersheds have influenced and supported human settlement of urban centres.

Importance to National Economy

It has emerged from the study, that the second tier towns and city of Jamaica are now the focus of the country's economic development. Their development has been a natural accompaniment to the exploitation of economically valuable resources in their localities.

As a consequence, secondary urban centres have begun to play major roles in tourism, mining and manufacturing, and in the nation's economy as a whole. Major towns outside the Metropolitan area have become the country's income earners. They provide significant contribution to the national accounts through high foreign exchange earnings provided by these strong sectors of the economy.

Major Environment Impacts

Investigation undertaken shows that to a great degree, Jamaica's natural and physical resources as well as its human resources are being severely impacted by urbanization. What has emerged from the analysis of the sites-specific problems are commonalties which permit general but accurate statements on the major environmental effect of urbanization in Jamaica as a whole.

Reference is made to the five major categories of environmental problems presented in the CIDA prepared Environmental Strategy for Jamaica: watershed degradation; pollution; coastal and marine resource degradation; destruction of wildlife habitats; and deficiencies in urban infrastructure. Some conclusion can be drawn, from the following description of impacts, on how urbanization contributes to general environmental problems in the country.

Table 4

Environmental Resources/Assets Impacted by Urbanization, Industrialization and Tourism

Resources/Assets	Mobay	May Pen	Mandeville	Spanish Town
Fresh Water Resources				
Watershed	*			
Aquifer	*	*		*
River	*	*		*
Human Resources		*	*	*
Coastal/Marine				
Mangrove/wetland	*	*?		*
Beach	*			
Water quality	*	*		*
Reef	*			
Terrestrial				
Forest	*		*	
Wildlife	*		*	
Scenic Landscape	*		*	
Soils				
Productive Soils	*	*	*	*
Sand	*	*		*
Air Quality		*	*	*

Urbanization and Human Resources

Urban systems respond effectively to human economic needs but sometimes fall short in maintaining the social and environmental well-being of urban residents. The inadequacies in urban infrastructure cited by the Urban Institute and CIDA studies have as profound an effect, perhaps even greater, on human health as on the health of coastal resources.

The rural populations moving to urban Jamaica today multiplies the risk to their health from air and water pollution, unsanitary conditions and even stressful conditions related to crime. This is not true for all urban areas, but where it pertains it can have a profound and debilitating effect on the productivity of affected persons in the short and long term.

The social and environmental risks that such persons face in trying to improve their economic welfare are both integral to the stressful and unsanitary conditions of urban slums and squatter settlements. Persons, who for employment reasons, find it convenient to locate as close as available residential accommodation would allow to industrial plants, e.g, Spanish Town, also place their health in jeopardy.

There is perhaps no single environmental impact from urbanization in the rapidly growing urban places of Jamaica that requires more immediate and critical attention than the deteriorating health of urban residents.

Urbanization and Future Water Supply

Three of the areas studied developed within drainage basins, a fairly common characteristic of urban settlement in Jamaica. All, with the exception of Mandeville, depend to a large extent on the water resources of their respective basins to meet urban water needs. Despite the absence of conclusive studies, there is reason to be concerned about the quantity and quality of water from urban drainage basins that will be available for urban uses in the future, based on current development patterns and their impacts.

No doubt there will continue to be adequate rainfall in the basins, but as critical areas of the watersheds lose their natural cover to roads, homes and other structures, more of the earth's surface becomes waterproofed and less water finds its way into underground reservoirs, the main source of water for these areas. River flow is also reduced for the same reasons.

Notwithstanding the increase in overall water extraction in recent years, one can surmise even without detailed study, that less water is available from the drainage basins to meet the increased urban water demand. Dry wells and salt water intrusion in the fresh water lens are indicative of the problem. Sinking new wells only adds to the already high cost of water production, and in any case it is becoming more difficult to find productive well sites because some of the more suitable areas may be already under concrete.

The other major impact limiting the amount of water available for urban use is the contamination of ground and river water by organic and inorganic wastes from dumps, households, other urban and agricultural uses. Drinking contaminated water is unhealthy and even fatal and thus under the circumstances water purification costs have been increasing, although it may not always be passed on to the consumer.

Urbanization and Soils

Urbanization is affecting soils in one or more ways in the areas covered in this study, namely:

Erosion and sedimentation: Given the fairly widespread cutting and filling in urban watersheds for roads and homes, it is reasonable to assume that the rate of soil loss in urban areas may be comparable to cleared rural areas on a per unit basis. Thus the upper limit of 120 tons/yr for deforestation rates cited for Jamaica may be reasonable for the developed slopes of Montego Bay. Sedimentation resulting from erosion would be higher for urban areas because the waterproofing effects of urban development increases run off and hence greater soil movement down slope.

The mining of sand in sections of the Rio Cobre and Rio Minho is an indication that sedimentation is silting rivers and streams. Soil loss robs affected areas of their fertility as nutrients attached to top soil particles end up in the rivers or Montego Bay, where they are usually not wanted.

Consumption of Prime Agricultural Lands: Urban areas developed in alluvial plains, such as Spanish Town and May Pen, inevitably consume chunks of prime agricultural land. Since urban uses may fetch a better rate of return in the use of such lands than agriculture, the decision on how much of the remaining prime lands should be preserved must be balanced between economics and considerations for long-term food security.

At the moment, prime lands are gradually being removed from agriculture as rising real estate prices make the industry less competitive with urban uses. Unfortunately, it is happening without the benefit of a policy decision having been made on which lands should be preserved.

Surface Strip Mining: Bauxite mining in particular requires the removal of large portions of top soil. In the case of Mandeville, this represents a potential loss to agriculture. However, this must be viewed in the realm of economic trade-offs and a policy decision has long since been made in favour of bauxite mining, which is a major earner of foreign exchange.

Loss of Moisture. Pumping of ground water has lowered the water table beneath Spanish Town, May Pen and Montego Bay. In theory, less water rises to the top soil from the water table, thus the moisture available to agricultural plots in some areas could be reduced, depending of course on sub-surface characteristics. Relevant studies are needed to determine the extent to which this occurs. If moisture loss is significant, it means that future irrigation costs would increase to maintain the level of moisture needed by certain crops.

Urban Effects on Biodiversity in Terrestrial Areas

The remaining 17 percent of Jamaica's original forest and secondary forests contain a major part of the country's biological wealth. Much of this is stored in moist or rain forests, which although not directly threatened by the areas studied, may be by urban activities elsewhere. The threat is rather to the dry woodland and scrub forests of urban watersheds or hinterlands, which are being cleared in some areas for development or to meet food demands of urban populations.

The floral and faunal diversity of affected areas is not well documented, therefore the impacts on biodiversity are more a matter of conjecture than fact. Such documentation is so very vital to arrive at trade-offs between development and strict resource preservation, which developing countries such as Jamaica must realistically make.

Urbanization and its Effects on Coastal Resources

Studies of Kingston Harbour indicate the adverse effects that urban uses have on coastal water quality and marine life. It has been documented that wastes carried by the Rio

Cobre from Spanish Town is one of the sources of impacts creating eutrophic conditions in the wider Kingston Harbour. Thus an urban area need not be coastal to impact coastal resources. The Rio Minho on its passage through May Pen and its agricultural hinterland carries urban wastes (as we have seen) to the coast, but the amount of urban pollution reaching the coast is likely to be far less than the 22,000 lbs of BOD generated by Spanish Town.

In addition to the impacts of domestic, industrial and agricultural wastes, coastal resources are subject to large amounts of sediment from cleared and developed slopes. Sediment effects are perhaps only critical in respect of Montego Bay for the areas covered in this study. For the others, the coarser sediment would be expected to settle out long before they reached the coast.

Although qualitative descriptions of the impacts on coastal resources of Montego Bay have been made, the lack of systematically compiled baseline data over time precludes quantification of the extent to which urban wastes and sediments contribute to coastal resource degradation. Physical alteration has resulted in notable damage to mangroves and reefs, not surprisingly based on the physical and economic development strategies being pursued for the town.

Urbanization and the Physical and Natural Landscape

When reference is made to the beauty of Jamaica, the images that come to mind are the physical attributes comprising the landscape, e.g., mountains, cliffs and escarpments, plains, vegetation, rivers and waterfalls, wetlands, beaches and adjacent waters. The sceneries, vistas and pleasures these create, are the foundation of the tourism industry.

The built environment also has its attributes, thus no one doubts the charm of downtown Montego Bay and Mandeville, the attractiveness of villas notched into steep slopes, the uniqueness of historic Spanish Town or the open market of May Pen, as subjective as these judgments may be. The ideal situation is for man's intervention in the landscape to be done in such a way that a combination of the built and natural environment increases rather than reduces scenic values and pleasures in a general sense.

Montego Bay, with its outstanding scenic qualities, is growing so fast that a clear vision of a harmonious built and natural environment is yet to be conceived. In all areas, unique sceneries and physical attributes are being devalued by surface mining, clearing of forest vegetation, and by activities that impair the aesthetic qualities of

rivers, streams and bathing waters, as well as the physical fabric of the town centres themselves.

Some of this is unavoidable, but a lot is wrongly viewed as an inevitable consequence of development. More interest and caution could be applied to achieve a greater degree of landscape preservation. From this point of view the rehabilitation of bauxite mines outside of Mandeville is commendable. It is noticeable that downtown areas are expanding without the level of city planning that would ensure adequate street layouts, maintenance of public open space and other amenities, all of which enhance the built landscape and the quality of urban living.

C. PRIORITY ENVIRONMENTAL ISSUES

From assessment of the condition, problems and impacts in these four urban areas, three priority issues have emerged which needs to be addressed if Jamaica is to begin to better protect its economically valuable environment base from the degrading impacts of urbanization.

I. URBAN ENVIRONMENTAL PROTECTION SERVICES

It is recognised that the management of resources, as this affects their control and monitoring of exploitation, is essential if these resources are to maintain their innate capacity to produce benefits, and the urban implication of this is discussed below. However, it is the provision of environment protection services which can mitigate the impacts of urban (or other development) pressures that is critical to preventing their degradation. Where provided they can satisfy the servicing demand economic activities and the population needs they generate.

Jamaica is not providing the level of services which are required to protect the urban air, marine and coastal environment, underground water and health of the urban population from pollution and deterioration. The study found evidence that the institutional capacity to control public sanitation, provide for the collection, treatment and disposal of industrial and domestic refuse and sewage, to prevent them from polluting the environment has fallen seriously behind.

Institutional Responsibilities

The agencies involved at both the local and national level are wholly or partially within the portfolios of central

Ministries. There are five such agencies which share or over lap responsibilities with a number of statutory bodies:

Ministry of Local Government

- Parish Councils are bodies of elected representatives drawn from community leadership (who are supported by an administrative staff) to represent and advocate for their community and to provide services and facilities for a parish-wide constituency (10). They have administrative and operational responsibilities in a wide range of service areas.

- Parks and Market Organisations which have operational responsibility for public cleansing/garbage collection and maintenance of parks and gardens. They function on a regional base, and three of them operate in the four areas studied:

  Western Parks and Market (WPM) - Montego Bay
  Southern Parks and Market(SPM) - Mandeville
  Central Parks and Market (CPM) -(Spanish Town
  (May Pen

Ministry of Health

- Medical Officer of Health who heads a Health Inspectorate in each parish with an Environment Division of six departments, Public Health, Occupational Health, Waste Water Control, Mosquito Control, Water Quality Control and Veterinary control.

- Environmental Control Division (ECD), Ministry of Health which provides technical advice, monitoring and assessment, and programme back-up to the agencies on the ground in regard to water quality control, sewage, industrial wastewater, solid waste, air pollution and noise.

Ministry of Finance and Planning

- National Resources Conservation Division (NRCD), which will fall within a new National Resources Conservation Authority (NRCA), who are called upon in special cases of suspected pollution especially affecting coastal resources.

Other Statutory Authorities

- Operations-specific responsibilities are carried out by several national agencies where there have been involved in urban installations and development. These include:

  Sewage Treatment Plants
  Ministry of Housing
  National Water Commission
  Urban Development Corporation
  National Housing Trust

  Building and Land Use Control
  Town Planning Department

Priority Services Deficiencies

The low level of services provided by urban authorities results mainly from fragmentation, under-financing and poor planning of their institutional arrangements and responsibilities in the following priority services areas.

Solid Waste Management Responsibilities are split between the Parish Council and local Parks and Markets organisations. The Parish Council own the landfill sites and administers a contract with the organisation to collect and dispose of the area's waste. They in turn subcontract for equipment, employ site staff and are responsible for site supervision and maintenance. Budgets for both agencies are sourced from the same Ministry and are subject to constraints on generating income from the services provided.

Although planning and siting of the landfill sites is the responsibility of each Parish Council there seems to be little standardization of facility and operations. Table 5 shows that the size of sites bear little consistent relationship to the size population to be serviced. The site in Mandeville is provided with dedicated equipment while for all the other areas equipment is contracted for limited periods. Technical capacity and levels of staffing also vary across the areas.

Waste disposal operations in most areas lack technical direction, suitably trained staff and reliable equipment. Where operation capacity meets these requirement as we have seen in Mandeville, it is possible to mitigate problems and impacts of landfill sites on the environment. With an area of 6 acres serving a population of 53,000, this site is more efficiently operated than Montego Bay's which is nearly three times larger, and services a population only twice the size of Mandeville.

Table 5

Environment Protection Services Deficiencies

Deficient Services & Contributing Factors	Montego Bay	May Pen	Mandeville	Spanish Town
1. Solid Waste Management:				
Number of Sites	1	1	1	1
Area (Acres?)	15	8	6	20
Site staff	2-3	6?	4	2-3
Equipment on site	No	No	Yes	No
General Site Operation	P	P	G	F/Poor
2. Sewage Disposal:				
Central Plant	1	0	0	0
Discharge Quality	P(Often)	-	-	-
Independent Plants	6	10?	1	20
Plant Operation	P	P	G	F/P
Septic Tank Use	Yes	Yes	Yes	Yes
Cesspool Site	0	0	0	0
3. Public Cleansing: & Sanitation:				
Street Cleaning	F	P	F	F/P
Market Upkeep	P	F/G	-	P
Street Vending	F/P	P	F/G	P
Surface Drains	F/P	F	G	P
4. Air Quality:				
Factory Emissions	0	F	0	P
Waste Burning	P	P	0	P
Automobile Emission	F	P	F	P
Red Mud Drying	0	0	P	0
5. Land Use Control:				
Squatter Areas	13	4	?	10
Street Vending				
Commercial Centre	F/P	P	F/G	F/P

Legend: 0 None Existing P Poor F Fair G Good

It is apparent that within the existing institutional arrangement, competent technical and supervisor staff can make a difference to operation of an area's solid waste facilities. Mandeville is fortunate to have a Manager of its Southern Parks and Market who has a qualification in solid waste management. The provision of technically competent staff can also create conditions to establish practices and procedures for the better overall management of solid waste.

There is need, for example, to develop systems for separating and treating toxic waste which represent a hidden component of the impacts on the environment. Such improved operation will however need to draw on advice and guidance from ECD. In this and other critical technical area, needed direction and monitoring which ECD should provide is constrained, due to the low levels of staffing and equipment of a department which is based in Kingston but which has island wide responsibilities.

Sewage Disposal It is clear that central sewage systems in urban areas provide the best solution for collecting and treating large demand. Although sufficient work has been done on the advantages of central systems beyond the need for them, Government of Jamaica remains committed to providing central systems in urban centres, although cost are seen as almost prohibitive.

It is equally clear however that deficiencies in the operations of existing treatment plants as we have seen demonstrate that the problem of sewage disposal is broader than just the level of provision. Management and operation of treatment plants, whether central or communal, public or private is seriously deficient and pose the most serious threat to the environment.

In 1990 an ECD survey of 84 of the islands 109 treatment plants, found that due to poor management and operation practices nearly 40% were not meeting discharge limits set by the department. Some 37 of these are located in the four areas studied. Operational responsibility for the majority of these, lies variously with the Parish Council, National Water Commission, Ministry of Housing, Ministry of Health and National Housing Trust.

Design and construction standards used by these agencies in installing their systems are not standardised and the report found the diversity of application of technology is placing a great strain on the technical capacity of staff who manage and operate them. Delays in the replacement of parts which must be procured from a variety of sources is

an additional impact of employing diverse technologies. Plant break-down or reduced operation due to worn or defective parts are not effectively restored because of the long process of procuring new parts.

The widespread use of private Septic tanks is a solution which is inappropriate in most cases to the physiological characteristics of areas of rapid urbanization. Three of the four areas studied lie in permeable limestone substrate where soak-a-ways of septic tank increase nitrate content of ground water run-off. Opportunities for new or improved solution are presently limited and systems and facilities for more regular and efficient clearing and disposal need to be put in place.

Public Cleansing and Sanitation The provision of sanitary conveniences and public cleansing in urban centres, markets and central transportation centres is generally low. Where facilities have been provided they have fallen within the function of several central agencies, such as the Urban Development Corporation and Ministry of Works. Cleansing and maintenance usually falls to the parks and markets organisations, and the control and monitoring of their sanitary condition is the responsibility of the local Health Inspectorate.

As we have seen there a very few convenience in urban centres and many of those that are provided are in poor order. Facilities replacement and repair costs have mounted at a time of reducing budgets of the Local Government Ministry. The scope for recovering costs of providing for and maintaining these facilities in transportation areas and markets is relatively low, and ways to bridge the finance gap have not been found.

Ministry of Health information indicate that over 50 percent of all urban markets are totally insanitary. There are major stresses on the capacities of the local Health Inspectorate in all areas to monitor the situation and to also provide for the level of public education on safe health and hygiene practices to a dominantly rural population. The major difficulty faced by the department is attracting and keeping junior level staff who carry out the main monitoring functions.

1990 figures for the MOH department in Spanish Town for example showed that 30 percent less site inspections were conducted than in 1989. The expectation is that the inspection rate will be even less in 1991 as only 22 out of 46 post are currently filled, and the majority of these are senior staff who are needed to carry out the more technical duties such as water quality control and sewage plant monitoring.

Provision of Public Amenities The paucity of public and recreational space is a feature of urban centres in Jamaica. The island's agreeable climate and attractive setting of its towns and cities are not being capitalised for enjoyment of its urban populations. Open spaces are equally important from an environmental perspective as they offer opportunities for self-managed environment protection. By allowing areas of urban landscape to remain in natural cover they can protect urban watersheds and provide a defense against soil loss. As was noted above, the can also provide a air resuscitation service to combat the effects of vehicular and industrial pollution.

Although firm figures are unavailable, the evidence on the ground point to a very low level of budgeted expenditure for the provision and maintenance of public spaces. The unsatisfied need and desire for more 'greenery' in the urban areas are increasingly being responded to by the private sector. In May Pen and Montego Bay organisations such as the Chamber of Commerce and Rotary Club have developed programmes to landscape and maintain areas of their town and city. Major provision however still remain, in print, the responsibility of public agencies.

Land Use Control Responsibilities for land use control services are carried by both local and national agencies. Physical degradation of urban areas mostly result from under resourced local capacity to enforce standards, and a definition of those standards which excludes severely degrading development activities.

Parish Councils have approval responsibility for subdivision and new built developments over relatively large areas, but rely on a low level of technical staff to carry out these duties. Too often schemes are referred to the Town Planning Department (TPD) for approval because of lack of in-house capacity to deal with technically complex developments. On the other hand building expansion in the commercial centres and informal residential development on the urban fringes fall outside of both the local and national control net, and outside of the scope to ensure safe and sanitary developments.

Air Quality Control Inability to maintain strict air quality control has had the greatest impact on the health of urban populations as we have seen. The major responsibility in this area lies with local Health Inspectorate with support from the national ECD centre. Constrained by limited resources both ECD and their local counterparts have been unable to monitor the urban air

quality on a sufficiently regular basis to provide the data necessary for analysis and planning to mitigate deleterious effects on the environment.

More staff and equipment, for example, are needed to collect, collate and analyse regular reading of ambient air quality. At the local level, posts are difficult to fill and the limited staff and facilities of ECD are more often pressed into operation to deal with crisis situations such as the fall-out from the lead factory in Spanish Town, or the recent urban outbreak of typhoid. The Division's Head points out that such emergencies could well have been prevented if adequate facilities to carry out their regular monitoring work were in place.

II LAND USE CONTROL

The study concludes that a vacuum exits in urban land utilization and management which is to a large degree responsible for the environmental problems in urban areas. An acute weakness exists which relate to the manner in which economic and land/resource use policies are merged, how land uses are planned, phased and regulated, incentives provided for compliance with regulations, mechanisms for dealing with conflicting and inimical uses and the nature of inter-agency cooperative and consultative mechanisms to facilitate land management.

Some of these factors are discussed below.

Planning of Land Uses. The latest available land use maps for the urban areas, 1983/84, are provided in Figures 1 to 4. Land use patterns have not changed significantly since then. The boundaries used for mapping can be considered rather arbitrary, but nevertheless, the relative percentage land cover of urban to non-urban uses is discernable (Table 6).

Economic forces, in particular the land market, are most influential in the shaping of land use patterns and as a consequence attempts to zone uses are not very successful. This favours economic growth in the short and medium term, but in the long run environmental sustainability is first compromised, to be followed by a decline in economic vibrancy. The tourism sector is the most vulnerable in this respect.

Market forces cannot, and perhaps will never be able, to effectively value, for example, the input of a watershed to water production, so because regulations and incentives for their protection are not being consistently applied, watersheds are being used in ways detrimental to their economic functions.

Table 6

Summary of Land Cover (1983/84)

Land Cover Type	Percent Cover (%)			
	Mobay	May Pen	Mandeville	Spanish Town
Urban/Built up	31.6	44.7	29.5	57.6
Crops	15.3	17.6	15.0	13.5
Pasture/Grassland	13.0	21.1	44.2	12.0
Forest	37.4	16.0	9.0	16.4
Surface Mining	0.3	)	0.3	0.5
Other	2.4	0.6	2.0	)
	(100.0)	(100.0)	(100.0)	(100.0)
Total Land Cover ('000 hectares)	8.2	4.0	3.5	4.0

Source: Rural Physical Planning Division, Ministry of Agriculture

Development of towns and cities as we have seen is failing to conform to the qualitative standards well described in these planning documents. In their absence Jamaica's urban centres provide little social benefit for their population as they fail to capitalise ideal opportunities to enhance the quality of urban living.

Investigations indicate that public ownership of urban lands which could be used to enhance the urban environment, is often substantial (8). Public waterfront areas, central squares and lands on the urban fringes could be utilised, either on temporary or permanent basis for open spaces and recreational facilities. Sadly most are exposed to uncontrolled and debilitating uses, which themselves injure the environment. Public urban lands represent a planning mechanism which is greatly underutilised.

Deteriorating Economic Image Three of the urban centres focussed on for this study typify a deteriorating urban image which is serving to damage the economic prospects of the central areas of Jamaica's town and cities. There is limited investment in cinemas, restaurants, quality shops in most downtown areas.

In Montego Bay for example, with a tourism population of close to 100,000 per year, investment in the central business area to service this large market is markedly low. City merchants see the growing trend in the establishment of all-inclusive hotels in Montego Bay, as both cause and effect of the city centre's poor urban image.

Increasingly attention is being placed on development outside of the central districts, pushing commercial activity to the outskirts of urban centres and robbing them of the economic vitality which they need. Marked by prevailing unattractive and insecure environmental conditions, the economy of the central districts of Jamaica's towns and cities are dying, with it much of its historic and architectural assets.

Diminishing Social Return As rural populations drift into urban centres, they bring great expectation of a better life which increasingly they are unable to achieve. Poor housing, insanitary condition and increased health risks is the menu of diminishing benefits they reap from their effort to seek improved employment and business prospects. Social benefits for even more affluent urban inhabitants are limited, as few provision exist to encourage social interchange and co-participation outside of their homes.

biodiversity data, which is being developed under USAID and Nature Conservancy supported projects.

Conflicting and Inimical Uses. A look at the land cover maps (Figures 2-5) will tell that there is no real organized pattern to land uses in the urban areas. Uses occur often in pockets, rather than zones. No agricultural belt exists as in the classic sense. There is nothing wrong with the patchwork of uses except when conflicting uses interface, such as polluting industries and homes, that prove inimical to the health of human beings.

This is the case of Spanish Town, where no less than eleven industrial pockets have emerged, just about all interfacing with residential and/or commercial areas. The threat to residents of Spanish Town from some of the industrial plants has already been described. There is peculiar twist to this situation, in that residential development is reported to have edged closer to the factories over the years. A similar pattern emerged in relation to residential development next to a municipal landfill in Spanish Town, and close to one bauxite manufacturing plant in Mandeville.

This shows quite clearly the need for strict zoning and control of certain uses in urban areas. The concept of buffer zones, though not common to the land use lexicon of Jamaica can be a practical response to the need for land use conflict resolution. Urban green areas are known to significantly reduce particulate matter from the air.

III. QUALITY OF URBAN LIFE

The study underscores the general concern about the poor social and environmental conditions which are a marked feature of Jamaica's urban centres. Prospective outbreak of of diseases related to poor sanitation and pollution. Noise congestion, inadequate public amenities and recreational opportunities and poor aesthetic features in many cases and concludes that not enough policy and strategic focus is being given to the quality of life in urban areas.

Unfulfilled Planning Objectives Existing Development Plans and Order have consistently proposed that areas of the urban landscape be reserved to serve the public as public parks and playing fields, and that they should be within relatively close proximities to sections of the town or city. They especially point to the desirability of location close to the centre to allow for daytime utilization by workers and others in the commercial sections of the area.

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As a result most urban centres are robbed of the vitality which these activities could generated, and which could

serve to increase the level of security especially during the night time hours. A generally low sense of public safety keeps casual populations in the urban centres for sustained periods of time relatively low, with lesser greater social as well as commercial benefits.

Public/Private Sector Collaboration There is increasing scope for building on the growing public/private sector collaboration now underway in a number of urban areas to provide for social and civic developments and programmes. Service Clubs and Chambers of Commerce are engaged in improving public awareness through civic action projects. Projects include clean-up townscape fixtures, improve business premises and landscape urban streets and roadways. There are signs that these collaborative efforts are gaining acceptability. The Central Parks and Market Manager for May Pen has been able to solicit local business support the organisation's efforts to clean up and maintain the town' market and its environs.

These local initiatives are being recognised for the scope they can provide in easing the constraints which urban authorities face. It has also been noted that they have value even if public sectors were in a stronger position. Public/private collaboration is much more likely to gain much needed public acceptance and responsibility in communities where local involvement is an integral part of plans to improve their conditions.

IV. ENVIRONMENT DEFICIENT ECONOMIC POLICIES

Economic Objectives So far the Government of Jamaica has not formalised a set of development objectives which could safeguard its environment. Economic policies and strategies geared to national economic imperatives have fuelled intense exploitation of the country's resources. The absence of a firm commitment to their protection is in strong contrast to the Government's explicit economic development policy which relies so heavily on them.

The major economic imperatives to generate foreign exchange earnings, are not balanced with the imperative to protect the potential to realise these earnings. The resulting development process has ignored the costs of environment protection and the need to provide for them from expected economic returns.

Imbalanced Expenditure o National Imperatives Government spending is geared to support and promote the national earnings from the major economic sectors. In 1989 the Jamaica Tourist Board was allocated a budget of J$200 M to promote Jamaica as a tourism destination. The provision to

underwrite the services to manage the environments in which tourism operates, received lower priority. A total J$165 M was allocated to meet Parish Councils costs of servicing 14 areas across the island, including the four major coastal tourism locations.

Budget allocation to local Parish Councils has not been consistent with the important role they need to play in protecting the economic base of the country. National planning is failing to recognise the critical role of these essentially urban authorities. Over the past decade as economic sectors have fuelled urban growth, there has been a massive erosion in the operations capacity of Parish Councils, and their ability to offer even the barest services to meet the increasing demand.

These authorities are also handicapped in their ability generate other funds. Although the Parish Council in the areas studied own sizeable stocks of properties, their ability to utilize these assets to overcome budgetary constraint are restricted. They are allowed to raise no more that 10 percent of their budget in additional income.

Segregated Institutional Arrangements Responsibilities for the economy and environment are segregated, discrete and largely dominated by economic agencies such as Planning Institute of Jamaica. Cross-agency consultations on economic, physical and environmental concerns which could inform an integrative approach to economic policy and programmes do not currently occurs.

Where such major environmental effects as we have seen are involved, economic planning should play a role in deciding the appropriate investment in policies and programmes to protect the environment base for economic development. Insufficient priority is given to the local environment impact. The needs of agencies who manage the resources, such as the Underground Water Authority, has tc be integrated into economic analysis, as future benefits depend directly on the well being of these resources.

C. RECOMMENDATIONS : SUGGESTED PROGRAMME

LAND MANAGEMENT

1. Establish and Urban Land Use Data Base

The TPD could coordinate, or at least assist, the networking of manual and mechanical data bases to enhance the quality of information available for environmentally sound land use planning and development control, giving priority to rapidly growing urban areas.

Rationale: This recommendation reinforces those of The Urban Institute in its study, Town Planning and Development in Jamaica:An Agenda for Reform, in which it calls for the rebuilding of TPD's research capability, including the upgrading of data assembly techniques. Further, many of the urban environmental impacts are due to incompatible land uses, often misguided by inadequate resource data.

2. The TPD and the technical arm of the NRCA, when the later is created, should consider decentralizing of appropriate functions to facilitate efficiency and promptness in development control at the parish level.

The study concludes also, that less complicated development applications should be processed without referrals if the data available to the reviewing agencies were readily accessible to the TPD. This would reduce the average time for processing applications, which in turn would reduce circumvention of the approval process.

Rationale: We think that a situation in which TPD or NRCA technical staff must routinely travel in excess of three hours by land, or less by plane, to check on development applications, is very costly in the long run. It is recognized that decentralization would also carry a price tag and difficulties in recruiting suitable staff. Nonetheless, when price considerations are balanced with the need for a development control services that are more responsive to public needs, creating the administrative and technical capacity to process "prescribed applications at the local parish level would be well worth the investment.

3. Prepare an Environmentally Sound Physical Development Strategy as a policy instrument to shape future land uses in Greater Montego Bay.

The strategy should parallel and complement the unique joint public/private sector effort of the Greater Montego Bay Development Company Ltd (GMBDC) in the preparation of a Development Plan for the city. As a basis for preparing the strategy, a series of resources assessment studies would be needed.

Rationale: It is assumed that the GMBDC's effort will be strong on economic, demographic and infrastructure analysis, but is likely to be weak in resource analysis and management needs. The strategy would therefore highlight resource potential and constraints to economic growth and set the stage for sustaining both the economy and the environment.

It would also provide guidelines for landscape preservation and enhancement, shoreline protection and watershed management, in the coastal zone stretching east from inner Montego Bay. If this approach in planning for the joint economic and environmental sustainability works for Montego Bay, it could then be used in other urban areas.

ENVIRONMENTAL PROTECTION SERVICES

4. Prepare a Programme to Implement the Recommendations of Existing Studies and Survey on Solid Waste Management in Jamaica.

Rationale: The Jamaica Country Environmental Profile is 1987 recommended that such a programme should be established, and investigation show that the need for its remains critical. The programme would map out the most effective way to carry out the recommendation and is intended to provide information to assess the suitability of present landfill sites. The end result should be development of a methodology to identify and determine the best sites for such use; alternative disposal methods to substitute for incineration on the sites

5. Build an Operations Monitoring Model to control the operation of all centralised sewage treatment facilities.

Rationale: Development of the model would be based on the partial survey already completed by ECD of the 109 such facilities on the island. The intention is to be able to rationalise the operations and establish a checklist type guideline for the proper management and control of existing sewage disposal sites. The model would identify the number of staff and technical competence needed to maintain efficient operations.

The executing agency for recommendations 4 and 5 should be the Environmental Control Division (ECD) of the Ministry of Health.

6. Establish an Urban Development Policy Framework which would establish the Parish Councils as Urban Mangers within their parish.

Rationale: Parish Councils have a key role to play in urban environment management and protection. This recommendation should build on the Trevor Hamilton Report on Parish Councils in Jamaica which contains a number of suggestions for strengthening their capacity to effectively carry out their urban functions.

The Parish Councils have existing institutional structures with a measure of local accountability, and as this study found, have begun to attract energetic and creative leaders and managers. Although they have no track record of efficiency in local management, the trend is changing and they may now be better viewed as underutilized resources which need to strengthened and developed to become an effective force in ensuring that greater benefits of economic development policies return to their areas.

The Hamilton study found that they would most benefit from an ability to raise local revenue which could be integrated as a mechanism into a policy for providing local earnings from economic activity. Local income could well be supplemented by a form of grant from central Government to support work in special areas or for special projects.

IMPROVEMENT OF QUALITY OF URBAN LIFE

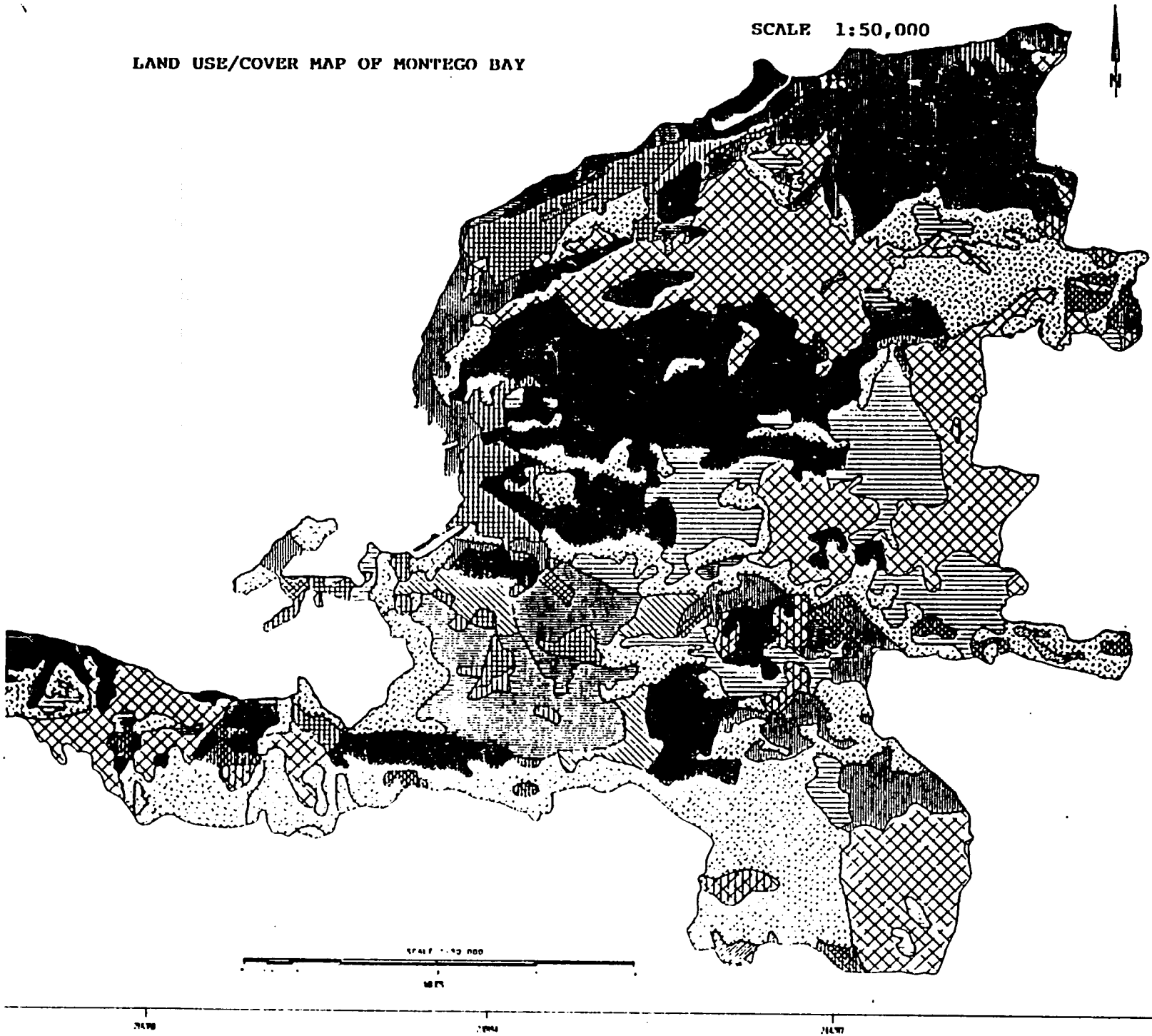
7. Develop a Comprehensive Health Strategy for Spanish Town.

Rationale. The model would be based on the chronic problems now facing the town and serve to establish an on going health programme for all largescale urban centres. The model would study of the effects of air and water pollution on the health or Spanish Town residents is recommended. This would involve a combination pollution assessment and monitoring and research into epidemiological records to ascertain links between pollution and unsanitary conditions and the occurrence of certain diseases.

The model would include the development of a Public Health Campaign for the town to address the critical need to increase public awareness of the importance of good hygiene and sanitation. As a study it would also serve to either confirm or disclaim suspicions of severe health impacts from industrial wastes, and in either case help to shape urban health policies.

LAND USE/COVER MAP OF MONTEGO BAY

SCALE 1:50,000

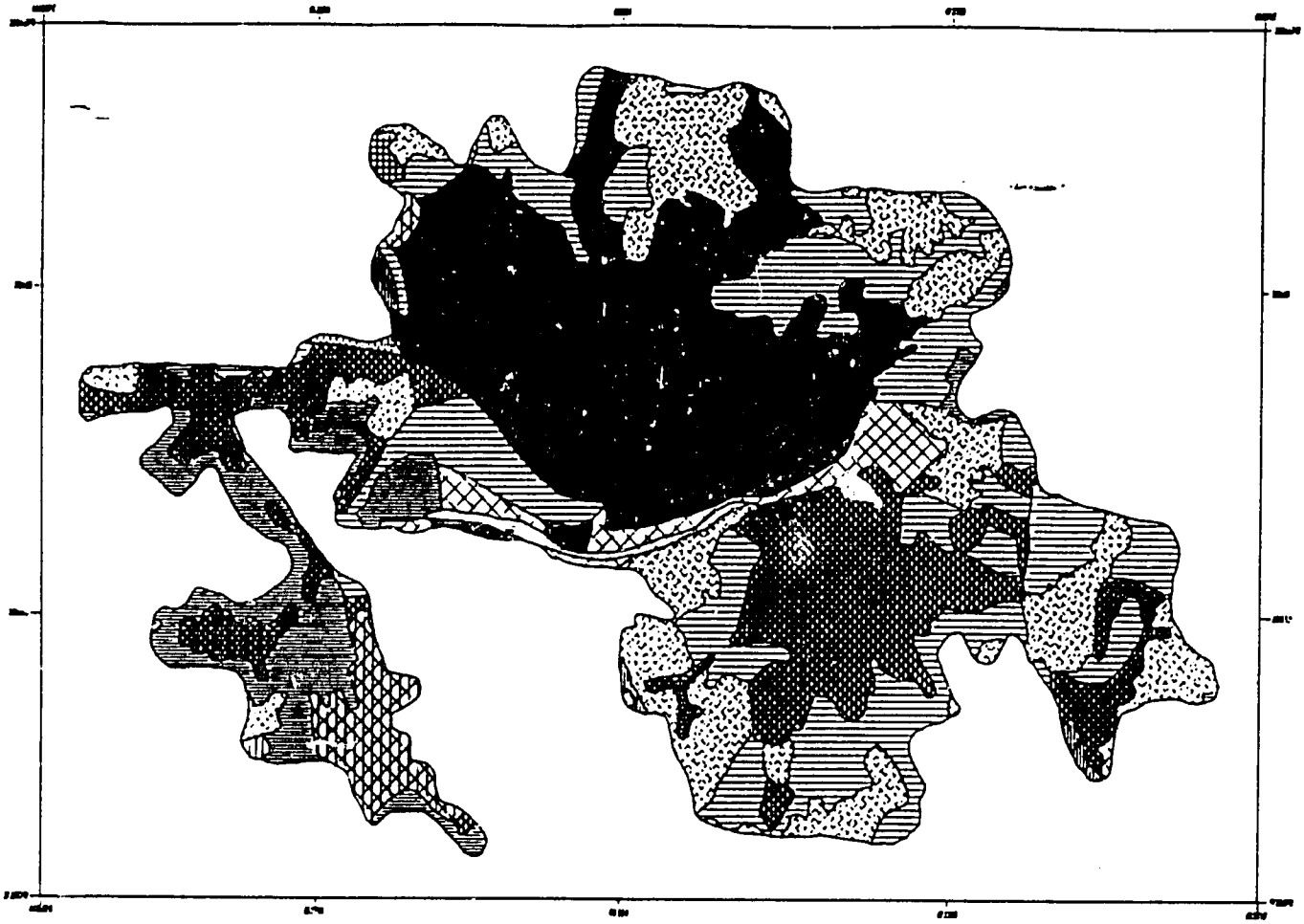


LEGEND

- URBAN RESIDENTIAL
- RURAL RESIDENTIAL
- INDUSTRIAL
- RESORT DEVELOPMENT
- OTHER URBAN
- SUGAR CANE FIELDS
- SUGAR CANE FIELDS CURRENTLY NOT IN P
- ABANDONED SUGAR CANE FIELDS
- BANANAS
- MIXED BANANAS AND COCONUTS
- COCONUTS
- FOOD FOREST
- INTENSIVE MIXED AGRICULTURE
- EXTENSIVE MIXED AGRICULTURE
- IMPROVED PASTURE
- UNIMPROVED PASTURE
- GRASS LANDS ON STEEP SLOPES
- GRASS LANDS ON LESS STEEP SLOPES
- COMIFEROUS FOREST
- DECIDUOUS FOREST - COMMERCIAL
- DECIDUOUS FOREST - NON-COMMERCIAL
- BRUSH
- LAKES
- RIVERS
- WETLANDS COASTAL
- LAGOON
- SURFACE STRIP MINING/LIMESTONE
- OTHER SURFACE MINING
- BARE SAND AND ROCK
- MISCODED OR NOT DOCUMENTED

FIGURE 2

LAND USE/COVER MAP OF MAY PEN SCALE 1:50,000



LEGEND

- URBAN RESIDENTIAL
- RURAL RESIDENTIAL
- INDUSTRIAL
- SUGAR CANE FIELDS
- SUGAR CANE FIELDS CURRENTLY NOT IN PROD
- COCONUTS
- TOBACCO
- TOBACCO FIELDS CURRENTLY NOT IN PROD
- INTENSIVE MIXED AGRICULTURE
- EXTENSIVE MIXED AGRICULTURE
- IMPROVED PASTURE
- UNIMPROVED PASTURE
- DECIDUOUS FOREST - NON-COMMERCIAL
- BRUSH
- FLOODPLAIN

FIGURE 3

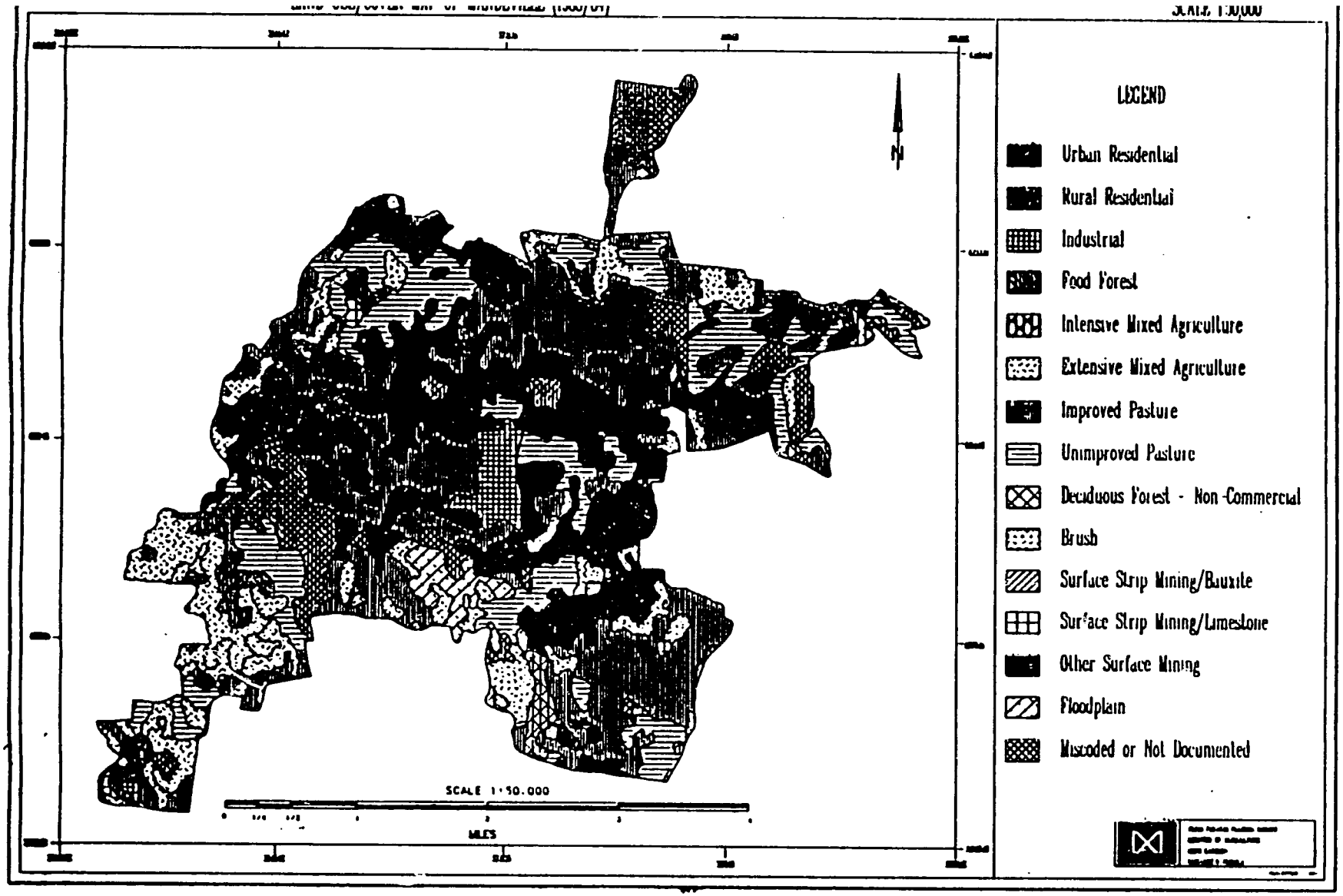
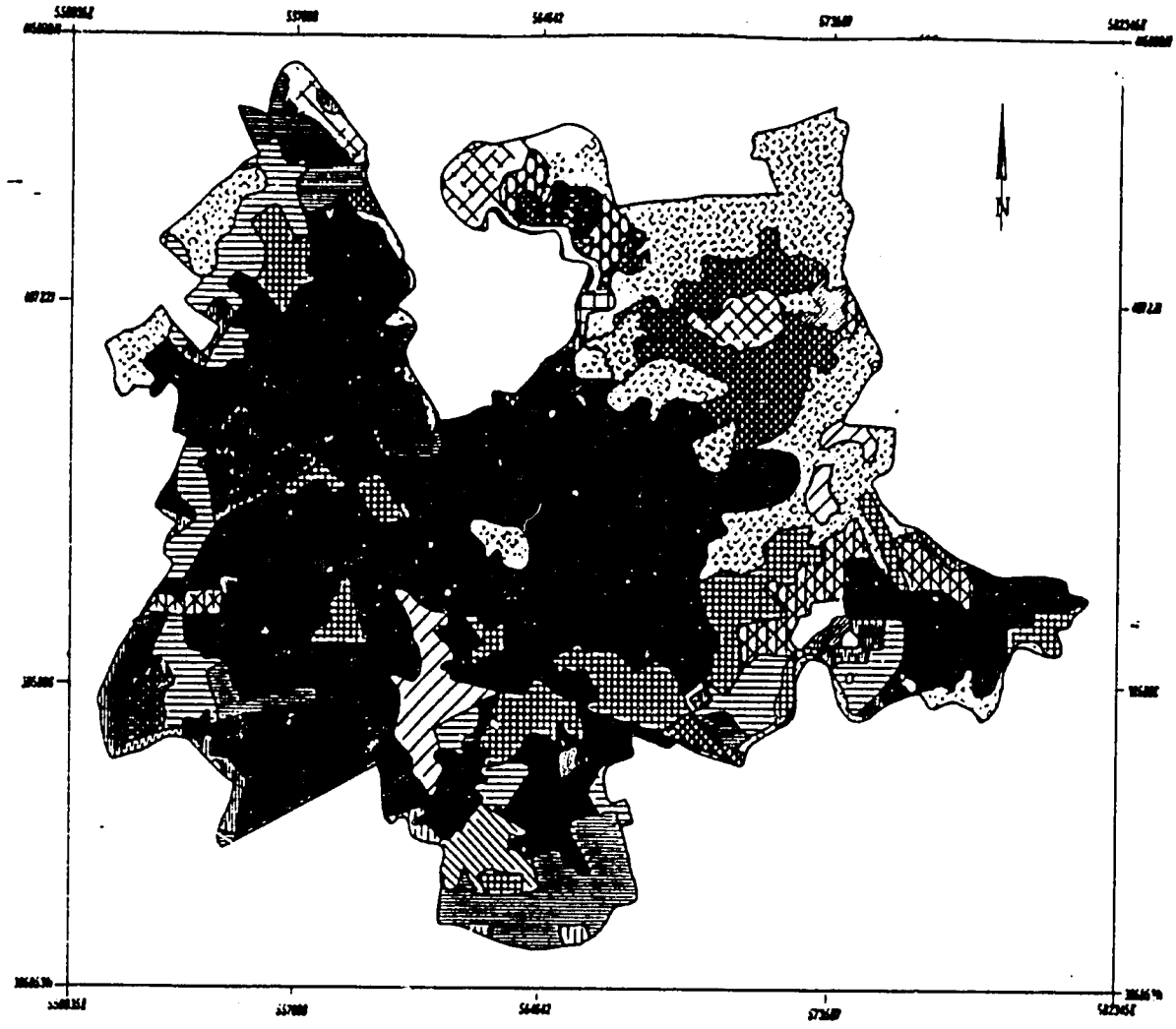

LEGEND
Urban Residential
Rural Residential
Industrial
Food Forest
Intensive Mixed Agriculture
Extensive Mixed Agriculture
Improved Pasture
Unimproved Pasture
Deciduous Forest - Non-Commercial
Brush
Surface Strip Mining/Bauxite
Surface Strip Mining/Limestone
Other Surface Mining
Floodplain
Miscoded or Not Documented
N
SCALE 1:50,000
MILES

FIGURE 4

LAND USE/COVER MAP OF SPANISH TOWN (1983/84) SCALE 1:50,000



LEGEND

- URBAN RESIDENTIAL
- RURAL RESIDENTIAL
- INDUSTRIAL
- OTHER URBAN
- SUGAR CANE FIELDS
- SUGAR CANE FIELDS CURRENTLY NOT IN PROD
- ABANDONED SUGAR CANE FIELDS
- FOOD FOREST
- ORCHARDS
- INTENSIVE MIXED AGRICULTURE
- VEGETABLE PRODUCTION
- EXTENSIVE MIXED AGRICULTURE
- FISH FARMING
- IMPROVED PASTURE
- UNIMPROVED PASTURE
- GRASS LANDS ON STEEP SLOPES
- GRASS LANDS ON LESS STEEP SLOPES
- DECIDUOUS FOREST - NON-COMMERCIAL
- BRUSH
- LAKES
- RIVERS
- SURFACE STRIP MINING/LIMESTONE
- OTHER SURFACE MINING

SCALE 1:50 000

MILES

FIGURE 5