The Integration of Biodiversity into National Environmental Assessment Procedures

National Case Studies

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5 GUYANA

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5.1 Introduction

Guyana, the only english-speaking country in South America, is situated in the north-eastern coast of the continent between latitudes 1°10' N and 8°35' N and longitudes 56°20 W (Fig. 1) (ter Steege *et al* 1996) and forms part of the Guiana Shield. The Guiana shield derives its characteristics from the crystalline geological formation covered by Roraima sandstones (Lindeman and Mori, 1989) now characterised as a massif of hard, predominantly Proterozoic rocks (Gibbs and barrow, 1993). The West African Guiana shields among the few oldest land surfaces on earth. Geographically, Guyana lies wholly in the tropics and enjoys typical equatorial climate- seasonal rainfall, high humidity and minor temperature variations.

The Guiana Shield covers an area of approximately 1 million square kilometres with a distinct floristic province consisting of over 8000 species of which approximately 50% are believed to be endemic to the shield (Maguire, 1970). According to Berry *et al* (1995) 3763 plant species of 118 genera belonging to 4 families are endemic to Venezuelan Guayana (i.e. Venezuela part of the Guiana Shield) of which 6.1 endemic genera occur in Guyana. Among regional endemic found in Guyana are *Victoria amazonica* lily, *Arapaima gigas*, *Pteroneura brasiliensis,* and *Priodontes giganteus*. *Chlorocardium rodiei*, a prime timber species has a range almost 95% restricted to Guyana. An estimated 20% of Guyana=s 500 orchids are endemic to Guyana. Other notable endemic tree species are *Dicymbe alstomi*, *Vouacapoua macropetala*, and *Swartzia leiocalycina,* The Guiana Shield is a neotropical centre of endemism (Prance 1982, 1989). Guyana with an area of 215,000 square kilometres is one of five countries in the world with a very high percentage forest cover and low human population pressure. Estimates indicate 90 percent of the country=s 745,000 population occupies only about 7.5 percent of the total land area predominantly in the coastal zone (National Development Strategy 2000).

The extremely low population pressure in most of the forest belt has facilitated the occurrence of large expanses of pristine rainforest supporting over 6000 plant species; 1400 chordates; 834 arthropods; 426 fungi; 33 bacteria; 13 nematodes; 44 algae; 17 molluscs and an estimated 30 viruses. The 1400 plus chordates comprise 123 mammals; 711 birds; 102 reptiles; 77 amphibians; and 352 freshwater fish (GAHEF/UNEP 1992). Since the 1992 country study for the UNCED meeting floristic and faunal inventories have yielded additional numbers of species. However, there is believed to be considerable under-recording: inventories of the Iwokrama International Rainforest Reserve, comprising an area of 360,000 hectares, have yielded 130 mammals, over 1200 higher plants, 476 birds, 408 freshwater fish and 132 amphibians and reptiles (Academy of Natural Sciences of Philadelphia, 1999).

The biodiversity inventory of Guyana is by no means complete. Mammalian inventories may yield probably a reasonable percentage of the country's species. Data on fungi, bacteria, arthropods, algae and nematodes are definitely much lower due to the lack of research attention to these groups. For instance, based on the global number of described species (WR1, 1997), the ratio of plant: fungi is 3.75. It could be reasonably surmised that with over 6000 plants, (approximately 10% of Amazon region), documented in Guyana, an estimated 1600 fungi should have been described for the country instead of 904 recorded so far (J.C. Caesar, in preparation). Similarly, arthropod numbers are grossly underestimated as 950 species were added in 1999 alone. (Charles *et al* 1998).

The documented data on biodiversity have been derived predominantly from inventories of terrestrial and freshwater habitats. However, the following habitats have been categorised for Guyana: coastal, marine, littoral, estuarine palustrine, mangrove, riverine, lacustrine, swamp,

savannah, white sand forest, brown sand forest, montane, cloud forest, moist lowland and dry evergreen scrub forests (NBAP, 1999). About 14 areas of biological interest have been identified as possible Ahotspots for a National Protected Area System (NBAP, 1999). (See Appendix 1).

The main threats and development pressures are: mining, itinerant forestry and commercial forestry operations (despite a selective logging approach), plans to open up the country through a Guyana-Brazil highway, hinterland urbanisation through tourism ventures wildlife trade, establishment of industries, freshwater pollution from small and large scale land and river mining, use of agrochemicals, agricultural practices, fuelwood collection, indiscriminate burning, ethnobiological fish poisoning, selective targeting of marine fish species, solid and other waste contamination, and poverty-affluence-related pressures (NBAP, 1999). However, global phenomena such as global warming, sea level rise and ozone layer depletion also pose a threat to Guyana=s biodiversity.

5.2 National Biodiversity Strategy and Action Plan

The development of a strategy preceded that of an action plan with a time lapse of about 2 years. The process leading to the development and finalisation of the *National Strategy for the Conservation and Sustainable Use of Guyana=s Bioilogical Diversity* commenced in 1994 and ended in 1997. An inter-agency group was established as the National Biodiversity Advisory Committee in 1994, under the aegis of the Office of the President. Guyana=s Head of State holds the senior Ministerial portfolio for Science, Technology, Environment, Energy and Natural Resources with a Presidential Advisor delegated to act on behalf of the President. Within the National Biodiversity Advisory Committee, a working group was established and tasked with the overall responsibility of spearheading the development of a Strategy through consultation.

The strategy conceptualisation process took into account the National Environmental Action Plan (1994), the National Forestry Action Plan (1989), Guyana/UNEP country Study of Biological Diversity (1992) the Environmental Protection Act (1996) and the Iwokrama International Centre for Rainforest Conservation and Development Act (1996). Act ions specified in chapter 15 of AGENDA 21 and provisions of the Convention on Biological Diversity was used as the framework in the process of strategy development. Four (4) workshops were held across the country involving participants from public, private, non-governmental, rural and hinterland communities, indigenous peoples, youth technocrats/academics, ministerial and parliamentary groupings totalling 89 persons. These workshops were held in October 1994, March 1995, December 1996 and January 1997.

The process of developing a National Biodiversity Action Plan commenced in February 1999 and ended in November 1999 as a direct consequence of the finalisation of the Strategy. The Co-ordination of this process was under the aegis of the Environmental Protection Agency. A Biodiversity- planner, spearheaded a Planning Team consisting of a Technical Planning Committee, an International Advisor and a Technical Support Staff. Accordingly, a series of five consultative workshops were held across the country (April 16 and 22, 1999; May 5 and 25, 1999 and June 23, 1999). Several drafts were also individually critiqued by members of the National Biodiversity Advisory Committee, technocrats/academics.

The final draft of the Action Plan was sent to the EPA Board and then to Cabinet and finally tabled in Parliament. The development of the Action Plan was based on the national policy relating to biodiversity adumbrated in the strategy which inter alia state:

- Biological diversity and its components have a value for agricultural, genetic, social, economic, scientific, ecological, cultural and aesthetic purposes;
- Measures must be taken to:
  - Study and use genes, species, habitats and ecosystems in an equitable and sustainable manner and protect them from domestic and foreign predatory activities;
  - avoid waste and misuse of biodiversity, and
  - provide opportunities for sustainable management of biodiversity.
- There is a need for a cross-sectoral and multidisciplinary approach to the management and conservation of biodiversity,
- Awareness and appreciation of the values and benefits of conservation and sustainable use of biodiversity by all stakeholders must be increased.
- The conservation and sustainable management of biodiversity represents an investment that can yield substantial benefits for indigenous people, local communities and the population as a whole.
- The prescription contained in the strategy document provide an appropriate basis for the further development and implementation of a policy framework and legal and other actions to foster the conservation and sustainable use of Guyana=s biodiversity.

Thus, wide consultations and high-level media coverage have helped to nurture a well circulated NBAP.

5.2.1 Progress with Implementation of NBSAP

In providing a general overview of the progress made to date with the implementation of both the National Biodiversity Strategy and the Action Plan, it may be convenient to summarise the objectives of both and provide a cursory census of the policy actions identified in both documents.

Summary of the National Biodiversity Strategy objectives
The general objectives of the National Biodiversity Strategy (1997) are:

- to sustainably use Guyana=s renewable natural resources, including biodiversity
- to develop institutional capacity and capability to execute all aspects of environmental management, especially the management of biological resources
- to integrate the conservation agenda into the national development agenda
- to equitably share benefits which will arise from research, conservation and sustainable use of components of biological diversity
- to take all necessary actions to achieve these goals

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Summary of the National Biodiversity Action Plan objectives

The objectives of the Action Plan (NBAP, 1999) are:

- Evaluate the state of capacity nationally to achieve the overall goal - to promote and achieve the conservation of Guyana=s biodiversity, to use its components in a sustainable way, and to encourage the fair and equitable sharing of benefits arising therefrom.
- Identify gaps and needs relating to achieving the above goal
- Proposed actions to achieve this goal and close the gaps
- Develop activities in a number of priority areas relating to the overall goal
- Identify the roles and responsibilities of the various stakeholder groups in the implementation of the plan
- Obtain and harness stakeholder involvement and support for the development and implementation of the plan
- Increase public awareness of biodiversity.

Progress with implementation

The strategy lists a total of 56 specific actions encompassing policy issues, legal and institutional arrangements, research, in situ and ex situ conservation including the creation of a National System of Protected Areas, identification and monitoring of biodiversity, international scientific cooperation, information exchange, public awareness and education, education and training, impact assessment, transfer of technology (including biotechnology), local and indigenous knowledge, intellectual property rights and economic implications.

Six (6) specific actions are identified under impact assessment. A description of these and a summary of progress to date are given in Table 1.

Table 1 Actions related to impact assessment and their status

No.	Action	Status
1.	Integration of EIA and auditing into policy formulation, planning and development activities for all public and private sector agencies through EPAs legislative and administrative measures.	Good (Some emphasis on enforcement and monitoring needed for small scale operations - EPA Act, 1996).
2.	Establishment of impact assessment standards and guidelines.	Good (Rules and procedures, generic and 3 key sectoral guidelines developed - Aug. 2000).
3.	a) Promotion and coordination of the development of national biosafety guidelines. b) Strengthening of national quarantine processes.	Poor (A National Committee has been established and is currently meeting and consulting). Poor (Except during times of global disease threats).
4.	Government's full cooperation with regional and international partners in implementing protocols and instituting new agreements	Good (CBD signed in 1992, ratified in August 1994; Strategy developed 1997, Action Plan development 2000; active participation in COP and subsidiaries)
5.	Governments use measures in Environmental Protection Act to correct or penalise offending parties	Moderate with respect to EIA requirement but monitoring and enforcement of penalties somewhat weak
6.	Identification of agencies and facilities for contact work on biodiversity impact assessment, auditing, chemical analyses and long-term programme of physical and human resource strengtheing.	Generally, poor. No comprehensive biodiversity studies related to EIA except cursory/rapid identification of abundant species on a selective basis. Lack of full involvement of biodiversity technocrats in a number of EIA contacts. Weak human resource base.

Overall, of the 56 actions identified in the strategy about 31 have engaged some attention albeit with varied intensity.

The NBAP, on the other hand, emerged barely a year ago, and emphasises four (4) principles - the participatory approach, the cyclic/adaptive planning approach, the ecosystem approach and the precautionary principle.

To actualise its objectives, nine programme areas and related activities have been identified (see Table 2).

Table 2 The nine programme areas of the NBAP and their progress

No.	Programme Area	Status
1.	Mobilisation of Financial and Technical Resources	Poor
2.	Human Resources and Institutional Capacity-building	Poor
3.	Research and Information on Biodiversity	Moderate for some taxa e.g. plants; Good for mammals very poor for fungi, bacteria, insects, Very poor for non-terrestrial habitats
4.	Consolidation of the Policy, Legal and Administrative Framework	Moderate
5.	Public Awareness and Education	Moderate to Good
6.	In situ and Ex situ conservation of Biodiversity	Poor However, a National Protected Areas Secretariat has been established since Aug. 2000.
7.	Incentive Measures and Alternatives	Poor
8.	Measures for the sustainable use of bioidiversity	Poor but should improve shortly
9.	Monitoring, evaluating and reporting of the implementation of Programme Areas 1 to 8	Poor except for Programme Areas 3, 4 and 5.

Overall implementation responsibilities lie with the EPA and its Sub-Committees. However, financial and human resources are the predominant constraints on implementation.

5.3 The EIA System

In Guyana, Environmental Assessment (EA) is categorised as a component of EIA together with, environmental baseline study (EBS) and the environmental impact statement (EIS) and defined as Abasically the identification and assessment of impacts of the proposed project and of its alternatives (EPA, 2000). In this regard the EA encapsulates mitigation measures needed to offset any negative impacts as well as the assessment of the possible impacts of implementing mitigation measures on the environment. According to the generic EIA guidelines of the EPA, the EA should provide the following:

- Results of the regulatory and public participation programme
- Identification, description and assessment of alternatives in relation to siting, processing, technology selection and reclamation.
- Detailed information regarding methods used to analyse impacts (EIA methods) and the techniques used to estimate the magnitude of the impacts (prediction techniques)
- Identification, characterisation, description and determination of the magnitude and importance of the social distribution of the potential impacts in the short, medium and long term.
- Analysis of the compatibility of the proposal with the existing environmental legislation that applies to the project itself or to its area of influence.
- Assessment of the physical effects for all phases including construction, operation and closure. This includes the estimation by type and quantity of expected contaminants, residues, and emissions (water, air and soil pollution, noise, radiation and heat) resulting from the operation of the proposed project.
- Placement of special emphasis on indirect impacts which may arise from project implementation.

- Identification of how much of a particular resource is degraded or eliminated, and how quickly the natural system may deteriorate.
- Assessment of the biological effects on ecosystems of all project phases (construction, operations and closure).
- Assessment of the positive and negative impacts on land use (compatibility), furture development, cultural/historic resources (archaeology), indigenous peoples, demographics, infrastructure, employment, income, skills and education, and public health.
- A description of any hazards or dangers which may arise from the project and an assessment of the risk to the environment.
- Assessment of the project with a view to the need to protect and improve human health and living conditions and the need to preserve the stability of ecosystems as well as the diversity of species.
- Detailed information regarding measures which the proposed developer intends to use to mitigate any adverse effects and a statement of reasonable alternatives (if any), and reasons for their rejection.
- An assessment of worker health and safety.
- Assessment of mitigation measures including cost/benefit analysis and implementation strategy.

The EA components outlined above, though generic are embodied in all the sectoral EA components - forestry, mining, electricity generation - which represent the most active areas for developmental projects. The EPA is currently developing sectorial EA/EIA guidelines for tourism, road construction, housing schemes, agriculture and manufacturing industries.

The process leading to the development and adoption of an EA system at the national government level commenced in 1989 with the preparation of *An Environmental Profile of Guyana and A Programme for Environmental Management* under the aegis of the Guyana Agency for Health Sciences Education, Environment and Food Policy (GAHEF, 1989) which agency was itself created in 1988. The Environmental Profile document was prepared as a background document for a National Environmental Conference held in 1989 at which a Plan of Action for the overall and integrated management of the country was to be drafted and presented to the Government for consideration and implementation. Subsequent to the National Conference and a series of workshop and consultations a National Environmental Action Plan was developed in 1994, prior to which a National Forestry Action Plan had been developed in 1989.

Among the several recommendations proposed as a programme of action for Environmental Management and assessment was mandatory requirement for environmental impact assessments for all large development projects, and the prioritisation of the preparation of guidelines for conducting such environmental assessments, which authority was vested in GAHEF. However, the genesis of national environmental consciousness and the imperative for environmental assessment and improvement was enshrined in chapter 2 of the country=s constitution (Constitution of the Cooperative Republic of Guyana, 1980).

The salient clauses of the relevant chapter state:

> Chapter 2:25
>
> A*Every citizen has a duty to participate in activities to improve the environment and protect the health of the nation.*≅
>
> Chapter 2:36
>
> A*In the interests of the present and future generations, the state will protect and make rational use of its fauna and flora, and will take all appropriate measures to conserve and improve the environment*

The above constitutional tenets provide the most forceful evidence for Guyana=s legal and moral commitment to sound environmental ethic and a strong commitment to sustainable development.

The prime importance of the environmental construct is also forcefully buttressed in development and policy issues as adumbrated in the six (6) cardinal Aenvironmental philosophies of Guyana=s newly prepared *National Development Strategy* (NDS, 2000). Guyana Aenvironmental philosophies as defined by the *National Development Strategy* are:

- Environmental considerations should underpin all aspects of development, whether physical or social;
- Where there are threats of serious or irreversible damage, the absence of scientific certainty will not be used as a reason for postponing the formulation and implementation of measures to prevent environmental degradation;
- Environmental protection is a matter of human survival. Each generation owes it to the next to act responsibly and to ensure that no irreversible damage is done to the environment. No generation has the right to leave future generations with a more limited choice than that which it inherited. Indeed, the current generation has an obligation to expand the range of such choices, and to improve the quality of the environment;
- Ultimately, the success of development strategy will depend on the extent to which it integrates, conceptually and operationally, environmental and developmental imperatives;
- Life on earth depends in the final analysis, on the support provided by the physical environment. This means that to maintain life, the integrity of the ecosystem must be preserved;
- Sustainability is not merely a question of ethics. There are limits to the extent to which natural systems can be utilised. Beyond these limits, their performance becomes impaired. Indeed, they may even be destroyed. Moreover, environmental systems are complex and unpredictable. We do not, therefore, always fully understand and appreciate their dynamics. Accordingly, we must, whenever such knowledge is not available, restrict our activities.

A common thread throughout the thirty-chapter *National Development Strategy* is the nexus between environment and development.

While in earnest the introduction of Guyana=s EA system may be considered to commence with the enunciation and Presidential assent to the Environmental Protection Act on June 5, 1996, two major investment concerns in the mining and forestry sectors were required to do EIA=s and

submit EISs in the early nineties. The major mining company *Omai Gold Mines* produced its EIA and EIS in 1992(?), while the *Barama Company* Environmental and Social Impact Assessment EIS were produced in 1993. Effectively, the EA system was implemented a few years prior to the Act.

5.3.1 Operation of the EA System

The EA system operates within the permitting and project cycle (Fig.1). EA is required immediately after project identification during the planning/feasibility phase through project preparation, environmental authorisation, development of a detailed design and the operation phase to project completion. An Environmental Assessment Board hold specific functions. Thus the EA is applied to all aspects of plans, programmes and projects (EPA, 2000). Specific functions are also delegated to an Appeals Tribunal.

The sectoral categories of projects to which the EA system is applied are:

- mining
- forestry
- agriculture
- energy
- infrastructure
- tourism
- fisheries - aquaculture

- On the basis of the sectoral classification adopted by the United Nations for its *Nations of the Earth Report Volume II* (UN, 1992), the following project categories would also require EA in Guyana - transport, housing, services, health services, social services, animal husbandry, hunting, fishing and gathering.

Summary of key legal requirements

The Environmental Protection Act and the EPA guidelines derived therefrom require all seven stages of EIA namely:

- Screening
- Scoping
- Environmental Profiling
- Risk assessment
- Risk management/mitigation
- Implementation and Review
- monitoring and Post-project audit evaluation

Additionally, public/specific stakeholder consultation/participation is legally required through media solicitation and direct invitation. Consumer groups play a major role in the public participation process. Appendix 2 shows a recent advertisement in a local newspaper.

The EA process requires a review of EIA and EIS. The EPA has established an Environmental Assessment Board with specific functions related to the review process. A detailed checklist of review parameters, including biological impact parameters, are provided in the EPA=s guidelines for the benefit of environmental permit applicants (EPA, 2000).

Details of the EA system in Guyana are provided in the *Environmental Protection Guidelines Volume 1: Rules and Procedures for Conducting and Reviewing EIAs version 3* (EPA/EAB, August 2000) and the legal framework is provided in the Environmental Protection Act. (Government of Guyana, 1996).

5.3.2 EA Implementation

Overall, the EA system appears to be reasonably functional and fairly effective except the nuances of wholehearted acceptability by a few sectors, particularly, gold and diamond mining and local/itinerant forestry. The views from these sectors appear to be based on recalcitrance to environmental and health safety ethic rather than a genuine desire to be educated and the acceptance of the environmental imperatives of such operations. Nevertheless, the EA system is becoming increasingly acceptable by stakeholders at least as a legal imperative, despite fears of business collapse emanating from the local gold and diamond mining stakeholder group.

The EA system, as currently being practised and evolving, may be considered as slowing down development consent procedures only by a few local business sectors which do not seem to have a good appreciation for the system and most times environmental issue. With enhanced public awareness and education, this is envisaged to change. Foreign investors seem to have a much better appreciation.

The following example of elements of proposed project activities for an environmental management plan and EIA (D. Simmons, personal comm.) illustrate, somewhat, the awareness and streamlining of issues:

Task for preparation of EMP for an industrial site:

- Conduction of reconnaissance visit to the site;
- Examination of relevant/background information/records;
- Consultations with stakeholders and/or their representative organisations, through a combination public meetings, correspondence and social surveys;
- Collection of baseline data on present land use, soils, climate, surface water quality, biodiversity, archaeology and demographies of the site area and surroundings;
- Identification and description of the potential adverse impacts on air, water soil and landscape, and natural resources, and the environmental risks associated with industrial activities earmarked for the estate;
- Identification and description of the appropriate mitigation and/or compensatory measure to avoid, reduce or remedy likely impacts or risks of the proposed industrial activities to be conducted within the industrial estate;
- Identification of human, financial and other resource requirements for ensuring effective implementation of the mitigation and/or compensatory measures;
- Development of a programme to monitor the potential impacts arising out of each industrial activity; and,
- Preparation of industry-specific EMPs.

There is a paucity of capacity for review, advice or follow-up, primarily as a result of the shortage of qualified EA professionals with the scope of multifaceted expertise or sector-specific specialisation. The pool of EA practioners is small. However, part of the EPA=s mission is to address this human resource capacity problem, through short-term courses/workshops for various target groups and relevant academic training for its staff. The economic conditions of Guyana also influence staff retention/turnover. Consequently, the financial resource base of the EPA needs to be enhanced and broadened to offer more competitive salaries and attractive employment conditions. In the short-to medium-term donor support is, imperatively, crucial.

5.3.3 EA System and decision-making

From a biodiversity perspective, the EA system may have resulted in somewhat Abetter decisions in some sectors but not all. This conclusion is based on the fact that some EIAs/EISs only provide a cursory overview of biodiversity issues, most of which are only site-specific and related, in the main, to terrestrial habitat species/communities. Few EIAs/EIS have provided biodiversity; details beyond terrestrial flora and fauna. In the few cases where aquatic biodiversity has been given some scant consideration, only fish fauna and a few emergent aquatic macrophytes have been considered. Soil biodiversity has not been considered in any of the EIAs/EISs reviewed! Likewise, there is no mention of algae, fungi (including lichens) and epiphytic bryophytes, although epiphytic vascular plants such as bromeliads and a few orchids have been mentioned on two occasions. Perhaps the only serious attempt to address aquatic biodiversity issues is the post-cyanide spill studies conducted in the Omai and Essequibo rivers for Omai Gold Mines. This is the only case in which a few algae and aquatic arthropods were mentioned in addition to fish fauna. The current checklist is evidential.

Somewhat Abetter decisions may have been facilitated at the level of the broader environmental and/or social view point. However, refinements and thoroughness are needed in a few cases. Here again, site-specific considerations out-way those of the broader ecosystem or subregional/non-site-specific impacts.

Against the backdrops of the above, and the available records, it is reasonable to suggest that the current EA system does not effectively/comprehensively take holistic account of impacts on biodiversity. This could possibly be due to the fact that in of cases the team of EA professionals producing EIAs/EISs did not include adequate representative of biologists and, in particular, biologists from key subdisciplines. For instance, where a biologist is included in a team he/she may be either an animal biologist or plant biologist. Only a few teams comprise of both, and only two such teams have comprised of others such as aquatic biologists/phycologists and entomologists. In most cases the single biology professionals are usually not specialists in other subdisciplines such as ornithology, herpetology, mycology, lichenology, soil biology, etc.

In conclusion, there is need for a mandatory requirement for a professional biologist with adequate subdisciplinary expertise to be part of ALL EA teams. Standard rapid biodiversity assessment procedures for all key/relevant habits/communities need to be developed and made legal requirements. Information base for baseline biodiveristy data in all EIAs/EISs needs to be broadened to fill crucial biodiveristy gaps. Species richness/species diversity baseline data need to be clearly delineated as mandatory requirements.

The Environmental Assessment Board needs adequate representation of experienced biologists to evaluate biodiversity-related aspects. The National Biodiveristy Advisory Committee or a Sub-Committee thereof may need to provide oversight on the biodsiveristy of the EA System.

5.4 Biodiversity and EA

The Environmental Protection Act 1996 requires EA for all projects. The legal requirement for the inclusion of biodiversity in EA si circumscribed by the Act=s definition of Aproject and the Fourth Schedule. The Act defines Aproject as follows:

A... *means the execution of construction works or other installations or schemes, any prescribed process or alteration thereof, any interference with any ecosystem or any*

activity in the natural surroundings or landscape including those involving the extraction of natural resources, or any project listed in the Fourth Schedule and shall include public and private projects≅ Part 1V, page 19.

The Fourth Schedule (EPA Act, 1996 page 76) stipulates the following projects for mandatory EA:

- The construction of any hotel, quest house or inn above ten rooms.
- Installation for hydro-electric energy production
- Construction of roads, harbours and airfield
- Dams and other installations designed to hold liquid or store it on a long-term basis.
- Installation for the treatment of waste water, industrial or domestic waste.
- The importing of any waste matter whether hazardous or not.
- The release, use or keeping of any genetically modified organisms.
- The harvesting and utilisation of forest resources.
- The extraction and conversion of mineral resources.

Additionally, the Act provides for the mandatory requirements for every EIA to Aidentify, describe and evaluate the direct and indirect effects of the proposed project on the environment including among others flora, fauna, species habitats, landscape, natural resources, and Athe ecological balance and ecosystems . Furthermore, the need for the protection and improvement of human health and living conditions as well as the preservation of the stability of ecosystems and the diversity of species in explicitly stated in the Act (EP Act 1996, p: 20-21). It is against the above background that the legal requirement for the integration of biodiversity strategies with the EA System is premised . However, the level/extent to which the letter and spirit of this legal instrument is adhered to has varied widely between the EIAs/EISs reviewed the preparation of this case study.

5.4.1 Biodiversity and Screening

The screening process is initially based on project description. The EPA Guidelines require specific information on the site and consequently biodiversity and human impacts become an immediate issue. Although data acquisition on the biodiversity status of Guyana is on-going the relevant data are accessible at both the Centre for the Study Biological Diversity, University of Guyana, the EPA, Guyana Forestry Commission, the Wildlife Division and the Guyana Natural Resources Agency. The Wild Birds Protection Act (1973) and the Forestry Act (1953) provide some information in addition to CITES updated lists. Depending on the expertise of EIA/EIS preparation teams, a few of the reports have provided details of protected species, threatened species and habitat locations. Interestingly, only EIAs/EISs on the forestry sector and sand mining have provided the level of professional data, indicating an ample consideration of this aspect during screening.

5.4.2 Biodiversity and Scoping

All terms of reference (TORs) are based on the legal requirements of the EP Act and the EPA guidelines which stipulate the consideration of biodiversity. The EPA guidelines categorise the EIA process as comprising:

- Environmental Baseline Study (EBS)
- Environmental Assessment (EA)
- Environmental Impact Statement (EIS)

Thus with the exception of a few cases, most of the limited coverage of biodiversity data is gleaned during the EBS. The level of biodiversity coverage in the EBS is dependent on the composition of the EIA preparation team. Evidently, the lack of a full complement of professional biologists on most of these teams is reflected in the grossly inadequate coverage of biodiversity. A majority of the reports do not list more than ten (10) each of terrestrial fauna and flora, and none have listed any fungi, bryophytes, soil microbes or soil invertebrates. With known sensitivity of some lichen families to air pollution, for example, at least some attention could have been paid to this group as a bio-indicator for monitoring process.

Generally, all EA-related biodiversity considerations have been limited to species, albeit, with very disparate levels of professional output. Scant attention has been paid to the ecosystem aspect generally. With the notable exception of a two forestry sector and one mining sector EIA/EIS mostly do not identify all the ecosystem types, habitats and communities in the study site/area or the wider potential impact peripheral project areas. No genetic biodiversity considerations have been reported in any report except for casual statements in two reports on the potential impact of chemicals on genetic mutation without providing baseline information. Guyana needs to develop capacity for genetic studies locally. Visiting scientists over the past 3 years have collected specimens for molecular systematics studies in air fauna, termites and the Lauraceae predominantly for phylogenetic determinations. However, aspects of conservation genetics are urgently required in Guyana to facilitate the National Protection Area System=s identification of other potential areas beyond the use of species diversity/richness and endemism indicators.

EPA Guidelines need to be structured to detail methodologies which must be used to gather biodiversity data in order to facilitate comprehensive biodiversity data collection during EIA, except for locations where biodiversity studies have been conducted previously.

5.4.3 Biodiversity and Impact Predictions

Very limited comprehensive methodologically-sound field studies for biodiversity data collection have been conducted. Such studies have been limited to the forestry sector EIA, obviously, because investors are interested in preliminary forest inventorisation to determine the stocking densities of commercial timber species. Only the sand mining EIA and the Omai Gold Mines EIA provide satisfactory though somewhat limited information on biodiversity impacts at the level of species and ecosystem. Most of the other EIA=s have provided limited information with respect to a few selected species mainly macrophyte flora and large chordates. None of the EIAs have predicted impacts on fungi (including lichens), soil microbes and arthropods. Genetic impacts have been cursorily alluded to in the case of the biological impact of pesticides in an agricultural project.

The intensity of study and level of detail reflecting biodiversity importance is impacted by the composition of the EIA team with respect to biological expertise and, more specifically, the scope of expertise. Generally, the limited satisfactory studies have emphasised locally important ecosystems. The Generic Guidelines of EPA stipulate the necessity for the Aassessment of the biological effects on ecosystems *(sic)* of all project phases (construction, operations and closure) implying a need for coverage of these aspects in the Impact prediction process. However, very scant detail has been provided in most of the EIAs on this aspect. The oversight of a committed biologist with a wide scope of expertise is needed to facilitate the work of the Environmental Assessment Board during the review process.

5.4.4 Biodiversity and mitigation

Although mitigation measures are provided in the majority of EIAs, only a few have detailed specific measures for impacts on biodiversity. A bridge construction EIS did not even mention biodiversity impact mitigation measures.

Biodiversity value/importance has influenced the level of mitigation measures and level of attention paid to this aspect only in the case of forestry sector EIA. Obviously, the extractable resource is biodiversity. Nevertheless, the issue of forest fragmentation and dislocation of faunal biodiversity and ecosystem disturbance (Lubchenco *et al* 1991; Huston, 1994) need mitigation considerations which may not have been fully addressed except for statements that dislocated fauna Awill relocate in nearby forest . Consequently, in some cases, particularly, in the mining sector EIAs, the opportunities for Aadequate biodiversity mitigation may have been missed

Implementation of mitigation proposals are legally mandatory as specified in the Constitutional clause alluded to in section 4 and also in the EP Act and related EPA Guidelines. However, the EPA=s current capacity for monitoring and enforcement may be impacting negatively. Financial and human resources are needed.

Examples, of effective biodiversity mitigation measures appear to be confined somewhat to the forestry sector due, somewhat, to the stipulations of the forestry management plan requirement policy of the Guyana Forestry Commission. The issue needs to be further addressed and diligently monitored for the other sectors except in the case of the Omai Gold Mines where tailings pond disaster engendered stringent monitoring regime, self-regulated by the Company itself under the watchful eyes of the EPA.

5.4.5 Biodiversity and Impact Evaluation

Generally, biodiversity values are qualitatively considered in the decision-making process. Nevertheless, it is reasonable to surmise that the level of attention needs to be raised. Furthermore, some critically important biodiversity groups which are not emphasised need to be brought to the fore in such considerations viz-soil biota, fungi lichens, arthropods and amphibians. No biodiversity use-values have been estimated and reported in any of the EIAs
As alluded to in preceding sections most EIAs suffer from the lack of adequate representation of professional biologists and methodologically-sound biodiversity base-line data collection. Consequently, the EISs, with the notable exception, a very few, lack the level and scope of biodiversity coverage desirable.

In the very limited areas where biodiversity issues have been somewhat satisfactorily covered, selected impacts are more fully explained than others in EISs. Obviously, some biodiversity groups/taxa previously identified would not have been covered altogether.

5.4.6 Biodiversity and the Review Process

The *EIA Guidelines, Volume 1- Rules and procedures for Conducting and Reviewing EIAs= vession 3* include a comprehensive, but not exhaustive (in terms of biodiversity), checklist for rating biological impact encompassing fauna, flora rare/endangered species, sensitive habitat and ecosystems and ecological balance as main subdivision parameters. However, within flora and fauna details of flora and faunal groups/taxa are not required for the rating.

In all the EIAs reviewed none have used the matrix model of impact analysis as a tool! Thus valuable information may not have been gleaned.

Generally, assessment of the coverage of Biodiversity during EIS reviews may have been inadequate due to the lack of adequate biodiversity information provided and or the possible lack of professional biologists with a wide scope of expertise on the Assessment Board to ensure adequacy of biodiversity coverage.

Consequently, with the exception of the forestry sector EISs the above deficiency may have limited the decision making process with respect to biodiversity baseline data, impact evaluation and mitigation measures. Consequently, with the apparent deficiencies in biodiversity-related issues in a majority of the EISs, greater weighting of economic considerations may occur by default rather than intentionally. Lack of adequate results in lack of very informed decision-making with respect to biodiversity, habitat, community and ecosystem threats in the EA process.

5.4.7 Biodiversity and Monitoring and Post-project Audit

Biodiversity monitoring has been recommended in some cases, for example, sand mining operations of the Omai Gold Mines and projects in the forest sector. None was offered for the bridge reconstruction project even though a list of contamination-related activities were identified in several communities/localities.

5.5 Illustrative Examples or Case -studies of treatment of biodiversity within Project-EA

To support a number of conclusions and related recommendations posited in the preceding sections, the following examples/ case studies are presented:

- EIA of a white sand mine at Yarrowkabra, Soesdyke-Linden Highway 1998;
- EIA Addendum - Wenot Pit tailing disposal - Omai Gold Mines 1998;
- Universal Amalgamated Communal Industries Ltd. (UNAMCO) EIA for Sustainable forestry management and logging operations 1997;
- EIS for an experimental agricultural project for Guyana Green farm Inc., 1999;
- EIA for recreation resort at Madewini Creek, Soesdyke-Linden Highway, Triple >D= Ltd, 2000.
- Guyana Bridge replacement project environmental Study, 1997.

Case study/Example 1 - Sand mining sector

***Location*:** Yarrowkrabra, Soesdyke-Linden Highway
***Proponent*:** Mr.P. Rahaman
***Proposal*:** Mine for the extraction of white sand
***Alternatives*:** None. However, biodiversity considerations were detailed with a number of suggestions for mitigation and restoration ecology.

***Biodiversity site characteristics*:**
The site falls within the classification of dry evergreen forest. This vegetation type occurs on white sand and contains predominantly wallaba (*Eperua)* falcata forest, xeromorphic rain forest, exromorphic wood land and xenomorphic scrub. Also occuring is dakama *(Dimorphandra*

Conjupata) forest which has very low to no commercial value. The site vegetation also includes the following dominant flora: *Tapirira guianensis, Erythroxylum citrifolium* and brachen fern.

Fauna includes savannah fox *Cerdocyon thoas*, rodents (Dasyprocta aguti) bats, the tortoise, *Geochelone carbonaria* absence of amphibians and reptiles (?) And ten arifauna species. No soil invertebrates are mentioned.

The soil-type / plant-type relationship established for neotropical forests (Clark *et al* 1998) is evidenced here. Specific vegetation types occur on white sands the Atiyiyid white sand predominates in this area. The uniqueness of this forest type is its fire-prone characteristics. No specific detail of pyrophytic characteristics have been described.

Biodiversity data:
The ecology of this type of vegetation has been documented previously with respect to soil and plant characteristics and floristic diversity. Ongoing studies of herepetofauna, arifauna and arthropods exist, including limited undergraduate field project data.

Although some existing data was used, transects studies were conducted to derive primary data for the site.

***EA process*:**
This is one of only two EISs providing adequate biodiversity data in the mining sector EIA.

Biodiversity status checklist:
- Screening: biodiversity is satisfactorily covered except in the case of arthropods, fungi, bryophytes.
- Scoping: adequately covered
- Impact Assessment: only study using impact analysis matrix as a tool - Biodiversity impact adequately covered with suggestions for experiments where there is lack of information.
- Mitigation: mitigation analysis matrix is used, albeit in a limited way with reference to biodiversity status.
- Impact evaluation: adequately addresses biodiversity aspects
- Monitoring process: satisfactorily addresses biodiversity integration in the monitoring process and recommends restoration ecology measures for closure and monitoring.
- Review & follow-up: process is adequately related to biodiversity issues.

***Biodiversity values*:**
Biodiversity use-values were not estimated/quantified. However, a somewhat over generalisation that the site has no biodiversity commercial value due to its fire-driven secondary successional status. Evidently the fauna and at least *Eperua* species have some commercial value, hence biodiversity value.

***Biodiversity survey techniques*:**
Survey techniques were very adequate for flora and some categories of fauna but with specific trapping methods data on herpetofauna and entomofauna could not have been gleaned.

The timing duration and qualifications of staff were adequate with respect to professional biologists and soil scientists.

***Biodiversity Impact Omissions*:**

No informaition was provided for fungi/lichens, soil microbes, soil invertebrates and epiphytes (if any).

***Outcome*:**
Actual/likely outcome was positive in terms of biodiversity impacts based on the methodologies and data provided.

Overall, this is a good example, with respect to biodiversity coverage.

5.5.1 Case Study/Example 2

Location **:** Omai, Essequibo River
Proponent*:* Omai Gold Mines Ltd.
Proposal **:** Gold mine pit tailings disposal addendum
Alternatives*:* None
Biodiversity Characteristics*:*:
Adequate commentary is provided on aquatic life, mainly aquatic insects and fish. No information is provided for algae and other aquatic macrophytes. Flora and fauna of terrestrial resources are covered but no comprehensive species list are provided for any of the taxa. It appears selected dominant/abundant taxa were mentioned although the methodology indicated satisfactory biodiversity data could have been collected. Curiously, amphibians were not observed during the wildlife surveys. There is no mention of specific trapping methods. Hence it is more than likely that the methods used and timing may have deprived the survey from gleaning amphibian data. The area is generally, wet tropical rainforest with nearby riparian vegetation on river-banks off the immediate site.

***Availability of Biodiversity data*:**
Taxonomic collections have been made in the area previously; hence data was available. No systematic faunal survey had been conducted except during the EA process. Primary data was collected for aquatic insects. Existing information was partially used to complete primary data from base-line study surveys.

***EA process*:**
Checklist of biodiversity impact integration:

- Screening Adequately covered for terrestrial flora and fauna and aquatic insects and fish but lacking in algae, aquatic macrophytes and nematodes.
- Scoping: adequately covered as per above
- Impact Assessment: inadequately covered: matrix model of impact analysis was not used.
- Mitigation: somewhat covered but deficient with respect to omitted taxa. No matrix is provided.
- Impact evaluation: somewhat deficient because of omitted taxa and the non-identification of potential bio-indicator species.
- Monitoring: adequately covered on the basis of identified taxa and habitats/ecosystems.
- Review and follow-up: adequate.

Biodiversity values
No biodiversity use values are provided

Survey techniques
Acceptable except for omitted taxa

***Biodiversity impact omissions*:**
Aquatic food web impacts omitted. Algae, nematodes, aquatic macrophytes omitted.

Outcome
Overall outcome positive in terms of taxa covered; but negative in terms of food web impact and taxa omissions.

5.6 Future Actions to improve effectiveness of biodiversity conservation and sustainable use

Aside from the legal stipulations and the sectoral EIA guidelines currently in existence, the following need to be addressed to improve the effectiveness of biodiversity conservation and sustainable use:

- mandatory requirements for the inclusion of at least two biologists with t he requisite plant and animal biology expertise on all EIA teams.
- comprehensive list of biodiversity taxa to be included in all EIA baseline studies, impact evaluation and mitigation measures
- mandatory requirement for the use of biodiversity impact checklist matrix in all EIS.
- mandatory requirement for the inclusion of fungal, arthropod and soil biota taxa in EBS and EIS.
- inclusion of methodological parameters to be used in EIA guidelines to ensure requisite biodiversity data collection.
- enhanced financial resources for the EPA to better equip it for monitoring and enforcement
- inclusion of professional biologist on the Environmental Assessment board to ensure quality assurance with respect to improved biodiversity integration with the EA process.
- Encouragement of the use of matrix models analytical tools in biodiversity impact assessment and mitigation analysis.
- Inclusion of basis ecological methods in guidelines to facilitate specific data collection which must be revealed in the checklist.
- Human resource capability-building, training and stakeholder awareness and education on the importance of biodiverstiy parameters in EA process.

5.7 Final Conclusion

Overall, the EA system is legally enforceable. Legal provisions for the EA process are very satisfactory. However, the EIA guidelines need to be slightly modified to elicit more biodiversity data. For instance, specific requirements for species diversity and species richness must be introduced to elicit such data. Scant attention has been paid to rare/endangered species in most of the EISs because of the deficiency in biodiversity data in the EA process.

Biodiversity concerns can be managed more effectively through the EA if some of the deficiencies identified in section 8 are remedied. Additionally, continued institutional capacity-building by the EPA is very desirable. EIA courses run by the EPA and the University of Guyana must ensure multi-disciplinary delivery to enhance biodiversity coverage.

The legal instruments and related Guidelines are designed to ensure the EA process addresses impacts on biodiversity in an open and informative manner. However, there is need for quality control/assurance to improve standards.

Unfortunately, no quantitative estimates of biodiversity use values currently exit except for a few attempts relating to ethnobotanicals (Caesar & S. Mohamed, in preparation).

Generally, the EA process in Guyana appears successful on the basis of the requirements. However, the issue of stakeholders meeting the requirements is disparate.