



Executive Summary

1.0 Introduction

The Northern Range covers approximately twenty-five per cent of the landmass of the island of Trinidad. As an ecosystem it is very significant to the environmental, economic, and sociocultural life of the island, and the country of Trinidad and Tobago, because of the range of services—the benefits that the society enjoys—from its various functions and resources. Some of these services are visible and tangible, and are directly and consciously used or consumed by citizens. Others are invisible and intangible, and they contribute in indirect ways to meeting environmental and human needs, and thus to overall well-being of the society. (See page 11 of this Report for a diagram of the constituents of human well-being used in this assessment.)

The Northern Range meets needs of the society in a variety of ways:

- It provides space for housing and agriculture;
- It contains forests which cleanse the air, contribute to water retention and mitigate flooding, provide habitat for birds and animals, yield timber and non-timber materials;
- It is the major source of the freshwater resources for the island;
- Its coastal resources allow safe harbour, artisanal fishing, tourism enterprises, coastal protection;
- It is biologically diverse as it bridges Continental and Antillean systems;
- It is high in amenity value from land and marine resources, which underpins economic, cultural, and educational activities.

In this assessment, these benefits are categorized and described as provisioning, regulating, supporting, and cultural services of the ecosystem.

This is a very complex ecosystem, especially given the range of influences on its natural functioning as a result of the variety of human uses, and abuses, to which it is subject. Many factors—the driving forces—interplay to affect the resources and integrity of the functioning of this ecosystem. They include economic, demographic, institutional, natural, behavioural, technological, policy, and regulatory influences. Understanding its natural complexity, analysis of the driving forces which impact on the ecosystem as a whole and its individual functions, and evaluation of effectiveness of policies and management that are directly or indirectly relevant, are essential for sustaining the services of the Northern Range and consequently the well-being of the society. (See page 10 of this Report for a diagram of the conceptual framework for the assessment.)

This assessment seeks to catalyse such an effort towards better understanding and management. Its objective is to enhance understanding, analysis, and evaluation and thereby contribute to the process of public policy formulation, and to appropriate management for sustaining the Northern Range and the variety of services it provides.

In doing so the assessment has undertaken no new research. It has drawn on published scientific literature, supplemented by professional judgement and community perspectives. It seeks to

explore and illustrate links between the Northern Range and human well-being. Data required for such analysis are patchy in relation to certain resources or services or ecosystem/human well-being relationships, scant in relation to some, and non-existent in relation to others. Nevertheless, it is felt that the composite body of scientific knowledge, professional judgement, and community perspectives assembled in this assessment reveals condition and trends which justify a special and urgent effort, so that the integrity of this ecosystem is not further compromised and the well-being of the society that derives from its resources and functions is assured into the future.

The assessment defines the Northern Range as bounded on the north by the coastal strip, on the south by the Eastern Main Road, and including the city of Port-of-Spain and the western offshore islands.

The assessment is organized on the basis of three components, each a subsystem of the Northern Range: forest, freshwater, and coastal resources. These components interrelate and affect one another and the ecosystem as a whole. Biological diversity is inherent to each of the three subsystems and land use affects them all, adding to the complexity of the ecosystem and its subsystems. Biodiversity and land use are thus presented as cross-cutting themes. Each subsystem, while offering its own amenity value, contributes to the total amenity value of the ecosystem as a whole. This dimension thus overlays the entire assessment. Consequences of these findings about condition and trends in the Northern Range for well-being of the society are explored in the Report.

Responses—policies, legislation, regulations, programmes, and management—are expected to be sensitive to these dynamics. The assessment provides a broad sweep of the responses to date that have been specifically or indirectly related to the Northern Range, and offers a set of further response options for consideration.

2.0 Summary of Findings on Condition and Trends

2.1 Overview

1. It is evident that the Northern Range is being affected by a range of driving forces:
 - a. Demographic: urbanization and pressure for housing space.
 - b. Economic: search by some groups for livelihoods and housing space; increasing incomes by others and therefore demand for superior housing sites, facilitated by technology and mobility.
 - c. Land use: permitted land use inconsistent with land capability studies and characteristics; unauthorized housing and agriculture; slash-and-burn method of land clearing.
 - d. Institutional: lack of rules or lack of their rigorous application in planning and authorization of activities.
 - e. Cultural: increased demand for recreational opportunity; misuse of environment; lack of understanding, care and sensitivity by users.
 - f. Environmental: increasing variability in weather patterns.
 - g. Public policy: lack of holistic planning; absence of co-ordination; ineffective management; no monitoring or accountability for impacts.
2. It is evident that the western section has been seriously degraded and that this pattern continues; that the eastern section is not as disturbed but that pressures are increasing; that freshwater sources are being depleted and waterways contaminated; that soil loss and flooding are exacerbated by forest clearance for housing, agriculture, and timber; and that



- downstream impacts of this pattern of use and misuse are widespread, increasing in frequency and intensity, and generating high costs for compensation and correction.
3. Though it may be less evident from empirical evidence and scientific studies, it is highly probable that the above driving forces and patterns of use and misuse would lead to reduction of biodiversity through loss of species and change in habitats, and eventually to reduction in the invisible but essential supporting services the Northern Range provides.
 4. The impacts and implications for the well-being of the society—of economic, cultural, health, security, and recreational significance—are definite and perceptible even if not measurable or quantifiable on the basis of existing data.
 5. Given its geology, the Northern Range is very vulnerable from land use that is inappropriate to contour and slope characteristics.
 6. It is foreseeable that conversion, degradation, and decline in its services will continue unless appropriate policies and management approaches and measures are applied.
 7. There is a low level of popular understanding of the relationships between ecosystems and human well-being. Intensive public education is required if the society as a whole is to take responsibility for sustaining the Northern Range and the human well-being to which it contributes.

2.2 Forest Component

1. There is very little, up-to-date, organized, reliable data on the extent of forest cover in the Northern Range and it is not possible to give a precise account of the current extent of forest cover. **However, it is evident that forests have declined in extent and quality of cover, especially in the western section, and the eastern section is now under threat from use of land space for housing and agriculture.** Unauthorized agriculture is increasing in the eastern section. Past and continuing land use for housing, including high-income housing, is the dominant cause of conversion of the southern slopes in the western section. Although regulations prohibit building on gradients greater than 1 in 6, these are not enforced.
2. **Forests are being increasingly used for recreational and educational purposes.** The Northern Range is important as a recreational and tourist site (Table 11 of this Report), and the number of visitors to some of its sites exceeds the total for all sites in other parts of Trinidad.
3. Forest cover is closely associated with watershed management and surface-water quality and quantity. **Loss of forest cover is associated with exacerbated soil erosion and flooding.**
4. Forest fires are also a source of forest degradation. **Over the last fifteen years, there has been no steady increase in the extent of land in Trinidad affected by fire (Fig 27), but the Forestry Division has noted increasing threat to primary forests within the valleys of the Range by fires due to inappropriate agricultural practices.** The highest proportion of forest fires occurs in the Northwest Conservancy in the areas that are most heavily settled (Annex 5).
5. **One of the factors that contributes to the degradation of forest resources is the lack of capacity to monitor activities and enforce legislation even where it exists.** One response to this has been the establishment of a system of honorary game wardens by the Wildlife Section of the Forestry Division, which enlists the help of volunteers to monitor illegal hunting of wildlife in Trinidad's forests. However, this system has not achieved its main objective mainly because of threats to personal safety.
6. The geology of the Northern Range makes it prone to land slippage, with consequent soil loss. **This underscores the importance of the forest cover of the Northern Range, as**



- natural forests seem to be most effective in helping to control downstream effects such as flooding and sedimentation (Table 10).
7. The economic returns from timber and wildlife harvesting from the Northern Range are not high (Table 8). **The value of its regulating, supporting, and cultural services, as well as its amenity value and the potential for economic activities based on such amenity value, could be considerably higher.**
 8. Appropriate planning will be required to ensure that the forests of the eastern section of the Northern Range, together with the biodiversity and freshwater resources which it encompasses, remain intact so that all its services can be sustained. **Zoning of the eastern section of the Northern Range for conservation purposes and appropriate but prescribed activities, and strict enforcement thereof, would be the single most effective intervention that can be made.** This would provide the planning framework for numerous other responses that are required in relation to other ecosystem services.

2.3 Freshwater Component

1. **The watershed areas of the Northern Range are the most significant contributor to fresh water supply for the island of Trinidad.** Of the surface freshwater sources exploited in Trinidad and Tobago, 80% comes from the Northern Range (WRA 2002). On the south-facing slopes, several major tributaries contribute to the Caroni River above the intake of the Caroni-Arena Water Treatment Plant, which is estimated to supply about fifty-one percent of Trinidad's potable water. The eastern section of the Range contributes more than the western section. **There is evidence to suggest that rivers flowing from primary forests release twice as much water halfway through the dry season, and between three and five times as much at the end of the dry season as do rivers flowing from cultivated land.**
2. Impacts on quality of freshwater resources can be a result of activities at the watershed level (e.g., land-use change) or in-stream activities (e.g., channelisation, pollution). **The Northern Range watersheds are becoming more degraded due to deforestation for agriculture on steep slopes, housing and associated infrastructure, road construction, squatting, quarrying, and forest fires.** The area of forest cover has declined (even with reforestation through the Northern Range Reforestation Project) resulting in disruption to hydrological processes and negative impacts on health of the aquatic ecosystems. Watersheds are being affected by a decrease in water retention through loss of forest cover, and water courses are being affected by pollution from human use and sedimentation from soil erosion.
3. **For Trinidad, supply of freshwater currently exceeds demand, but this is projected to be more closely balanced by the year 2025, especially during the dry season (Tables 13 and 14). The recent discovery of deep bedrock megawatersheds in the islands of Trinidad and Tobago is significant for meeting the country's demand for freshwater in the future.** The country's long experience in petroleum drilling could make it well placed to exploit these deep ground-water resources. It should be noted, however, that such deep ground-water is not a renewable resource (except over an extremely long period). So it would be necessary to protect and conserve both surface-water sources and deep-water resources. While appropriate watershed management could protect and conserve surface and aquifer water, deep ground-water resources are not rechargeable through surface watershed management. If accessed, this body of water will need to be harvested conservatively to prolong its availability.

- **An indicator of the high economic value of surface and aquifer freshwater provided by the Northern Range may be provided by a rough estimate of the cost of substituting this water with desalinated water:** it is estimated that 80% of the surface water sources in Trinidad and Tobago exploited by WASA comes from the Northern Range. It is also estimated that WASA currently spends about TT \$13.4 million per month to buy 10% of its water supply from a local desalination plant. If WASA had to substitute the surface water supplied by the Northern Range with desalinated water at this price, it would cost in the order of TT \$107 million per month (or TT \$1,286 million per year).
- 4. **It is speculated that about fifty to sixty per cent of the island's water supply is lost after harvesting and treatment because of old and faulty distribution infrastructure.** Much saving of water and cost could be realized through investment in renewing water-delivery infrastructure.
- 5. Though not as important to well-being as the provision of freshwater for domestic, agricultural, and industrial activities, the freshwater resources of the Northern Range also provide fish for food. **There is a declining trend in freshwater fish catch for the country as a whole. Since most of the rivers are located in the Northern Range, the same conclusion might be made for freshwater fish catch from the Northern Range.**

2.4 Coastal Component

1. **The Northern Range includes a range of coastal habitat types—wetlands, beaches, seagrasses, algal communities, and coral reefs.** While their significance for ecological functions and amenity value are known, there is very little information on the condition and trends in the services derived.
2. **However, it is evident that coastal resources are under threat from land-based and coastal activities, including intensive use for recreational purposes. Major causes of disturbance are coastal development, land-based activities which contribute to pollution and eutrophication, over-exploitation of coastal resources, and natural disasters.** There is evidence of increased levels of pollution in some coastal areas after intensive use for recreation. Studies indicate that the purification capacity of coastal waters is often exceeded in popular recreational waters. The western section of the North Coast is noted as one of the most fished areas in Trinidad. Soil erosion combined with flooding lead to sedimentation of coastal waters with negative consequences for uses of the coastal strip and functioning of coastal wetland resources.
3. **Coastal resources are being heavily used and coastal waters contaminated from a variety of practices.** High and growing demand for the use of the coastal resources for recreation, tourism enterprises, fisheries, anchorage and sea transportation, and conflicts among these activities for use of limited resources, have implications for sustainable management. **The trade-offs among these are not being actively examined and managed.**
4. **The protected Chaguaramas Bay in the north-west peninsula of Trinidad provides safe anchorage for boats and yachts, especially during the hurricane season. This has spawned intensive use of this section of coastal waters.** The most recent example of this is the movement of yachts within the Caribbean to the Chaguaramas peninsula during Hurricane Ivan in September 2004. The activities spawned by this safe anchorage service generate jobs and income, but also contribute to pollution of these coastal waters.
5. Comprehensive data on fisheries are not available, although it is reported that for the Caribbean Sea as a whole, **catch per unit of effort is declining and fishing is lower down the food web. The same trend can be extrapolated for Trinidad and Tobago.**

2.5 Biodiversity

1. Given the origins of the island of Trinidad, it represents a dividing line (an ecotone) between Antillean and Continental species, and makes the island rich in species diversity. **Many of the species recorded for the islands of Trinidad and Tobago are found in the Northern Range (Table 5). This gives the Northern Range a very special character in terms of biological diversity.**
2. A deep understanding of the species diversity of the Northern Range—its links with human well-being; detailed knowledge about the condition and trends in the abundance, diversity, and distribution of species; and how these are affected by driving forces—is constrained by data and information paucity. Several species have not been reflected in the current assessment for this reason. **Lack of scientific information results in not knowing how critical the role of any species is within the ecosystem and therefore the precise ways in which they contribute to ecosystem services.** We can only speculate, based on general scientific principles, about the ecological value of species found in the Northern Range.
3. **A few species are endemic to the Northern Range because of the special climatic and edaphic conditions which exist especially at higher altitude**, e.g., the golden tree frog (*Phyllodytes auratus*) and the luminous lizard (*Proctoporus shrevei*). Several plant species currently considered to be endemic are noted.
4. **Species diversity is linked to genetic diversity, but very little information exists about the genetic diversity of Northern Range species, except for cocoa**, which has been cultivated in the Northern Range and elsewhere in Trinidad as a commercial crop.
5. **Several species have demonstrated economic value (Table 4).** For example, the lappe, agouti, and deer are prized hunting game species. Species like the Pawi and marine turtles generate revenue through eco-tourism activities. **The amenity value of species diversity, especially birds, is high but the economic potential of this is not significantly realized.** Some species, like the howler monkey (*Alouatta seniculus*), which is known to be a carrier of the Yellow Fever virus, have also been identified as potential species for medical research. Species which are not known to be or are not currently of economic value, and for which information does not currently exist, may be potentially important for medical research and for maintaining integrity of the ecosystem, as well as for their use for recreational and educational purposes.
6. **The main threats to the biodiversity of the Northern Range are habitat destruction (including fragmentation) resulting from forest fires, logging, clearing for housing and agriculture, and over-exploitation of wildlife species. Ineffective or lack of enforcement of existing regulations allows unmanaged harvesting of wildlife species to occur.** Information about the pattern and frequency of such threats indicate negative consequences for distribution and abundance of species in the Northern Range, especially for specialist species like the Pawi, oilbirds, golden tree frog, and other forest interior species like the ocelot and lappe. The species most under threat include the Pawi (which has been recommended to be formally designated as an Environmentally Sensitive Species), the ocelot and the river otter.

2.6 Land use

1. The northern slopes of the Northern Range are generally not under intense pressure for human settlement mainly because of their inaccessibility, given the rugged terrain and the sea cliffs along the North Coast. Early settlements have concentrated mainly along the foothills of the southern slopes and the accessible valley areas. **Recently, however, there**

has been movement up the slope in a number of the valleys. This is usually done in non conformity with land capability and proper land-use management.

2. Slopes of the Northern Range are very attractive for high-income homes. This pattern of land conversion for housing is facilitated by the current wealth of the country and by modern architecture, engineering, and means of mobility. **The Northern Range is thus affected by authorized high-income housing as much as by unauthorized low-income settlements.**
3. **The lower reaches of fertile valleys in the western section are now converted from agriculture into housing.** The exception is Tucker Valley in Chaguaramas which is State owned and used as a farm for producing seed for various crops. At the same time, unauthorized agriculture on the upper slopes of these valleys is quite common, though in small pockets. A pattern of small-scale, unauthorized and inappropriate agricultural crops and practices is now observed in the valleys and slopes of the eastern section of the Northern Range, including within Forest Reserves.
4. **No timber is now officially harvested from natural forests in Forest Reserves because over-exploitation in the past has resulted in depleted reserves.** However, in recent years there has been a trend of old family-owned estates being sold and their commercial timber being removed.
5. **The Northern Range is the main source in the country of deposits of blue limestone and other non-hydrocarbon construction materials. Lack of implementation of the Mining and Minerals Act, 2000 allows quarrying to proceed in an unregulated manner, with many negative impacts and nuisances, and without restoration of sites.**
6. **Land-based sources of pollution (from quarrying, agriculture, waste disposal and malfunctioning sewage-treatment plants) pose a major threat to the Northern Range freshwater resources and thus to coastal environments,** as the coastal zone receives water from rivers and drains and is therefore the ultimate sink for effluents generated from land-use activities.
7. **Numerous bush fires which ravage terrestrial vegetation during the dry season take their toll on coastal vegetation during the rainy season, as exposed soil runs off into the sea, smothering coastal systems like seagrass beds.**
8. **Deforestation on Northern Range slopes leads to increased sedimentation in rivers, especially in the rainy season.**

2.7 Amenity Value

1. Amenity value of the ecosystem of the Northern Range contributes to human well-being through recreation, education, religious practices, and tourism. **Amenity sites in the Northern Range are numerous and varied and are major contributors to the interests of residents and visitors.**
2. The forests, rivers, and coastal zone of the Northern Range offer many opportunities for recreation and cultural activities. **Though there is little systematic documentation of the flows of visitors and monetary value of these activities to the national economy, their importance to national well-being and eco-tourism is growing. However, the amenity value of these resources is threatened by incompatible uses, exceeding carrying capacity, absence of facilities, and misuse.**
3. **At the same time, demand for these services is growing** due to increasing accessibility, mobility, leisure time, and wealth of users.

4. **The forests of the Northern Range and their biota have supported significant international research in a variety of fields for almost 100 years.** Scientific research conducted on the Northern Range has always included some coverage of the rivers and other aquatic ecosystems.
5. **The economic potential of the amenity value of the Northern Range may well exceed the returns from forestry, agriculture, mining, and wildlife harvesting which the ecosystem supports.**

2.8 Summary of Condition and Trends

Based on the assessment made from both quantitative data and professional judgement, the table below summarizes conclusions about trends for most services derived from forests, freshwater, and coastal resources of the Northern Range. These conclusions relate to trends in the capacity of these components to deliver their services and not to the human demand for use of those services.

Summary Table: Assessment of Condition and Trends

Northern Range ecosystem service	Service type - Provisioning/Regulating/Supporting/Cultural	Condition	Trend	Certainty level
<i>Forest ecosystems</i>				
Timber and non-timber forest products	Provisioning	Fair	Declining	Medium
Land space	Provisioning	Fair	Declining, especially in the south-western regions of the NR	High
Minerals	Provisioning	Good	Decreasing	High
Runoff regulation and retention	Regulating	Fair	Significant decline especially in the Western NR	Medium
Soil conservation	Regulating	Fair	Declining	Medium
Water cycling and replenishment	Supporting	Fair	Declining	Medium
Amenity value	Cultural	Good	Declining, especially in the south-western regions of the NR	Medium
<i>Freshwater ecosystems</i>				
Water resources	Provisioning	Fair	Declining, especially in the south-western regions	High
Fisheries, aquaculture	Provisioning	Fair	Declining	Low
Waste disposal, assimilation, and treatment	Regulating	Fair	Declining	Medium
Flood regulation, water storage	Regulating	Fair	Declining, especially in the south-western regions of the NR	Medium
Amenity value	Cultural	Fair	Declining, especially in the rivers on the southern flanks	Medium



Northern Range ecosystem service	Service type - Provisioning/Regulating/Supporting/Cultural	Condition	Trend	Certainty level
<i>Coastal ecosystems</i>				
Fisheries	Provisioning	Fair	Declining (as evidenced by the increase in effort per unit catch)	Low
Safe anchorage	Provisioning	Good	Stable	High
Waste disposal, assimilation and treatment	Regulating	Fair	Declining	Medium
Amenity value	Cultural	Good	Declining, especially in the south-western region of the NR	Medium

Given the constituents of human well-being (Fig 5) and their linkages with ecosystem services (Table 2), overall consequences for the well-being of Trinidad and Tobago citizens of the condition and trends presented can readily be inferred, although it is not possible to assess quantitatively consequences associated with a given ecosystem change.

Our demands on these three components of the Northern Range, especially for their amenity value, have been increasing. More purposeful management strategies are required to ensure that user demand as well as ecological functions can be satisfied. **Fortunately, maintaining amenity value to satisfy user demands would at the same time sustain capacity for the regulating and supporting services, which these components provide. This positive relationship is very relevant to policy decisions about management and use of these resources in the short and long term.**

3.0 Responses and Response Options

3.1 Assessment of Responses to Date

Based on an assessment (Section 9) of a range of responses (policies, legislation, regulations, programmes, projects) undertaken by official public entities as well as the civic and corporate sectors, the following conclusions have been made:

1. It is evident that there are many policies and plans within the public sector that have implications for the country's ecosystems generally, and for the Northern Range specifically. **Altogether the range of policy instruments that might generally or specifically affect the Northern Range reveals awareness of the issues and declarations to address them.**
2. **But this array of policies and plans is not being systematically or adequately translated into action and effectiveness. While links between ecosystems and human well-being are embodied in many documents, these links are not made explicit; nor are targets for, and impacts on, the ecosystem or human well-being enunciated. Given the assessment of condition and trends, it is apparent that these policy instruments are not effective in achieving their objectives.** This is the result of a general lack of follow through on many policies; consequently implementation is patchy, and enforcement of the stipulations of the policies is not rigorous.
3. **Moreover, where these links are pursued they are done on a very sectoral basis, and not cross-referenced to, or co-ordinated with, policies or activities of other sectors.**

The highly sectoral organization of the public administration system, in which responsibilities that have implications for the Northern Range are distributed among many government departments and statutory authorities, inhibits systemic application of these official policies.

4. Despite this fractured system, **there is no co-ordinating mechanism to ensure that all agencies are operating consistently with these policies**, or to make use of synergies or manage the trade-offs among their objectives and activities.
5. **Understanding of the links between the natural environment and human well-being is at a very low level within the society. But there is evidence that such awareness is beginning to take root among small groups and within a few communities.** Many small community-based initiatives are underway and many special-interest groups are organized as nongovernmental organizations. While their impacts are localized and limited, their special initiatives are considered useful in taking responsibility, showing leadership, motivating and mobilizing people and resources to address particular issues. They have been at the forefront of advocacy and public education for environmental management and resource conservation. However, they have not yet attained critical mass to make a significant difference; especially as the major driving forces or potential for responding are outside their influence or capability, and their activities are not undertaken within an overall planning framework for the Northern Range.
6. **A practice of evaluating effectiveness of policies and implementation of plans, rules, and regulations; or of monitoring and evaluating outcomes and impacts of activities, is not established within the public sector.** Thus there is no feedback into successive rounds of policy-making.
7. **There is a range of international and regional treaty law and agreements to which the country subscribes that have implications for natural resource management and sustain able development, which would by extension be relevant to the Northern Range.** These are sometimes reflected in the national legislative and policy framework, more often they are not so reflected; and **a poor track record of implementation implies that these agreements do not significantly affect the matters that are their subject.**

3.2 Options for Further Responses

Responses are required that are sensitive to the dynamics of the Northern Range as an ecosystem, to the driving forces which affect its integrity and its functioning, and to the human well-being that is directly and indirectly associated with its services. Some options for consideration are examined in the Report in two categories, although there is no watertight separation between them:

- Framework responses, which relate to the overall system of policy and public administration, to governance and public involvement, and responses which are capable of achieving multiple outcomes;
- Specific responses, targeted to issues and needs within each of the three components of the Northern Range assessed (forests, freshwater, coastal resources) as well as relevant to the cross-cutting themes of biodiversity, land use, and amenity value.

No response options specifically dealing with human well-being are presented: the contribution to human well-being made by the Northern Range will accrue and be sustained to the extent that appropriate responses are made to arrest declining trends and to sustain its services.

3.2.1 Framework Responses

3.2.1.1 Implementation of Policy; Enforcement of Regulations

1. **Implementation of existing policies and plans, suitably revised in the light of this composite assessment, would be the most immediate response that might be considered.** Policy implementation takes place mainly through projects which channel funds to stated objectives. The various policies depend upon development and funding of projects through which they could be applied. But such projects do not automatically follow the formulation of policies, as projects have to compete for funding within the Public Sector Investment Programme or funded by an external agency. This approach to public-sector investment is a major limitation to policy implementation. One option is for decision-makers to require that proposed policies be accompanied by proposed implementation plans. Another is for policies of specific relevance to the Northern Range to be accompanied by commitment of dedicated funds to implement projects as a means of ensuring implementation of the policies. This would be only one aspect of clearly defined implementation plans. **Similarly, there is a considerable body of legislation and regulation which is not well enforced.** Noncompliance with existing policies and legislative provisions occurs within public agencies and by citizens.
2. **But implementation also requires appropriate human capabilities and administrative arrangements, as does enforcement.** While the size of the public service is relatively large, whether there are suitable competencies at the appropriate levels required for implementation and enforcement is a question to be addressed. Enforcement of regulations relating to the Northern Range might be better achieved if there is clear location of responsibility and accountability with the necessary resources being provided to enable effective enforcement.

3.2.1.2 Integrated Planning; Co-ordination and Collaboration

1. **Comprehensive planning for the Northern Range might be undertaken with the following core elements:**
 - **Zoning of the eastern section of the Northern Range for conservation purposes,** while there is still time, to avoid the pattern of land conversion and use that characterizes the western section;
 - **Revised contour and slope limits to construction of housing in the western section,** in light of cumulative downstream experience to date, with strict enforcement of stipulations;
 - **Urgent executive and legislative action on proposals for Environmentally Sensitive Areas and Species,** with the required management authority and arrangements clearly established and resourced;
 - **Local area physical development plans (required by the Town and Country Planning Act 1968) compatible with the overall plan for the Northern Range.**
2. **Recognizing that Northern Range related activities cut across various sectors and ministries, one option is to consider planning and decision-making for the Northern Range as a single ecological and socioeconomic system,** given the significance it has for the country as a whole. This could then lead to designation of political and technical leadership, and to setting up the public administrative mechanism/s that would be required for oversight, coherence, and co-ordination. **One approach to this is a sustainable development council for the Northern Range, which would be charge to**

oversee the Hillside Development Policy, revised to embrace the whole of the Northern Range, and to co-ordinate activities in the Northern Range relating to housing, infrastructure, tourism, water/forest/coastal resource management, mining, agriculture, and community development. These all have to be compatible within an approach to the Northern Range that seeks to identify and manage trade-offs among the environmental, economic, and social aspects of development.

3. **Increased collaboration among all sectors—academic, public, civic, community—would also contribute to better co-ordination of initiatives.** An alternative to a sustainable development council for the Northern Range might be to set up a Cabinet-appointed Northern Range co-ordination mechanism under the Ministry of Planning and Development.

3.2.1.3 Governance Arrangements

1. **One immediate response given the country's highly centralized governance system would be for policy, implementation and enforcement, and management to be devolved to the various Regional Authorities into which the Northern Range falls.** This would allow for local area development plans to emerge, and would make possible a framework for local community involvement in joint management of Northern Range resources. Devolution of authority and decentralization of services to local authorities could have many positive consequences, including planning and managing development for, and with, communities. But local authorities will require adequate staff with appropriate expertise and experience, in keeping with expanded authority and responsibility, as accountability would require resources necessary for carrying out the functions.
2. **One option to compensate for lack of public sector capacity for planning, implementation, and enforcement would be to devolve management for natural resources and assets to communities, within the framework of local government authorities, and in the context of clearly articulated national policy.** This option is predicated on compatible and facilitative local government arrangements, on effective education and training, and on easy and continuing access to technical support, to equip local government authorities and communities for this role. Community motivation and engagement would be more likely to occur if communities were involved in a consultative process about policies that would affect them or their space, and if benefits from such involvement are evident. There need not be total devolution of management responsibility at once or in all situations; and government's role in implementation could be designed to decrease in tandem with an increase in competencies of the local authorities and civic/community sector.
3. **Early involvement of the private sector is also likely to affect conformity positively with official policy.** Its decisions and actions are of central importance in an overall societal approach to sustain ecosystem services and to assure continuous progress in human well-being.

3.2.1.4. Public Responsibility and Public Education

1. It would appear that public understanding of how natural resources are related to the long-term development of the country and to the well-being of the society is quite superficial. **Processes for open discussion, better public understanding of the rationale for policies and regulations, and transparency in public decision-making could positively affect attitude and behaviour of the public.** Public responsibility

depends on awareness of the issues and understanding of how they matter to human well-being. This in turn requires intensive and systematic public education.

2. While there are pockets of public education effort initiated by civic organizations, they are scattered and discontinuous and have not attained critical mass. Financial support for these activities from public sources would strengthen and sustain them. This would capitalize on their initiative, energy, and expertise and would complement the rudimentary efforts possible within the formal education process, given an overloaded formal education curriculum. **Public education could be accelerated through a national sustainable development education strategy and action plan, designed to incorporate existing initiatives and actors, and supported as necessary by materials and technical assistance.**

3.2.1.5 Financing Management of Natural Resources

1. **More attention to the use to which funds are put, rather than to availability of funds, may be useful.** Where the question of availability of funds persists, the policies and responses that are being considered need to be designed to be more financially autonomous. Arrangements need to be built-in to decrease dependency on government's central funds and therefore on the vagaries of political will for policy implementation and enforcement. In this regard, the transparent activation of the Green Fund is long overdue.
2. **User fees, and fines for noncompliance with site regulations would be a source of financing for specific amenity sites** and for developing desirable habits in relation to the use of sites.

3.2.1.6 Research and Documentation

1. **Research organizations might consider a series of possible responses to the need for the type, range, and continuity of data required for continuous monitoring and evaluation, and for periodic assessments of this kind:**
 - Linking research resources with public interest issues and public policy needs
 - Developing a research ethic that embodies sustainable development principles
 - Designing research that is interdisciplinary and multi-sectoral
 - Collaborating in research with other entities, including communities.

The University of the West Indies at St. Augustine could take a leadership role in reflecting the above characteristics in its research approach and agenda.

2. **It would greatly help future assessment activities of this kind if research results relating to the Northern Range held by various government departments from consultancies, along with those from the University and other research organizations, could be available in a central location in hard copy and also via the Internet.** If processes for public involvement are to be effective, transparency and freedom of information will be required.

3.2.1.7 Monitoring and Evaluation

A systematic approach to monitoring and evaluation of impacts of policies and programmes on the Northern Range is required, which would provide necessary feedback into successive rounds of assessment, research, and policy formulation. Better practice here might be attained in the wake of clear designation of responsibility and accountability for implementation.



3.2.2 Multi-purpose and Specific Responses

A summary of response options for multi-purpose or specific issues relating to the Northern Range can be found on pages 113 to 115 of this Report. They relate to cross-cutting themes as well as specific ecosystem services. It will be readily seen that the measures identified would be symbiotic, and can be expected to be most effective if undertaken in the context of the Framework response options discussed above.