SFG1485

COOPERATIVE REPUBLIC OF GUYANA

UNIVERSITY OF GUYANA SCIENCE AND TECHNOLOGY SUPPORT PROJECT

Project ID Number: P125288

THE WORLD BANK

ENVIRONMENTAL AND SOCIAL MANUAL

CHAPTER 1

Environmental Assessment (EA) and Environmental Management Plan (EMP)

Final Document

July 2015

Acronyms

ARC	Agriculture Research Centre
CBD	Convention on Biological Diversity
CEI	Construction Environmental Inspector
CWP	Construction Work Plan
CCP	Construction Communication Plan
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPco	Environmental Management Plan of the contractor
EMF	Environmental Management Framework
EPA	Environmental Protection Agency
ES	Environmental Specialist
ESDU	Education Sector Development Unit
ESM	Environmental and Social Manual
ETS	Environmental Technical Specifications
FAO	United Nations Food and Agricultural Organization
FMP	Fisheries Management Plan
GD	Georgetown Datum
GFC	Guyana Forestry Commission
GoG	Government of Guyana
GWI	Guyana Water Incorporated
ICT	Information Communication Technology
ICZMP	Integrated Coastal Zone Management Plan
IPPF	Indigenous People Planning Framework
ITCZ	Inter Tropical Convergence Zone
LCDS	Low Carbon Development Strategy
MOE	Ministry of Education
NBSAP	National Biodiversity Strategies and Action Plan
NDS	Guyana National Development Strategy
NEAP	National Environmental Action Plan
NTU	Nephelometric Turbidity Units
OP	Operational Policy
PC	Project Coordinator
PIU	Project Implementing Unit
PSC	Project Steering Committee
UG	University of Guyana

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Executive Summary

This Environmental Assessment (EA) and Environmental Management Plan (EMP) are part of the three safeguards instruments developed for the COOPERATIVE REPUBLIC OF GUYANA: University of Guyana (UG) Science and Technology Support Project, financed by the World Bank. The objective of the Project is to strengthen the four science and technology faculties at UG through infrastructure, research and curricular improvements while developing the basis for improved facilities management and future growth. The project comprises of three components: Component 1 would support (a) carrying out of a science curriculum reform process by updating existing curricula and/or reorienting the existing curricula of UG aimed to support the Government of Guyana's Low Carbon Development Strategy (LCDS); and (b) carrying out of selected research relevant to the LCDS through the provision of Research Grants to selected UG lecturers. Two times each year, the UG Research and Publications Committee would review standardized research grant applications and apply common criteria to assess (i) their relevance to the LCDS, (ii) potential for funding and (iii) clearance of any environmental and social safeguards issues. Component 2 would support (a) rehabilitation and/or improvement of existing science laboratory buildings of four faculties located within the UG; (b) provision of scientific and multimedia equipment to the existing science laboratory buildings; and (c) establishment of a campus wide internet network within UG to connect its faculties and libraries to the internet and to prepare UG to connect it into an international link. Component 3 would support building of institutional capacity within UG through the provision of technical assistance on managerial and administrative capacities and strategic business planning matters; and honoraria to selected UG staff for carrying out Project tasks.

The Ministry of Education (MOE) will be the implementing agency responsible for the Project and a member of the Project Steering Committee (PSC), also comprising stakeholders from the government, civil society, private sector and academia. Coordination, technical and fiduciary aspects of the Project would be overseen by a Project Coordinator (PC), to be located in the Coordination and Technical Unit at UG, and who would report to the Permanent Secretary of the MOE and collaborate closely with the UG Vice-Chancellor on a day to day basis. The technical team of the PIU will include an Environmental Specialist (ES) responsible for environmental supervision of the implementation of project components and the application of the safeguards environment instruments prepared for this project: i) Environmental Management Plan and (ii) Environmental Management Framework (EMF). The ES would be responsible for reviewing the research proposals before they are sent to the Research committee to check for any environmental safeguard issues and apply a screening checklist and guidelines included in the (EMF) (a separated document has been prepared for this). The ES will be responsible to provide progress reports to the Bank. The ES will supervise all environmental compliance of the rehabilitation works. The PC will be responsible to monitor the implementation of all mitigation measures included in this EMP, EMF and IPPF and will provide support to the ES to ensure adequate oversight of safeguard measures by the overall project, including those of approved research projects.

Given that the environmental impacts of the civil works are moderate, the Project has been classified as "Category B," following OP/BP 4.01 – Environmental Assessment. The Project includes environmental considerations that were developed during Project preparation to ensure

the Project's environmental sustainability and its compliance with Guyana national regulations and the World Bank Group's safeguard policies.

The main environmental impacts expected from the Project would be those connected to the rehabilitation works on several science buildings planned under Component 2 of the Project. In addition, UG faces different issues related to water supply, electricity, flooding and waste management. For instance, water storage, water quality and water supply are issues requiring immediate attention. There is also a pressing need for a safe, environmentally acceptable means of disposal for increasing quantities of bio-hazard waste that are currently (indefinitely) stored on campus awaiting a solution. Many of the items of disrepair and much of the poor existing condition of the facilities have their origin in what appears to be an absence of a comprehensive and systematic approach to facilities management, space and storage management. Power, light and air conditioning systems need to be rationalized to reflect the current and future needs of the institution. The Project would address these needs through a comprehensive rehabilitation of 14 existing science buildings and laboratories.

The rehabilitation works planned to develop UG will generate environmental and social impacts common to any civil work: dust, noise and solid waste from the construction activities (cement, electrical wires, glass, metal, etc.), traffic congestion, use of campus space, reduction of aesthetics due to construction, decreased quality of surface water during clearance of canals, risks of accidents arising from increased traffic, reconstruction of sidewalks, etc., solid and hazardous waste from disposal of old materials from laboratories, safety issues related to presence of workers in the university campus, disruption of academic program and the campus life. These environmental and social impacts will be prevented and mitigated through the implementation of this EMP. Additionally, health and safety measures will be recommended during Project and University implementation.

Project activities and its potential environmental and social impacts was informed and consulted with a broad pool of stakeholders who provide important recommendations in the preparation of the safeguards instruments for this project. During preparation the WB team met with stakeholders from the University of Guyana (management, faculties and students), Ministry of Education, Ministry of Finance, Guyana Environmental Protection Agency (EPA) and several NGOs, such as Conservation International and Iwokrama. Later, on April 2011, two more formal consultation workshops were held with UG representatives (faculty, students and consultants), government official (EPA, MOE and Ministry of Amerindian Affairs), private sector, indigenous groups, and civil society organizations. All stakeholders had to opportunity to comment and provide guidance on the drafts of (i) the EA and EMP for the activities of Component 2 (civil works), (ii) the EMF prepared for the activities of Component 1 (Research Fund) and (iii) the (IPPF).

The consultative process will continue during implementation, each year with both internal departmental review and external consultation with key stakeholders to review implementation of the EMP, EMF and IPPF. Of particular importance for UG stakeholders is their participation to identify and build consensus around the curricular domains within and across the four target Faculties most in need of revision/development as well as the research agenda relevant in order to support the LCDS (activities of Component 1). The participation of the UG stakeholders is expected to play decisive role in the implementation of this Project.

UNIVERSITY OF GUYANA SCIENCE AND TECHNOLOGY SUPPORT PROJECT

Environmental Assessment (EA) and Environmental Management Plan (EMP)

1. PURPOSE OF THE PROJECT

The purpose of the " University of Guyana Science and Technology Support Project" from the World Bank is to assist the Government of Guyana in its plan to strengthen the educational services and research activities at the University of Guyana (UG) by improving its physical facilities, expanding its curricula and enhancing scientific research. The project will seek to incorporate in the UG new curriculum elements and financial support for scientific research related to Guyana's Low Carbon Development Strategy (LCDS).

2. THE COUNTRY OF GUYANA[1]

Population: 762,498 people
Capital: Georgetown
Area: 215,000 km^2
Currency: Guyanese dollar
GNI per capita: US$1,450
Main exports: Sugar, gold, bauxite/alumina, rice, shrimp, molasses, rum, timber
Language: English, Guyanese Creole
Religion: Christian (57%), Hindu (23.4%)
Life expectancy: 67 years

Figure 1. Location of Guyana in South America.

Guyana is a low-lying country situated in the Northern part of South America, bordering the North Atlantic Ocean, and with Suriname, Venezuela and Brazil as neighbors. It is the third smallest country in South America after Suriname and Uruguay, and with a population of less than a million (mainly of East Indian, African, mixed, and Amerindian descent), it has one of the lowest population densities in the world. Guyana is also the third poorest country in Latin America and the Caribbean, after Haiti and Nicaragua, has one of the highest rates of skilled migration in the world, and is the greatest recipient of remittances (relative to Gross Domestic Product-GDP) in the region. It is well endowed with natural resources including bauxite and gold, fertile agricultural lands, and large tropical forests. Ninety percent of the inhabitants live on the narrow coastal plain, which represents 10 percent of the country's area and lies largely below sea level. With 77.2% percent of the country (152,050 km^2) covered by forests, Guyana has one of the world's highest forest cover per capita ratios.

[1] **Guyana Country Brief Report. 2011. The World Bank.**

Guyana is a center of biodiversity and is initiating a series of efforts to prepare itself to provide environmental services on a global scale, which include using the forest as a carbon sink that can generate a new revenue stream for the country. Much of the country's indigenous population (9.2 percent) lives in forests on which they depend for their economic, social and cultural subsistence. These Amerindian communities hold formal land titles for over 2.4 million hectares. The annual deforestation rate is estimated at 0.1-0.3 percent, which is relatively low, compared to most tropical countries, and about 90 percent of Guyana's forest is still intact. At present, the main pressures on forests are considered to be forest clearing for mining, the conversion of forest to agriculture, and the opening of infrastructure, especially roads. The main factors that have protected Guyana's forests so far are considered to be the very low population density away from the coastal plains, and the lack of physical accessibility to the forest hinterland.

Guyana is committed to addressing the various challenges that constrain its growth by:

- Protecting the environment and managing natural resources with simultaneous sustainable social and economic development.
- Managing the sea level rise and changes in rainfall patterns through disaster mitigation.
- Improving infrastructure to promote growth and private sector development.
- Improving the quality of education.
- Improving the quality of health services which is hampered by the emigration of skilled health personnel.
- Deepening governance and modernizing the state, while building on progress already made.
- Preventing crime and enhancing citizen's security.

3. DESCRIPTION OF THE PROJECT

The scope of the project extends to the rehabilitation of university infrastructure at the university campuses, particularly with respect to laboratory spaces, internal curriculum development, and provides a fund for research grants related to LCDS targeted at university researchers.

The project is divided into three components[2]:

Component 1: Education Quality Improvement Program (EQIP) *(estimated total cost: US$1.9 million of which IDA: US$1.5 million).* This component would support (a) carrying out of a science curriculum reform process by updating existing curricula and/or reorienting the existing curricula of UG aimed to support the LCDS through, inter alia: (i) the provision of technical assistance on curriculum reform, instructional design and science content and (ii) the provision of honoraria to selected UG lecturers participating in such curriculum reform processes; and (b) carrying out of selected research relevant to the LCDS through the provision of Research Grants to selected UG lecturers.

Component 2: Infrastructure Rehabilitation *(estimated total cost: US$6.2 million, of which IDA: US$5.5 million).* This component would support (a) rehabilitation and/or improvement of existing science laboratory buildings of four (4) faculties located within the UG campus aimed to

[2] From the Project Appraisal Document (PAD) of the World Bank.

provide basic teaching, including the improvement of UG campus wide drainage; (b) provision of scientific and multimedia equipment to the existing science laboratory buildings aimed to deliver practical science teaching and research; and (c) establishment of a campus wide internet network within UG to connect its faculties and libraries to the internet and to prepare UG to connect it into an international link including, inter alia, the development of software applications, e-learning tools and digital content repositories to support the curriculum reform process described in component 1.

Component 3: Institutional Capacity Building *(estimated total cost US$1.8 million, of which IDA: US$1.5 million).* This component would support the building of institutional capacity within UG through the provision of (a) technical assistance on (i) managerial and administrative capacities, including, *inter alia*, curricular supervision, information and communication technology, environmental and social management, monitoring, evaluation and facilities management Project capacities, *including, inter alia*, the elaboration of a facilities management plan, a project website, and an environmental management framework; and (ii) strategic business planning matters, including, *inter alia*, the preparation of studies related to the creation of a biodiversity institute, the setting up of a research and innovation fund, the establishment of a business development unit and an assessment of existing human resources; and (b) honoraria to selected UG staff for carrying out Project tasks.

3.1 Relevant Component Details

Component 1 - Education Quality Improvement Program. Sub Component (a) will support curriculum reform (sub-component a). This would support the development of a standardized process for the updating of existing curricula and the development of entirely new curricula to support the Low Carbon Development Strategy (LCDS). Activities would include providing targeted technical assistance from instructional design and content specialists, as well providing stipends to UG lecturers who dedicate time, expertise and energy to the process. These reforms would include the development of practical assessment components for each of the courses. At least 12 new courses relevant to the LCDS would be developed over a 3-year period.

The domains of study relevant to the LCDS that the University has identified as requiring development include among others:

- GIS and Remote Sensing
- Climate Change and Climate Modeling
- Hydrology (Water Resource Management)
- Ground Water Management
- Alternative Energy (bio fuels, solar energy, hydroelectricity etc.)
- Agriculture Resources Management
- Sustainable Forestry
- Natural Resources Management
- Food and Nutrition Technology
- Biodiversity Inventory and DNA Analysis (in collaboration with international research centers)

Sub-component (b) would provide limited funding to stimulate research relevant to the LCDS, with the aim of (1) supporting the development of a broader research/knowledge-generation culture at the UG, and (2) providing concrete examples of UG research which directly contribute to the LCDS. Such examples might include: formulation of policy recommendations; development of LCDS-relevant services or products; generation of field research skills among UG graduates demanded in the labor market; production of industry-specific baseline information (water quality, timber supply, flora/fauna inventory) against which the impact of economic activities can be measured; studies of social groups affected by LCDS industrial development, etc.

The safeguards Policies of the World Bank Group which were triggered for this component were OP 4.01, OP 4.04, OP. 4.36, OP 4.09 and OP. 4.10 and these will be secured implementation in the project by the application of two tools: an Environmental Management Framework (EMF) and an Indigenous Peoples Planning Framework (IPPF), both instruments were properly disclosed prior to appraisal in the UG and the World Bank web sites. It was agreed that an environmental specialist, specially hired for this project, and a representative of the UG Indigenous Committee will screen all proposals to identify any potential safeguards issues and provide guidance to researchers in the implementation of mitigation and prevention plans. Please refer to the EMF and the IPPF in Chapter 2 and 3, respectively, for further details.

After, the UG Research and Publications Committee, an established statutory body, will review the research grant applications and apply UG criteria to assess their relevance to the LCDS, scientific contribution and potential for funding. Research proposals will be screen out by procedures described in the EMF for the Research Fund. Preference would be given to research activities which engage students and even secondary level students in survey administration, data collection, data analysis, etc., as well as to research projects which involve external/international partners and/or generate co-financing. Grants would be relatively small (average grant size US$15,000), ranging from US$5,000-$50,000, and would be disbursed to UG lecturers through the UG Bursar's Office. Over the course of the Project an estimated 40 research projects would be funded.

Component 2: Infrastructure Rehabilitation. Sub-component (a) on laboratory and building rehabilitation would first rehabilitate 14 science laboratory buildings in the four focal science faculties on the campus by improving the physical infrastructure to allow for basic teaching and research. The rehabilitation would include new floor surfaces, new cupboards, new water and power systems, new lighting, provision of air conditioning, new furniture, etc. The component would also address basic electrical, water, sewage, and roofing for the buildings in which the laboratories reside. Finally, the sub-component would address the campus-wide issue of appropriate drainage and pumps to avoid frequent flooding on the campus.

Of the Safeguard Policies of the World Bank Group only the OP 4.01 was triggered. As a result, the project prepared this environmental assessment to identify potential environmental and social impacts that might occur due to the implementation of this component (civil works in the 14 science buildings). It also prepared an Environmental Management Plan (EMP) to prevent, mitigate and reduce environmental and social impacts in the UG campus.

Sub-component (b) would equip the labs with basic scientific equipment such as microscopes, slides, flasks, water testing kits, etc. as well as multi-media equipment. The equipment will be prioritized based on low operating costs, low level of technical skills for use and greatest benefit to students and faculty.

Sub-component (c) would support the establishment of a campus wide Internet network.

Component 3: Institutional Capacity Building. This component will support the building of institutional capacity at the University of Guyana to (i) manage the Project; (ii) plan for future phases of its strategic plan; and (iii) monitor and evaluate the Project results.

Sub-component (a) will strengthen the existing capacity of the University with additional coordination, curricular supervision, civil works, ICT (Information Communication Technology) and facilities management capacities. Environmental consultancies will be contracted in conjunction with the facilities management functions on an as needed basis. As the facilities management capacities will be essential in order to maintain and sustain the investments in basic infrastructure rehabilitation and equipment, this component would establish a comprehensive and systematic facilities management system at the University and finance capacity building for staff in charge of undertaking continuous review and maintenance of infrastructure and equipment. The financial management and procurement capacities would be leveraged from the Ministry of Education's Education Sector Development Unit (ESDU).

Sub-component (b) would provide essential technical assistance and capacity building for future strategic planning to expand the science offerings of the university; improve research; and more effectively link knowledge to demands in the productive sector. Three forward looking feasibility studies would be supported: (i) Options and viability options for a new biodiversity institute on the campus; (ii) Research and Innovation Fund to support development of new knowledge; and (iii) Establishment of a Business Development Unit which would focus on connecting university talent with external needs on a fee for service basis. The ES will provide support in the reviewing contracts to be sure environmental safeguards clauses are included in these documents and the project follows the environmental and social safeguards instruments.

Sub-component (c) will support monitoring and evaluation studies to assess the progress of the investments in achieving the Project Development Objective.

4. Scope of the Environmental and Social Manual

The safeguards instruments prepared for this project were the following: (i) an Environmental Assessment (EA) and an Environmental Management Plan (EMP) for applicable activities related to the civil works expected to be developed under Component 2; (ii) and Environmental Management Framework (EMF) and Indigenous Peoples Planning Framework (IPPF) for the Research Fund planned to operate as described in Component 1. Other activities planned to be developed under project implementation such as the preparation of specific environmental and feasibility studies will review the EMF for guidance and will be supervised by the Environmental Specialist (ES) of the Project. The threes documents have been compiled to form the Environmental and Social Manual (ESM) of the project which will be included as an Annex of the Project Operational Manual. The EA and EMP are embedded in Chapter 1; the EMF is Chapter 2 and the IPPF will be Chapter 3.

5. Project Location

The University of Guyana

The University of Guyana (UG) was established on October 1, 1963. When the University commenced lectures on October 2, 1963, it functioned as an evening institution with only 164 students enrolled for classes in three Faculties – Arts, Natural Sciences and Social Sciences.

In January 1968, the Booker Group of Companies provided 586.7 hectares of land for the construction of the Turkeyen campus. The first building was declared open on February 24, 1970. Since then, major physical rehabilitation and expansion programmes were created and new buildings were built. However, several of these buildings have deteriorated through the years and issues related to flooding, sewage, energy and water management have been accumulated, posting challenges to the current operation of the UG. Further details about the current situation of the campus site related to the implementation of this project will be discussed in later sections.

The UG is divided into several faculties such as: Agriculture and Forestry, School of Earth and Environmental Sciences, School of Education and Humanities, Health Sciences, Natural Sciences, Social Sciences and Technology. Each faculty is further subdivided into several departments. The Faculties and Schools are supported by several other departments, including: Maintenance, Administration, Personnel, Bursary, Information Technology, Senior Lecturer Accommodation, Student Halls of Residence, Canteen and the Library. There are approximately 50 buildings located on the Turkeyen Campus.

Geographical location

The Turkeyen main campus of the University of Guyana is located in the floodplain of the Demerara River, at about 2m below sea level and at about 2 km East from the capital city of Georgetown (Figure 2). The purpose of Component 2 of the Project is to rehabilitate 14 buildings of the four science Faculties (Faculty of Agriculture and Forestry, Faculty of Natural Science, Faculty of Technology, and the School of Earth and Environmental Science). This EA has been prepared to evaluate the potential impact of the civil works involved in the rehabilitation of UG science buildings, upon the UG campus activities, its people and its surroundings. As a result of this environmental assessment, an EMP was prepared in order to prevent, mitigate and reduce environmental and social impacts derived from the proposed project development.

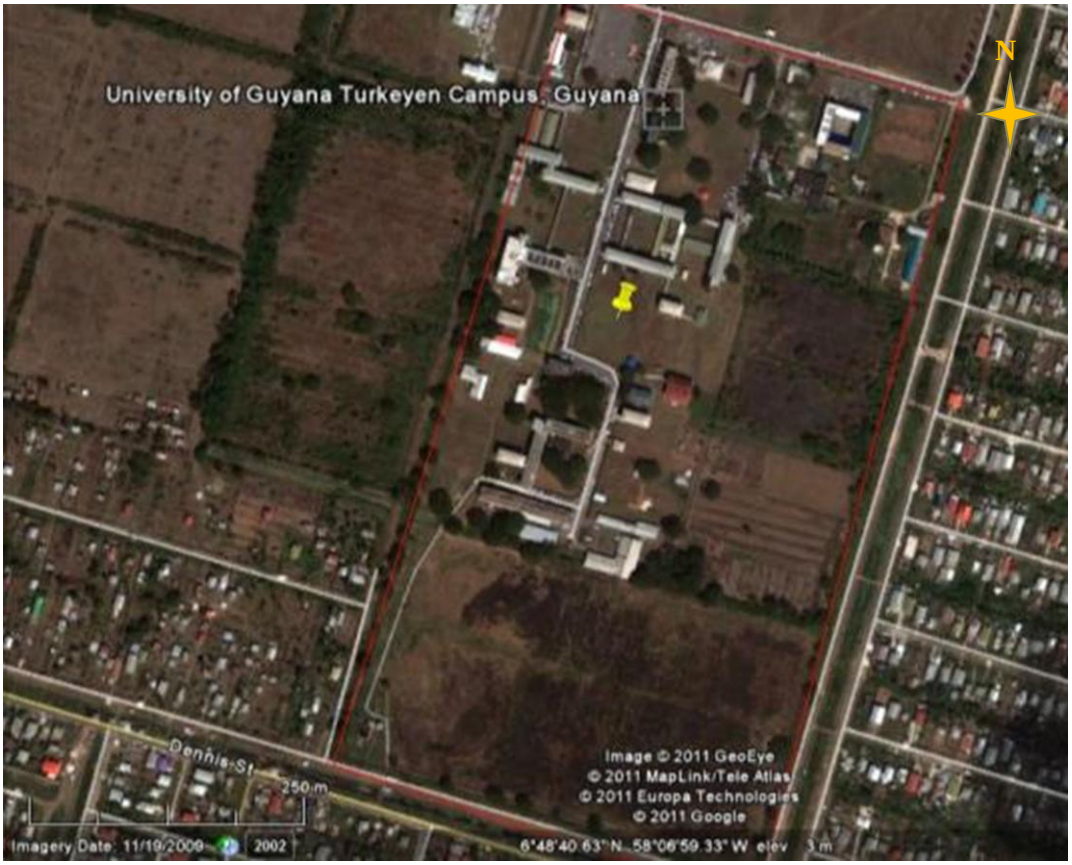

Figure 2. Location of the University of Guyana, Turkeyen Campus in Georgetown, Guyana.

6. LEGAL FRAMEWORK

6.1 THE WORLD BANK SAFEGUARDS POLICIES

During project preparation, five Safeguards Policies have been applied to the "University of Guyana Science and Technology Support Project (Figure 3). These policies were triggered to ensure that project funds are engaged in a manner consistent with Bank institutional policies with respect to social and environmental protection and management. The application of relevant Bank safeguards is required during the preparation and execution of Bank projects. Information about the safeguards policies can be found in Annex 1.

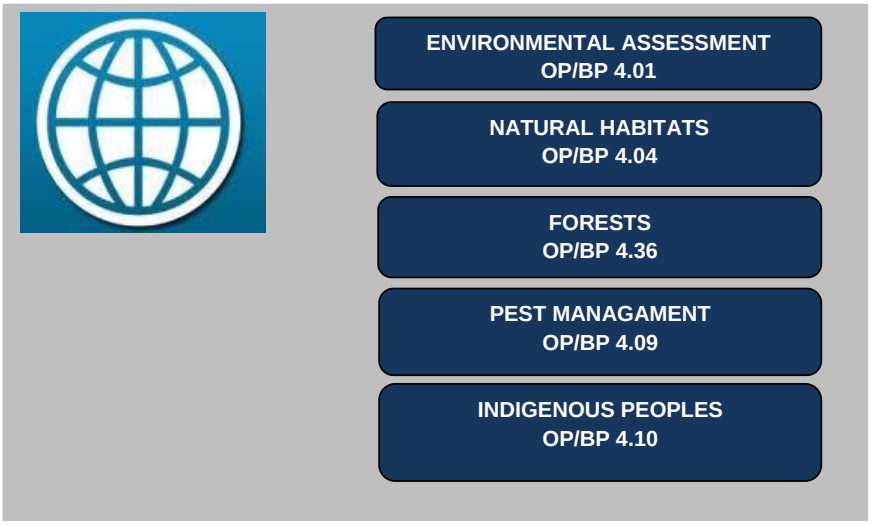

Figure 3. The World Bank Environmental and Social Safeguards Policies triggered for the UG Project, 2011.

OP/BP 4.01 – Environmental Assessment (EA)

This project has been classified as Category B and thus an environmental assessment was required during preparation of the project. According to the Policy, a Project is classified as Category B if:

> "Its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A, EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation"

OP/BP 4.04 – Natural Habitats

This safeguard seeks to support the protection and rehabilitation of natural habitats associated with sponsored projects. This safeguard applies when activities are identified that may significantly affect the quality of natural and critical habitats. Critical Habitats are those declared as national protected areas by the country or those areas international recognized of high biodiversity value (RAMSAR wetlands) or considered to be so by the World Bank. Particular attention is applied to critical habitats where impacts may result in ecological modifications that affect core survival requirements for resident species particularly where endangered, species are involved. This safeguard is triggered based on the possibility that research activities financed under Component 1 (Research Fund) may relate to issues affecting natural habitats which covered a large portion of the country.

OP/BP 4.09 – Pest Management

Activities involving the use of pesticides or pest control measures are subject to the application of this safeguard. As a matter of policy, the safeguard promotes the use of appropriate biological or environmental pest control measures and seeks to minimize the potential health risks associated with pest management activities. Additionally, the safeguard prohibits the use of internationally banned pesticides and promotes the safe application and applicator training when pesticides are employed. Additionally, under this project, the use of pesticides identified as class 1A or 1B and II in the *WHO recommended Classification of Pesticides by Hazard and Guidelines to Classification,* World Health Organization, 2009, presented in Annex 2. This safeguard is triggered owing to the possibility that research activities financed under Component 1 (Research Fund) may involve the use or could promote the use of pesticides. During the restoration activities of the UG campus after the civil works (Component 2) is no expected the use of agrochemicals.

OP/BP 4.36 – Forests

The forest safeguard is designed to guide Bank sponsored projects when activities may potentially affect forest resources. The safeguard seeks to enhance the use of forest management practices that promote resource conservation, renewable resource uses and inclusion of considerations for ecological services offered by forest resources. As research projects (under the Research Fund) may be proposed relating to forestry and forest management, research proposals will be reviewed for compliance with this safeguard following instructions described in the EMF (Chapter 2) and IPPF (Chapter 3).

In addition to these five Environmental Safeguards policies triggered for the UG Project, the OP 4.10 was also triggered; the social team expert guided the client in the preparation of an IPPF.

OP/BP 4.10 – Indigenous Peoples

The Indigenous Peoples safeguard aims to ensure that Bank sponsored projects protect and include the rights and perspectives of potentially affected indigenous groups. Such groups possess specific and often unique social and cultural characteristics that need to be considered and incorporated in the design and execution of Bank sponsored activities. Under this project, this safeguard provides a mechanism for ensuring the participation of indigenous groups in both the development of new academic program and research projects (both in Component 1), particularly with respect to LCDS. The project operational manual will ensure that potential research projects in indigenous areas are conducted in a manner acceptable to the affected groups.

6.2 GUYANA: NATIONAL LAWS AND REGULATIONS

The UG Project implementation is subject to comply with Guyana national legal framework. Table 1 shows the main national environmental regulatory framework of Guyana applicable to this project; however this table might not be considered complete since it might lack some other important regulations, decrees, etc. Also at the time of Project preparation, important environmental regulations were under study by the Government (for instance related to the declaration of new protected areas) and these new regulations can later become applicable to the UG project implementation. In the future, the Environmental and Social Manual of this project should be updated and improved to accommodate new regulations applicable to Project implementation, prior review of the World Bank.

Project activities area also subject to the application of international treaties and agreements in which Guyana is signatory. These treaties pursue the conservation of biological diversity, wetlands and marine ecosystems and promote adequate management of pesticides, climate change, among other topics (see Table 1). Guyana has also signed important international treaties in recognition of the rights of Indigenous and Tribal Peoples and for the conservation of Cultural Heritage. Further details related to indigenous communities are discussed in IPPF (Chapter 3).

Table 1. Guyana Environmental Legal Framework.

National Regulatory Framework
Environmental Protection Act, 1996
Environmental Protection (Air Quality) Regulations, 2000
Environmental Protection (Noise Management) Regulations, 2000
Environmental Protection (Water Quality) Regulations, 2000
Environmental Protection (Hazardous Waste Management) Regulations, 2000
Litter Enforcement Regulations, 2014
Wildlife Management and Conservation Regulations, 2013
Forestry Act, 2009
Mining Act, 1989
Mining Amendment Regulations, 2005
Fisheries Act, 2002
Pesticides and Toxic Chemicals Control Act, 2000

Pesticides and Toxic Chemicals (Amendment) Regulations, 2007
Pesticides and Toxic Chemicals Control (Amendment) Act, 2007
Pesticides and Toxic Chemicals Regulation, 2004
Protected Areas Act, 2011
Wild Birds Protection Act, 1919
Plant Protection Act, 2011
Occupational Health and Safety Act
Food & Drug Act, 1971
Amerindian Act, 2006
National Trust Act, 1972
INTERNATIONAL TREATIES (more details in Table 2)
United Nations Framework on Climate Change (UNFCCC)
Kyoto Protocol (and its successor)
United Nations Convention on Biodiversity (UNCBD)
Cartagena Protocol on Biosafety
Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress
Nagoya Protocol on Access and Benefit Sharing
International Plant Protection Convention
United Nations Convention to Combat Desertification (UNCCD)
United Nations Law of the Sea Convention
International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)
Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
Protocols to the Cartagena Convention
Ramsar Convention on Wetlands
Convention on the International Trade of Endangered Species of Wild Flora and Fauna (CITES)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes
Stockholm Convention on Persistent Organic Pollutants
Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
Treaty of Amazonian Cooperation (ACTO)
Indigenous and Tribal Peoples Convention, 1989
Convention Concerning the Protection of the World Cultural and Natural Heritage
UNESCO Convention of the Protection of the Underwater Cultural Heritage

The following information summarizes some of the environmental regulations of Guyana included in Table 1. However, it is recommended for project personnel in charge of the environmental and social supervision of this Project and for future contractors responsible to comply with this ESM, to consult directly with the EPA personnel about country regulations, procedures and permits and/or visit their website (http://www.epaguyana.org).

- **THE ENVIRONMENTAL PROTECTION ACT, 1996 (AS AMENDED BY THE ENVIRONMENTAL PROTECTION (AMENDMENT) ACT, 2005**

The Environmental Protection Act, 1996, and the Environmental Protection Amendment Act 2005, establishes the basic institutional and regulatory framework within which all activities that may significantly impact on the natural, social, and cultural environments are assessed. The Act also provides that the EPA will be the central coordinating agency for environmental management in the relevant sectors in Guyana. For example, the EPA also has Memoranda of Understanding with the Guyana Geology and Mines Commission and the Guyana Forestry Commission.

Section 68 of the Act provides for the elaboration of regulations to articulate specific areas of environmental management, and of relevance are the Regulations on hazardous waste management, water quality, air quality, noise management and environmental authorization which were established under the Environmental Protection Act in 2000. These pollution management regulations were developed to regulate and control the activities of developmental projects during construction and operation. Standards establishing the permissible parameters under these regulations are being developed.[3]

- **ENVIRONMENTAL PROTECTION (AIR QUALITY) REGULATIONS 2000**

These Regulations were formulated to protect the air quality and provide the necessary infrastructure for controlling the amount of contaminants by stipulating specific allowable levels of emissions that are released into the atmosphere at any given time. Parameters are specified for several contaminants including smoke, solid particles and carbon monoxide.

- **ENVIRONMENTAL PROTECTION (WATER QUALITY) REGULATIONS 2000**

These Regulations were developed to manage the discharge of waste matter into inland and coastal water bodies. They provide for minimizing the contamination of potential and existing water supply sources.

- **ENVIRONMENTAL PROTECTION (NOISE MANAGEMENT) REGULATIONS 2000**

These regulations are concerned with the control and management of noise emission in Guyana. In practice, the EPA (Guyana) combines the *Regulation* with the GNBS *Noise Standard* into the atmosphere, since the Regulation is silent on measurements and parameters for ambient noise emission etc.

- **ENVIRONMENTAL PROTECTION (HAZARDOUS WASTE MANAGEMENT) REGULATIONS, 2000**

[3] For example the *Interim Guidelines for Noise Emission into the Environment, 2009*

These Regulations cover the management of waste[4] including chemical waste and cover industrial, commercial and any other activity that produces waste. Some of the key activities which are covered under the Regulations are generation, treatment and disposal[5] of hazardous waste. The Regulation is read and construed as being in addition to, and not in contravention of the Pesticides and Toxic Chemicals Control Act 2000 (No. 13 of 2000). Based on the definition all chemical wastes including persistent organic pollutants (POPs) are covered under these Regulations for the purposes of management.

Permits are required for the generation of waste which is monitored throughout the production, storage, transport and release phases. The waste streams on which focus is centered for control are as follows:

(a) Clinical Waste from medical care in hospitals, medical centers and clinics;
(b) Waste from the production and preparation of pharmaceutical products;
(c) Waste from the production , formulation and use of biocides and phytopharmaceuticals;
(d) Waste pharmaceuticals, drugs and medicines; and
(e) Waste from the manufacture, formulation and use of wood preserving chemicals.

Specific constituents are also listed in this Regulation.

- **THE ENVIRONMENTAL PROTECTION (AUTHORIZATIONS) REGULATIONS, 2000**

These Regulations are concerned with the guidelines for granting authorization for projects that can have medium to high environmental impacts in Guyana. Guidelines and procedures are specified in its contents and a fee structure in its schedule.

- **THE ENVIRONMENTAL PROTECTION (WILDLIFE MANAGEMENT AND CONSERVATION) REGULATIONS, 2013**

The Wildlife Management and Conservation Regulations (2013) was made under the Environmental Protection Act. This critical piece of legislation focuses on the management and conservation of wildlife. It addresses issues including the capturing, gathering, collecting, hunting, killing and taking of wildlife. The regulations cover the use of wildlife for any purposes, including as bush meat, for research, and for medicinal purposes. It also makes provisions for the classification of wildlife, as well as areas within Guyana. The regulations are already being enforced.

- **LITTER ENFORCEMENT REGULATIONS 2014**

The Litter Regulations addresses the littering of public spaces and outlines several offences and penalties and provides for Litter Wardens with authority to enforce these Regulations and with special powers of court on convicting offenders. Under 'offences', "A person who, without reasonable excuse, deposits litter in or on any public place… is guilty of an offence". Also,

[4] Hazardous waste is any "waste or combination of wastes which, because of its quantity, concentration or physical, chemical or infectious characteristics, may pose a substantial hazard to human health, and belong to any category contained in Schedules I, unless they do not contain any of the characteristics contained in Schedule II and includes waste that is hazardous industrial waste, acute hazardous waste chemical, hazardous waste chemical, severely toxic waste, flammable waste, corrosive waste, reactive waste, radioactive waste, clinical waste, leachate toxic waste or polychlorinated biphenyl waste.

[5] Under the Regulations, disposal is defined as "the discharge, deposit, injection, dumping or placing of any hazardous waste into or on any land so that it may enter the environment, be emitted into the air or discharged into any waters, including groundwater"

persons who deposit litter from a moving vehicle unto a public place will be considered an offender. Enforcement activities for these Litter Regulations commenced April 2014 with the establishment of a Litter Enforcement Unit at the EPA.

- **FORESTRY ACT, 2009**

The *Forestry Act 2009* sets a regime for the sustainable management of the state forests, by providing State forests through concessions for forest activities, including the conservation of biological diversity and environmental services provided by the forest. The second part of the *Act* provides for the issuance of five types of state forest authorizations: concessions, exploratory permits, use permits, community forest management agreements and afforestation agreements. This section also addresses compliance with occupational health. The *Act* prohibits acts that could cause forest fires in State Forest areas and allows the GFC to declare certain areas to be fire protection areas. The *Act* places emphasis on value added activities by addressing issues of quality control through legally binding codes of practice which can be subject to amendments from time to time. Issues of under-pricing, unlawful exportation of forest produce, trade of timber in contravention to the GFC's guidelines, and procedures for ownership of concession areas and change thereof, are also outlined in the *Act*.

State Forests are to be declared by public notice under s. 3 of the *Act*, and exclude:

- village lands as identified under the *Amerindian Act, 2006*
- Iwokrama Rainforest
- Kaieteur National Park

A particular feature of the *Act* is that it merges exploitation and conservation with respect to State forests, and creates some degree of uncertainty. Additionally the *Act* contemplates the use of State forests for eco-tourism, but does not identify control measures such as carrying capacity.

As with the previous Forestry *Act*, the 2009 *Forestry Act allows* logging concessions to be issued over untitled traditional lands. Amerindian are thus in the same position as other citizens of Guyana with respect to these land, with the financial benefits from leases to these lands will accrue to the lessee.

- **MINING ACT, 1989**

The Mining Act 1989 establishes the legal framework for the utilisation of mineral resources in Guyana. The Act makes provision for a system of mineral agreements and licences for regulating prospecting. It gives the Guyana Geology and Mines Commission the responsibility for establishing regulations for mining and quarrying operations. A mining licence is required in order to mine any mineral and is issued at the discretion of the Minister responsible for mining. The rights of persons in possession of lands grants as well as the privileges of Amerindians in relation to prospecting, mining, quarrying are preserved under this Act. Further regulatory framework under the Act makes provisions for the disposal of sanitary waste and the storage of poisonous substances in mining areas.

The Act also provides for the granting of prospecting and mining licences and quarrying permits by GGMC and for the conduct of geological and geophysical surveys in any part of Guyana.

MINING (ENVIRONMENTAL) REGULATIONS, 2005

Environmental regulations under the Mining Act were passed in 2005 for the mining sector. These regulations require a license for the use of poisonous substances such as mercury and cyanide and promote the enforcement of environmental standards in the sector for small and medium scale mining. In general, the regulations established regulatory control in areas of key environmental concerns. These include management of mining waste, water quality, closure and reclamation, management of the natural environment for exploration and mining, submission of environmental management plans in accordance with an environmental code of practice established by GGMC and contingency and emergency response plans.

- **FISHERIES ACT, 2002**

The Fisheries Act, which was enacted in 2002, is intended to assure the sustainable management of fisheries resources and replaced the 1957 Act. Together with the Fisheries Regulation of 1959, the Fisheries (Pin Seine) Regulations of 1962, the Fisheries (Aquatic Wildlife Control) Regulation of 1966, as well as the Maritime Boundaries Act of 1977, these pieces of legislation provide for the development, management, exploration, utilization and conservation of fisheries and for associated purposes. These existing pieces of legislation provide a framework for sustainable fisheries management and the protection of Guyana‟ s aquatic environments from pollution, which is necessary for biodiversity conservation and management.

- **PESTICIDES AND TOXIC CHEMICALS CONTROL ACT, 2000 AND ITS ASSOCIATED REGULATIONS**

    - **Pesticides and Toxic Chemicals Control Act, 2000**

The management of chemicals in Guyana is governed by the Pesticides and Toxic Chemicals Control Act 2000 (No.13 of 2000). This Act provides for the establishment of the Pesticides and Toxic Chemicals Control Board, which comprise representatives from the Ministry of Agriculture, Ministry of Health, Environmental Protection Agency and other representatives from the private sector and non-governmental organization.

A Secretariat has been established for the management of pesticides and toxic chemicals with the administrative head being the Registrar of Pesticides and Toxic Chemicals. All chemicals used in Guyana must be registered by the Board. The decision to register or not is done based on registration submission to the Board. The relevant documentation are examined along with international guidance and previous decisions emanating from international agencies such as the Food and Agricultural Organization of the United Nations (FAO), United Nations Environmental Programme (UNEP), *Stockholm Convention on Persistent Organic Pollutants (POPs)*[6], the *Rotterdam Convention on the Prior Informed Consent for Certain Hazardous Chemicals in International Trade*[7], European Union and United States of America Environmental Protection Agency (US EPA).

[6] See http://chm.pops.int/default.aspx and http://www.pops.int/documents/convtext/convtext_en.pdf

[7] See http://www.pic.int/home.php?type=s&id=77 and http://www.pic.int/home.php?type=t&id=49

- **Pesticides and Toxic Chemicals (Amendment) Act 2007 (No. 13 of 2007)**

This Amendment provides for the regulating of exports and accession to international Agreements governing pesticides and toxic chemicals[8] management by providing for the adoption of Agreements containing legally binding instruments.

- **Pesticides and Toxic Chemicals Regulations 2004 (No. 8 of 2004)**

These Regulations were established under Section 32 of the Act and provide the instruments and requirements for the implementation of the Act in the following areas:

(a) Pesticide and Toxic Chemical Registration and Classification Procedure;
(b) Pesticide labeling;
(c) Certification of Pesticide Applicators;
(d) Pesticide Manufacturing and Distribution Certificate;
(e) Experimental Pesticides and Toxic Chemicals Studies;
(f) Transportation, Storage, Disposal and Recall of Pesticides and Toxic Chemicals;
(g) Ministerial Emergency Registration and Exemptions;
(h) Pesticide Residues; and
(i) Pesticide Worker Protection.

Pesticides are classified as Prohibited, Restricted or General Use. A prohibited pesticide is not allowed for use and is classified based on toxicity, use pattern under local conditions and the respective decisions of the following international agencies:

(a) United Nations Food and Agricultural Organization (FAO);
(b) Rotterdam Convention;
(c) Stockholm Convention;
(d) United Nations Environmental Programme; and
(e) World Health Organization.

A restricted pesticide is permitted for use only on certain stated crops.

- **Pesticides and Toxic Chemicals (Amendment) Regulation 2007 (No. 8 of 2007)**

This Amendment provides the instruments for regulating exports of pesticides and toxic chemicals. It covers prohibited, restricted and registered products along with information on monthly import of any chemical into Guyana, vending premises, legislations, reports, and news pertaining to current and ongoing developments. Other methods of dissemination of information include the publication of a Quarterly Newsletter, and the use of the print and television Media for public and general notices.

- **OCCUPATIONAL SAFETY AND HEALTH ACT 1997 (NO. 32 OF 1997)**

The provisions for registration and regulation of industrial establishments and for occupational safety and health of persons at work are enshrined in the Occupational Safety and Health Act

[8] The Stockholm and Rotterdam Conventions. The Basel Convention is addressed by the Environmental Protection (Hazardous Wastes Management) Regulations, 2000

1997. The Act covers hazardous chemicals at workplaces which can endanger the health of workers, and allows for the limited or restricted use of such chemicals. It also covers the introduction of new chemicals in the workplace. Implementation of this Act is the responsibility of the Occupational Safety and Health Department of the Ministry of Labour.

- **FOOD & DRUG ACT, 1971**

This *Act* regulates food, drugs, cosmetics, and therapeutic devices, and is concerned with the institution of standards for food and drugs, the regulation of the sale of food or drugs that are considered unfit or harmful for consumption and the prohibition of marketing food and drugs in a manner misleading to the public.

- **THE AMERINDIAN ACT, 2006**

Enacted to repeal the *Amerindian Act, 1973* and any subsidiary legislation made under that it. The Second Schedule of the Act also indicates amendments to four (4) pieces of legislation with respect to the *Act.* To date, the *Amerindian Act, 2006* is the principal legislation in Guyana solely focused and therefore directly affecting indigenous people's rights and issues. The main intention of the Amerindian *Act, 2006* is to provide for the recognition and protection of the rights of Amerindian villages and communities and the granting of land to these villages and communities. The *Act* is also concerned with good governance within Amerindian villages and communities and is largely aimed at empowering Amerindian peoples with respect to their tradition, culture and lands.

The *Act* also provides – within the laws governing protected area systems – for villages and communities to designate the whole or any part of its village lands as a protected areas, providing that there is consent of the village and the establishment does not alter or abrogate any traditional right over the land unless consent is given in writing. The Amerindian community which has traditional rights over the land should be adequately consulted about the management of the protected area. The *Act* also provides for protection of Amerindian artifacts and monuments of historical religious or cultural significance and renders offender liable to penalties prescribed in the First Schedule. However this is not without prejudice to the *National Trust Act, 1972.*

PROTECTED AREAS ACT, 2011

The Protected Areas Act was enacted in 2011 and provides the framework for the establishment and management of a national system of protected areas, including a mechanism for sustainable long-term financing (the National Protected Areas Trust Fund) and establishment of a Protected Areas Commission. Under the Protected Areas Act, existing and new state-owned protected

areas, Amerindian protected areas, privately managed protected areas, and Urban Parks such as the Botanical Gardens and the Zoological Park will comprise the national protected areas system.

WILD BIRDS PROTECTION ACT, 1919

The Wild Birds Protection Act was enacted in 1919 and seeks to enforce fines and penalties on persons who are inclined to injure, harm or capture wild birds without consent.

PLANT PROTECTION ACT, 2011

The Plant Protection Act, which was enacted in 2011, provides for the prevention, eradication and control of diseases and pests affecting plants. The Act is administered by the National Agricultural Research and Extension Institute.

- **NATIONAL TRUST ACT, (No. 7 of 1972)**

The *Act* provides for the preservation of monuments, sites, places and objects of historic interest or national significance. The main body vested with this responsibility is the Office of the National Trust of Guyana which was established in 1972. The Act states that " when it appears to the National Trust that in the public interest that any monument (*defined as:* "any building structure, object or other work of man or of nature whether above or below the surface of the land or the floor of the sea within the territorial waters of Guyana and any site cave or excavation") should be preserved on account of the historic, architectural or archaeological attaching to it or its national importance, the National Trust may declare the monument to be a national monument." At present there are nine gazetted National Monuments.

6.3 NATIONAL POLICIES AND ENVIRONMENTAL STRATEGIES

- **NATIONAL ENVIRONMENTAL ACTION PLAN**

The National Environmental Action Plan (NEAP) of 2001-2005, follows directly the NEAP of 1994, which summarizes the national environment policy and focuses on coastal zone management, natural resources management including land resources, biodiversity, wildlife, forestry and ecotourism, waste management and pollution control, and mining. NEAP is best described as a Guyana's expressed national commitment to sustainable development in the pursuit of national social and economic goals; and provides a framework for integrating cross-sectorial environmental concerns into the wider context of Guyana's economic and social development programs (NEAP, 2001-2005).

The main goals of the NEAP are identified as:

- prevention or control of pollution in order to maintain the integrity of the land and the natural purity of the air and water resources;
- general preservation and conservation of ecological integrity and, in particular, the protection of natural habitats and fragile ecosystems; and
- ensuring sustainability through best practice of the management and use of natural resources for national development.

Further, the NEAP further states that in order to fulfill these objectives, the Government of Guyana will:

- Institute punitive measures to deter possible violations of environmental norms;
- Ensure that, where environmental damage occurs, remedial action will be taken with the cost being covered by those responsible for causing the damage;
- Rehabilitate damaged ecosystems where possible and reverse any degradation of the environment;
- Ensure prior environmental assessments of proposed activities that may significantly affect the environment;
- Ensure that conservation is treated as an integral part of the planning and implementation of development activities;
- Raise the consciousness of the population on the environmental implications of economic and social activities through comprehensive education and public awareness programmes; and
- Involve the population, including indigenous peoples, women and youth, in the management of the environment and natural resources.

- **LOW CARBON DEVELOPMENT STRATEGY**

As a direct mitigation response to global climate change, the GoG launched a National Low Carbon Development Strategy[9].

The strategy seeks to provide insights on how to stimulate the creation of a low-deforestation, low-carbon, climate-resilient economy. Guyana's LCDS identifies five strategic imperatives for Guyana to undertake in order to generate economic growth, while simultaneously eliminating approximately 30 percent of non-forestry emissions through the use of clean energy. These strategic goals are:

- Invest in strategic low carbon economic infrastructure, such as: hydropower development; improved access to unused, non-forested land; and improved fiber optic bandwidth to facilitate the development of low-carbon business activities.

- Nurture investment in high-potential low-carbon sectors, such as fruits and vegetables, aquaculture, and sustainable forestry and wood processing.

- Invest in other low-carbon business development opportunities such as business process outsourcing and ecotourism.

- Expand access to services and new economic opportunity for indigenous peoples through improved social services (including health and education), low-carbon energy sources, clean water and employment which do not threaten the forest.

- Improve opportunities to Guyana society, including improving and expanding job prospects, promoting private sector entrepreneurship, and improving social services with a particular focus on health and education.

[9] The Low Carbon Development Strategy of Guyana: http://www.lcds.gov.gy/

Guyana‟ s LCDS was prepared in 2009 and has since been revised in 2010 and updated in 2013. The LCDS is currently in its implementation phase and is being coordinated by the Office of the President through the Office of Climate Change and overseen by a Multi-Stakeholder Steering Committee (MSSC).

The LCDS is being supported through a partnership between GoG and the Kingdom of Norway. On November 9th, 2009, the Governments of Guyana and Norway signed a Memorandum of Understanding which set out how the two countries will "work together to provide the world with a relevant, replicable model for how REDD-plus can align the development objectives of forest countries with the world's need to combat climate change." [10] Norway committed to providing financial support of up to US$250 million by 2015 for results achieved by Guyana in limiting emissions from deforestation and forest degradation.

Monies received under this initiative are being managed under the Guyana REDD-Plus Investment Fund (GRIF). The GRIF aims to align national economic development with climate resilience and low-deforestation, low carbon growth by investing in low-carbon strategies identified in the LCDS.

- **NATIONAL FOREST POLICY**

The National Forest Policy (NFP) was revised in 2011 and aims to ensure the "*conservation, protection, management and utilization of the nation's forest resources while ensuring that the productive capacity of the forests for both goods and services is maintained or enhanced* ". The revised NFP addresses the country's national and global responsibility for the sustainable management of the forest and recognizes the critical role of forests in maintaining the ecosystems and life supporting services.

- **ABS POLICY**

A national policy addressing Access and Benefit Sharing (ABS) has been finalised and endorsed by the GoG in 2007. The policy addresses ABS in the context of Guyana and the UNCBD and defines the mandates and the responsibilities of the national agencies directly involved in the implementation of the policy. Implementation of the ABS policy follows a draft ABS Regulations that addresses prior informed consent, sharing of benefits, genetic resources among other aspects.

- **NATIONAL BIOSAFETY FRAMEWORK**

A National Biosafety Framework for Guyana was developed and is currently in the implementation phase. As part of the National Biosafety Framework, a draft policy on biotechnology, biosafety and biosecurity has been prepared in accordance with Guyana's obligations under the Cartagena Protocol. The policy aims to control and monitor Genetically Modified Organisms (GMO) and Living Modified Organisms (LMO) while preventing adverse effects on the conservation and sustainable use of biological diversity in Guyana. In addition to GMO's, and LMO's, the policy also targets all elements of genetic materials used in genetic

[10] http://www.lcds.gov.gy/images/stories/Documents/Low%20Carbon%20Development%20Strategy%20-%20May%202010.pdf

manipulation, as well as, laboratory and field applications of biotechnology within Guyana. Consultations were recently held on the draft policy and the feedback from these consultations is currently being addressed.

- **NATIONAL INTEGRATED WATER RESOURCES MANAGEMENT POLICY**

A National Integrated Water Resources Management Policy and Roadmap was prepared in 2013 to ensure water resources are managed in a manner to safeguard the health, safety and welfare of Guyana's citizens and ecosystems and to ensure effective, efficient, and equitable use of water resources consistent with the sustainable development goals of the nation. This policy sets out the framework for the management of Guyana's water resources and presents a road map for the planning for integrated water resources management, which includes maintaining the integrity of the aquatic ecosystems.

- **NATIONAL FOREST PLAN**

In an effort to complement the National Forest Policy (NFP), the Guyana Forestry Commission (GFC) has developed a National Forest Plan (1997 and 2000), which is essentially a five-year strategy for the forestry sector. The overall objective of the National Forest Policy is to promote conservation, protection, management and utilization of the nation's forest resources, while ensuring that the productive capacity of the forests is maintained or enhanced. Thus, the Plan promotes sustainable use and management of Biological Diversity in the forestry sector and therefore proposes a range of activities land use, forest management, research and information, forestry training and education, and forest administration and governance. It builds upon the National Forest Plan (1998), which is essentially a five-year strategy for the forestry sector, that outlines the programmes necessary for the achievement of the prescriptions of the NFP and highlights, among other uses, the need for strengthened collaboration between the Guyana Forestry Commission and the National Biodiversity Advisory Committee. Basically, the plan seeks to promote sustainable use and management of Biological Diversity in the forestry sector. Additionally, it promotes the development of guidelines for best practices on intellectual property rights.

The Guyana Forestry Commission also has a number of operational guidelines that seek to protect forests through direct actions that help to maintain and rehabilitate watershed areas. Chief among these are:

- Annual Plan Guidelines for Timber Harvesting (2002);
- Code of Practice for Timber Harvesting (2002);
- Annual Plan of Operation Guidelines for Conservation (2002); and
- Forest Management Plan Guidelines (2002).

- **NATIONAL PROTECTED AREAS SYSTEM PLAN**

The NPAS Plan was prepared in 2013 covering the period 2013-2015 and is built on the need to allow for the protection and maintenance of Guyana‟ s unique natural and cultural heritage,

whilst at the same time facilitating sustainable social, environmental and economic development. The plan reflects the goal and objectives of the NPAS and was prepared in accordance with the Protected Areas Act, 2011. Several initiatives to enhance the protected areas system are included in the plan such as to adequately maintain and manage existing protected areas, expand on the national protected areas, monitoring of protected areas, enhancing of public awareness and participation, etc. This plan is to be updated as is necessary.

- **NATIONAL LAND USE PLAN**

The NLUP was developed in 2013 and provides support to decision making through looking at development options and constraints throughout the country. It was compiled by assessing current land use, potential, constraints and stakeholders‟ concerns. It provides a strategic framework to guide land development in Guyana. As such the NLUP is built upon a number of national policies and strategies that have a direct relevance for land use and land management. The NLUP seeks to enable financial resources to be targeted at optimal land uses at the regional level and to provide a spatial element to development planning.

- **NATIONAL MANGROVE MANAGEMENT ACTION PLAN**

National Mangrove Management Action Plan (2001) was developed to guide the work of stakeholders involved in the utilization and protection of mangrove resources. Basically, this Plan: (i) proposes specific actions, including review of policy and legislation, as well as zonation of mangrove forest to ensure protection; (ii) identifies main facilitators of the process; and (iii) outlines indicators and establishes time-lines. The ultimate objective of this plan is to foster a more coordinated approach in planning, policy formation, institutional cooperation and implementation of actions. Additionally, this Management and Action Plan laid the basis for the development of a mangrove management plan in Guyana.

The Guyana Forest Commission (GFC) also has in place a number of measures to ensure the conservation and management of Guyana's flora and fauna. These include a Forest Management Plan (1999), a Code of Practice for Timber Harvesting (2002), a Sectorial Environmental Assessment for the forestry sector, and National Standards for Forest Certification.

- **INTEGRATED COASTAL ZONE MANAGEMENT PLAN**

The Integrated Coastal Zone Management Plan (ICZM, 2001) identifies, among other factors, sea level and floods as social, economic and ecological stresses that impact on the coastal zone. The Plan basically addresses issues related to policy development, analysis and planning, inter-agency coordination, public education and awareness building and education, environmental control and compliance, monitoring and measurement and information management-all of which are necessary to reduce the risks posed by climate change. One of the constraints in the implementation of the ICZM is the limited institutional capacity in terms of human, technical and physical capital to implement the specific actions to address issues affecting the coastal zone, including solid waste management, air, land and water pollution, and environmental health of its inhabitants.

- **NATIONAL STRATEGY FOR THE CONSERVATION AND SUSTAINABLE USE OF GUYANA'S BIODIVERSITY[11]**

The National Biodiversity Strategies and Action Plan I (NBAP) and Sustainable Use of Guyana's Biodiversity of 1997 identified the national position relating to biodiversity and provided the context within which the NBAP II was developed. Specifically, the policy recognizes the multi-purpose value of biodiversity for all sectors (agriculture, genetic, social, economic, scientific, ecological, cultural and aesthetic), and calls for, among other actions, to study and the use of genes, species, habitats and ecosystems in an equitable and sustainable manner.

The general objectives of the Policy 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; and to take all necessary actions to achieve these goals. These policy objectives provided the broad framework for the development of the National Biodiversity Action Plan (NBAP). In essence, the National Strategy for the Conservation and Sustainable Use of Guyana's Biological Diversity became the critical point of reference for a number of national documents.

- **NATIONAL BIODIVERSITY ACTION PLAN II[12] (2007-2011)**

The National Biodiversity Action Plan (NBAP) II (2007-2011) builds upon NBAP I, which has as its 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 out of the use of Guyana's biodiversity.*' Essentially, this policy this policy provides Guyana with a further five year plan (2007-2011) to develop and accelerate conservation and sustainable use activities and programs related to biodiversity.

- **NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN (2012 – 2020)**

During 2014, the NBAPII was revised and updated to the National Biodiversity Strategy and Action Plan (NBSAP) 2012 to 2020. This Plan sets out the vision, the roles, duties and obligations of the state and its citizens and the actions to protect, conserve, use sustainably and share equitably the benefits arising from biodiversity. It provides the guidance and support actions for biodiversity and sets out the national priorities and the strategic objectives to be achieved.

It allows as well, partners at all levels to better identify how they can contribute and support Guyana in meeting its national biodiversity vision while meeting at the same time, its obligations to the UNCBD. The Plan incorporates the goals of the UNCBD Strategic Plan for Biodiversity 2011-2020 and selected Aichi 2011- 2020 Targets.

[11] Information obtained directly for NBAP II.

[12] Approved by the Cabinet of the Government of Guyana August 2008

- **NATIONAL POLICY ON ACCESS TO GENETIC RESOURCES AND THE FAIR AND EQUITABLE SHARING OF BENEFITS ARISING FROM THEIR UTILIZATION**

The Environmental Protection Act, 1996 gives the EPA the mandate to coordinate and maintain a program for the conservation and sustainable use of biological diversity. Since ratifying the Convention on Biological Diversity (CBD) and enacting the EP Act, the Government of Guyana and the EPA have been committed to developing national strategies plans and programmes for the conservation and sustainable use of biodiversity, and to implementing legislative, administrative and policy measures in furtherance of the provisions of the CBD.

In implementing its mandate, the EPA has paid particular to those aspects of the CBD that are of immediate national importance. One such aspect is covered by Articles 15 of the CBD which make provisions for Access to Genetic Resources and Benefit-Sharing.

- **WATER**

Guyana National Development Strategy (NDS 2001-2010)[13], addresses in Chapter 40 issues related to water management and flood control policies. This document indicates the commitment of the Government of Guyana to strengthen the capacity of key institutions responsibility for water management. For example, the strategy for the Hydrometeorological Service will lead to the upgrading of existing stations and the working environment, including improved communication links to data collection centers and automation of stations, plus the recruitment of qualified staff.

Recently, the Government of Guyana has established a National Water Council in Guyana to develop and/or review the national water policy and to oversee its management and coordination. The goal of the Policy is to provide a framework to maximize the contribution of the water sector to sustainable economic, social and environmental development in an efficient and equitable manner. Recently a National Integrated Water Resources Management Policy and a National Waste Water Management Strategy were developed.

- **AGRICULTURE**

A National Strategy for Agriculture in Guyana (2013-2020) was developed in 2013 and outlines a roadmap to ensure that Guyana achieves its ambitions as a food and nutrition secure nation and as a major contributor to food and nutrition security within the Caribbean Region. Guyana has identified food security as a way to end poverty and hunger by 2025 and agriculture as the vehicle to achieve this. Guyana's vision for agriculture seeks to change the view that agriculture is for subsistence livelihood while promoting agriculture as a wealth generator and entrepreneurial enterprise, producing food and non-food commodities to meet local and export demands. The Strategy focuses on a wide range of activities including environmental sustainability, plant and animal health, agro diversity, land availability, agro energy and efficient infrastructure.

[13] http://www.ndsguyana.org/document.asp

A National Policy on Inland Fisheries and Aquaculture was developed in 2012 and was guided by the Caribbean Community Common Fisheries Policy (2011). The policy aims at promoting the sustainable development of inland fisheries and aquaculture to ensure food security and social and economic benefits while protecting, maintaining and rehabilitating the ecosystem. The policy also focuses on institutional strengthening, capacity building and research and development.

A Fisheries Management and Development Plan was prepared in 2006 to promote the conservation and sustainable development of the fisheries resources of Guyana. Additionally, this Plan has provided information on fisheries policy, guiding principles, goals and the legal and institutional framework for fisheries management and development, including aquaculture. There also exists a Management Planfor Arapaima in North Rupununi) that was developed with the communities of the North Rupununi and the North Rupununi District Development Board (NRDDB). This Plan represents the first attempt to have local Amerindian communities managing an inland fishery plan in Guyana. In addition there is Marine Fisheries Management Plan which provides a 7-year management plan for marine fisheries in Guyana, from 2013-2020 and updated the previous management plan, which covered the period 2007-2011. The key fisheries outlined in the plan are artisanal fishery, industrial seabob and prawn fishery, semi-industrial red snapper fishery and shark fishery. Detailed management measures are outlined for each fishery including long- and short-term objectives, including measures to protect and conserve marine species.

Moreover, the NDS (2001-2010) articulates a number of policy objectives aimed at transforming the sector to increase its productivity, output, production and competitiveness. Three of those objectives are vital to the sustainable utilization and management of fishery resources: (i) providing adequate support services and infrastructure to facilitate development of the sector; (ii) designing and implementing systems for information generation as they relate to market intelligence and research and development; and (iii) increasing the relevance of agricultural training and education.

- **GUIDELINES FOR NOISE EMISSION INTO THE ENVIRONMENT, 2009**

Developed to assist the Environmental Protection Agency in the enforcement of the *Environmental Protection (Noise Management) Regulation 2000* and to reduce the level of noise emanating from commercial, residential, institutional, educational, industrial, construction, transportation and recreational activities. The Standard sets outs permissible noise levels for different categories of areas,

6.4 INTERNATIONAL TREATIES

Guyana is signatory of different international treaties and Agreements. For the implementation of the UG Project, especially in relation to the activities related to the Research Fund, the Feasibility study for the Biodiversity Center among other activities, the Project will need to ensure compliance with these agreements and include any capacity building activities or other necessary tasks so Project staff, stakeholders (contractors, researchers) understand and apply

accordingly such agreements. The Environmental Specialist hired for the UG Project, with the support of the Project Coordinator, will be both responsible to ensure compliance with these country regulations and agreements. Table 2 describes the main international treaties that could be applicable to the UG Project, however this list should not be considered as a complete list.

Table 2. Details of Guyana International Treaties and Agreements.

INTERNATIONAL AGREEMENT	OBJECTIVE OF INSTRUMENT	DATE OF APPLICATION	GUYANA'S STATUS	NATIONAL FOCAL POINT/	SECTORS ADDRESSED	RELEVANT NATIONAL LEGISLATION
United Nations Framework Convention on Climate Change	To achieve stabilisation of greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system	31 March, 1994	Ratified	Office of the President (focal point) Office of Climate Change(implementing agency)	forestry	Forest Act, 2009
Kyoto Protocol	To assist developing countries in reducing the greenhouse gas emissions and preserving carbon sinks	16 February, 2005	Ratified	Office of the President (focal point) Office of Climate Change(implementing agency)	forestry	Forest Act, 2009
Convention on Biodiversity	1. conservation of biological diversity 2. sustainable use of its components; 3. fair and equitable sharing of benefits arising from genetic resources	29 December,1993	Ratified	Office of the President (focal point) Environmental Protection Agency (implementing agency)	environmental management forestry fisheries	Environmental Protection Act, 1996 Forestry Act, 2009 Amerindian Act, 1996
Cartagena Protocol	A supplement to the Convention on Biological Diversity. In accordance with the precautionary approach, contained in Principle 15 of the Rio Declaration on Environment and Development, the objective of the Protocol is to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of 'living modified organisms resulting from modern biotechnology' that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements (Article 1 of the Protocol)	11 September, 2003	Ratified	Environmental Protection Agency (focal point) Environmental Protection Agency (implementing agency)	environmental management forestry agriculture fisheries health customs	Regulations in draft
Nagoya Protocol	Adopted by the Conference of the Parties to the Convention on Biological Diversity at its tenth meeting on 29 October 2010 in Nagoya, Japan. The Nagoya Protocol will	NOT IN FORCE YET	–	Environmental Protection Agency (focal point) Environmental	environmental management forestry agriculture	Regulations in draft

INTERNATIONAL AGREEMENT	OBJECTIVE OF INSTRUMENT	DATE OF APPLICATION	GUYANA'S STATUS	NATIONAL FOCAL POINT/	SECTORS ADDRESSED	RELEVANT NATIONAL LEGISLATION
	be open for signature by Parties to the Convention from 2 February 2011 until 1 February 2012.			Protection Agency (implementing agency)	fisheries	
International Plant Protection Convention	-Securing common and effective action to prevent the spread and introduction of pests of plants and plant products -To promote measures for their control	3 April 1952	Contracting Party	Ministry of Agriculture (focal point) Plant Quarantine Unit (implementing agency)	agriculture	Plant Protection Act, 1942 as amended in 1973. Revised 1996
United Nations Convention to Combat Desertification	1.To combat desertification and mitigate the effects of drought and/or desertification, particularly in Africa, through effective action at all levels 2.Supported by international cooperation and partnership arrangement 3.Participate in regional programmes for desertification	December 1996	Acceded 10 December 1977	Office of the President (focal point) Guyana Lands & Surveys Commission (implementing agency)	land management	
United Nations Law of the Sea Convention	-Establishes a legal order for the seas and oceans that would facilitate international communication and promote peaceful use of the seas and the oceans -The equitable and efficient utilization of their resources, the conservation of their living resources, the study, protection and preservation of the marine environment	1994	Adopted 10 December 1993	Ministry of Foreign Affairs (focal point) Ministry of Foreign Affairs (implementing agency)	management of the Guyana's marine environment fisheries shipping	Fisheries Act 2002 Draft Maritime Zones Bill, 2010
International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)	1.To preserve the human environment in particular the marine environment 2.To achieve the complete elimination of international pollution of the marine environment by oil and other harmful substances and minimizing the discharge of substances	2 October, 1983	Accession 10 December 1997	Ministry of Works (focal point) Transport and Harbours Department (implementing agency)	shipping port facilities	Shipping Act, 1999

INTERNATIONAL AGREEMENT	OBJECTIVE OF INSTRUMENT	DATE OF APPLICATION	GUYANA'S STATUS	NATIONAL FOCAL POINT/	SECTORS ADDRESSED	RELEVANT NATIONAL LEGISLATION
Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region	1.To protect the ecosystems of the marine environment of the Wider Caribbean Region 2.To protect the marine environment of the Wider Caribbean Region for the benefit and enjoyment of future generations 3.The Convention has 3 Protocols – dealing with protected areas and endangered wildlife (the Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region or SPAW Protocol), land based sources of pollution (Protocol Concerning Pollution from Land-Based Sources and Activities or the LBS Protocol and direct emissions of pollutants into the marine (Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region or Oil Spills Protocol)	1983	Acceded 17 June 2010	Environmental Protection Agency (focal point) Environmental Protection Agency (implementing agency)	management of the Guyana's marine environment fisheries shipping land based sources of pollution	Environmental Protection Act, 1996 Draft Maritime Zones Bill, 2010 Water Quality Regs, 2000 Hazardous Waste Regs, 200 Fisheries Act 2002
Ramsar Convention on Wetlands	The conservation and sustainable utilization of wetlands To stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.	21 December 1975	-	Office of the President (focal point) Environmental Protection Agency (implementing agency)		
Convention on the International Trade of Endangered Species of Wild Flora and Fauna	To prevent international trade from critical endangered wild flora and fauna To control international trade of live and dead animals and plants and of derivatives, and have parts through the issuing of permits/ certificates for such trade	Adopted 1973	27 May 1977	Office of the President (focal point) Environmental Protection Agency / Wildlife Unit (implementing agency)	species and wildlife management	Species Protection Regs, 1999 Draft Wildlife Conservation & Management Regulations Draft Wildlife

INTERNATIONAL AGREEMENT	OBJECTIVE OF INSTRUMENT	DATE OF APPLICATION	GUYANA'S STATUS	NATIONAL FOCAL POINT/	SECTORS ADDRESSED	RELEVANT NATIONAL LEGISLATION
						Import & Export Regulations
Basel Convention for the Control of Transboundary Movements of Hazardous Wastes	To regulate the transboundary movement of hazardous wastes, reducing to the minimum its rational environmental management and promoting the international cooperation on this field. To protect countries from receiving unwanted shipments of waste	5 May 1992	Acceded	Office of the President (focal point) Environmental Protection Agency (implementing agency)	hazardous wastes	Hazardous Wastes Regulations, 2000
Stockholm Convention on Persistent Organic Pollutants	Action to outlaw the use of POPs, defined as "chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects to human health and the environment".	May 2004	Acceded	Ministry of Agriculture (focal point) Pesticides and Toxic Chemicals Control Board (implementing agency)	persistent compounds used in agriculture and other industries	Pesticides and Toxic Chemicals Control Act, 2000. Pesticides and Toxic Chemicals (Amendment) Regulations, 2007. Pesticides and Toxic Chemicals Regulation, 2004
Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Promote shared responsibilities in relation to importation of hazardous chemicals. The convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labeling, include directions on safe handling, and inform purchasers of any known restrictions or bans	24 February 2004	Acceded	Ministry of Agriculture (focal point) Pesticides and Toxic Chemicals Control Board (implementing agency)	hazardous chemicals	-Pesticides and Toxic Chemicals Control Act, 2000. Pesticides and Toxic Chemicals (Amendment) Regulations, 2007. Pesticides and Toxic Chemicals Control (Amendment) Act, 2007. Pesticides and Toxic Chemicals Regulation, 2004

INTERNATIONAL AGREEMENT	OBJECTIVE OF INSTRUMENT	DATE OF APPLICATION	GUYANA'S STATUS	NATIONAL FOCAL POINT/	SECTORS ADDRESSED	RELEVANT NATIONAL LEGISLATION
Treaty of Amazonian Cooperation		2 August 1980	Adopted	Ministry of Foreign Affairs (focal point) Ministry of Foreign Affairs (implementing agency)	Environment, science and technology, indigenous affairs, education, tourism, health , transportation, infrastructure,	
Indigenous and Tribal Peoples Convention, 1989	the most important operative international law guaranteeing the rights of indigenous peoples	05 September 1991	-			
World Heritage Convention	Combining cultural conservation with nature conservation	16 November 1972	Acceded 20 June 1977	Ministry of Culture, Youth and Sport (focal point) National Trust of Guyana (implementing agency)	cultural heritage natural heritage	National Trust Act 1972
UNESCO Convention of the Protection of the Underwater Cultural Heritage	Saving the underwater cultural heritage. "Underwater Cultural Heritage" means all traces of human existence having a cultural, historical or archaeological character, which have been partially or totally under water, periodically or continuously, for at least 100 years	2 January 2009	-			Guyana is not State Party to the Convention, but many of the provisions contained in the Draft Maritime Zones Bill, 2010 support the objectives of this treaty
WTO	Regulation of trade between participating countries; it provides a framework for negotiating and formalizing trade agreements, and a dispute resolution process aimed at enforcing participants' adherence to WTO agreements	1 January 1995	Ratified	Ministry of Foreign Affairs (focal point) Ministry of Foreign Affairs (implementing agency)	Trade	

INTERNATIONAL AGREEMENT	OBJECTIVE OF INSTRUMENT	DATE OF APPLICATION	GUYANA'S STATUS	NATIONAL FOCAL POINT/	SECTORS ADDRESSED	RELEVANT NATIONAL LEGISLATION
Revised Treaty of Chaguaramas	Arose from the Grand Anse Declaration,[14] which had 3 key features : 1. Deepening economic integration by advancing beyond a common market towards a Single Market and Economy. 2. Widening the membership and thereby expanding the economic mass of the Caribbean Community (e.g. Suriname and Haiti were admitted as full members in 1995 and 2002 respectively). 3.Progressive insertion of the region into the global trading and economic system by strengthening trading links with non-traditional partners.4.it establishes the Caribbean Community, and provides a Community instrument addressing economic issues, foreign policy coordination and functional cooperation		Signed	Ministry of Foreign Affairs (focal point) Ministry of Foreign Affairs (implementing agency)	Trade	

[14] See http://www.jis.gov.jm/special_sections/CARICOMNew/grandAnse.pdf

6.5 ENVIRONMENTAL PERMITS AND REQUIREMENTS

The Environmental Protection Agency of Guyana (EPA) was created through the Environmental Protection Act, No 11 of 1996. The EPA web site indicates: "The Act mandates the Agency to oversee the effective management, conservation, protection and improvement of the environment. It also requires that the Agency takes the necessary measures to ensure the prevention and control of pollution, assessment of the impact of economic development on the environment and the sustainable use of natural resources." The Minister of the Environment is the President of Guyana.

EPA is responsible to evaluate project development in the country and to classify each project according to the potential environmental and social impact. EPA is also responsible to undertake proper supervision and monitoring of the project environmental and social outcomes.

EPA is responsible to supervise compliance of several of the environmental regulations set up in the country such as the Environmental Protection Act (2000 updated in 2005), which aims to control and prevent noise, air, water, hazardous waste and soil contamination. These regulations as well as others indicated in the Section of Guyana Legal Framework should be carefully reviewed by the Project Implementing Unit (PIU), the ES and future contractors of this project. The main environmental regulations applicable to the civil works planned by this project are:

- Environmental Protection Regulations, 2000, 2005
- Environmental Protection (Air Quality) Regulations, 2000
- Environmental Protection (Noise Management) Regulations, 2000
- Environmental Protection (Water Quality) Regulations, 2000
- Environmental Protection (Hazardous Waste Management) Regulations, 2000
- Litter Enforcement Regulations, 2014

The environmental permitting process in Guyana varies depending on the type of project, its dimension and potential environmental impacts or whether it is new or existing. For new development projects there are two processes: (i) Environmental Impact Assessment (EIA) not required and (ii) EIA required (Figure 4). The process to obtain the final environmental permits can take from 2 to 6 months. The environmental permit process starts by filling out the Application Form "Environmental Authorization" which can be downloaded from the EPA website (http://www.epaguyana.org) and providing the information requested by EPA (Table 3). Since, the proposed civil works in this Project are related to the rehabilitation of existing buildings, perhaps the Application Form "Operation Permit for Existing / Registered Operations" will be needed to prepare instead. After the EIA approval, EPA will emit the environmental permit which entitles the developer to pursue with the project and pay several fees to EPA.

Due to the scale of the works to be performed during the implementation of the UG-World Bank Science and Technology Support Project (P125288), it is not known if EPA will request to UG an EIA or any other environmental or construction permit. It is recommended that as soon as possible, the ES and PIU start communication with EPA before contracts are awarded to guide contractors throughout the permitting process. During project preparation, EPA officials were informed and consulted in relation to the proposed project activities and they offered guidance during Project preparation and future implementation.

In the case that EPA requests an EIA or any other type of assessment for the proposed civil works or for any other activity related to this Project, the current Environmental Assessment and its EMP can be presented to EPA with the necessary additional information that the agency might request. The ES and the PIU will always consult with EPA and other national agencies in order to comply with the permits and documentation required by the national legislation.

Table 3. Environmental Information Required by EPA to Grant an Environmental Authorization.

Part III. Article 17. (1, 2). An application for an environmental authorization shall be made to the Agency pursuant to section 11, 19 or 21 of the Act. (Environmental Protection Act 1996).
(a) shall be completed in triplicate and shall be submitted to the Agency together with the fee as specified in the Schedule;
(b) shall be in respect of one project or facility;
(c) shall contain the following information: (i) the company or corporate name, the names of directors if any, the name and position of the applicant, the name of the owner or occupier and exact location of the facility;
(ii) proof that the applicant either owns the facility or has a lease or other agreement with the landowner or occupier to enable the applicant to conduct the activity on the facility or has the legal right or ability to conduct the activity without the consent of the landowner or occupier;
(iii) topographic map showing the location of any existing or proposed intake and discharge structures and the location of any discharge;
(iv) a detailed description of the process or activity generating the discharge; (v) existing or proposed effluent discharge rates;
(vi) map and description of the existing or proposed outfall locations;
(vii) a description of any substances discharged, their environmental impact, the sources of the substances, the method by which the substances will be discharged and the steps to be taken to reduce the amount of the substances discharged or to mitigate their impacts;
(viii) a summary of required environmental monitoring information gathered during any previous approval period which has not already been submitted to the Agency;
(ix) an identification of the receiving water or waters; (x) an indication whether or not the facility is proposed or is in existence and an indication whether the application is a new application or application for renewal or variance;
(xi) an indication whether or not the facility has ever has ever violated any environmental requirement under the Act;
xii) an indication whether or not a permit or license from any other government entity is required under written law and whether such permits or licenses have been obtained;
(xiii) copies of existing environmental authorization, permits or certificates or licenses relating to the activity, that have been granted to the applicant by the Agency or any government entity;
(xiv) copies of any Environmental Impact Assessment study or reports relating to the activity;
(xv) characteristics of discharge, including quantity, conditions and concentrations of constituents;
(xvi) the proposed or actual dates of construction commencement, construction completion, commencement of operation and project completion;
(xvii) an account of the measures undertaken to avoid, mitigate or remedy the water pollution caused by the operation of the facility;
(xviii) proof that the applicant can financially mitigate or carry out remedial work; and

(xix) any other information deemed necessary by the Agency.

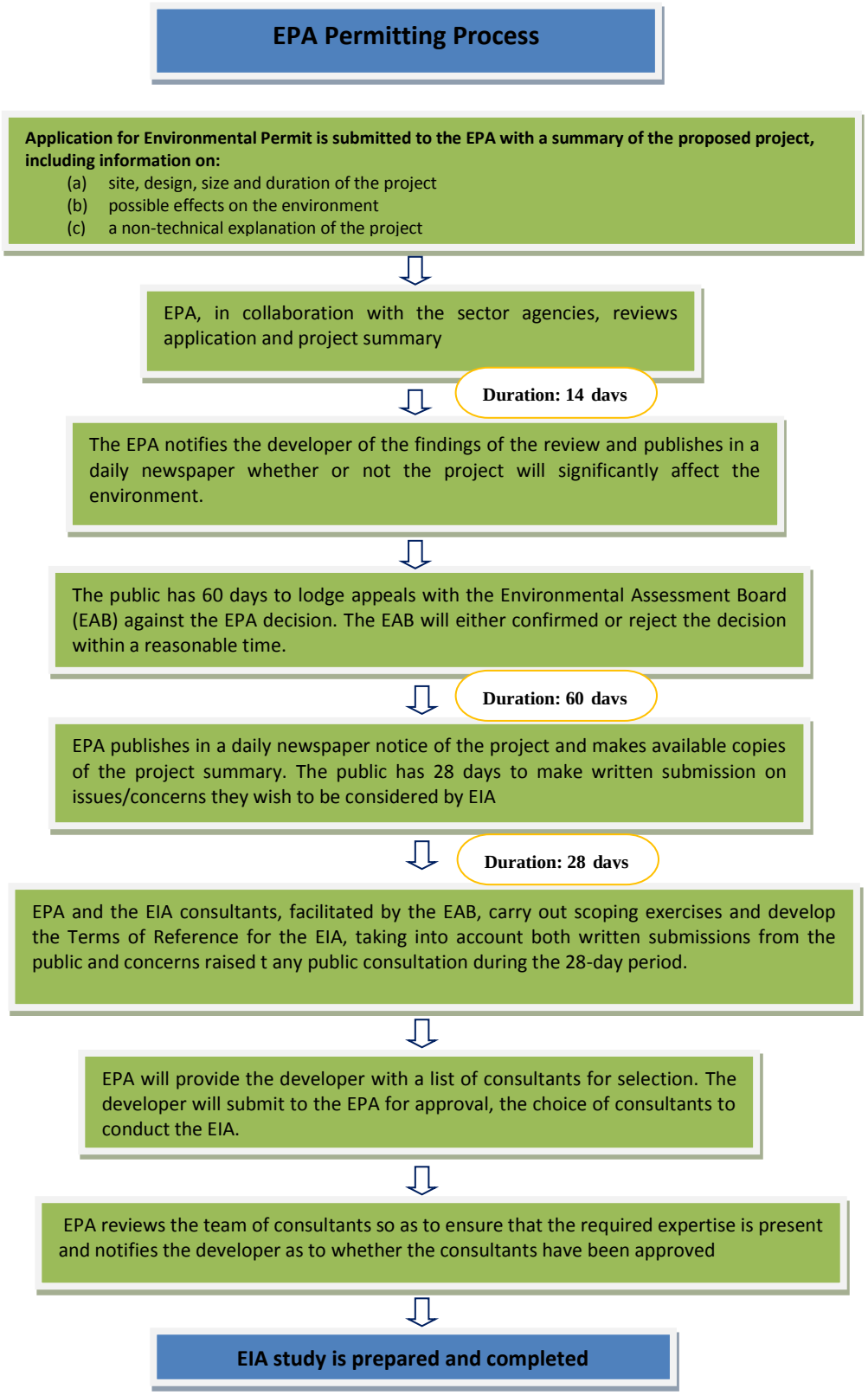

Figure 4. Application for Environmental Permit procees at EPA.

7. ENVIRONMENTAL DIAGNOSTIC OF THE PROJECT AREA

An environment and social assessment was developed in order to (i) analyze the potential impacts of the future civil works planned to be developed under Component 2 of the UG Project and (ii) to prepare an environmental management plan to mitigate such impacts. This section identifies the main biological, physical and social characteristics of the UG Campus.

7.1. SOCIAL CHARACTERISTICS OF THE UG CAMPUS

Students

The total student enrolment for both campuses is approximately 5,000. Foreign students account for approximately 0.7% of the student body with the majority pursuing law, the remainder are local students.

The Turkeyen campus offers seventy (70) programmes across nine (9) Faculties/Schools which include the Faculties of Agriculture and Forestry, Health Sciences, Natural Sciences, Social Science and Technology and the Schools of Education and Humanities, Earth and Environmental Sciences and the Institute of Distance and Continuing Education (Table 3). During the period 2006-2010, the number of students that entered the UG was between 1,725 and 2,189 and the number of students that graduated in the same period ranged between 1,224 and 1,861 (Table 1). The Project to be developed with the support of the World Bank at UG aims to expand academic programs towards the LCDS and improve the scientific infrastructure and opportunities for research for both the students and faculty.

At the Tain Campus, only nineteen (19) programmes are offered in four (4) Faculties/Schools, namely Agriculture and Forestry, Education and Humanities, Natural Sciences and Social Sciences. During the period 2006-2010, the average number of students who entered or graduated from this campus is less than 300 students per year (Table 4)

The majority of the programmes offered at the UG are at the undergraduate levels. The academic programmes offered at both UG campuses and the corresponding numbers of students entering and graduating from the programmes are detailed in Tables 3b and 4.

Table 3b. Academic Programme for Turkeyen Campus and Intake and Output 2006/07 to 2009/10.

Turkeyen Campus									
Faculty/School	Programme	2006/07		2007/08		2008/09		2009/10	
		Intake	Output	Intake	Output	Intake	Output	Intake	Output
Agriculture & Forestry	Degree in Agriculture	13	19	24	18	23	8	23	13
	Degree in Forestry	9	11	4	11	5	4	6	9
	Diploma in Forestry	14	4	13	7	8	7	28	8
Health Sciences	Assoc Degree in Environmental Health	0	8	9	7	6	4	6	9
	Assoc Degree in Pharmacy	25	21	23	18	24	24	27	23
	Assoc Degree in Medical Technology (changed to Degree from 2008/09)	19	23	38	2	40	21	50	38
	Assoc Degree in Radiography	0	1	Discontinued					
	Degree in Medicine	30	15	36	17	27	25	35	
	Bachelor of Science – Nursing	21	15	27	19	10	27	12	10
	Bachelor of Science – Optometry	Commencing in 2010/11							
	Degree in Rehabilitation Science	Commencing in 2010/11							
	Degree in Dental Surgery	6	0	6	0	2	0	11	6
	Post Grad. Dip in General Surgery	Commenced in 2007/08		2	5	0	4	0	0
Natural Sciences	Master in Forest Biology	0	1	0	0	0	1	4	0
	Degree in Biology	84	37	123	25	103	16	124	84
	Degree in Chemistry	19	11	14	10	17	10	11	19
	Degree in Computer Science	44	19	20	24	21	11	23	44
	Degree in Mathematics	13	5	8	5	13	6	17	13
	Degree in Statistics	1	0	1	0	0	0	0	1

	Degree in Physics	0	0	0	0	1	0	1	0
	Diploma in Computer Science	116	29	120	32	91	47	89	91
Social Sciences	Master in Social Sciences	0	2	Suspended					
	Masters in Development Policy & Analysis	0	19	0	1	Suspended			
	Executive Masters in Business Admin.	Commenced in 2008/09				25	0	29	25
	Executive Masters in Public Admin.	Commenced in 2008/09				11	0	11	11
	Post-graduate Diploma (Dev. Studies)	41	26	35	23	0	19	26	0
	Post-graduate Diploma (International Studies)	18	11	33	21	0	8	13	0
	Degree in Business Management	121	104	77	121	150	79	182	121
	Degree in Communication Studies	24	9	0	17	20	13	15	24
	Degree in Economics	63	21	64	25	54	17	95	63
	Degree in International Relations	72	34	81	44	36	43	63	72
	Degree in Law	44	45	43	26	51	39	56	44
	Degree in Public Management	97	54	64	86	53	48	47	97
	Degree in Social Work	48	54	53	43	65	52	58	48
	Degree in Sociology	74	39	55	29	44	32	63	74
	Diploma in Accountancy	43	42	33	40	22	25	40	22
	Diploma in Banking & Finance	37	19	0	30	22	6	31	22
	Diploma in Communication Studies	30	9	0	40	44	21	61	44
	Diploma in Marketing	40	49	54	30	39	35	79	39
	Diploma in Public Management	114	96	124	81	64	55	88	64
	Diploma in Social Work	76	74	88	73	81	65	133	81
Technology	Degree in Architecture	6	3	2	2	6	7	4	2
	Degree in Civil Engineering	9	21	37	23	13	22	6	37
	Degree in Electrical Engineering	6	10	24	1	6	11	6	24
	Degree in Mechanical Engineering	3	11	14	7	2	12	3	14

	Degree in Geological Engineering (various options)	4	0	2	0	0	6	0	2
	Diploma in Aeronautical Engineering	0	0	2	0	1	1	0	1
	Diploma in Architecture	14	4	12	8	9	8	13	9
	Diploma in Civil Engineering	49	32	72	32	51	34	54	51
	Diploma in Electrical Engineering	32	24	34	18	27	13	28	27
	Diploma in Geology	13	2	26	9	9	11	20	9
	Diploma in Mechanical Engineering	26	13	23	10	27	16	19	27
	Post Graduate Certificate in Water Resources Management	Commenced in 2009/10						25	25
Education & Humanities	Master in Education	5	0	0	1	0	6	30	0
	Post-graduate Diploma in Education (Math)	8	7	3	6	5	3	3	5
	Post-graduate Diploma in Education (Science)	7	10	5	7	5	5	8	5
	Post-graduate Diploma in Education (MED-Supervision & Planning)	0	0	44	0	0	7	0	12
	Post-graduate Diploma in Education (Social Studies)	4	13	7	4	9	5	11	9
	Post-graduate Diploma in Education (Administration)	10	23	7	10	7	8	18	7
	Post-graduate Diploma in Education (English)	0	0	1	4	4	1	4	4
	Degree in English	21	17	16	20	20	8	16	21
	Degree in Geography	1	0	0	0	0	0	0	1
	Degree in History	7	12	8	6	8	6	6	7
	Degree in Spanish	3	4	7	3	3	1	2	3
	Degree in Fine Arts (Creative Arts)	5	7	5	2	0	4	3	5
	Degree in Tourism Studies	12	5	5	11	6	5	10	12

	Degree in Geography/Economics	0	0	0	0	0	0	3	0
	Bachelor of Education (various options)	101	164	90	107	123	86	143	123
	Diploma in Tourism	31	9	20	11	22	19	10	22
	Certificate in Education (various options)	154	86	158	122	159	141	156	159
Earth & Environmental Sciences	Degree in Earth Sciences – Geography	2	11	10	7	2	2	6	2
	Degree in Earth Sciences - Environmental Studies	5	9	18	12	17	4	17	5
IDCE	Diploma in Occupational Health & Safety	0	0	0	0	12	0	8	12
	TOTAL	**1894**	**1423**	**1924**	**1373**	**1725**	**1224**	**2189**	**1861**

Table 4: Academic Program for Tain Campus and Intake and Output 2006/07 to 2009/10

Tain Campus									
Faculty/School	**Program**	**2006/07**		**2007/08**		**2008/09**		**2009/10**	
		Intake	**Output**	**Intake**	**Output**	**Intake**	**Output**	**Intake**	**Output**
Agriculture & Forestry	Degree in Agriculture	0	5	4	7	5	3	9	0
Education & Humanities	Bachelor of Education – Administration	13	7	4	12	13	5	9	13
	Bachelor of Education - Social Studies	3	6	2	3	7	2	6	7
	Bachelor of Education – Nursery	4	6	6	4	6	6	3	6
	Bachelor of Education – Primary	15	16	8	17	12	8	16	12
	Certificate in Education - Nursery General	7	8	6	6	8	4	10	8
	Certificate in Education - Primary General	13	8	17	12	24	17	19	24
	Certificate in Education - Social Studies	8	3	5	7	5	6	9	5
	Certificate in Education – Math	0	0	0	0	10	0	0	10
	Certificate in Education – Administration	15	7	7	13	6	7	3	6
Natural Sciences	Assoc Degree in Math	5	4	6	4	3	4	5	3
	Assoc Degree in Biology	13	8	30	1	30	18	32	30
	Assoc Degree in Chemistry	4	4	3	0	8	4	9	8
	Diploma in Computer Studies	4	9	13	4	18	6	24	18
Social Sciences	Degree in Public Management	11	9	8	11	9	3	14	11
	Diploma in Accountancy	27	11	17	12	12	16	15	12
	Diploma in Marketing	24	11	16	18	12	16	14	12
	Diploma in Public Management	31	10	25	17	35	21	30	35
	Diploma in Social Work	19	13	21	11	22	15	13	22
	TOTAL	**216**	**145**	**198**	**159**	**245**	**161**	**240**	**242**

- **Faculty**

Table 5 provides statistical details of full-time staffing levels at the University of Guyana over the period 2002/03 and 2009/10. During this period, Senior Management (the Vice-Chancellor, Deputy Vice-Chancellor, Bursar and Registrar), UA Academic Library and Non-academic positions have been relatively stable.

Table 5. Full time personnel of the University of Guyana, 2002/2003 to 2009/10.

Category	2002/03		2003/04		2004/05		2005/06		2006/07		2007/08		2008/09		2009/10	
	Tur'n	Tain	Tur'n	Tain	Tur'n	Tain	Tur'n	Tain	Tur'n	Tain	Tur'n	Tain	Tur'n	Tain	Tur'n	Tain
Senior Management Staff	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1
Academic Staff	206	7	212	15	228	17	224	16	223	19	214	19	210	16	219	23
UA Lib Staff	14	3	13	3	14	3	13	3	12	3	16	3	15	3	15	3
Non Academic Staff	36	1	44	1	39	2	35	1	39	1	41	1	49	1	44	3
UB Staff	315	10	365	13	332	18	317	19	313	17	288	18	313	19	315	23
Total	575	22	638	33	617	41	593	40	591	41	563	42	591	40	597	53

Source: University of Guyana Strategic Plan 2009-2010.

The UG *Strategic Plan 2009-2012* indicates that for the Turkeyen Campus, "the number of full time teaching staff has declined steadily from a high of 252 in 1990/91 to a low of 206 in 2000/01 and 2002/03" while at the Tain Campus, the "number of full time lecturers there has grown by approximately 2.4% since the start of the campus; however the relative proportion of part time faculty (the majority of whom are full time lecturers from the Turkeyen Campus) has remained substantially higher than full time lecturers, with the ratio being highest in 2002/03 (9:1) and lowest in 2008/09 (1:1)."

In the last academic year (2009/2010), there were a total of 242 full time lecturers; 219 at the Turkeyen and 23 at Tain campuses. During the period 2000-2009, full and part time faculty levels at the Turkeyen campus, where the main civil works will be performed by this Project, has reached a maximum of 392 professors (Table 6).

Table 6. Teaching staff at the Turkeyen Campus of the University of Guyana during 2000/01 to 2008/09.

UG FACULTY	**2000/ 2001**	**2001/ 2002**	**2002/ 2003**	**2003/ 2004**	**2004/ 2005**	**2005/ 2006**	**2006/ 2007**	**2007/ 2008**	**2008/ 2009**
Full Time Lecturers	206	214	206	212	228	224	223	214	210
Part time Lecturers	161	147	154	154	159	168	160	174	166
TOTAL	**367**	**361**	**360**	**366**	**387**	**392**	**383**	**388**	**376**

Source: University of Guyana. *Strategic Plan 2009-2012.*

- **Science laboratories**

The rehabilitation and expansion of the science laboratories, as proposed by this Project, is essential in order to address the needs of Science and Technology goals of the University and the country. This relates particularly to the development of the Faculties of Agriculture and Forestry, Natural Sciences, Health Sciences, Technology and School of Earth and Environmental Sciences. A total of 29 laboratories are found in the science and technology faculties and schools at UG (Table 7). The goal of this Project is to rehabilitate and improve the physical conditions, design, management and equipment in 14 of these laboratories.

Table 7. Number of Science laboratories at Turkeyen Campus.

Faculty/School	Number of laboratories
Faculty of Agriculture and Forestry	2
Faculty of Health Sciences	4
Faculty of Natural Sciences	10
Faculty of Technology	11 (plus 2 studios)
School of Earth and Environmental Sciences	2 (1 is located in the Faculty of Natural Sciences

Many of these laboratories have deteriorated through time and face a limited space for conducting science teaching, while equipped with outdated equipment and the lack of appropriate system for hazardous waste disposal, including emergency equipment and procedures. Additional detail about the conditions of these labs will be presented in the coming sections.

7.2. Physical Characteristics of the project area

- **Location**

The Turkeyen Campus is located along the coastal plain of Guyana which is about 2 meters below sea level and about 2 km East from Georgetown, the capital city. The campus as well as the rest of Georgetown has gone through significant manipulation of the natural water flow regime which dates back to the colonization period where the Dutch developed an extensive drainage system in the city to control water flow in the floodplains to increase arable land. The UG campus is apparently based upon a retention water site and during heavy rainfall, the UG campus can become flooded. Soils in the UG campus area are hydromorphic and belong to recent and sub-recent deltaic deposits; these are front land or marine clays that are low ¨humic gleys¨ of high base status. They are placed in land capability class I-II, indicating that these have poor drainage, are deep and mixed with salt soils associated with rivers, and sandy soils in intermittent strips paralleling the coast (*General Soil Map of British Guyana*, 1964).

- **Climate and Precipitation**

Guyana experiences a wet tropical climate with warm temperatures and abundant rainfall. The coast of Guyana generally experiences two wet and two dry seasons due to the annual meridional migration of the Inter Tropical Convergence Zone (ITCZ). According to Guyana Hydro-meteorological Service at the Ministry of Agriculture, the mean annual rainfall recorded in Georgetown, during the period of 2000 to 2009, varied from 1500 mm to 3500 mm (Figure 5). Georgetown receives on average 2418 mm of precipitation annually.

In January 2005, unusually high rainfall was recorded in Georgetown causing the flooding of the Turkeyen Campus. During the period from 2001 to 2008, there has been a general increase in the total annual rainfall on Georgetown (Figure 5).

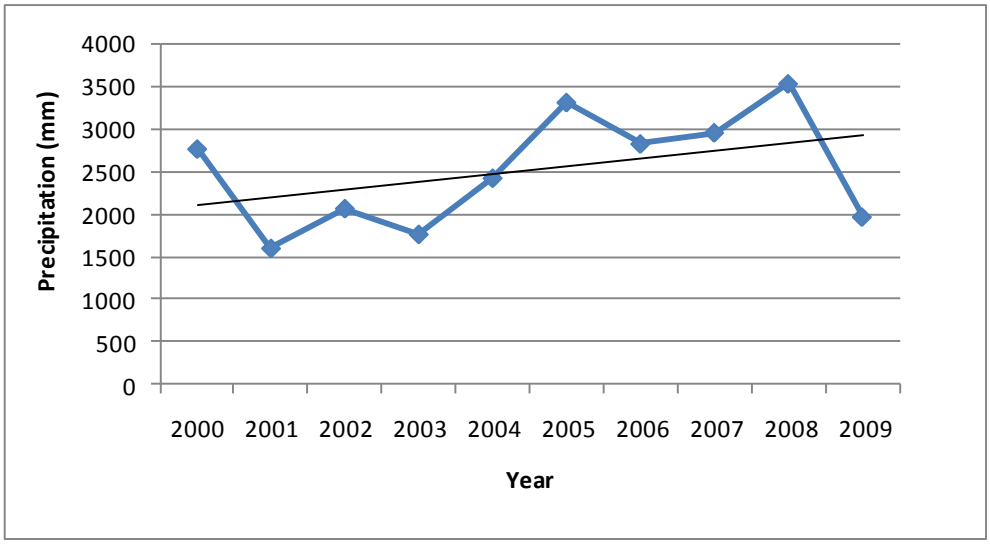

Figure 5. Mean annual rainfall during the period 2000-2009. Source: Ministry of Agriculture. Guyana.

Georgetown usually experiences heavy rainfall between April and July each year (Figure 6). While this is due to the northward movement of the ITCZ, the southward migration of the ITCZ brings the second wet season to Georgetown between November and January. Generally, the wettest months are June and December and the driest February, March and September. Civil construction works planned for the rehabilitation of the science buildings at UG will need to take into consideration the rainy season in order to plan ahead the time frame of the works and in order to reduce social and environmental effects in the campus operation and academic program.

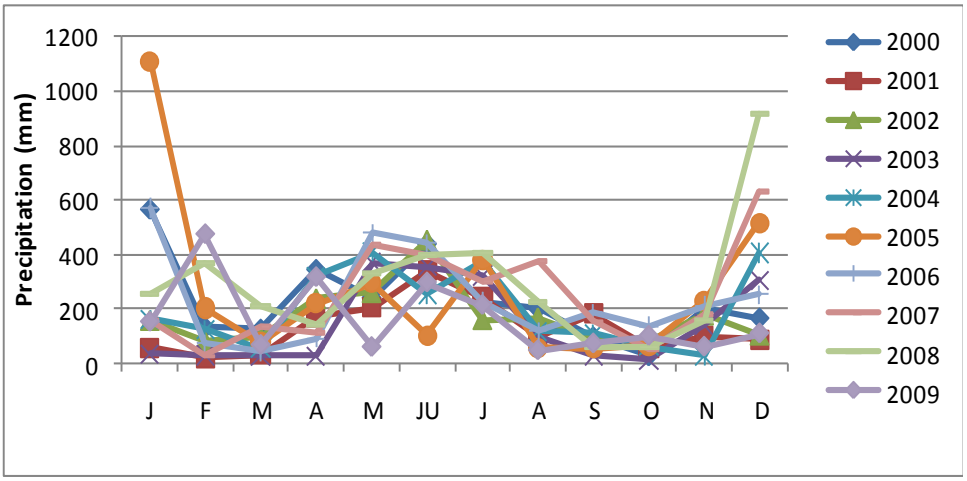

Figure 6. Monthly rainfall at Georgetown, during the period 2000-2009. Source: Ministry of Agriculture, Guyana.

- **Temperature**

The average temperature in Georgetown, Guyana is 27.0 °C (81 °F). The warmest average maximum temperature is 31 °C (88 °F) in September and October. The average minimum temperature is 24 °C (75 °F) in January, February, March, June, July, August and December. During the period 2000 to 2009, the annual mean maximum and minimum temperatures in Georgetown have remained relatively constant (Figure 7). The annual maximum and minimum temperatures averaged 30.5 and 24.1°C, respectively.

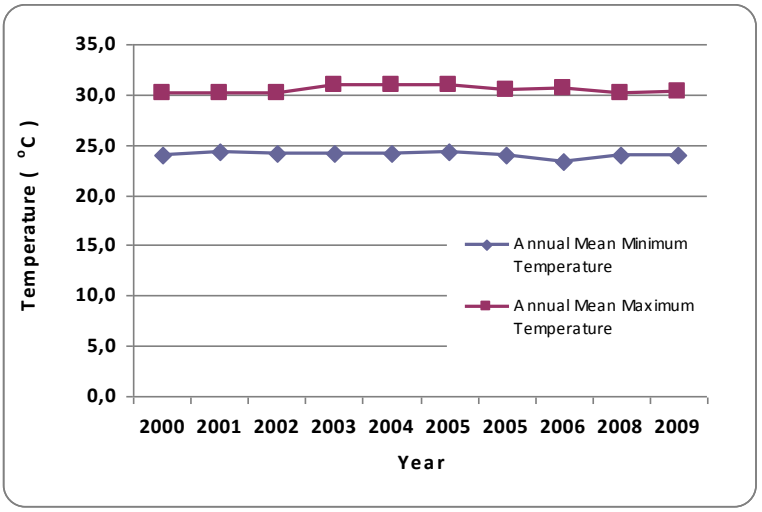

Figure 7. Annual Mean Minimum and Maximum Temperatures for Georgetown (2000-2009). Source: Ministry of Agriculture, Guyana.

- **Humidity**

Georgetown usually experiences high humidity. During the period of 2000-2009, the relative humidity recorded has been over 70% as shown in Table 8. The annual morning and afternoon relative humidity average 80% and 72%, respectively.

Table 8. Relative Humidity in Georgetown (2000-2009).

Year/Time	Annual Mean Relative Humidity (%)	
	8:00 hrs.	14:00 hrs.
2000	80.0	71.0
2001	77.0	69.0
2002	77.0	71.0
2003	79.0	70.0
2004	81.0	71.0
2005	83.0	74.0
2005	81.0	75.0
2006	82.0	74.0
2008	81.0	72.0
2009	79.0	71.0

- **Ground water**

The UG campus is located on a large coastal aquifer system. This groundwater system has been identified to occupy a subsurface area of about 20,000 square kilometers, extending about 250 kilometers along the Atlantic coast and 40 to 150 kilometers inland, comprises three aquifers: the "Upper Sands", the "A Sand" and the "B sand". Overlying layers of clays confine the lower two aquifers, therein protecting them from contamination from external sources.

The "Upper Sands" aquifer, which is the shallowest of the three aquifers, is 30 to 60 meters deep varies in thickness from 15 to 120 meters. This aquifer is no longer used as a source of potable water because of its high iron content (>5 mg/l) and salinity (up to 1200 mg/l), (FAO 2011). The "A sand" aquifer is 150 to 220 meters deep and 12 to 27 meters thick. Reports indicates that the piezometric head was 4.5 meters above ground level when it was first extracted, but constant withdrawal has caused the head to fall to 14 meters below ground level. The "B sand" aquifer is encountered at depths of 350 and 800 meters. Most of the potable water is obtained from the two deep aquifers.

- **Potable water**

The Guyana Water Incorporated (GWI), the national water company, supplies untreated ground water to the UG from two wells located at the Turkeyen campus. These wells are interconnected and the water is pumped directly from the aquifer into the distribution network. The distribution system (a six inches PVC transmission pipe) is owned and maintained by the University of Guyana.

Well at UG Turkeyen Campus.

A recent report by Jackson (2010b) indicates that even that all the ground floors of the various buildings receive a pressure supply

above the standard required level (five pounds per square inch); however this pressure is insufficient to provide for the various elevations of the buildings. The fire flow analysis concluded that the current supply is *inadequate and resulted* in an unacceptable level of service. In addition, the existing pipe network has exceeded its design life of 30 years and is considered old. In fact, water storage, water quality and water supply are issues requiring immediate attention at the University. It is considered that the UG needs to plan the construction of an elevated water storage tank/s together with a water filtration facility to provide for the supply of potable water to the entire campus by gravity feed. These issues will be evaluated and hopefully resolved with the civil works planned to be developed under the proposed Project.

- ***Ground water quality***

There is water quality issues related to the water extracted from the two wells at the UG campus. Table 9 indicates the results of water analyses developed by the GWI and the University of Guyana during samplings of 2009 and 2010.

Ground water from both wells have shown problems with low pH, indicating the presence of acid waters and thus below the World Health Organization (WHO) Standard, (Table 9). Also the turbidity levels in 40% of the water samples analyzed were higher than the WHO turbidity standard of 5 Nephelometric Turbidity Units (NTU). In both wells and at the Campus, water samples have been found to have high levels of turbidity (>20 NTU), (Table 9).

The iron content of all the water samples were above the GWI iron standard of <0.5 mg/l Fe (Table 9).

Three water samples from the Turkeyen #1 well and four samples from the Turkeyen #2 well did not achieve the total coliform standard. Moreover, two of the three samples from the UG Campus contained total coliform. However, no fecal bacteria contamination was found in all water samples (except in one sample) analyzed from both wells and the UG campus; therefore these samples (except one), were below the fecal coliform standard (Table 9). The Turkeyen #1 failed towards the end of 2010 and remains nonfunctional at the time of writing this report.

Table 9. Water quality data from the two wells that feed the University of Guyana.

MONTH	pH	Turbidity (NTU)	Iron (mg/l Fe)	Total Coliform (CFU/100 ml)	Fecal Coliform (CFU/100 ml)
Standard[1]	**6.5-8.5**	**<5.0**	**<0.5[2]**	**0**	**0**
Turkeyen #1 Well:					
A[1]					
March 2009	6.15	1.20	2.14	TNTC	3
June 2009	5.93	0.70	0.79	0	0
September 2009	6.35	6.15	1.35	na	na
December 2009	6.24	17.6	1.40	22	0
B[1]					
September 2009	5.81	0.75	na	0	0
October 2009	5.77	0.86	na	0	0
May 2010	6.12	28.6	na	5.1	0.0
May 2010	5.73	10.3	na	0.0	0.0
Turkeyen #2 Well					
A[1]					
June 2009	6.11	0.90	0.59	25	0
September 2009	6.23	6.4	1.54	na	na
December 2009	6.24	6.8	1.44	40	0
B[1]					
September 2009	5.63	0.72	na	2.2	0
October 2009	5.79	1.02	na	0	0
April 2010	5.60	0.89	na	0	0
May 2010	5.75	1.02	na	2.2	0
UG campus					
A[1]					
June 2009	5.98	1.90	1.34	3	0
September 2009	6.08	21.35	2.02	na	na
December 2009	6.09	8.9	1.11	15	0

Sources: 1: World Health Organization (WHO) Standard; 2: GWI standard; A[1]: GWI Statistics, B[1]: University of Guyana 2009 and 2010; na: not analyzed; CFU: colony forming units per100 ml of water sampled. TNTC: Too numerous to count

- **Drainage System**

In the coastal plain where the UG is located and even 8 km inland, the land is below sea level at high tide. "Drainage throughout most of Guyana is poor and river flow sluggish because the average gradient of the main rivers is only 0.2 $^{0}/00$. Drainage by gravity is possible only when the tide is low, and this form of drainage is affected by the ever-changing levels of the foreshore outside the sea defenses. On account of this, it has been necessary in many areas to resort to the expensive method of drainage by pumps." (FAO 2011).

The drainage system at UG was designed and built at the same time when the campus was constructed in the 1960's. It comprises concrete lined drains (primary and secondary) and earthen drains which covers a substantial portion of the campus. The Campus' drainage network is currently linked to the Liliendaal and Ogle pump stations located in Liliendaal and Ogle, respectively.

The system was drained by two 4800 gallons per minute (0.303 m^3/s) pumps that were located on the Southern end of the campus grounds. During the operation of these pumps, flooding of the campus was minimal although the magnitude and intensity of rainfall remained the same. Currently, due to the heavy rainfall the campus is frequently flooded and this poses a problem to the normal functioning of the university (see photos below).

According to Jackson 2010b, the Faculty of Technology reports that mean land level (lawns and play field areas) of the campus is 14.933m Georgetown Datum (GD) and pumping at the Liliendaal pump station at the outlet generally occurs between 14.935m GD and 14.326m GD. As a result, whenever the pump station at Liliendaal starts to operate the campus is flooded with about 187 millimeters (7.4 inches). There are some areas on the campus that are as low as 14.75 m GD.

At the outlet at Ogle, the pump station operates between 14.32 m GD and 13.71 m GD. The operation head at Ogle is lower that the land level on campus which should have contributed to an efficient gravity drainage system.


Flooding of the University of Guyana Turkey Campus, after a heavy rainfall.

The presence of weeds is the primary cause of for the poor state of the drainage system on campus. Moreover, the internal and external drains are clogged with weed and silt most of the time (see photo below).

A weed infested drain

A Clogged drain

- **Sewage Treatment**

The sewerage system was built after the campus was opened with a student population of 164 students and only 10 buildings. Now, the population has increased to approximately 6000 students and staff, and the number of buildings has increased to 25.

The sewage system consists of approximately 66 manholes within a network of gravity pipes. The Department of Civil Engineering prepared a report[15] of the UG sanitary sewer system and describes the system in detail:

¨The existing sewerage system consists of a network of pitch fiber and PVC gravity sewer pipes draining to Du-O-Jet sewage ejectors. The pitch fiber and PVC pipes are mainly of 4 inches diameter. The sewage ejectors operate by pneumatically ejecting the collected wastewater from the university complex a distance of approximately 1846ft via a 12inches diameter discharge PVC pipeline to the Model V treatment plant that is no longer functional. This plant was previously responsible for treating the sewage by utilizing a process called the activated sludge process, after which its effluent is discharged into a nearby drainage trench.¨

Wet well and pump at the University of Guyana.

[15] Jackson, M. 2010a. Evaluation and Redesign of the University of Guyana Sanitary Sewer System. 2010. http://es.scribd.com/doc/46412916/413-Project-Final

The sewage treatment (Model V plant) was obtained from Smith and Loveless Inc. of Lenexa, Kansas during the mid-1970's. The treatment process (activated sludge) is a modification of the conventional treatment method and is primarily used in small communities and institutions. The major differences of the UG plant to the conventional method are : (i) there is no sludge dewatering stage (ii) The aeration time is longer (iii) after the clarifiers the waste sludge is pumped into a sludge digester where the sludge is settled and the liquid on top (supernatant) is recycle into the aeration tank (*see photos below*)

At the time of preparation of this document, the treatment plant is being rehabilitated and is expected to be in full operation at the conclusion of the rehabilitation works. The current civil works are undertaken by the Ministry of Education with minimal input from the maintenance unit of the University.

The rehabilitation work is documented by Jackson (2010b) as follows:

a) Provide for temporary waste storage system.
b) Clean and fumigate tanks prior to rehabilitation.
c) Sandblasting of 4 No. Sewerage tanks.
d) Welding porous areas of the above tanks.
e) Replacing the 5 No. Existing motors attached to the Chopper.
f) Replace existing defective cast iron and flex pipes with Ductile Iron pipes.
g) Allow for repairs to electronic jets.
h) Provide concrete bases using high phosphorus cement.
i) Flush all Sewerage lines with power jets.
j) Allow for cleaning sewerage manholes at Turkeyen Campus.

A sealed manhole within a building and an existing manhole at the Turkeyen campus, University of Guyana. Source: Jackson, 2010b.

Primary Settling Tank and the Aeration Tank at the Turkeyen campus, University of Guyana. Source: Jackson, 2010b.

- **Solid Waste**

A preliminary characterization of solid waste at UG, was conducted in June 2010 by Mr. Calvin Hector of the Faculty of Technology. The results indicate that the Faculty of Technology generated about twice more waste than the Faculty of Health Sciences (Table 10). About 50% of the waste generated at the Faculty of Technology was mixed paper. In the Faculty of Health Sciences, the main waste was plastic bottles (24%), Table 10. Other important wastes found at both Faculties were cardboard, steel and ferrous metals, glass bottles, among others (Table 10). The majority of this waste could be recycled if UG develops a campus strategy and promotes its discussion, research and teaching. The UG can play an important role in promoting a better waste management in the country.

All solid waste generated by the Turkeyen Campus is currently stored in metal bins around campus and collected three times a week (Mondays, Wednesday and Fridays) by a private collector named Cevons. These metal bins are corroded, dirty and heavy to lift and a source of contamination all over the campus. It will be important to change these bins for plastic bins which will be easier to handle and wash. All waste material was previously disposed of at the ¨Le Repentir¨ Disposal site, but with the opening of ¨Haags Bosch¨ landfill, the material is currently disposed there. There is no form of separation of waste on the UG campus or any recycling activity is currently undertaken. However, a team from the Faculty of Technology is currently developing a proposal to undertake a pilot project that would involve the separation of waste at source, recycling of waste, and generation of energy from waste.

Outdoors and indoors solid waste

Around the UG campus is common to find old equipment or debris of different type of sources. Also, inside of some buildings high amount of paper, books and documents can fill rooms and corners. For instance, at the Biodiversity Centre, large amount of papers, scientific magazines and documents can be seen as trash waiting for storage or a disposal solution. This is high flammable material that needs to be properly discarded. During project implementation is expected that UG will develop waste management protocols to improve waste management within the campus.

Indoors waste at the UG Biodiversity Center.

Waste containers at the UG Turkeyen campus

Table 10. Characterization of solid waste generated in faculties of the University of Guyana.

Description	Faculty of Health Sciences[16]		Faculty of Technology [17]	
	Average weight (lbs)	Percent	Average weight (lbs)	Percent
Mixed paper	9	11.92	81	42.86
Plastic bags and containers	12	15.89	9	4.76
Aluminum cans	6	7.95	2	1.06
Styrofoam (cups and boxes)	5	6.62	3	1.59
Wood	0	0.00	6	3.17
Cardboard	12	15.89	12	6.35
Glass bottles and glasses	8	10.60	12	6.35
Plastic bottles	18	23.84	25	13.23
Steel and ferrous metals	0	0.00	30	15.87
Sponge, coal and battery	0	0.00	1	0.53
Leather and rope	0	0.00	4	2.12
Food waste	5	6.62	4	2.12
Miscellaneous	0.5	0.66		0.00
Total	**75.5**	**100.00**	**189**	**100.00**

Source: Hector (2011).

- **Electricity**

The main source of energy in Guyana and the UG is derived from fossil fuels. Guyana has 226MW of installed capacity which correspond to low efficient thermoelectric diesel-engine driven generators.

[16] Solid waste was collected over three day period June 9-11, 2010.
[17] Solid waste was collected over the three day period June 6-8, 2010.

Klass, Welch, Ketwaru and Rose (2010) reviewed the University's present electrical distribution system at the Turkeyen campus and identified three separate sources of electricity supply as follows:

a) Natural Sciences Building: This is the main distribution system near the Natural Sciences building which comprises two distribution systems from the Guyana Power and Light Incorporated (GPL) and a standby generator with the following details:

   (i) The first distribution system is supplied by a 1000 kVA, 13.8 kV/220-127 V transformers.
   (ii) The second distribution system is supplied by 3 x 167 kVA, 13.8 kV/415-240 V transformers.
   (iii) A 375 kVA, 220/127V standby generator supplies nearly all the areas that receive normal supply from the above mentioned transformers.

b) Centre for Information Technology (CIT) Building: A second distribution centre was added when the new computer centre was built and normal supplies consist of 3x 100 kVA, 13.8 kV/220-127V transformers with a 268 kVA, 220/127 V generator as standby.

c) Administration Buildings: A third distribution centre was recently established. The details of this centre are the same as those for the CIT Building. The summary details of the Turkeyen campus distribution system are shown in Table 11.

Table 11. Details of Electricity Distribution System at Turkeyen Campus, University of Guyana.

System	Location	GPL Capacity (kVA)	Standby Capacity (kVA)	Voltage (V)	Load (kVA) (Estimated)
Supply #1(a)	Natural Science	500	375	415/240	320[18]
Supply #1(b)	Natural Science	1000		220/127	
Supply #2	CIT	300	268	220/127	100[1]
Supply #3	Admin	300	268	220/127	Included in the above
Total		**2,100**	**911**		**420**

The situation of the electrical system in the UG is complex; there are many places with mixed and exposed cables. The electrical system at UG suffers constant service interruptions and black outs are common. This project will try to incorporate energy efficiency components and if possible, solar panels to increase the UG backup system and the use of renewable energy sources in the campus.

[18] Source - GPL Electricity Bills

Klass *et al.* (2010) indicate that:

> *¨The electricity distribution supply arrangements at the Natural Science location are chaotic and in a deplorable condition. In addition to the untidy arrangement of the cables there are several automatic changeover switches (ATS) connected to sub-distribution panels operating the sole standby generator set. It is assumed that this arrangement became necessary because it was difficult to obtain a supply from the distribution transformers to control the changeover switches. A complete rearrangement and relocation of this distribution centre is necessary.¨*

Exposed wires at the University campus. July, 2011

In addition, Singh (2009)[19] did an evaluation of the UG Electrical distribution system and identified the areas served by the main and stand by supply systems (Table 12). This information will be useful for the electrical works planned to be done during the rehabilitation works under the activities of Component 2 of this Project.

Table 12. University of Guyana Electrical distribution and supply systems.

Areas served by the GPL Supplies	
Parameter	**Areas**
Supply #1 (a)	IDCE, ELT, Facilities Maintenance, GWLT, Communications Centre, Library, Faculties of Natural Sciences, Technology, Agriculture, Social Sciences, School of Education and Humanities;
Supply #1 (b)	Library, LRC, Herbarium, Spicy Dish, Security, Bookstore and Faculties of Law, Technology, Agriculture and Health Sciences
Supply #2	CBJ, CIT
Supply #3	Bursary, Administration, Personnel, Loan Agency
Areas Served by Standby Supplies	
Parameter	**Areas**
Supply #1 (a)	IDCE, ELT, Facilities Maintenance, GWLT, Communications Centre, Library, Faculties of Education, Natural Sciences, Technology, Agriculture, Social Sciences;
Supply #1 (b)	Library, LRC, Herbarium, Spicy Dish, Security and Faculties of Law, Technology (labs), Agriculture and Health Sciences
Supply #2	CBJ, CIT
Supply #3	Bursary, Admissions, Personnel, Loan Agency

[19] Singh, A. 2009. Assessment of University of Guyana's Electrical Distribution System to determine Capability to meet Current and Future Needs. University of Guyana.

- **Health and Safety**

Throughout the buildings there are numerous locations that represented potential threats to the health and safety of the buildings occupants. Exposed electrical wiring, open faced electrical panels, derelict but possibly live electrical installations, locked doors, tripping hazards, no emergency evacuation signage or general safety signage, questionable fire escape capacity and location, inoperative fire alarms and no smoke or heat detectors, and chemical and biological material storage are all issues that require immediate attention. A fuel storage tank is in the campus with no fence around.

Ketwaru (2011) identified the following main hazards in the science laboratories:

- Exposed breaker panels;
- Overloaded breaker circuits – many points to one breaker;
- Inoperable fume hoods;
- Limited firefighting capacity on campus;
- No fire escapes or second entrance;
- Water leakages – water collecting on light fixtures;
- Poor storage facilities in the chemical preparatory area;
- Tripping hazards – southern side of D17; and
- Storage of chemical waste.

The University of Guyana has 14 science laboratories which are going to be rehabilitated during the implementation of this Project. In all these labs, chemical products are easily found and some of these chemical can be hazardous, toxic, corrosive and even cancerogenous. Chemicals are sometimes stored open-shelfed cabinets.

For instance, fixing agents such as formaldehyde can be found in the floors or tables of these labs with no labels or hazard information about how to handle these chemicals which can produce high toxic fumes. At the moment of this study, the University does not have laboratory management guidelines nor emergency procedures or hazard material safety procedures.

Corrosives chemicals can be found at the UG and these can be either acids or bases. For example, common acids found at the labs of UG include hydrochloric acid, nitric acid, sulfuric acid, acetic acid and hydrofluoric acid and common bases include ammonium hydroxide and sodium hydroxide (caustic soda).

Corrosives could attack exposed body tissues and could also damage metal materials (collection bins) and caused dangerous flumes. These chemicals could cause damage as soon as they touch the skin, eyes or the respiratory tract. Breathing in corrosive vapors could irritate and damage inner tissue of the nose, throat and lungs.

Annex 3 has a list of chemicals commonly used in some of the chemistry laboratories at UG which will need to be handled with care during the rehabilitation works. Many of these chemicals are very toxic and they cause even explosions if they are not manipulated and move by technical personnel.


Storage of chemicals at the University of Guyana.

Fuel storage container at the UG Turkeyen campus without any preventive fense or signs.

Chemical reagents, a gas container and trash at the main entrance of the Biodiversity Center at UG.

Lab space at the Biodiversity Center

Trash containers at UG.

Lab at UG.

Fish collections on unstable cabinets.

- **Pesticide Use**[20]

The Agriculture Research Centre (ARC) is primarily used for student and staff projects in the area of crops. Currently, weed control is undertaken manually and by the use of the herbicides: 2-4 D and Glyphosate.

In addition, the fungicide Verita is used. Notably, it is only in the event of a major insecticide attack that ¨Hyperkill¨ is used.

In addition, the Research Centre uses two types of fertilizers: 15-15-15 and urea. These fertilizers are not regularly applied, but are used whenever there is premature fruit and flower fall and yellowing of the plant. Importantly, the Biodiversity Research Centre does not purchase any banned chemicals, it receives its supply of chemicals locally from Caribbean Chemicals.

Nevertheless, the Environmental Specialist (ES) assigned by the PIU for the Project supervision, will maintain oversight of the use of any type of pesticides, provide guidance or developed appropriated pest management plans as needed for the University.

- **Traffic**

Methodology

The planned civil works to be executed at the UG campus requires the entrance of heavy trucks and contractors' vehicles. A short traffic survey was conducted to capture the present volume of traffic flowing into and parking on the campus, over a 12 hour period on April 13, 2011. Importantly, an assumption was made that all vehicles counted would have entered the campus that day, given the fact that (with the exception of three areas which were excluded in the study); there are currently no residential buildings on the campus.

During the survey counting, three individuals counted the parked vehicles in specific locations in the UG campus, during each of the following time periods: 9:00-11:00 hrs. 11:00–13:00 hrs., 13:00–15:00 hrs., 15:00–17:00 hrs., 17:00– 19:00 hrs., and 19:00-21:00 hrs. Table 13 shows the locations included in the count.

[20] Information obtained from direct communication with the Manager of the Agriculture Research Centre

TABLE 13. Locations of parked cars on the UG campus on April 13, 2011.

ID #	Location	Comments
A	Education Lecture Theatre and Education Building	Designated car park and vehicles parked along the Road
B	Tarmac	Largest designated car park and vehicles parked along the road and on the grass
C	Centre for Information Technology	Designated car park
D	Cheddi Jagan Building (CBJ)	Vehicles parked on the grass
E	Bookstore	Vehicles parked on both sides along the road
F	Faculty of Natural Sciences	Designated car park and in front of Herbarium
G	Humanities Building/Social Sciences	Designated car park
H	Area between Humanities and Library	Vehicles parked along the road
I	Faculty of Health Sciences	Designated car park and vehicles parked along the drive way
J	Library	Designated car park
K	Area between Library/Faculty of Natural Sciences and Administration	Vehicles parked on both sides of the road
L	Administration Building	Designated car parks
M	Biodiversity Centre	Vehicles parked along driveway
N	Faculty of Agriculture and Forestry	Vehicles parked on both sides of road
O	NDMA Building	Designated car park and vehicles parked along the road on the eastern side
P	Faculty of Technology	Designated car park
Q	Maintenance	

Results

The number of vehicles parked on campus is ranged from 145 to 202 in one single day (Table 14). The locations included in the count consisted of designated car parks at both sides of the road.

The data reveals that the peak time for vehicles (parked) on campus is the period 11:00/13:00 hrs to 17:00/19:00 hrs. Most vehicles are parked on the Tarmac which is the largest area designated for parking. The second are with more traffic is in front of the Faculty of Natural Sciences. This finding is important because several buildings will be rehabilitated within this Faculty and proper selection of storage and parking space will be needed.

Traffic in the vicinity of the Faculties of Natural Sciences, Health Sciences, Agriculture and Forestry, and Technology declined towards the end of the monitoring period as the courses offered by these Faculties are offered primarily during the day.

Table14. Results of traffic count in the UG campus on April 13, 2011.

ID code	Location	Time Periods						Total
		9:00-11:00 hrs.	11:00-13:00 hrs.	13:00-15:00 hrs.	15:00-17:00 hrs.	17:00-19:00 hrs.	19:00-21:00 hrs.	
A	Education Lecture Theatre and Education Building	9	9	10	6	30	24	**88**
B	Tarmac	25	50	46	49	59	44	**273**
C	CIT	5	2	4	5	11	10	**37**
D	CBJ	0	1	1	3	6	7	**18**
E	Bookstore	2	6	3	2	2	1	**16**
F	Faculty of Natural Sciences	21	26	26	20	19	22	**134**
G	Humanities Building	7	9	11	9	6	6	**48**
H	Area between Humanities and Library	2	3	7	5	4	6	**27**
I	Faculty of Health Sciences	14	18	15	17	17	7	**88**
J	Library	6	9	11	10	11	11	**58**
K	Area between Library/FNS and Administration	6	8	10	15	10	8	**57**
L	Administration Building	10	12	10	11	6	5	**54**
M	Biodiversity Centre	1	1	1	2	1	0	**6**
N	Faculty of Agriculture and Forestry	9	5	12	11	7	4	**48**
O	NDMA Building	6	8	8	8	4	2	**36**
P	Faculty of Technology	18	22	20	14	8	5	**87**
Q	Maintenance	4	3	4	3	1	1	**16**
	Total	**145**	**192**	**199**	**190**	**202**	**163**	

7.3 BIOLOGICAL CHARACTERISTICS OF THE UG CAMPUS

Methodology

The University of Guyana Turkeyen campus is located on 586 hectares of land. It is constituted by seven faculties in addition to administrative buildings on this campus. For the biological diagnostics the project area, the campus was divided into eighteen study plots. See Annex 4 showing a sketch of the campus divided into the study plots.

To determine the plant species density in the study areas, 18 study sites was selected and quadrats and line transects were used. The quadrats were randomly thrown from one end of the site diagonally to the center of the study site. The additional quadrats were then thrown randomly to at various locations of the study site in order to develop line transects. The plants and animals within the quadrats were observed and counted. The numbers were recorded so that abundance of each species could be later determined. Additional observations of were also taken to record fauna species and large trees in the study site.

RESULTS

Study Site A: This study site constitutes the playing field near the entrance of the campus.

Study Site A.

The plants species recorded at Site A (Figure 8) are mainly grasses and herbs such as carpet grass (*Axonopus affinis*), nut grass (*Cyperus rotundus*), touch me not (*Mimosa pudica*), pig weed (*Amaranthus blitoides*), bahama grass (*Cynodon dactylon*), para grass (*Brachiaria mutica*), tanner grass (*Brachiaria radicans*). The main tree species found in this study site is the canon ball tree (*Couroupita guianensis*), (Table 15).

The dominant family in Study site A was Poaceae since most of the species were grasses (Table 15). Since this study site is disturbed few animal species were observed here. Two species of red ants are common (*Myrmica differentialis*) and carpenter ants (*Camponotus sp*).

Table 15. Species Abundances found in Study Site A: playing field near the entrance of the campus.

Common Name	Scientific Name	Family Name	Count (Total of 9 quadrats)	Total Percentage (%)
Pig weed	*Amaranthus blitoides*	Amaranthaceae	20	4.1%
Nut grass	*Cyperus rotundus*	Cyperaceae	45	9.2%
Touch me not	*Mimosa púdica*	Fabaceae	60	12.2%
Canon ball tree	*Couroupita guianensis*	Lecythidaceae	10	2.1%
Carpet grass	*Axonopus affinis*	Poaceae	120	24.5%
Bahama grass	*Cynodon dactylon*	Poaceae	150	31%

Para grass	*Brachiaria mutica*	Poaceae	40	8.2%
Tanner grass	*Brachiaria radicans*	Poaceae	45	9.2%

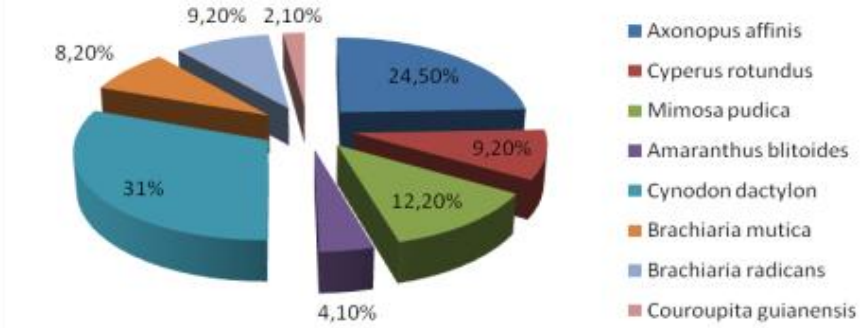

Figure 8. Plant abundance and species dominance in Study site A.

Study Site B: This study site is located immediately behind the Education Lecture Theatre and along the entrance of the Faculty of Health Sciences.

This area is relatively undisturbed and had higher species abundance than Study Site A (Figure 8). The main species in the site B (Figure 9) were bahama grass (*Cynodon dactylon*), bird seed grass (*Echinochloa colonum*), gripe weed (*Phyllanthus schum*), tanner grass (*Brachiaria radichans*), nut grass (*Cyperus rotundus*), carpet grass (*Axonopus affinis*), *Desmodium rotundifolium*, pig weed (*Amaranthus blitoides*), touch me not (*Mimosa pudica*) and one tree species rain tree (*Samaea saman*) (Table 16).

Study site B.

Table 16. Species abundances in Study Site B: behind the Education Lecture Theatre and along the entrance of the Faculty of Health Sciences.

Common Name	Scientific Name	Family Name	Count (Total of 9 quadrats)	Total Percentage (%)
Bahama grass	*Cynodon dactylon*	Poaceae	130	19.6%
Bird seed grass	*Echinochloa colonum*	Poaceae	80	12.1%
Gripe weed	*Phyllanthus schum*	Euphorbiaceae	90	13.6%
Tanner grass	*Brachiaria radichans*	Poaceae	75	11.3%
Nut grass	*Cyperus rotundus*	Cyperaceae	50	7.5%
Carpet grass	*Axonopus affinis*	Poaceae	105	16%
	Desmodium rotundifolium	Fabaceae	45	6.8%
Pig weed	*Amaranthus blitoides*	Amaranthaceae	50	7.5%
Touch me not	*Mimosa púdica*	Fabaceae	30	4.5%
Rain tree	*Samanea saman*	Fabaceae	7	1.1%

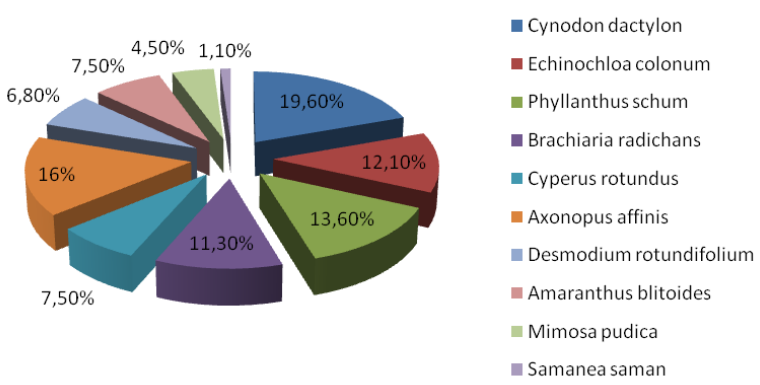

Figure 9. Graph showing plant abundances in Study site B.

Study Site B1, B2: This study site runs parallel to the Faculty of Education and Humanities front building near the main entrance of the campus. The most abundant species is the carpet grass (*Axonopus affinis.* Running perpendicular to study site B1, three trees of flamboyant (*Delonix regia*) and five of ackee tree (*Blighia sapida*) were recorded. In the parking lot, there are several tree species such as *Terminalia catappa*, rain tree (*Samanea saman)* and ball nut tree (*Calophyllum inophyllum*), (Table 17).

Table 17. Species abundances for Site B1 and B2: Faculty of Education and Humanities front building near the main entrance of the campus and nearby parking lot.

Common name	Scientific name	Family	Count (from 4 quadrats)	Total Percentage (%)
SITE B1				
Carpet grass	*Axonopus affinis*	Poaceae	75	90.4%
Ackee tree	*Blighia sápida*	Sapindaceae	5	6%
White periwinkle	*Catharanthus roseus*	Apocynaceae	3	3.6%
SITE B2				
Rain tree	*Samanea saman*	Fabaceae	3	27.3%
Tropical almond	*Terminalia catappa*	Combretaceae	6	54.5%
Ball nut	*Calophyllum inophyllum*	Clusiaceae	2	18.2%

Study Site C: This study site is located between the Small Lecture Theatre and the Faculty of Education and Humanities building. This location is characterized by mainly grasses such as carpet grass (*Axonopus affinis)*, bahama grass (*Cynodon dactylon)*, and nut grass (*Cyperus rotundus*), Table 18. The most abundant species was the carpet grass (*Axonopus affinis)*, Table 18.

Table 18. Species abundances for Site C, near the small Lecture Theatre and the Faculty of Education and Humanities building, University of Guyana.

Common name	Scientific name	Family name	Count (Total of 9 quadrats)	Total percentage (%)
Carpet grass	*Axonopus affinis*	Poaceae	110	44.2%
Bahama grass	*Cynodon dactylon*	Poaceae	90	36.1%
Nut grass	*Cyperus rotundus*	Cyperaceae	45	18.1%
Rain Tree	*Samanea saman*	Fabaceae	3	1.2%
Flamboyant tree	*Delonix regia*	Fabaceae	1	0.4%
TOTAL			**249**	**100**

Study Site D1: This study site is located on the left side of the catwalk between the Library and the School of Education and Humanities building. The most abundant plant species found in this study site (Figure 10) were the bahama grass (*Cynodon dactylon*), (Table 19). Other common species in this site are: bird seed grass (*Echinochloa colonum*), gripe weed (*Phyllanthus schum*), tanner grass (*Brachiaria radichans*), para grass (*Brachiaria mutica*), sand box tree (*Hura crepitans)* and long john tree (*Triplaris surinamensis*). Commmon Animal species found in the site are grasshoppers (*Melanoplus differentialis*), red ants (*Myrmica rubra*) and lady bugs (*Coccinella septempunctata*).


Site D1

Table 19: Plant abundances in D1: on the left side of the catwalk between the Library and the School of Education and Humanities building.

Common name	Scientific name	Family name	Count (Total of 9 quadrats)	Total percentage (%)
Bahama grass	*Cynodon dactylon*	Poaceae	165	56%
Bird seed grass	*Echinochloa colonum*	Poaceae	51	17.3%
Gripe weed	*Phyllanthus schum*	Euphorbiaceae	30	10.2%
Tanner grass	*Brachiaria radichans*	Poaceae	30	10.2%
Para grass	*Brachiaria mutica*	Poaceae	12	4.1%
Sand box tree	*Hura crepitans*	Euphorbiaceae	5	1.7%
Long John tree	*Triplaris surinamensis*	Polygonaceae	2	0.7%
TOTAL			**295**	**100**

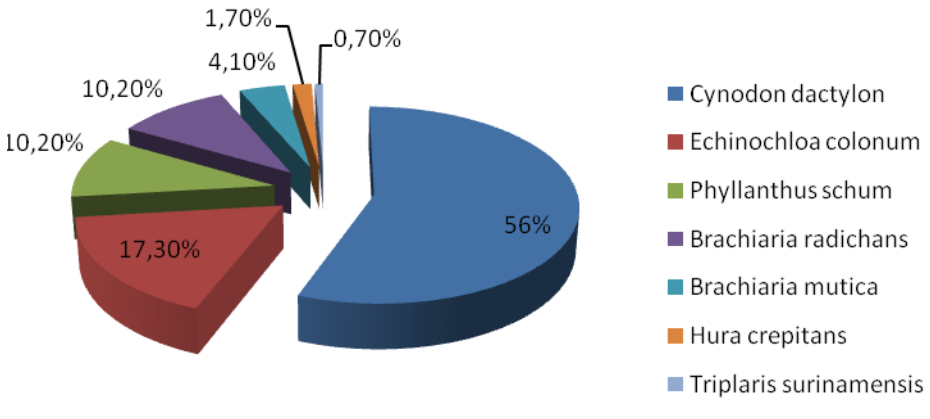

Figure 10. Plant species abundance in the Study Site D1, at the University of Guyana, Turkeyen Campus.

Study Site E1: This study site is located between the drainage canal and the back of the Library, Learning Resource Centre and the Bursary.


Site E1.

The main species found in this site (Figure 11) were Daisy (*Bellis perennis*), black sage (*Salvia mellifera*), zebra grass (*Miscanthus sinensis*), carpet grass (*Axonopus affinis), p*ig weed (*Amaranthus blitoides*), nut grass (*Cyperus rotundus* & *Cyperus digitatus*) and touch me not (*Mimosa pudica*) (Figure 24). Some animal species found at this site include: black carpenter ants (*Camponotus pennsylvanicus*), red ants (*Solenopsis invicta*), lizard (*Naultinus elegans*), dragon fly (*Anisoptera*) and grasshoppers (*Melanoplus differentialis*).

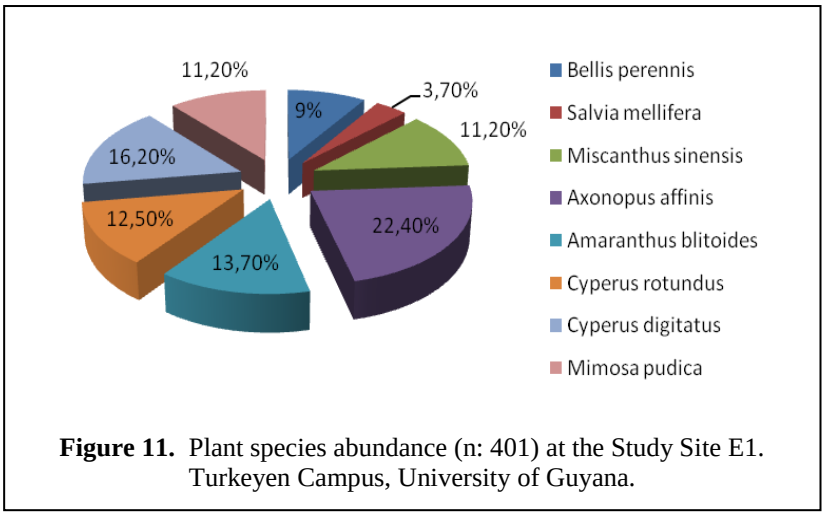

Figure 11. Plant species abundance (n: 401) at the Study Site E1. Turkeyen Campus, University of Guyana.

Study Site E2: This study site comprises the pond in front of the Learning Resource Centre. Only one plant species is found *Victoria amazonica* and two animal species: the black caiman (*Melanosuchus niger*) and *Jacuna jacuna*.

Study Site F: This study site is bordered by the Biology and Chemistry Natural Sciences Building, the Chemistry Annex and the Centre for the Study of Biological Diversity Buildings. The two common plant species are bahama grass (*Cynodon dactylon*), carpet grass (*Axonopus affinis*), (Table 20). Also, two tree species were registered: rain tree (*Samaea saman*) and *Eucalyptus oblonga*. Fauna species found at the site were: carpenter ants (*Camponotus pennsylvanicus)*, red ants (*Solenopsis invicta)*, grasshoppers (*Melanoplus differentialis*) and lizards (*Naultinus elegans).*

Study Site E2

Site F

Table 20. Plant species abundance in Study site F: area is bordered by the Biology and Chemistry Natural Sciences Building, the Chemistry Annex and the Centre for the Study of Biological Diversity Buildings.

Common name	Scientific name	Family name	Count (Total of 9 quadrats)	Total percentage (%)
Bahama grass	*Cynodon dactylon*	Poaceae	75	14.8%
Carpet grass	*Axonopus affinis*	Poaceae	103	20.2%
Touch me not	*Mimosa púdica*	Fabaceae	55	10.8%
Para grass	*Brachiaria mutica*	Poaceae	63	12.4%
Tanner grass	*Brachiaria radicans*	Poaceae	76	15%
Zebra grass	*Miscanthus sinensis*	Poaceae	40	7.9%
Daisy	*Bellis perennis*	Asteraceae	53	10.4%
Razor grass	*Paspalum virgatum L.*	Poaceae	43	8.5%
TOTAL			**508**	**100**

Study site G1: This study site is located between the two Natural Sciences buildings to the right of the catwalk. The most common plants in this site were grasses including: carpet grass (*Cynodon dactylon*), para grass (*Brachiaria mutica),* tanner grass (*Brachiaria radicans*), (Table 21). Two tropical almond nut trees were also recorded.

Animal species found at this site were: black carpenter ants (*Camponotus pennsylvanicus)* and a dragonfly species (*Anisoptera*).

Table 21. Plant abundances for Study site G1: between the two Natural Sciences buildings to the right of the catwalk. University of Guyana.

Common name	Scientific name	Family name	Counts (Total of 6 quadrats)	Total (%)
Carpet grass	*Cynodon dactylon*	Poaceae	56	38.6
Para grass	*Brachiaria mutica*	Poaceae	44	30.3
Tanner grass	*Brachiaria radicans*	Poaceae	35	24.1
Tropical Almond nut tree	*Terminalia catappa*	Combretaceae	2	1.4
Ornamental species	Ornamental species		6	4.1
Rain Tree	*Samanea saman*	Fabaceae	2	1.4
TOTAL			**145**	**100**

Study site G2: This study site is located between the two flats of faculty offices in the Faculty of Natural Sciences. The grass plant species were common in this site, including (Figure 12): carpet grass (*Cynodon dactylon*), para grass (*Brachiaria mutica*), tanner Grass (*Brachiaria radicans*). Also, some trees are found in the site: rain tree (*Samanea saman*), coconut tree (*Cocos nucifera*) and almond nut trees (*Terminalia catappa*).

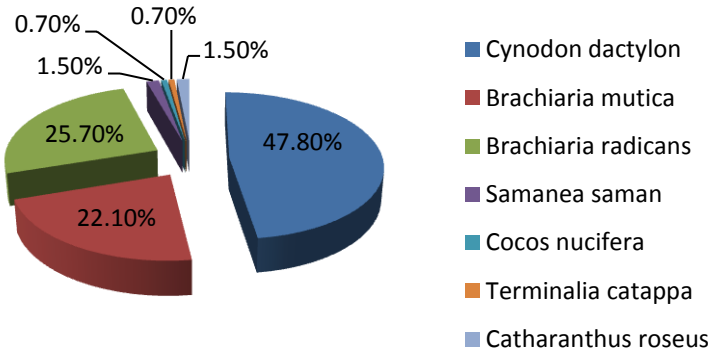

Figure12. Plant species abundance for Study Site G2, (n: 136). Turkeyen Campus, University of Guyana.

Study Site H: This Study site is located between the Biodiversity Building and the Faculty of Agriculture and Forestry. The main plant species in this site were carpet grass (*Axonopus affinis*), bahama grass (*Cynodon dactylon*), pig weed (*Amaranthus blitoides*), *Desmodium roduntifolium*, nut grass (*Cyperus rotundus* & *Cyperus digitatus*), razor grass (*Paspalum virgatum L.*, (Table 22).


Study Site H.

Table 22. Plant species abundance in Site H: located between the Biodiversity Building and the Faculty of Agriculture and Forestry. University of Guyana.

Common name	Scientific name	Family name	Count (Total of 9 quadrats)	Total Percentage (%)
Carpet grass	*Axonopus affinis*	Poaceae	95	20.1%
Bahama grass	*Cynodon dactylon*	Poaceae	105	22.2%
Pig weed	*Amaranthus blitoides*	Amaranthaceae	70	14.8%
Nut grass	*Cyperus rotundus*	Cyperaceae	45	9.5%
Nut grass	*Cyperus digitatus*	Cyperaceae	55	11.6%
Razor grass	*Paspalum virgatum*	Poaceae	35	7.4%
	Desmodium roduntifolium	Fabaceae	66	14%
Rain tree	*Samanea saman*	Fabaceae	1	0.2%
TOTAL			**472**	**100**

VERTEBRATE FAUNA

At the UG campus, a total of 35 bird species have been recorded, among these herons, jacanas, kingbirds, hawks, parrosts, etc. (Table 23).

Among the amphibians, there are about 5 species recorded. All of these species are connected to the swamp, drainage channels and ponds found at the UG campus. Only 5 reptiles have been recorded (Table 23), among these the caiman *Caiman crocodilus* which inhabits the drainage channels around the campus and it's an endangered species. Contractors will prevent to cause any impact to the UG campus flora and fauna.

Table 23. List of bird species and sites recorded at the University of Guyana Turkeyen Campus.

FAMILY	SCIENTIFIC NAME	COMMON NAME	Farm	Ponds	Vegetation on Periphery	Trench on Periphery	Playing Field
Accipitridae	*Rostrhamus sociabilis*	Snail Kite or Krekete Hawk	■	■	■	■	■
Accipitridae	*Buteo albicaudatus*	Chicken Hawk or White Tailed Hawk	■		■		■
Aramidae	*Aramus guarauna*	Limpkin	■	■		■	■
Ardeidae	*Ardea alba*	Great Egret	■	■	■	■	■
Ardeidae	*Bubulcus ibis*	Cattle Egret	■	■	■	■	■
Ardeidae	*Buteo albicaudatus*	White Tailed Hawk	■		■	■	■
Ardeidae	*Butorides striatus*	Striated Heron	■	■	■	■	■
Ardeidae	*Nycticorax Nycticorax*	Chow/Black Crowned Night Heron	■	■	■	■	■
Ardeidae	*Egretta caerula*	Little blue Heron	■	■	■	■	■
Ardeidae	*Egretta tricolor*	Tricoloured Heron	■	■	■	■	■
Colombidae	*Leptottila verreausi*	White Tipped Dove	■		■		■
Colombidae	*Columbina talpacota*	Ruddy Ground Dove	■		■	■	■
Cuculidae	*Crotophaga ani*	Old Witch	■		■		■
Emberizidae	*Paroaria gularis*	Red Capped Cardinal	■		■		■
Emberizidae	*Volatinia jacarina*	Blue-Black Grassquit	■		■		■
Emberizidae	*Sporophila lineola*	Lined Seedeater or Moustache	■		■		■
Emberizidae	*Sporophila minuta*	Fire Red	■		■		■
Falconidae	*Caracara plancus*	Crested Caracara	■	■	■		
Fumariidae	*Certhiaxis cinnamoncus*	Rootie or Spinetail	■		■	■	■
Hirundinidae	*Progne chalybae*	Grey Breasted Martin / Swallow	■		■		■
Icteridae	*Icterus nigrogularis*	Yellow Plantain	■		■		■
Icteridae	*Sturnella militaris*	Red Breast	■		■	■	■
Icteridae	*Quiscalus lugubris*	Carib Grackle	■		■		■
Jacanidae	*Jacana jacana*	Wattled Jacana or Jacana	■	■		■	
Mimidae	*Mimus gilvus*	Tropical Mockingbird	■		■		■
Psittacidae	*Amazona farinosa*	Mealy Parrot	■		■		
Thraupidae	*Thraupis episcopus*	Blue Sacki	■		■		■
Thraupidae	*Thraupis palmarum*	Palm Tanager or Coconut sacki	■		■		
Troglodytidae	*Troglodytes musculus*	House Wren	■		■		
Turdidae	*Turdus leucomelas*	Pale Breasted Thrush	■		■		
Tyrannidae	*Fluvicola pica*	Cotton Bird/ Cotton Strainer	■		■		■
Tyrannidae	*Pitangus sulphuratus*	Kiskadee	■	■	■	■	■
Tyrannidae	*Tyrannus melanchalicus*	Tropical kingbird	■		■		

Source: Da Silva, Phillip (2009): Birding for the beginner: with an introduction to the birds of the Turkeyen Campus. Unpublished Sabbatical Report.

Table 24. List of amphibians and reptils commonly found at the University of Guyana Turkeyen Campus.

Scientific Name	Common Name
Amphibians	
Scinax rubra	tree frog
Hypsiboas boans	tree frog
Rhinella marina	cane toad
Rhaebo nasicus	not available
Rhaebo guttatus	spotted toad
Reptiles	
Gonatodes humeralis	orange-spotted gecko
Thecadacytlus rapicauda	turnip-tailed gecko
Ameiva ameiva	South American ground lizard
Anolis species	green anole
Caiman crocodilus	spectacled caiman

7.4 DIAGNOSTIC COMMENTS

The vegetation in the UG campus is represented mainly by members of the Poaceae and Cyperacece families such as *Cynodon dactylon, Axonopus affinis, Cyperus rotundus* and *Cyperus digitatus*. The larger trees that are more common on the campus are *Samanea saman* and *Terminalia catappa*. It is expected that no trees will be needed to be cut for the construction and rehabilitation works planned for the Project.

Vegetation in the UG Campus represents an important asset to the landscape and esthetic value of the University campus. Contractor will be responsible to restore all areas were vegetation could be affected during the construction and civil works planned under the Project.

The birds and amphibians identified on campus are common to Guyana's coast and easily found in the UG campus. Efforts must be taken during construction to avoid harm to these animals, their habitat, to feed them, to contaminate the university ponds and to reduce environmental impact on the campus fauna. Most of the fauna species are quite common to the coastal zone of Georgetown, except the spectacled caiman (*Caiman crocodilus*) which is a protected and endangered species which will be protected during the works.

The UG faces important challenges in relation to (i) management of solid waste, water effluents, water quality, energy, etc; (ii) emergency systems, (iii) adequate space and equipment for research and teaching, (iv) management of hazardous waste, (v) needs for scientific equipment for teaching and research, (vi) adequate space to store and used this equipment.

During the rainy season the campus can become flooded and places like labs, lectures rooms and the library become flooded. It is expected that the development of this Project will improve waste management, electrical and ventilation systems, the drainage system, 14 science buildings, developed a research fund, purchase scientific equipment for teaching and researching, among other things. Construction and rehabilitation works will cause some temporal environmental and social negative impacts. But overall the Project will bring many benefits to the UG community and to the overall UG academic and research program.

Storage space of lab microscopes at UG, 2011

Small labs are a commong problema at UG

8. ANALYSIS OF PROJECT IMPACTS

Potential environmental and social impacts from the Project activities are mainly related to the planned construction activities (Component 2). Some potential impacts can also be caused by the development of the other Project components; some of these possible impacts are also identified (Table 25).

The main environmental and social impacts will be those related to small construction works and renovation activities associated with existing structures. Particularly important is the need to manage construction activities so as to reduce impacts on the academic environment, although some disruption in the normal academic program will be unavoidable. Environmental o social impacts related to the Project will occur mainly during the construction period. Also, some impacts will still occur during the operation period mainly related to the use of the rehabilitated labs, production of chemical wastes, management of solid waste (broken material, old equipment that will become replaced by the new equipment that will be purchase for the UG science labs), etc.

Table 25. Identification and Description of the Potential Environmental and Social Impacts of the Component 2 (Sub-Component (a): Laboratory and Building Rehabilitation) and other project activities. Key: + = positive impact; - = negative impact

Activity	Component of Environment	ID code	Potential Impact
PREPARATORY PHASE			
Design of the 14 buildings and laboratory spaces within the buildings for the four Science and Technology faculties of the Project.	Social	1	Lack of consultation and participation of UG students, faculty and staff
	Environment	2	Improver design of rehabilitation works which will not resolver main environmental problems affecting these building and the overall UG campus
CONSTRUCTION PHASE			
Implementation of the rehabilitation works and laboratory retrofit for equipment. This would include: • Rehabilitation of floors, roofing, work benches, cupboards and counters, electrical outlets, sinks, bathrooms, doors and fittings, partitions and provision of air conditioning, new furniture. • Power and Light – the existing installations would be brought up to code and derelict installations removed. Replacement of electrical	Environment	1	Loss of vegetation due to storage of materials (-)
		2	Generation of particulate matter, particularly due to demolition activities, storage of materials and operation of cement mixers (-)
		3	Generation of construction and other waste materials (including hazardous) generated by construction activities (-)
		4	Overload of current capacity of waste disposal facilities (-)
		5	Generation of noise from machinery and construction activities (-)
		6	Traffic congestion due to delivery of material supply (-)

lighting of fluorescent tubes and mechanical ballasts with energy efficient fittings. • Water. Rehabilitation of water storage and supply • Sewage. Relocation and upgrading of existing 4 inch diameter sewage pipe system.		7	Increased emission of gases and particulate matter from increased traffic (-)
		8	Exacerbation of the storage space problem on campus (-)
		9	Reduction in aesthetics due to construction and storage of materials (-)
		10	Decreased quality of surface water during clearance of canals (-)
		11	Decreased quality of surface water due to discharge of fuel, engine oil and transmission or hydraulic fluids into surface water (-)
		12	Decreased quality of soil due to discharge of fuel, engine oil and transmission or hydraulic fluids (-)
		13	Improved energy efficiency (+)
		14	Impact on potential cultural resources (-)
	Social[21]	14	Increased risk of accidents arising from increased traffic (-)
		15	Disruption of utilities (-)
		16	Difficulties of access to lecture rooms and laboratories which would impact on the delivery of lectures (-)
		17	Health and Safety risk to workers, students and lecturers due to construction activities (-)
		18	Social conflicts arising from presence of construction personnel on campus (-)
		19	Overall improvement in the 14 targeted buildings and the facilities (+)
		20	Reduction in the occurrence of flooding of the campus (+)
		21	Increased opportunities for Health and Safety arising from the improvement in facilities (+)
OPERATION PHASE			
Space Efficiency – proposal for sharing of facilities to improve space use The current situation is that each faculty has its own individual lab (for example a computer laboratory). The proposal is the adoption of an open plan approach to office space where everyone sits at work stations instead of individual offices.	Social	22	Increased possibility for social conflicts (-)
		23	Difficulty to adopt to new 'environment' and to concentrate (-)
		24	Lack of privacy , especially when dealing with students' matters (-)
		25	Perhaps a more efficient use of space (+)

[21] Including: Human health, occupational health and safety, public safety, income, aesthetic quality, social infrastructure, population, social cohesion

Conduct of studies (a) to assess these bio-chemical hazards in the University and identify possible solutions to its management and disposal; and (b) to prepare laboratory protocols and chemical waste management guidelines, among others.	Environment	26	Reduction of environmental contamination on campus (+)
	Social	27	Reduction of risk of occupational health and safety impacts (+)
		28	Improved standards for management of activities and substances used in laboratories at the university (+)
Purchase of laboratory equipment.	Environment	29	Increased traffic due to delivery of laboratory equipment (-)
		30	Increased generation of solid waste from the packaging of laboratory equipment (-)
		31	Exacerbation of the storage space problem on campus (-)
Installation, use and maintenance of laboratory equipment	Environment	32	Generation of hazardous waste from use of equipment (-)
	Social	33	Possibility for theft (-)
		34	Expansion of University of Guyana's ability to offer services to the public (+)
		35	Increase in social relevance of University of Guyana within a national context (+)
		36	Capacity building at higher education level to implement the LCDS (+)
Connection to the Government of Guyana's fiber optic cable, implementation of a fiber ring around the campus and wireless access points and connection to each faculty building on campus.	Environment	37	Disruption to land and landscape(-)
	Social	38	Increase in campus network in terms of information sharing, communication and better management (+)
		39	Increased access to internet services by staff and students (+)
Procurement of Data centre servers to host web services and software and educational software for statistics and GIS applications.	Environment	40	Generation of wastes due to packaging (-)
	Social	41	Greater use of modern software applications to the delivery of educational programs (+)
		42	Greater access to websites for preparation of lectures and the undertaking of research with specific reference to literature review of current materials/publications (+)

8.1 Impact Analysis

Five criteria were selected for the impact evaluation process: duration, likelihood of occurrence, geographic extent, reversibility, and nature of impact –all are standard criteria for impact analysis. Evaluation criteria are defined in Table 26. Where applicable, numerical values were assigned to criteria, as well as, to the degree of significance: values of +- 11 to +-4. (Table 26). The actual analysis was informed by expert opinion and similarity in terms of project activities and impacts.

The matrix in Table 27 indicates the results of the analysis of the significance of each of the impacts identified for the project components and main activities.

Table 26. Key for Criteria for Impact Analysis.

Criteria	**Details**
Duration: (D)	Short term < 2 years or intermittent = 1 ; Medium term 2-3 years = 2; Long term > 3 years = 3
Likelihood of Occurrence (LO)	High =3; Medium=2;Low=1
Geographic Extent (GE)	Within the University Campus = 1; within campus and surrounding communities = 2; outside the area of influence (beyond surrounding communities) = 3
Reversibility (R)	Reversible 1; Irreversible = 2
Nature of Impact (NI)	Beneficial = +1; Adverse = -1
Score = (D +LO +GE +R) x NI	
Symbols = - negative ; + = positive	
Significance (S) : Beneficial Impacts: High ≥ 9; Moderate = 6 - 8; Low ≤ 5 Adverse Impacts: High ≥ -9; Moderate -6- -8; Low ≤ - 5	

Table 27. Environmental Impact Valuation of Project components and main activities.

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
PREPARATORY PHASE										
Design of the 14 buildings and laboratory spaces within the buildings for the four Science and Technology faculties of the Project.	Social[22]	1	Lack of consultation or participation of students and faculty members in the design of construction an rehabilitation plan	3	2	1	1	-1	-7	Moderate
	Environment	2	Improper design to resolve some of UG problems: flooding problems, drainage system, storage of chemical solutions, research cubicles, emergency (fire) alarm systems, electrical system, storage of hazardous waste, labs space, etc.	2	3	1	2	-1	-8	High
CONSTRUCTION PHASE										
Implementation of the rehabilitation works and laboratory retrofit for equipment. This would include: • Rehabilitation of floors, roofing, work benches, cupboards and counters, electrical outlets, sinks, bathrooms, doors and fittings, partitions and provision of air conditioning, new	Environment	3	Loss of vegetation due to storage of materials (-)	1	2	1	1	-1	-5	Low
		4	Generation of particulate matter, particularly due to demolition activities, storage of materials and operation of cement mixers (-)	2	3	1	1	-1	-7	Moderate
		5	Generation of construction and other waste materials (including hazardous) generated by construction activities (-)	2	3	1	1	-1	-7	Moderate
		6	Overload of current capacity of waste disposal facilities (-)	2	3	1	1	-1	-7	Moderate
		7	Generation of noise from	2	3	1	1	-1	-7	Moderate

[22] human health, occupational health and safety, public safety, cultural resourcs, income, aesthetic quality, social infrastructure, population, social cohesion.

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
furniture. • Power and Light – the existing installations would be brought up to code and derelict installations removed. Replacement of electrical lighting of fluorescent tubes and mechanical ballasts with energy efficient fittings. • Water. Rehabilitation of water storage and supply • Sewage. Relocation and upgrading of existing 4 inch diameter sewage pipe system.			machinery and construction activities (-)							
		8	Traffic congestion due to delivery of material supply (-)	2	3	2	2	-1	-9	High
		9	Increased emission of gases and particulate matter from increased traffic (-)	2	2	2	2	-1	-8	Moderate
		10	Exacerbation of the storage space problem on campus (-)	1	3	1	1	-1	-6	Moderate
		11	Reduction in aesthetics due to construction and storage of materials (-)	2	2	1	1	-1	-6	Moderate
		12	Decreased quality of surface water during clearance of canals (-)	1	3	2	1	-1	-7	Moderate
		13	Decreased quality of surface water due to discharge of fuel, engine oil and transmission or hydraulic fluids into surface water (-)	1	1	2	1	-1	-5	Low
		14	Decreased quality of soil due to discharge of fuel, engine oil and transmission or hydraulic fluids (-)	1	1	2	1	-1	-5	Low
		15	Improved energy efficiency (+)	3	3	1	1	+1	+8	Moderate
	Social	16	Increased risk of accidents arising from increased traffic (-)	1	1	2	2	-1	-6	Moderate
		17	Disruption of utilities (-)	1	3	1	1	-1	-6	Moderate
		18	Difficulties of access to lecture rooms and laboratories which would impact on the delivery of lectures (-)	1	3	1	2	-1	-7	Moderate
		19	Health and Safety risk to workers,	2	2	1	1	-1	-6	Moderate

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
			students and lecturers due to construction activities (-)							
		20	Social conflicts arising from presence of construction personnel on campus (-)	2	2	1	1	-1	-6	Moderate
		21	Overall improvement in the 14 targeted buildings and the facilities (+)	3	3	1	1	+1	+8	Moderate
		22	Reduction in the occurrence of flooding of the campus (+)	3	3	2	1	+1	+9	High
		23	Increased opportunities for Health and Safety arising from the improvement in facilities (+)	3	3	1	1	+1	+8	Moderate
Component 1: Education Quality Improvement Program (EQIP) **Sub-Component (a): Curriculum Reform**										
Broad-based consultation to identify and build consensus around the curricular domains within and across the four target faculties most in need of revision/development in order to support the LCDS.	Social	24	Increase work load of lecturers who will be involved in the review of curricula (-)	1	3	1	2	-1	-7	Moderate
		25	Increased participation of the UG in the country LCDS Agenda, by inserting key issues and research activities in the curriculum of future professionals (+)	3	3	2	1	+1	+9	High
Pilot adapted and new courses, course review and finalization by UG staff instructional design and content specialists to incorporate results of evaluation.		26	New courses for students will expand career opportunities in sustainable development , increase knowledge on critical environmental issues affecting the country and increase their marketability (+)	3	3	2	1	+1	+9	High

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
		27	Capacity building at higher education level to implement the LCDS. (+)	3	3	1	1	+1	+8	Moderate
	Environment	28	New courses can promote exploitation of natural resources (mineral, water, forest, soil) in critical sites in the country, such native forest land, indigenous forests, coastal areas, estuarines (-)	3	3	1	1	+1	+8	Moderate
Sub-Component (b): Stimulation of Research										
Analysis of the University's current facilities management processes and recommendation of new systems, processes and capacities to upgrade these systems.	Social	29	Enhanced Project management by strengthening the existing facilities management of the University with additional coordination, environmental management, and ICT capacities (+)	3	3	1	1	+1	+8	Moderate
Procurement of services of a qualified consulting firm to develop operations manuals and other studies and manuals for the implementation of the project in the University.	Social	30	Improved financial management and procurement facilities (+)	3	3	1	1	+1	+8	Moderate
		31	Alienation of University staff with the experience and ability to develop these manuals (-)	3	2	1	1	-1	-7	Moderate
		32	Lack of input from the University of Guyana staff which may reduce the sense of 'local ownership" (-)	3	2	1	1	-1	-7	Moderate
Strengthening of the existing capacity of the University with additional coordination, environmental management, and ICT capacities.		33	Improve environmental management and ICT capacities within the University (+)	3	3	3	1	+1	+10	High

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
Environmental and ICT consultancies that would be contracted.										
Monitoring and evaluation studies to assess the progress of the investments in achieving the PDO Indicators would be conducted by an independent institution (consultant)	Social	34	Improved environmental performance of Contractor/s during implementation of Component (+)	3	3	1	1	+1	+8	Moderate
	Social	35	Independent consultant will not know the university needs and project challenges. Reports might not accurate informed PDP achievements (-)	3	2	1	1	-1	-7	Moderate
Use of a Project website and a crowd sourcing platform to use mapping, geo-spatial and social networking technologies to encourage student and faculty community to participate in the implementation of the Project.	Social	36	Opportunities for stakeholders to be involved in the management and development of the project (+)	3	3	3	1	+1	+10	High
Strengthening of financial management and procurement capacities at the Ministry of Education's Planning Unit.	Social	37	Reduce the role of the University of Guyana in the financial management and procurement of the project (-)	3	2	1	1	-1	-7	Moderate
	Social	38	Lack of input from the University of Guyana community which may reduce the sense of 'local ownership" (-)	3	2	1	1	-1	-7	Moderate
Division of PIU responsabilities between the Ministry of Education and	Environmental/ Social	39	Coordination and communication challenges between the 2 PIUs could result in risks associated	3	2	1	2	-1	-8	Moderate

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
UG			with the quality and overall contractor's works and supervision (-)							
Biodiversity institute – feasibility study	Environment / social	40	Provides an opportunity for the expansion of the current Centre for Biological Studies (+)	3	3	1	1	+1	+8	Moderate
		41	Provides an opportunity for the UG to establish cooperation with biodiversity international centers and to produce research to support the country LCDS. (+)	3	3	1	1	+2	+9	Moderate
		42	Increase collection of flora and fauna species in a rich diverse country where many species are unknown to science. Also species will be collected from protected areas and indigenous forest lands (-)	3	2	1	2	-1	-8	Moderate
Research and Innovation Fund – feasibility study	Environment /social	43	Increased generation of new knowledge and new marketable products/services relevant for the LCDS (+)	3	3	1	1	+2	+9	Moderate
		44	Increased research development by University community (students and professors) (+)	3	3	1	1	+2	+9	Moderate
		45	Provides opportunity for University to increase the generation of income (+)	3	3	1	1	+2	+9	Moderate
		46	Promote research in fields (energy, agriculture, mining, forestry) that can increase pressure	3	2	1	2	-1	-8	Moderate

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
			on natural resources and on vulnerable natural habitats and communities (river ecosystems, forest, indigenous peoples). (-)							
Business Development Unit – feasibility study	Environmental/ social	47	Increased opportunities for the University of Guyana to support the private sector (+)	3	3	1	1	+1	+8	Moderate
		48	Potential conflict of interest if UG supports development of activities which cause negative and social impacts (-)	2	3	1	1	-1	-7	Moderate
Review of UG's present distribution of human resources, including teaching, administrative and maintenance staff.	Social	49	Increase development of UG administrative capacity (+)	3	3	1	1	+1	+8	Moderate
		50	Lack of input from the University of Guyana community which may reduce the sense of 'local ownership" (-)	2	3	1	1	-1	-7	Moderate
OPERATION PHASE										
Space Efficiency – proposal for sharing of facilities to improve space use The current situation is that each faculty has its own individual lab (for example a	Social	51	Increased possibility for social conflicts (-)	3	2	1	2	-1	-8	Moderate
		52	Difficulty to adopt to new 'environment' and to concentrate (-)	2	3	1	1	-1	-7	Moderate
		53	Lack of privacy , especially when dealing with students' matters (-)	3	2	1	2	-1	-8	Moderate

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
computer laboratory). The proposal is the adoption of an open plan approach to office space where everyone sits at work stations instead of individual offices.		54	Perhaps a more efficient use of space (+)	3	3	1	1	+1	+8	Moderate
Conduct of studies (a) to assess these bio-chemical hazards in the University and identify possible solutions to its management and disposal; and (b) to prepare laboratory protocols and chemical waste management guidelines, among others.	Environment	55	Reduction of environmental contamination on campus (+)	3	3	1	1	+1	+8	Moderate
	Social	56	Reduction of risk of occupational health and safety impacts (+)	3	3	1	1	+1	+8	Moderate
		57	Improved standards for management of activities and substances used in laboratories at the university (+)	3	3	1	1	+1	+8	Moderate
Purchase of laboratory equipment.	Environment	58	Increased traffic due to delivery of laboratory equipment (-)	1	2	1	1	-1	-5	Low
		59	Increased generation of solid waste from the packaging of laboratory equipment (-)	2	3	1	2	-1	-8	Moderate
		60	Exacerbation of the storage space problem on campus (-)	1	3	1	2	-1	-7	Moderate
Installation, use and maintenance of laboratory equipment	Environment	61	Generation of hazardous waste from use of equipment (-)	3	3	1	2	-1	-8	Moderate
	Social	62	Possibility for theft (-)	3	3	1	1	-1	-8	Moderate
		63	Expansion of University of Guyana's ability to offer services to the public (+)	3	3	3	1	+1	+10	High
		64	Increase in social relevance of University of Guyana within a national context (+)	3	3	3	1	+1	+10	High

Activity	Affects	ID code	Potential Impact	Impact Analysis						
				D	LO	GE	R	NI	Score	Impact Significance
		65	Capacity building at higher education level to implement the LCDS (+)	3	3	1	2	+1	+9	High
Connection to the Government of Guyana's fiber optic cable, implementation of a fiber ring around the campus and wireless access points and connection to each faculty building on campus.	Environment	66	Disruption to land and landscape (-)	1	3	1	1	-1	-6	Moderate
	Social	67	Increase in campus network in terms of information sharing, communication and better management (+)	3	3	1	1	+1	+8	Moderate
		68	Increased access to internet services by staff and students (+)	3	3	3	1	+1	+9	High
Procurement of Data centre servers to host web services and software and educational software for statistics and GIS applications.	Environment	69	Generation of wastes due to packaging (-)	2	3	1	2	-1	-8	Moderate
	Social	70	Greater use of modern software applications to the delivery of educational programmes (+)	3	3	1	1	+1	+8	Moderate
		71	Greater access to websites for preparation of lectures and the undertaking of research with specific reference to literature review of current materials/publications (+)	3	3	3	1	+1	+9	High

9. THE ENVIRONMENTAL MANAGEMENT PLAN

9.1 Introduction

This Environmental Management Plan (EMP) includes measures of prevention and mitigation actions identified in the analysis of mitigation of impacts and an integrated set of plans and programs organized to optimize the objectives of the work. The EMP is the safeguard instrument which main objectives are:

- To reduce environmental and social impacts due to the Project activities and components
- To minimize risk to the UG campus community during the construction and rehabilitation works
- To ensure Environment, health and safety measures are implemented throughout Project development and construction activities
- To increase environmental management capacity at UG
- To ensure UG stakeholder participation in the project development

The EMP consist of mitigation and prevention measures and programs necessary to implement by the Project coordinators, consultants, contractors and to ensure proper environmental management of the overall project. The Environmental Specialist of the Project (ES) will be responsible to verify compliance of these measures included in the EMP, EMF, Guyana regulations and the World Bank Safeguards Policies. Environmental inspections will be performed by the ES without previous notice to contractors. The ES will revise/strengthen the EMP, EMF as deemed necessary in the light of any changes in the dynamics of environmental processes of the Project, previous No Objection of the World Bank. The ES will work in this project in all stages: planning and preparation, construction and operation.

UG campus

9.2 Mitigation and Prevention Measures

The following Table 28 indicates the mitigation and prevention measures necessary to implement during project preparation and development. The ES will add additional measures as the dynamic of the project development requires.

Table 28. Proposed Mitigation and Prevention Measures.

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
PREPARATORY PHASE				
Design of the 14 buildings and laboratory spaces within the buildings for the four sciences and technology faculties of the Project.	Social	Lack of consultation or participation of students and faculty members in the design of construction and rehabilitation plan	1	The ES will be part of the technical team preparing and reviewing the construction-rehabilitation design proposal. The ES and the UG Project coordinator will be responsible to design proper consultation process for all the phases of the Project. The ES with the support of the UG Project coordinator will organize activities open to the UG community to inform about the design proposal, the possible work schedule and potential impacts in the academic program and campus life. The UG and MOE will support participation process and communication mechanism so the UG community has the opportunity to comment in the design of the construction work plans and other project activities.
	Environment	Improper design to resolve some of UG problems: flooding problems, drainage system, storage of chemical solutions, research cubicles, emergency (fire) alarm systems, electrical system, storage of hazardous waste, labs space, etc.	2	The PIU will include in the letter of invitation , bidding document, etc to hire a design firm, the mandatory need to review this EA and EMP to ensure incorporation of measures and recommendations for the construction and rehabilitation works. The ES will review the terms of reference for such contract and ensure incorporation of EMP measures and other as appropriate to ensure compliance of Guyana

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
				National Environmental regulations and the Safeguards Policies (consultation). The selected contractor/design firm will organize meetings with the UG community to ensure understanding of UG main problems and main issues in the science buildings and other issues affecting UG.
CONSTRUCTION PHASE				
Implementation of the rehabilitation works and laboratory retrofit for equipment. This would include: • Rehabilitation of floors, roofing, work benches, cupboards and counters, electrical outlets, sinks, bathrooms, doors and fittings, partitions and provision of air conditioning, new furniture. • Power and Light – the existing installations would be brought up to code and derelict installations removed. Replacement of electrical lighting of fluorescent tubes and mechanical ballasts with energy efficient fittings. • Water. Rehabilitation of water storage and supply • Sewage. Relocation and upgrading of existing 4 inch diameter sewage pipe system.	Environment	Loss of vegetation due to storage of materials (-)	3	Contractor will use only areas cleared of vegetation and defined by the ES for the storage of construction materials. These sites will have had been reviewed and proposed during the review of the Construction Work Plan. The ES will have had reviewed and approved selected sites.
			4	Contractors will restore all sites in the Campus after finishing the works. For reforestation and re-vegetation activities, contractors will use only native species in a proportion 3x1. Species will be indicated by the ES.
		Generation of particulate matter, particularly due to demolition activities, operation of cement mixers (-)	5	Demolition of large areas will be done at night or weekends so students are not affected by the dust and possible asbestos materials fine particulate matters. Workers must use protective equipment such as masks, ear plugs, etc. All trucks transporting demolition wastes will cover their load with a heavy tart. Speed limit within the campus is 25 km/h. If considered necessary by the ES, water will be spray on the areas of mayor works to reduce air fine particulate pollutants. In this case, fine sediment traps (hay bales, filters) will need to be set up in the drainage channels

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
				and ditches where water will run in order to capture sediments and fine particulate matter and avoid polluting surface waters
		Generation of construction and other waste materials (including hazardous) generated by construction activities (-) Overload of current capacity of waste disposal facilities (-)	6	All demolition materials will be classified according to its type (domestic, recyclable, hazardous, etc,) and the final materials disposed in areas designated by the national Authority (such as the EPA/Georgetown M&CC). Contractor will not place demolition materials in the vicinity of the worksite.
		Generation of noise from machinery and construction activities (-)	7	Contractor shall use trucks and machinery with mufflers
			8	Contractor shall organize their working hours to reduce disruption, for instance working at nights, vacation periods and weekends.
		Traffic congestion due to delivery of material supply (-)	9	Contractor shall avoid having materials being delivered during peak hours. Traffic management shall be coordinated with the University officials
		Increased emission of gases and particulate matter from increased traffic (-)	10	Contractor vehicles will have all permits required by national regulations
		Exacerbation of the storage space problem on campus (-)	11	Designated areas shall be identified for storage in consultation with the Authority
		Reduction in aesthetics due to construction and storage of materials (-)	12	ID code 7
			13	Environmental Specialist shall provide training for the Contractor and his workers
			14	Environmental Specialist will prepare environmental guidelines to guide construction activities
		Decreased quality of surface water during clearance of canals (-) Decreased quality of surface water due to discharge of fuel, engine	15	Contractor shall collect and store waste oils in the event it becomes necessary to change these in the UG campus. Containers labeled with lids will be place in ventilated area with impermeable floors.

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
		oil and transmission or hydraulic fluids into surface water (-) Decreased quality of soil due to discharge of fuel, engine oil and transmission or hydraulic fluids (-)	16	Secondary containment for fuels to avoid spill contamination
		Improved energy efficiency (+)	17	Where possible, the Contractor in consultation with the University Administration and other stakeholders shall explore possibilities of optimizing the use of solar power, as well as the use of energy efficient bulbs.
	Social[1]	Increased risk of accidents arising from increased traffic (-)	18	Contractor shall place signs and prevention measures around construction zones
			19	Flagmen will warn of dangerous sites and inform of construction zones
			20	Contractors will drive at less than 25 km/h within the UG campus. Trucks will always cover their load with a heavy cover when driving inside the campus and outside the campus.
		Disruption of utilities (-)	21	Contractor shall prepare a detailed construction work's plan
			22	Contractor shall coordinate service interruption with public utilities and the University Administration
			23	Contractor will inform staff and students, two weeks in advance about any interruptions in water, sewage and other services on the campus.
		Difficulties of access to lecture rooms and laboratories which would impact on the delivery of lectures (-)	24	Contractors will proposed the relocation plan according to the work schedule and the UG will explore possibilities of temporary relocation for affected faculties. Plan will be discussed with faculty and students.
			25	Contractor shall organize the phasing of his construction works to minimize disruption to lectures and laboratories

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
		Health and Safety risk to workers, students and lecturers due to construction activities (-)	26	Students, lecturers and members of the public shall avoid work sites
			27	Workers shall wear dust masks, safety boots and eye protection at all times
			28	CEI will train contractor's staff in health and Safety matters.
		Social conflicts arising from presence of construction personnel on campus (-)	29	Contractor and Staff will follow the Project Code of Conduct
			30	The UG coordinating Unit will establish a mechanism for receiving and responding to complaints. The ES and CEI will supervise resolution of complains. The Engineer Supervisor will inform contractors of any disciplinary action or penalty that could apply if problem is not resolved.
		Overall improvement in the 14 targeted buildings and the facilities (+) Increased opportunities for Health and Safety arising from the improvement in facilities (+)	31	The UG Administration will develop and implement a maintenance schedule for improved facilities
		Reduction in the occurrence of flooding of the campus (+)	32	The University Administration will develop and implement a maintenance schedule for equipment (for example, drainage pumps)
Component 1: Education Quality Improvement Program (EQIP) ***Sub-Component (a): Curriculum Reform***				
Procurement of services of a qualified consulting firm to develop operations manuals and other studies for project implementation.	Social	-Lack of input from the University of Guyana staff which may reduce the sense of 'local ownership" (-) -Alienation of University staff with the experience and ability to develop these manuals (-)	33	The bidding documents might include clauses to include participation of local professionals, UG professionals, students. Selected firm should present a work plan in consultation with UG Project Committee. Selected firm will use methods to ensure participation of the UG

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
				(student body, Faculties, etc) by organizing meeting, by internet, etc. The ES will be responsible to supervise that consultations are performed by contractors and PIU coordinators. Reports will be disclosed and available to comment by UG community.
Monitoring and evaluation studies to assess the progress of the investments in achieving the PDO Indicators would be conducted by an independent Firms (consultant)		Independent consultant will not know the university needs and project challenges. Reports might not accurate informed PDP achievements (-)	34	Same measures as above
Strengthening of financial management and procurement capacities at the Ministry of Education's Planning Unit.		Reduce the role of the University of Guyana in the financial management and procurement of the project (-)	35	The PIU at the Ministry of Education will send monthly financial and procurement reports to UG to facilitate project coordination and implementation.
Division of PIU responsabilities between the Ministry of Education and UG		Coordination and communication challenges between the 2 PIUs could result in risks associated with the quality and overall contractor's works and supervision (-)	36	UG will inform monthly to the Ministry of Education about the quality and compliance of contractors with bidding documents, environmental and social measures, issues, etc. Every week PIU coordinators at the MoE and UG will meet to coordinate work plan.
Biodiversity institute – feasibility study	Environmental/ Social	Increase collection of flora and fauna species in a rich diverse country where many species are unknown to science. Also species will be collected from protected areas and indigenous forest lands (-)	37	All research projects will follow country environmental regulations (EPA and other applicable regulations). Feasibility study will include guidelines and procedures for the institute to properly include (i) EPA regulations and (ii) environmental and social World Bank Safeguards to reduce environmental and social impact. The ES appointed to the project will review TORS for the contract of this consultancy, review Bidding documents, guide the

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
				consultant and review final proposals and reports. Selected firm will develop proposal in consultation of UG by holding workshops, seminars, etc.
Research and Innovation Fund – feasibility study	Environmental/ Social	Promote research in fields (energy, agriculture, mining, forestry) that can increase pressure on natural resources and on vulnerable natural habitats and communities (river ecosystems, forests, indigenous peoples),(-)	38	Same measures as above
Business Development Unit – feasibility study	Environmental/ Social	Potential conflict of interest if UG supports development of service fee activities which might cause negative and social impacts (-)	39	Same measures as above
Review of UG's present distribution of human resources, including teaching, administrative and maintenance staff.	Social	Lack of input from the University of Guyana community which may reduce the sense of 'local ownership" (-)	40	Selected firm will develop proposal in consultation of UG by holding workshops, seminars, etc. The PIU at UG and the ES will ensure that UG community participate openly in this review.
OPERATION PHASE			41	
Space Efficiency – proposal for sharing of facilities to improve space use The current situation is that each faculty has its own individual lab (for example a computer laboratory). The proposal is the adoption of an open plan approach to office space where everyone sits at work stations instead of individual offices.	Social	Increased possibility for social conflicts (-) Difficulty to adopt to new 'environment' and to concentrate (-) Lack of privacy , especially when dealing with students' matters (-) Perhaps a more efficient use of space (+)	42	The PIU will ensure to include in the bidding document of design works and civil works the inclusion of research cubicles so professors and students can have quality space to do research. Also as space is possible, the design plans will include the inclusion of cubicles in the new building to offer office space to maintain privacy of students and while maintaining the lecturers' privacy. The ES will supervise adequate consultation and proposal to ensure adequate space for researchers, and lectures in the new buildings.
Conduct of studies (a)	Environment	Opportunity for reduction	43	The ES will be responsible to

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
to assess these bio-chemical hazards in the University and identify possible solutions to its management and disposal; and (b) to prepare laboratory protocols and chemical waste management guidelines, among others.		of environmental contamination on campus (+) Reduction of risk of occupational health and safety impacts (+)		prepare the terms of reference for such studies and review compliance of these with the safeguards Policies and the Pollution Prevention and Abatement Handbook (Annex 1). The PIU and UG Project coordinator will support the ES in implementing the recommendations derived from these studies and incorporated them in the UG environmental management procedures and to ensure their incorporation in the overall Project development.
	Social	Improved standards for management of activities and substances used in laboratories at the university (+)	44	UG will establish timeline to adhere to new guidelines developed for laboratory safety and the handling of bio-chemical hazards, and waste management.
Purchase of laboratory equipment.	Environment	Increased traffic due to delivery of laboratory equipment (-)	45	Traffic management shall be coordinated by the University Administration
			46	Designated areas for the delivery of laboratory equipment shall be identified by the University Administration
		Increased generation of solid waste from the packaging of laboratory equipment (-)	47	The University Administration shall select suppliers that avoid excessive packaging of products
		Exacerbation of the storage space problem on campus (-)	48	The University Administration and staff shall practice separation and shall maximize opportunities for recycling of wastes such as cardboard.
Installation, use and maintenance of laboratory equipment	Environment	Generation of hazardous waste from use of equipment (-)	49	University staff shall consult the EPA for advise on the disposal of such wastes in keeping with the Draft Management Strategy for Hazardous Wastes
			50	In the interim, these wastes shall be stored in designated areas on the campus
	Social	Possibility for theft (-)	51	The University Administration shall increase the number of security guards on the campus, and particularly in the vicinity of work and /storage sites with purchased materials

Activity	Area	Potential Impact	ID Code	Proposed Mitigation/Enhancement Measure
		Expansion of University of Guyana's ability to offer services to the public (+)	52	The University shall publicize its services to the wider society
		Increase in social relevance of University of Guyana within a national context (+)	53	The University shall offer courses/programs that will enhance scientific skills of targeted groups in response to the LCDS
		Capacity building at higher education level to implement the LCDS (+)	54	The University shall design and implement courses through its Professional Development Unit to provide opportunities for recurrent training (in science oriented fields) to professionals whose jobs are related directly/indirectly with the implementation of the LCDS
Connection to the Government of Guyana's fiber optic cable, implementation of a fiber ring around the campus and wireless access points and connection to each faculty building on campus.	Environment	Disruption to land and landscape(-)	55	The Contractor shall restore the landscape to its original state after completion of the activity
	Social	Increase in campus network in terms of information sharing, communication and better management (+)	56	The University staff and students shall optimize opportunities for information sharing etc
		Increased access to internet services by staff and students (+)	57	The University staff and students shall optimize opportunities for communication, research, information sharing etc.
Procurement of Data centre servers to host web services and software and educational software for statistics and GIS applications.	Environment	Generation of wastes due to packaging (-)	58	The University Administration shall select suppliers that avoid excessive packaging of products
			59	The University Administration and staff shall practice separation and shall maximize opportunities for recycling of wastes such as cardboards.
	Social	Greater use of modern software applications to the delivery of educational programmes (+) Greater access to websites for preparation of lectures and the undertaking of research with specific reference to literature review of current materials/publications (+)	60	The University staff shall be trained in the use of modern software equipment and shall apply skills to the delivery of their lectures and the research process.

9.3 PLANNING AND PREPARATION

Institutional arrangements

Project Implementing Unit

The PIU will be located in the Ministry of Education (MOE) and at the University of Guyana. The Project Coordinator of the PIU at the UG will provide support and the necessary equipment to the Environmental Specialist appointed by Project in order to develop the project in a way to reduce, prevent and mitigate any social or environmental impact.

The Engineer supervisor of the works

The Engineer supervisor of the works and appointed either by the UG and/or at the MOE will coordinate closely with ES that contractors follows and complies with this EMP and Guyana national regulations. The Engineer supervisor of the works will support the ES in every way to ensure contractors compliance with all bidding environmental and social clauses.

Project Environmental Specialist (ES)

- The Project Environmental Specialist is the professional with environmental expertise hired or contracted by the PIU for the overall environmental and social supervision of the Project.
- ES is selected and named. The ES will comply with the profile described in Annex 5. The ES reports to the UG Project Coordinator and he/she will be contracted before the bidding and any other contract is prepared. ES revises the EMP and other safeguards instruments of the Project and the Operational Manual and if needed environmental amendments are made (these must be approved by the World Bank);
- ES prepares the Environmental Technical Specifications (ETS) to be included in the bidding documents, includes the clauses included in this EMP and adds as necessary other pertinent clauses, consult the Bank and other necessary sources and agencies. The Bank will give its clearance to the ETS
- ES revises Bidding documents include the ETS and all necessary environmental and social clauses; including the requirement that contractor will hire an environmental staff to oversees and coordinate environmental supervision of the works
- ES revises contractors company's environmental management proposals, environmental permits, traffic permits, etc.
- ES works with the PIU team in selecting operational sites for the contractors (parking, dining rooms, material storages sites, etc.); water, electricity sources are agreed.
- ES works with the PIU team in the preparation of the Plan of Relocation and Mobility developed according to the approved plan of civil works and the approved schedule.

- ES will be responsible to prepare the terms of reference for environmental studies which will be contracted to increase UG environmental management, some of these are: hazard assessment, laboratory guidelines, hazardous waste management manuals. Es will review compliance of these studies with this EMP, Safeguards Policies and the Handbook Abatement Handbook (Annex 1).

- The ES will be responsible to monitor overall works performance and will use Environmental Datasheets (EDS to monitor the project environmental and social management. Annex 6 contains some examples of EDS. The ES as soon as appointed by the PIU will need to prepare additional EDS to monitor all mitigation measures agree in this EMP.

- The ES will be assigned an office at UG (and any other members responsible of the Environmental and social supervision) with telephone, fax, computer and printer.

Contractor's Environmental Inspector

The contractor's Environmental Inspector is the professional appointed by the contractor to support its company in the compliance of this EA and EMP developed for the mitigation and prevention of social and environmental impacts associated with the construction and rehabilitation works for which the company was hired.

PIU ensures that bidding documents request Contractors to hire an environmental staff responsible to prepare and supervise implementation by the contractors and subcontractor of EMPco and provide overall training (health, safety, environment, code of conduct, etc.) to workers and subcontractors, etc. This person will be named "Contractor's Environmental Inspector" (CEI) and the professional qualifications will be defined in the bidding documents. The CEI will be hired as soon as possible after the contract is signed.

Design of construction works

During the EA evaluation of this project and during the consultation process with UG stakeholders (see Tables 34, 35, 36), it was possible to identify mayor problems that need to be addressed during the restoration and construction works planned in this Project. The PIU and consultants hired to design these works shall revised this EA and EMP. The ES must ensure that UG community (student, faculty, staff) are offered opportunities to consult the design and construction plans, that communication activities are prepared before the final designs are approved and the designs include the recommendations given in this EMP and by the ES.

Some mayor needs identified during this EA and important to address in the Design of the construction works are:

1. Research cubicles for faculty researchers and student's researchers. There seem to be a need for individual space which affects research conditions and development at the UG.
2. Emergency systems. It is necessary that in the new buildings contain fire alarm system, smoke and carbon monoxide detectors, emergency exit lights, fire extinguishers, etc.

3. Fuel tank in the campus. This is mayor threat for an explosion. It is necessary to fence the tank, to have impermeable floors and a secondary collection system for spills, etc.
4. Electrical System. Students comply of the constants black outs. It will very important to improve electricity supply and it possible establishes solar panels as a backup system. Also it will be very important to leave all the layouts of the electrical system in the UG so future maintenance works are more efficient.
5. Flooding of library. Students and Faculty are concerned with the library which gets inundated during flooding. This is a very important asset for the University and will be important that the project tries to improve the drainage system so the water can be pump out quickly from the library and other UG building which become flooded very easily.
6. Storage of Chemicals solutions. Many labs are too small to hold chemical solutions. It will be important to build a space to store chemical substance in each lab, with the adequate ventilation and cabinets attached to the walls and floors.
7. Storage of chemical waste. A lot of these wastes are sent from the sink to the coastal zone and the aquifers. It is important to build a storage place to store and manage properly chemical waste in each building.
8. Health and Safety equipment at the labs. These labs hold many toxic substances (Annex 3). New labs must have emergency, health and safety systems. Wash stations, prevention signs, Fume hoods, goggles, fire extinguishers, etc.
9. There is an urgent need to improve waste and hazardous waste management in the UG. It is expected that the several studies which will be financed by this Project (as part of Component 3 activities) will increase UG environmental and facilities management. These studies are: a hazard assessment, laboratory guidelines, waste management manuals and other studies. The ES will be responsible to prepare the terms of reference for such studies and review compliance of these with the safeguards Policies and the Pollution Prevention and Abatement Handbook (Annex 1). The PIU and UG Project coordinator will support the ES in implementing the recommendations derived from these studies and incorporated them in the UG environmental management procedures and to ensure their incorporation in the overall Project development.

Permits

The PUI and the ES will contact EPA and other local or national agencies to define and coordinate any environmental permit required for the construction works. The contractor will be required to fulfill all necessary permits (environmental, construction, noise, etc) to do the construction and rehabilitation works described in the bidding document and agreed in the contract. The contractor or its CEI will visit the EPA web site and their office to fill all necessary forms to acquire the Environmental Authorizations by EPA and any other permit required by current national legislation. According to the laws of Guyana, the Contractor will need to submit an EMP, and will be responsible for the implementation of all plans and actions described in this EMP, in addition to other actions defined by the ES to ensure adequate environmental and social management during the construction works. The Contractor will closely follow the technical

specifications outline in this document and any other environmental clause of the bidding document.

The Contractor shall verify, adapt, and optimize all the mitigation measures included in this EA and the environmental plans listed in this EMP and prepare the environmental management plan for the construction and rehabilitation works (EMP contractor or EMP co) that will as minimum the following programs and plans (the ES might request additional programs or plans to the contractor):

- Public Participation and Communication Program
- Code of Conduct Plan
- Environment, Social, Health and Safety Program
- Waste Management Program
- Environmental Restoration Program
- Monitoring Program
- Contingency and emergency Plan
- Environmental Closure Plan

Construction Work Plan (CWP)

The EMPco will be part of the Construction Work Plan (CWP) that will be prepared by the contractor (see next sections for more details).

1. The ES verify and identify areas of interest and sites sensitive (environmental and social) to construction or the rehabilitation works. ES id potential sites to assign for the contractors operation office, parking lots, material and storage sites, waste collecting sites, etc.

2. Selected Contractor prepares and submits the **Construction Work Plan (CWP)** (see next sections for more details).

3. The CWP should include among other things related to the civil works, an Environmental Management Plan (EMPco) proposal which will incorporate all measures and programs and plan define in this EMP. The EMP co will also include a (i) proposal of the areas needed to place materials, to park trucks and machinery, demolished materials, management of hazardous areas and materials (chemistry labs), (ii) a proposal of the rehabilitation chronogram, (iii) an academic relocation plan if needed, etc.

4. The CWP will be approved by the PIU team assigned to this task. The Es in coordination with the Engineer Supervisor of the works, UG representatives, and other PIU members will review and make amendments to the Construction Schedule proposal, the logistics plan proposal and the intervention and relocation plan.

5. The ES will review the CWP carefully to ensure proper sites have been selected for the contractors operation sites, approve the EMPco proposed and help the PIU and UG

authorities to determine the best way to intervene the 14 buildings to be restored. The ES must ensure that the overall intervention will cause the minimum environmental and social impact in the UG campus assets, community and services. The ES will support this team in

6. If a Relocation Plan is needed, the Contractor will be responsible to coordinate it very closely with the UG authorities. The Es will be responsible to supervise that appropriate measures are taken by the Project to reduce social and academic impacts due to the Project works.

7. The Relocation Plan will be supervise by the UG Coordinator and it will contain specific measures and actions to be included in the plan such as:

    i. Priority list of the labs to intervene in the academic year, in order to reduce impact, contractors should intervene larger labs during the vacations breaks

    ii. Contractor appoints trained workers to remove safely laboratory equipment, chemicals, glass and other sensitive equipment, keep them dry, and prevent accidents and loss of equipment to the university. UG maintenance and technicians supervise and guide actions. The ES supervise contractors.

    iii. Proposal to move the classes, teachers and students. The ES will review proposal with UG Project Coordinator and Engineer Supervisor and define alternative options for the relocation to reduce social and academic impact.

    iv. Define communication strategy and public outreach.

    v. Appointment of a UG Coordinator if needed to complement the implementation of the Plan

    vi. Additional support as needed by the PIU, UG representatives, etc.

Other project components

This EMP has focused mainly in the environmental and social impacts of the civil works. However, the ES is responsible to oversees the overall project environmental and social performance and guide the PIU and UG Coordination Unit to incorporate measures to reduce environmental and social negative effects by other project components and activities. Thus, the ES must also supervise implementation of all project activities (see Tables 25, 27) and include mitigation and prevention measures described in this EA and EMP (see Table 28) and apply additional measures defined by the ES during preparation and implementation to address potential impacts associated to other Project activities. The ES will need to prepare EDS forms to supervise these other Project activities.

Before any construction starts, the ES will have to support the team in preparing terms of reference to environmental studies agreed for the Project to increase UG environmental management and improve facilities management. For instance, in the diagnostic of this EA, it was identify the urgent need to improve waste and hazardous waste management in the UG.

These studies that will be contracted are: a hazard assessment, laboratory guidelines, waste management manuals and other studies. The ES will be responsible to prepare the terms of reference for such studies and review compliance of these with the safeguards Policies and the Pollution Prevention and Abatement Handbook (Annex 1). The PIU and UG Project coordinator will support the ES in implementing the recommendations derived from these studies, to incorporate them in the UG environmental management procedures and to ensure their incorporation if applicable in the design of the rehabilitation works or after during project operation.

9.4 PROGRAMS AND PLANS OF THE EMP

To facilitate implementation and supervision of the EMP, mitigation and prevention measures are included into programs and plans where more detail is given. The programs and plans are basic components of any EMP. Depending of the development of the project and works, it might be necessary to include other programs or plans not include in this section.

Program 1. Code of Conduct

During the consultation process, students and faculty raise the questions about the potential social impacts to have outside workers within the campus in terms of potential issues related to the female population, potential theft problems and insecurity. In order to reduce any potential impact, the contractors and subcontractors and any one related to the Project will follow the Project Code of Conduct which is a set of principles which will ensure adequate relationships during the construction period.

All TGP workers and contractors must comply with the rules and procedures indicated in this Code of Conduct which strives to maintain harmonious relations with the UG community and the local population located around the UG campus (area of direct influence of the project). Non-compliance of this Code of Conduct will lead to disciplinary and other measures.

The Code of Conduct will be an integral part of the EMPco and the CEI will inform about it during capacity building activities with the workers.

Table 29. Code of Conduct for contractors and workers working in the UG Project.

1	All workers must leave the UG campus or working sites at the agreed hour of their schedule, unless a written authorization is issued by the Engineer Supervisor of the works or other member of the PIU.
2	All workers must carry appropriate identification on their clothing at all times during the construction/rehabilitation period.
3	The UG is the most important academic institution in the country and its students, professors and staff must be treated (male and females) with respect at all times.
4	All workers are forbidden to possess or consume alcohol within the UG campus.

5	All workers are forbidden to carry guns or any other type of weapon, unless they are performing guarding activities and posses the required permits by national legislation to carry a gun and have approved a permit by the UG authorities.
6	All workers will take care of the environment and will follow the Environmental Management Plans agreed with the contractor.
7	Complaints of students, faculty, visitors, etc. regarding problems with misbehavior of workers (verbal or sexual insinuations to students) or other type of problems during construction works will be communicate to the contractor and disciplinary measures will be taken.
8	Workers will not take any archaeological piece found during excavations in the work sites. If such archaeological pieces are found while works are being carried on, works must be stopped and informed to the CEI and the ES.
9	Other..
10	Other ..

Program 2. Environment, Social, health and Safety Program

- ***Training Plan***

The Contractor, prior to commencement of work, will inform and train (the CEI will support this training) all staff on matters pertaining to the EMPco and the environmental clauses included in the bidding document and shall reinforce this training throughout the construction period. The ES will also participate in this training by providing initial presentations to the contractor and its technical personnel in relation to the EMP, the UG campus, the expected results and the grievance and participatory mechanism that will be implemented during the construction period.

The Contractor shall therefore establish a training plan (written and verbal) on topics such as Health and Safety, Code of conduct, Environmental and Social Management Plan, Speed limits, waste management, etc for their staff and sub-contractors in compliance with the approved EMP and EMPco. The plan will be revised and approved by the ES.

Training workshops will cover the following topics

1. The EMP prepared by the contractor and the responsibilities of workers on following the EMP and the Code of conduct within the campus, the supervision of the PIU on the works and environmental management.
2. Health and safety at the worksite, Safety equipment, speed limits (within the campus will be 25/km) emergency procedures, etc. All contractors must attend these courses specially workers responsible of driving within the campus or transporting materials, or operating heavy duty machinery, working at heights, managements of electrical installations, etc.
3. The Code of conduct within the UG campus; respectful treatment to students and faculty, especially female students and faculty; penalties for breaking the code of conduct.

The ES will 'monitor' the Contractor to ensure that ensure compliance with the occupational health and safety standards of Guyana and those health and Safety regulations of the World Bank.

- ***Health and safety equipment***

Contractor will provide health and safety equipment for workers (helmets, safety masks, gloves, vests, caps, ear muffs, boots, etc).
Contractors will provide potable water to workers and portable toilets and showers.
Contractors will provide first aid equipment and Portable Fire Extinguishers.
Contractor will provide identification cards to all workers who must carry it at all times.

Program 3. Public Participation and Communication Plan

Public participation is an essential element of the EIA process in Guyana and the World Bank Safeguards Policies (OP 4.01). Thus, this project will facilitate the involvement of the 'public' (stakeholders including project beneficiaries including students and lecturers, affected groups such as Amerindian communities; NGOs, government ministries; the Environmental Protection Agency and the utility companies).

The public participation process will involve the conduct of public participation workshops aimed at: (i) provision of information on project phases, components and activities; (ii) discussion of environmental and social concerns and recommended mitigation measures. Agreed actions will be incorporated into the EMP-contractor document.

To complement these workshops the EMP-contractor document will be posted on the UG website and a *Facebook* account will be open for stakeholders to provide feedback throughout the construction and operation phases of the Project. The ES and the UG administration, in collaboration with the Contractor, will respond appropriately, either by remedial actions or verbally whenever and explanation or a clarification is needed.

- ***Construction Communication Plan (CCP)***

The Construction Work Plan (CWS) and schedule will be informed to the UG community through the Construction Communication Plan (using emails, websites, meetings, official communication channels of the UG) to inform the UG at large of work schedules and actions that could cause environmental and social impacts. Special attention will be given to diversion of traffic, generation of noise and dust, interruption of social utilities such as water, toilets, electricity and to inform all mitigation and prevention measures that will have to be taken by the University, students and staff (academic and non-academic staff) to accommodate the construction works and the academic program.

All measures will try to prevent injuries to passersby and to inform the 'university community' of the scheduled activities of the Contractor. The Contractor must provide the schedule of activities at least 6 months before any work to ensure that UG Coordination Committee can take the necessary measures to minimize the negative impacts to the UG campus life and academic program.

The execution of the works on each faculty building will be done sequentially and efficiently so as to lessons the interference and negative effect of the academic curriculum and student life. Different work plans will have to be prepared by the Supervisor of Works. These should be reviewed by the ES who will ensure that the environmental and social impact is minimal and is communicated effectively to staff and students of UG.

The Supervisor of Works, in association with the Contractor will be responsible for preparing the plan and its dissemination, as well as addressing complaints.

The Environmental Specialist will approve and monitor the Communication Plan to ensure effective and efficient implementation of this EMP and the EMP-contractor. Thus, information must be communicated at least 2 weeks of planned minor works and 1 month for major works. The EA will help guide the Contractor on how to communicate the plan more efficiently, based on feedback or direct observation.

The work plan will be prepared by the Supervisor of Works in collaboration with the Director of the PIU. The work plan must be approved by the university authorities and should know and ensure that the impact on academic life and operation of the university is minimal.

- ***Grievance Mechanism and Resolution of conflicts***

The safeguards policies of the World Bank ensure the establishment of a grievance mechanism during project implementation which aims to offer a clear set of opportunities for affected people or any other interested stakeholder to post a claim, request information and have a formal mechanism to communicate with project developers and supervisors.

A project-level grievance mechanism for affected communities is a process for receiving, evaluating, and addressing project-related grievances from affected communities at the level of the company, or project.

Grievance mechanisms will be established early to respond early and effectively to any potential escalation of tensions with UG students or staff or members of near communities. It is possible that most of the grievances may relate to any flaws in the consultation process, noise, traffic, and access to classrooms. A straightforward procedure has been established and the Contractor Environmental Inspector (CEI) will to act as a point of contact to receive complaints and to foster positive engagement when issues arise.

The Communication methods will consist of the following:

a. The Project will prepare a web site within the UG web site which will contain the information of the Project, the EA, EMP, EMF and all safeguards instruments and project documents. A section of the Project web site will indicate the names of all the members of the Project implementation Unit in both the UG and MOE, such as PIU coordinator, ES, the Engineer Supervisor, etc.

b. The Project web site will inform about report or consultation meetings, seminars, etc that will be given during the Project implementation period.

c. In the Project web site a section will be named Grievance Mechanism of the Project. Here the visitor will find an explanation how to post a claim, recommendations and just a note to the project coordinators. Grievance forms, emails and on line chat channel will be offer to the visitor.

d. The ES and UG Coordination Committee will develop clear tasks and responsibilities for addressing grievances and the way that contractors will respond to any claim.

e. The following steps will be following for the grievance mechanism:

Step 1	Inform the mechanism and develop accessible ways to use by stakeholders
Step 2	Receive and register using different grievance mechanisms
Step 3	Review and investigate issue
Step 4	Resolve issue. Define solutions.
Step 5	Monitor and evaluate

If necessary, a clear list of tasks and outcomes that an investigation is expected to achieve shall be developed. If issues are related to conduct of contractor workers (this will be address by the Code of conduct described in the Program Social Interference)

The PIU, contractors and ES will handle claims with respect, respond as quickly as possible, and will maintain records of the resolutions since these documents could be requested at any time by the Bank.

Program 4. Waste Management

- ***Solid waste management***

The contractor will place wastes bins and containers for each specific type of solid waste: paper-cartoon, glass (windows), metals (pipes, etc), electrical (old wires, etc), plastic (all types), wood (all types). All containers will be properly labeled and will have lids which will not easily fall.
No burning all any type of materials will be allowed for the wastes generated by this Project.
The Contractor, under the supervision of the ES, will develop out spill prevention, control, and containment (SPCC) plans. In addition, the ES shall conduct intermittent spill training exercises for the contractors and UG staff and coordinate with the CEI training activities for the Contractor, Sub-Contractor, etc.

Type 1. Demolition materials

All demolition materials will be classified according to the type of materials and place accordingly in labeled containers and in agreed sites with the ES and the Engineer Supervisor of the works. Transportation: all waste transported to the final disposal sites will be transported with care (loads will be covered with heavy tarts or plastics) and truck will drive at speed of 25 km/h within the campus and 50 km/h outside the campus.

Type 2: Recyclables

The Contractor will implement a program to classify waste materials to ensure that those waste that can be recycled[23] (paper, cardboard, aluminum, metals, glass) can be collected and donated to interested parties of the adjacent communities.

Type 3: Domestic Materials

The Contractor will collect all this wastes in the designed containers and will dispose the wastes of in an area designated by the Authority (such as the EPA/Georgetown M&CC) or other site (the Haag Bosh landfill).

Type 4: Hazardous Wastes

Hazardous wastes (for example, old chemicals from labs, waste oils, grease, fibers, hydrocarbons etc.) that arise during contraction works will be carefully collected, characterized, labeled, stored, and if possible, recycled or transported and disposed of in accordance with World Bank standards, to avoid soil contamination. Hazardous wastes will be placed in proper ventilated sites and with impermeable floors. Additionally, the University administration, in collaboration with the ES shall consult the EPA for advice on the disposal of such wastes in keeping with the Draft Management Strategy for Hazardous Wastes. Also, the UG will improve environmental management of its campus once several consultancies are developed as part of this Project (Component 3). The following consultancies will be performed to increase environmental management in the UG campus:

a. Hazardous Assessment
b. Lab management Guide
c. Hazardous Waste Management Plan
d. Others to define

The ES will be responsible to prepare the terms of reference for these consultancy studies and coordinate with the PIU its contract as soon as possible the Project starts.

Type 5: Soils affected by accidental spills, oils or mal-functioning vehicles

Oil changes will not be permitted on campus, and therefore should be done at the nearest gas station. The Contractor will restrict the locations of hazardous materials.

- ***Water pollution and effluents***

During construction, water pipelines will be changed and restore. Improvement will provide better water distribution in the building and old pipes will be replaced. Contractors will need to ensure adequate supply and quality of water during project works.

During construction, sanitary systems and bathrooms will be replaced in different building as needed. Contractors must ensure proper management of the effluents and avoid spills and superficial runoff in the worksites.

[23] *Recycling* involves separation and collection of waste materials, preparation, and reuse, re-processing, or re-manufacturing, which leads to a reduction of waste to be land filled.

Contractors will provide portable toilets and bathrooms to the workers to avoid intervening with the student's bathrooms and avoid potential social issues.

Water quality monitoring will be conducted to ensure compliance with water quality discharge limits established by the EPA. Sample locations, which will be discharge points, will be determined by the Environmental Specialist. Surface water samples will be recovered quarterly during construction. Ground water samples will also be collected and analyzed by both the contractor and the ES.

Program 5. Control of noise and dust

- ***Noise***

Noise disturbance is a concern for the UG community. Contractor shall ensure that the equipment is in good working order with manufacturer supplied noise suppression (mufflers etc.) systems functioning and in good conditions. Contractor will make reasonable efforts to schedule heavy noise activities for weekends or in the late afternoon and keep the less noisy activities for normal working hours (between 8 am and 5 pm). Contractor will request Noise Permits to EPA is necessary in order to reduce noise impact to the academic program. Where noise is likely to pose an impact to the normal environmental surrounding the UG campus and the community, the contractor shall inform the site manager and shall develop a public notification and noise management plan for approval by the ES and UG authorities.

Contractors will follow noise limits established by Guyana and those included in this EMP. The CEI and ES will monitor noise levels frequently during the construction works.

The Guyana National Bureau of Standards and EPA developed Interim Guidelines for Noise emissions into the Environment. Under these Interim Guidelines, noise emissions from the Industrial and construction sources for both day (6AM-6PM) and night (6PM-6AM) will be 65-55 decibels (Construction) at the property limits or 15 meters from the source.

During construction these noise levels will be frequently increased, if noise reaches more than 85 decibels and remain more than an hour, all workers must use hearing protection. The ES will follow the World Bank standards in case necessary. The ES will review the World Bank "Pollution Prevention and Abatement Handbook" which can be downloaded at the internet. [24]

- **Dust**

Demolition of large areas will be done at night or weekends or break periods so students are not affected by the dust and possible asbestos materials and fine particulate matter. Dust collectors if possible should be use to collect fine dust in closed rooms and labs.

[24] http://www.ifc.org/ifcext/sustainability.nsf/Content/Publications_Handbook_PPAH

Workers must use protective equipment such as masks, ear plugs, etc. All trucks transporting demolition wastes will cover their load with a heavy tart. If considered necessary by the ES, water will be spray on the areas of mayor works. However, fine sediment traps will need to be set up in the drainage channels and ditches where water will run in order to capture sediments and fine particulate matter and avoid polluting surface waters. The ES will follow the World Bank standards in case necessary. The ES will review the World Bank "Pollution Prevention and Abatement Handbook."

Program 6. Excavations and demolishing activities

Workers will have to use personal safety equipment at all times. During excavations soil (organic layer) should not be contaminated with demolished material or any other type of waste from the construction. Soil must be separated and cover with plastic to avoid soil runoff and contamination. Soil layer will be very important to restore natural areas affected by the works. Neither explosives nor highly noisy equipment will be allowed to be use during the works at UG.

If during excavations, archaeological pieces are found, works must be stopped and informed to the CEI and the ES. In the bidding document, it is important to include a clause related to potential chance findings of cultural or archeological, paleontological resource, following the OP 4.11 of The World Bank.

Program 7. Restoration Plan

All sites intervened by the contractor and construction or rehabilitation works at the UG campus will be restore and re-vegetated. Excavations areas, drainage channels will be recovered and any solid waste sites if included in the campus (cement only) will be restored. Plant species that will be preferred for the restoration are native species. The ES will be responsible to guide the CEI in the selection of plants and re-vegetation and reforestation activities. No pesticides or any agrochemical include in the List 1a, 1b and II of the WHO (Annex 2) will be used to maintain these plants or any other activity supported by Project such as the Research Fund (Component 1).

Program 8. Contingency and emergency Plan

Contractors will include in the EMP co, a section describing the Contingency and Emergency Plan which will be followed during the construction works.

This plan must include the possible contingencies and emergency situations:

a. Workers possible accidents and injuries related to the construction works where they will be involved
b. Fires. Fire extinguishers must be placed in working sites and training provided to use them.
c. Flooding. During the rainy season in common that the UG campus becomes flooded. The contractor must have a plan to deal during this period and maintain the works on the timeline agreed and reduced environmental and social impact.
d. Structural collapse. During the demolition and restoration works, some structures could collapse and generate possible accidents.

e. Explosions. Explosions might occur due to the presence of chemical compounds in several labs and a fuel tank in the UG Campus, thus there is a need to proper handle this areas and materials by trained staff.

Program 9. Sustainable Development

The project will try to incorporate energy efficient equipment and request the purchase and use of sustainable materials (certified woods, use of low carbon emission equipment).

The project will request to contractors to increase opportunities to people living close to UG in order to increase social benefits by targeting recruitment of local people, students, etc. For instance, a lot of the materials to be removed could be recycle, wood, glass, metals, etc. The project is expected to include a strong recycling program which be later adopted by the University. Also, the World Bank seeks opportunities to women in developing countries and contracts must make any efforts to provide opportunities for women as part of the personnel or subcontractors.

Program 10. Environmental Monitoring Plan

Environmental monitoring will be implemented throughout the construction and operation phases by both the contractor and the PIU. Baseline monitoring shall be conducted early on by the Contractor to establish a baseline of conditions before the works begins and track any changes that could be attributed to the project, in the event of complaints or issues arising in the construction and operation phases. The Contractor will be responsible for implementing this Monitoring Plan and ensuring that construction activities are carried out in compliance with the EMP. The ES will also monitor overall works performance and will use Environmental Datasheets (EDS) developed to monitor the project environmental and social management. Annex 6 contains some examples of EDS. The ES as soon as appointed by the PIU will need to prepare additional EDS to monitor all parameters agree in this EMP.

The objectives of the Environmental Monitoring Plan are to:

- control impact generating activities or actions;
- monitor impacts and verify that, where applicable, environmental parameters/indicators are within regulatory standards;
- verify that recommended mitigating measures are effective in protecting the environment; and
- Response to environmental impacts.

Monitoring Activities

The primary monitoring activities are highlighted below:

- Vegetation monitoring activities will include maintaining records on vegetation re-growth after clearing activities for dining room, storage site and new parking sites; and area cleared/vegetation destroyed.

- Air quality and particulate (dust) monitoring will include ensuring that the implemented dust suppression methods are effective and will be visual or the total suspended solids measured.

- Water quality monitoring will be conducted to ensure compliance with water quality discharge limits established by the EPA. Sample locations, which will be discharge points, will be determined by the Environmental Specialist. Surface water samples will be recovered quarterly during construction. Ground water samples will also be collected and analyzed.

- Monitoring of waste from the project will include the preparation of weekly inventories on types and quantities of solid and hazardous waste generated; and methods of collection, storage and disposal.

- Health and safety monitoring will be undertaken weekly through the recording of incidents and accidents.

- Noise monitoring will be conducted by measuring noise levels weekly in the vicinity of construction areas and new parking area and surrounding buildings to ensure compliance with the noise level standards established by the Guyana National Bureau of Standards.

- Code of conduct. It will be very important for the CEI to inform contractors' workers of the code of conduct and the penalties related if code is broken. The CEI and ES will supervise closely its compliance and will investigate any claim or issue.

Construction Phase

During the construction phase, the CEI under the supervision of the ES will be responsible for continuously monitoring the following environmental impacts at the construction site:

- loss of vegetation;
- generation of particulate matter;
- generation of solid waste;
- generation of noise;
- traffic congestion;
- decreased surface water quality;
- health and safety risk;
- social conflicts; and
- reduction in aesthetics.
- accidents and emergencies

The Contractor should be responsible for the monitoring of various impacts to ensure the proper functioning and implementation of mitigation measures (Table 30). CEI will perform constant monitoring and weekly inspections to ensure that the mitigation measures are implemented and that the project is not adversely affecting the environment. The Environmental Specialist will be responsible to supervise adequate monitoring by the contractors and the CEI. During the

construction period, the Environmental Specialist will perform monitoring weekly or daily inspections and during operation on monthly basis. The ES will use standard environmental datasheets (EDS) to record all monitoring activities (see Annex 6 for some examples of EDS).

Table 30. Construction Period Monitoring Plan.

Impact	Monitoring parameter	Sampling Frequency	Responsible	Monitoring location
Construction Phase				
Loss of vegetation due to the setup of dining room, storage site and new parking sites	Area cleared/amount of vegetation destroyed Total area recovered Number of plants planted by Contractor(s)	Within 3 months of construction Annually Annually	Contractor Environmental Specialist	All intervened sites – workers' area, storage area, new parking sites
Generation of particulate matter, particularly due to demolition activities, storage of materials and operation of cement mixers	Ease of visibility Number of vehicles arriving covered	Weekly Weekly	Contractor Environmental Specialist	All intervened sites – construction areas, storage areas, new parking sites
Increased generation of emission of gases and particulate matter from increased traffic	Frequency of maintenance of vehicles	Monthly	Contractor Environmental Specialist	All intervened sites – new parking sites
Generation of construction and other waste materials generated by construction activities Overload of current capacity of waste disposal facilities	Quantity and type of waste Waste collection, storage and disposal method/s	Weekly Weekly	Contractor Environmental Specialist	All intervened sites – construction sites, workers' area, new parking lot, designated waste disposal area
Generation of noise from machinery and construction activities	Level of decibels	Weekly	Contractor Environmental Specialist	All intervened sites - construction sites, workers' area, new parking lot, designated waste disposal area To be identified by the Environmental

				Specialist
Traffic congestion due to delivery of material supply	Number of accidents	Weekly	Contractor Environmental Specialist	All intervened sites
Reduction in aesthetics due to construction and storage of materials	Number of sites with waste materials left unattended by contractor	Monthly	Contractor Environmental Specialist	All intervened sites
Decreased quality of surface water due to discharge of fuel, engine oil and transmission or hydraulic fluids into surface water and during clearance of canals	pH Turbidity levels Conductivity pH Oils/Grease Total nitrates Total phosphorus BOD or COD Coliforms	Quarterly	Contractor	At discharge points To be determined by the Environmental Specialist
Decreased quality of soil due to accidental discharge of fuel, engine oil and transmission or hydraulic fluids	Oils	Annually	Contractor Environmental Specialist	At fuel, waste oil storage sites, oil changing areas and areas that show visible signs of contamination
Disruption of utilities	Frequency and type of utilities disrupted	Monthly	Contractor Environmental Specialist	All intervened sites
Difficulty to adopt to new 'environment' and to concentrate	Number of duration of disruptions to use of classrooms	Weekly	Contractor Environmental Specialist	All intervened sites
Health and Safety risk to workers, students and lecturers arising from construction and from increased traffic	Number of accidents due to construction works	Weekly	Contractor Environmental Specialist	All intervened sites
Social conflicts arising from presence of construction personnel on campus	Number of reported complaints/grievances	Monthly	Contractor Environmental Specialist	All intervened sites

Operation Phase

During the operation phase, monthly monitoring of some critical parameters will be necessary, and will be the responsibility of the University of Guyana's Environmental Specialist. It is expected by the project that the consultant or UG staff appointed as ES during the construction

period could become a permanent staff of the UG so he/she could continue supervising activities related to the operation phase.

The environmental impacts that will be monitored at the Campus include: generation of solid and hazardous waste, water quality, etc. Other parameters will be included as necessary during operation of the new equipment and research activities are developed. The Environmental parameters to be monitored, frequency and responsible body are indicated in the Table 31.

This EMP has focused mainly in the environmental and social impacts of the civil works. However, the ES is responsible to oversees the overall project environmental and social performance and guide the PIU and UG Coordination Unit to incorporate measures to reduce environmental and social negative effects by other project components and activities. Thus, the ES must also supervise implementation of all project activities (see Tables 25, 27) and include mitigation and prevention measures described in this EA (see Table 28 and elsewhere) or apply additional measures defined by the ES during preparation, implementation and operation to address potential impacts associated to other Project activities. The ES will need to prepare EDS forms to supervise these other Project activities.

Before any construction starts, the ES will have to support the team in preparing terms of reference to environmental studies agreed for the Project to increase UG environmental management and improve facilities management. For instance, in the diagnostic of this EA, it was identify the urgent need to improve waste and hazardous waste management in the UG. These studies that will be contracted are: a hazard assessment, laboratory guidelines, waste management manuals and other studies. The ES will be responsible to prepare the terms of reference for such studies and review compliance of these with the safeguards Policies and the Pollution Prevention and Abatement Handbook (Annex 1). The PIU and UG Project coordinator will support the ES in implementing the recommendations derived from these studies and to incorporate them in the UG environmental management procedures and project development as necessary.

Table 31. Operation Monitoring Plan.

Impact	Monitoring parameter	Sampling Frequency	Responsible	Monitoring location
Operation Phase				
Increased generation of solid waste from the packaging of laboratory equipment	Quantity and type of packaging Waste collection, storage and disposal methods	Monthly	Environmental Specialist UG	All intervened sites
Purchase of new equipment for labs and classrooms	Number of training and capacity building activities to use the new equipment	Monthly	Environmental Specialist Lab technicians	All intervened sites
Exacerbate the storage space	Proper cabinets and storage space defined	Monthly	Environmental Specialist UG	All intervened sites

problem on campus	Equipment is clean and properly stored.			
Generation of hazardous waste from use of new and current lab equipment	Volume of hazardous waste Collection, storage and disposal of hazardous waste according to new Waste Management Manual	Monthly	Environmental Specialist UG	All intervened sites
Possibility for theft	Security locks are placed in all labs. Number of theft incidents	Annually	Environmental Specialist UG	All intervened sites
Disruption to land and landscape due to installation of fiber optic cables around the campus	Landscape was restored and it maintained by UG	Monthly	Environmental Specialist UG	All intervened sites
Generation of wastes due to packaging of software and educational software for statistics and GIS applications.	Waste is collected and properly dispose Recoiling material is donate to interested stakeholders	Monthly	Environmental Specialist UG	All intervened sites

Mid Term Reviews and Closure Phases

As part of any World Bank Project, an evaluation of the project is performed at the middle of the project period (usually third year) and at the end of the project. The ES will be responsible to prepare in report for these evaluations periods in order to highlight main environmental and social challenges during project implementation, main results, products and pending issues to resolve. The ES will report about all project components and safeguards issues.

Some of the topics to be included in these reports are:

a. Compliance with the EMP, EMF prepared for the project.
b. Issues arisen during project implementation in relation to the construction period
c. Issues arisen during project implementation in relation to the research program
d. Consultation, participation, the Grievance Mechanism and main claims posted by UG stakeholders if any.
d. Improvement in the UG of environmental management and maintenance facilities works.
e. Establishments of the Health, Safety and Environmental Management Guidelines at the UG

E.Capacity building activities achieved in relation to Health, Safety and environmental Management.
f. Any other topic important to report.

The World Bank will perform periodical supervision mission to the Project and will request reports to the ES about Project implementation.

UG laboratory conditions in 2011.

9.5 ENVIRONMENTAL TECHNICAL SPECIFICATIONS FOR BIDDING DOCUMENTS

In this section, we provided recommendations for the preparation of documents and procedures for the bidding documents and construction management by contractors. While construction activities are inherently disruptive, actions can be taken to minimize impacts to the UG environment. Based on the potential impacts identified, the PIU shall include in the bidding documents and in the construction contract specific clauses to guide contractor activities during the construction period. These clauses "Environmental Technical Specifications (ETS), presented in the following, are preliminary and will be complete as needed by the ES to comply with Guyana national legal requirements and The World Bank Group Safeguards Policies. The ES as soon as possible is appointed will be responsible to elaborate in more detail the Environmental Technical Specifications to be included in all bidding documents related to this Project. The World Bank will review them before giving the No Objection to a bidding document; the Environmental Specialist of the World Bank Project Team will review the ETS to ensure adequacy with the World Bank safeguards policies.

General Environmental Clause:

In the bidding documents must be indicated that the Contractor shall, throughout the execution and completion of the Works, therein:

(a) have full regard for the safety of persons entitled to be upon the site and keep the Site (secure as possible) and the works in an orderly state appropriate to the avoidance of danger to such persons and the students and professors and other people present in the working area;

(b) Provide and maintain at the Contractor's own costs all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Project Manager (PIU, Engineer Supervisor, ES or other) or by duly constituted authority, for the protection of the Works or for the safety and convenience of the UG community.

(c) notify the ES and the Project Manager within 48 hours or as soon as reasonably possible after the occurrence of any accident which has resulted in a disability or loss of human life, might have a significant impact on the environment or well being of the UG people and shall submit a summary report to the Project Manager, no later than 30 days after the occurrence of such an event,

(d) take all reasonable steps to protect the environment on and off the Site and to limit damage to people and property resulting from pollution, noise and other results from the Contractor's operations;

(e) ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values indicated by the ES and shall not exceed the values prescribed by applicable laws of Guyana or those indicated in the Environmental and Social Manual of this project.

(f) ensure the adequate disposal of construction and excavation wastes;

(g) restore the Site to original conditions or to a state after the completion of the Works as set out in the Specifications;

(h) complete the work in compliance with the Environmental Guidelines of this Project given by on site by the ES and those included in the ESM of this project, and apply the recommendations of the project environmental impact assessment, the EMP, the

EMPco, all in accordance with Guyana´s laws and the World Bank Safeguards Policies, in respect of health, safety, security and protection of the environment, as described in these Specifications.

Personnel

The Contractor will include as part of their staff proposal an environmental professional with environmental experience who will serve as the Contractors' Environmental Inspector (CEI). In the bidding document the experience and necessary credentials will be defined.

Equipment

The contractor will purchase and deliver to the Environmental Specialist assigned to the environmental supervision of the works a noise meter and camera and other equipment as defined and detailed in the Bidding document.

Site Security

The contractor shall be responsible for maintaining security over the construction site including the protection of stored materials and equipment. In the event of severe weather, the contractor shall secure the construction site and associated equipment in such a manner as to protect the site and adjacent areas from consequential damages. This includes the management of onsite wastes, construction and sanitary, additional strengthening of erosion control and soil stabilization systems and other conditions resulting from contractor activities that may increase the potential for damages.

Asbestos

While asbestos materials is not known that will be presented in structures targeted for repair or reconstruction under this project, the following asbestos management procedures shall be implemented should they be discovered during the construction process.

The contractor shall contact the ES to develop an asbestos management plan if necessary. This plan shall be approved by the UG and PIU. Site management shall consist of stabilizing friable asbestos and the provision of worker protection to prevent contamination with asbestos fibers. Respiratory protection together with measures to prevent the contamination of clothing and inadvertent transport of asbestos fiber off-site shall be provided to exposed workers.

The asbestos management plan shall be developed by the contractor in consultation with the ES and include as a minimum:

- Description of the issue and extent of contamination
- Site safety measures
- Stabilization techniques to be employed
- Storage and transport plan
- Approved disposal procedure

- Worker awareness and training

Worker Sanitation

Sanitation facilities shall be provided to site workers. All sanitary wastes generated as a result of project activities shall be managed in a manner. The contractor shall provide a site sanitation plan for approval and implementation prior to the commencement of site activities. During the preparation phase, the ES will approve the sites that will be used to set up all portable toilets and showers.

Noise Control

The contractor shall control noise emissions generated as a result of contracting activities to the extent possible. In the case of site locations where noise disturbance will be a concern, the contractor shall ensure that the equipment is in good working order with manufacturer supplied noise suppression (mufflers etc.) systems functioning and in good repair. Where noise management is a concern, the contractor shall make reasonable efforts to schedule heavy noise activities for weekends or in the late afternoon and keep the less noise activities during normal working hours (between 8 am and 5 pm). Where noise is likely to pose an impact to the normal environmental surrounding the UG campus and the community, the contractor shall inform the site manager and shall develop a public notification and noise management plan for approval by the ES and UG.

Contractors will follow noise limits established by Guyana and those included in this EMP. The CEI and ES will monitor noise levels frequently during the construction works.

Use and management of hazardous materials, fuels, solvents, paint substance, etc.

Any use hazardous materials excluding pesticides, oils, fuels and petroleum products shall conform to the proper use recommendations of the product. Waste hazardous materials and their containers shall be disposed of in a manner approved by the relevant agency and the approved EMPco and the Environmental and Social Manual of this Project. The ES of the project will supervise compliance of the contractors with the proper management and disposal of hazardous wastes and the approved measures.

An environmental management plan will be developed by the contractor (EMPco) and it will include the estimated quantities to be consumed in the process, storage plans, spill control plans, and waste disposal practices to be followed. All paints and preservatives shall be used only with the approval of the PIU. Information shall be provided to the PIU that describes the essential components of the materials to be used so that an informed determination can be made as to the potential for environmental effects and suitability can be made. Storage, use, and disposal of excess paints and preservatives shall be managed in conformance with the manufacturers' recommendations and as approved by the PIU and the ES.

Site stabilization and erosion control

The Contractor shall implement measures at the site of operations to manage soil erosion through minimization of excavated area, preservation of existing ground cover to the extent possible, provision of approved ground cover. Contractors will follow approved mitigation measures of the EMPco and those included in the Environmental and Social Operational Manual of the Project which include the World Bank Safeguards Policies applicable to this project. The ES will supervise and report any issue related to excavations and potential erosion issues. Where excavations are made, contractor shall implement appropriate stabilizing techniques to prevent cave-in or landslide. Erosion control measures will be approved by the ES.

An erosion management plan will be required where the high potential exists for significant sediment quantities to accumulate in wetlands, lakes, rivers and near-shore marine systems. This plan shall include a description of the potential threat, mitigation measures to be applied, and consideration for the effects of severe weather and an emergency response plan. This plan will be approved by the ES and the Engineer Supervisor of the civil works.

Traffic Management

In cases where construction activities result in the disruption of area transportation services, including temporary loss of roadway, blockage due to deliveries and site related activities, the contractor shall provide the UG and PUMOE with a traffic management plan including a description of the anticipated service disruptions, community information plan, and traffic control strategy to be implemented so as to minimize the impact to the surrounding community. This plan shall consider time of day for planned disruptions, and shall include consideration for access to essential services such as medical, disaster evacuation, and other critical services.

Management of standing water

Under no circumstances shall the contractor permit the collection of standing water as a consequence of contractor activities without the approval of the PIU and UG. The ES will supervise and report any issue related to bad management of water resources by the contractor.

Management of trash and debris

The contractor will provide in the EMPco a waste management plan that conforms to the solid waste management policies and regulations of Guyana, UG and the EMP of this project. Under no circumstances shall the contractor allow construction wastes to accumulate so as to cause a nuisance or health risk due to the propagation of odors, insects and disease vectors. The site waste management plan shall include a description of how wastes will be manage, stored, collected and disposed of in accordance with current law and improve environmental practice. Additionally the contractor shall provide for the regular removal and disposal of all site wastes and provide the contracting officer with a schedule for such removal. The ES will supervise execution of this plan; the Engineer Supervisor of the civil works will ensure enforcement of accorded plans and if necessary applied the environmental fines defined for this contract.

Behavior and code of conduct

The Contractor shall not engage, and shall cause its personnel as well as any Subcontractors and their personnel not to engage, either directly or indirectly, in any business or professional activities that would conflict with the activities assigned to them under this Contract. At all moments, contractors and its personnel will be respectful of the students and professors, PIU team members, inspectors and any other member of the UG and particularly of those who are women. The contractor and its staff will follow the Project Code of Conduct described in this EMP and incorporated to the EMPco.

Others

The ES will include other Environmental and social clauses as needed to the bidding document to ensure compliance with the EMP of this project, Guyana Environmental Legislation and the World Bank Safeguards Policies. For instance, clauses related to an Environmental Closure Plan, Emergency Plan, Training on Health and Safety among others.

Compliance with the Environmental and social measures

PIU Supervision

The Environmental specialist (ES) who will be appointed as part of the PIU team will perform on site supervision of the environmental and social management of the works hired under this contract. The Contractor shall carry out all instructions of the ES and Project Manager and those which comply with the UG and national laws.

The ES will do supervision of the works and will use the Environmental Data Sheets (EDS) to identify Non compliance activities by the contractors or subcontractors and every Monday, the ES will inform the Project Manager and the contractors of any ¨Environmental/Social Non Conformity ¨ which needs immediate attention and resolution. They will also meet and agree on week´s works. The ES will also prepare a ¨Monthly Environmental Audit Report¨ and the ¨Annual Environmental Report¨ which will report contractors performance and overall project development and will be share with the contractors, UG, the PIU and the World Bank.

Inspection of the sites

The Contractor shall permit the ES, the Project Manager and/or persons authorized by the Project Manager or those appointed by PIU to inspect the Site and/or the accounts and records of the Contractor and any Subcontractors relating to the environmental/social performance of this Contract. As well be prepared in case EPA official make on site inspections.

Monitoring

The ES will perform monitoring activities on the site according to the EMP and will inform the Engineer Supervisor of the PIU and the Contractors of any ¨Environmental/Social Non Conformity ¨ which needs immediate attention and resolution. The ES will use the EDS to report

monitoring activities and non conformities to the contractors and the Engineer Supervisor of the PIU.

Non conformities

¨Environmental/Social Non Conformities¨ are those which are in disagreement with the EMP, ESM of the project, the environmental clauses of this contract, the EMPco, any other regulation indicated or agreed with the UG, the PIU or the ES.

Contractors will have a maximum of three days to resolve ¨Environmental/Social Non Conformities¨ unless any other time frame is agree with the contractor, the ES and the Project Manager. The PIU will retain from each payment due to the Contractor the proportion of 2% as the Environmental Protection Guarantee until completion of the Non conformities per month. Also the same penalty will be applied for the final payment if there are Non conformities during the final reception of all the works.

Completion of works

If the contractor does not resolve any pending Environmental/Social Non Conformity, the Project manager will not issue any Certificate of Completion, the cost to repair or resolve any of these non conformities will be responsibility of the contractor.

9.6 CONSTRUCTION WORK PLAN

Contractor is responsible to present to the PIU a Construction Work Plan (CWP) in a time period defined in the bidding document. Construction activities will occur during the active academic year and as such, activities need to be designed so as to minimize the impacts to academic environment. While temporary in nature, construction impacts can be disruptive particularly with respect to noise, management of construction debris, traffic management and interruption of basic services such as drinking water, sanitary, and communication. To manage these impacts, the PIU shall include in the construction contract the requirement to develop a Construction Works Plan (CWP). This plan shall be developed in close coordination with university officials and the PIU team in both MOE and UG and will include:

- EIA and other construction permits approved
- Construction Schedule proposal
- Service interruption Schedule proposal
- Logistics plan (site preparation, excavations, transportation plan for delivery's construction materials and needs of storage space, water, light, etc.)
- Relocation Plan (mobilization plan)
- Communication Construction Plan (to advise and alert faculty and students to construction activities)
- Environmental Management Plan of the contractor (EMPco), (including plans to manage noise, traffic, waste transportation, oils, trash, waste, health and safety, etc.) and the environmental and sanitary permits required.

- Coordination activities (including regular meetings with UG officials, PIU supervisors, etc.)

The Contractor shall, as soon as practicable following the signature of this Contract, prepare and deliver a site-specific environmental management plan ("EMPco"). The EMPco will have to be approved by the national agency if applicable. The EMPco will be carefully reviewed and approved by the ES. Once the contractor makes all necessary changes indicated by the ES, the contractor will include the EMPco into the Construction Works Plan proposal, described in more detail in the next sections.

This CMP shall be submitted by the contractor for approval by UG and the PIU prior to the commencement of construction activities. To the extent possible, the contractor shall schedule major disruptive activities to occur at times when campus activities are at a minimum (e.g. weekends, holidays, and vacation periods).

During the Site position date, the contractor, the project manager (Engineer Supervisor of the works) and the ES will agree and prepare the Site Environmental Conditions Letter which will be signed by the contractor**.**

Quality and Continuity of Service

1. Construction works will be planned and designed in a manner that seeks to minimize disruption of university services. The Contractor will liaise with university to ensure all works are coordinated with the internal university systems that may be disrupted.

2. The Contractor will ensure good coordination of all construction works, good communication, maintenance or possible effects of the works on electricity grid, water, electricity, sewage, to ensure proper operation.

3. The University Administration, in collaboration with the Contractor and maintenance units, shall develop and implement a maintenance schedule for changes or improvement of equipment (for example, drainage pumps, electrical and ventilation system, etc). The ES will supervise proper environmental and social management of these activities.

10. Public Consultation

The goal of the public consultation was to facilitate participation as a management tool to aid successful project design and implementation by incorporating stakeholders' knowledge in the project, reducing immediate and future conflict, and establishing communication between the stakeholders and the project designers.

Meetings with UG faculty members and World Bank team members. February 2011

Stakeholders

Project stakeholders could be considered as persons or groups who are directly and/or indirectly affected by the project, have "interests" in the project, or have the potential to influence the project outcomes. The project stakeholders included: the University community, indigenous groups, regulatory and government entities, and non-governmental organizations. Table 32 presents the list of stakeholders related to this project and that were consulted during project preparation and in the EIA consultations.

Table 32. Target Stakeholders for the consultation of the University of Guyana Science and Technology Support Project- The World Bank.

Target Group	Entity
University of Guyana	University of Guyana Workers' Union University of Guyana Medical Centre
	University of Guyana Students Society
	Academic Board
Indigenous Groups and Non-Governmental Organizations	Amerindian Peoples Association
	Guyanese Organization of Indigenous Peoples
	The Amerindian Action Movement of Guyana
	The National Amerindian Development Foundation
	National Toshaos Council
	Conservation International – Guyana
	Iwokrama International Centre for Rainforest Conservation and Development
	World Wildlife Fund – Guianas
Government Agencies and Utility Agencies	Environmental Protection Agency
	Guyana Forestry Commission
	Office of Climate Change
	Ministry of Public Works and Communication
	Pesticides and Toxic Chemicals Control Board
	Ministry of Local Government
	Ministry of Education
	Ministry of Amerindian Affairs
	Ministry of Health
	Guyana Power and Light Incorporated

	Guyana Water Incorporated
	Guyana Telephone and Telegraph Company Limited

Stakeholders were invited to the consultations via written communication, that is, an invitation letter issued by the Vice Chancellor, University of Guyana and/or an e-mail, and/or verbal communication - a telephone call. Further, the University personnel were given permission by the Personnel Division to participate in the consultations.

The main public consultation activities conducted in the preparation of this document included:

I. Formal and informal meetings between the World Bank members, consultants with faculty and students.
II. Formal focal meetings with a range of stakeholders from the university to identifying the key environmental issues associated with the project and potential mitigation measures; and
III. Formal disclosure and consultation meeting with project stakeholders to present the draft EA and EMP.

10.1 Scoping


Meetings with UG students and the World Bank team members.

Scoping was undertaken at an early stage in the EIA process, on April 8, 11 and 12, 2011. It was designed to ensure that matters which stakeholders believed should be considered in the EIA were addressed. The scoping primarily focused on identifying the important issues associated with the project that should be included in the study. Scoping provided information to the UG project proponents and the World Bank Team to listen to UG stakeholders and allowed stakeholders to comment on the project proposal. Scoping for this project consisted of five (5) meetings facilitated by the EIA consultants Team with selected stakeholders (see Table 33 and Registration forms). The issues raised during the scoping meetings are summarized in the Tables 34, 35 and 36. Please see Annex 7 for the list of participants to these meetings.

Table 33. Scoping meetings held for the EIA for the University of Guyana Science and Technology Support Project

Target Group	Target Entity	Date and Time	Venue	Number of Attendees
University of Guyana	University of Guyana Workers' Union University of Guyana Medical Centre	April 8, 2011; 10:00 hrs	CBJLR 5, University of Guyana, Turkeyen Campus	35
	University of Guyana Students Society	April 8, 2011; 14:00 hrs	CBJLR 5, University of Guyana, Turkeyen Campus	11

	Academic Board	April 12, 2011 (immediately after Academic Board Meeting)	Education Lecture Theatre	34

Indigenous Groups and Non-Governmental Organizations
April 11, 2011; 10:00 hrs
CBJLR 5, University of Guyana, Turkeyen Campus
Number of Attendee: 6
Amerindian Peoples Association
Guyanese Organization of Indigenous Peoples
The Amerindian Action Movement of Guyana
The National Amerindian Development Foundation
National Toshaos Council
Conservation International – Guyana
Iwokrama International Centre for Rainforest Conservation and Development
World Wildlife Fund – Guianas
Government Agencies and Utility Agencies
April 11, 2011; 14:00 hrs
CBJLR 5, University of Guyana, Turkeyen Campus
Number of Attendee: 7
Environmental Protection Agency
Guyana Forestry Commission
Office of Climate Change
Ministry of Public Works and Communication
Pesticides and Toxic Chemicals Control Board
Ministry of Local Government
Ministry of Education
Ministry of Amerindian Affairs
Ministry of Health
Guyana Power and Light Incorporated
Guyana Water Incorporated
Guyana Telephone and Telegraph Company Limited

Table 34. Summary of Scoping Session. Group: University of Guyana Workers' Union (UGWU).
Date : Friday, 8th April, 2011 (am)- Venue: CBJLR 5

Component	Sub Component	Issues	Recommendation
1. Education Quality Improvement Program	(a)Provision of technical assistance to: • Support a standardized process for updating existing and generate new curricula. • Develop new curricula to support the LCDS. • Provide stipends to UG lecturers who dedicate time, expertise and energy to this process.	• Lack of equipment	• More technical equipment needed to facilitate science and technical instruction. • In some instances staff members are currently required to work with obsolete equipment which impact negatively on the learning and motivational processes. • Need for provision of equipment (laptops, hard drives, cameras, etc.) for the Learning Resources Centre to fulfill its mandate.
2.Infrastructure Rehabilitation	(a) Rehabilitation of 14 science buildings across Turkeyen campus	• Noise	• Staff are concerned about the impact of construction work on individuals and collection performance as well as personal health
		• Fire hazard	• Some buildings contain large amounts of combustible material such as past examination paper, unused books, etc. contributing to fire and other safety hazards.
		• Security of plant.	• The current security arrangements on campus appear to be porous. Since the project is like to bring high density technologies which are costly security standards should be improved.
		• Toilet facilities	• Leakages in water and sewage conveyance systems which at times impacts negatively on the health status of employees. • Inadequate number of female washroom facilities bearing in minds the male to female ratio of staff and students on the campus. These issues need to be addressed.
		• Flooding and leaks	• Regular flooding on the campus causing damage to the physical plant and sometimes valuable technical equipment • Flooding impacts negatively on attendance at the level of both student and staff engagements. • Leakages in the roof and walls of campus buildings inclusive of classrooms negatively impact on the work of the University at all levels, but particularly in the areas of Library services and classroom facilities.
		• Solid waste	• Current arrangement for solid waste collection seems inadequate. • Collection mechanisms or arrangements negatively impact on the public health conditions on campus. • There is need to develop a solid waste management system at the University. • In addressing solid waste management, consideration must be taken of what is

			currently taking place and how "new" actions could support current actions. • Develop a protocol for solid waste management on campus which would form part of a Solid Waste Management Agreement with Waste Management Contractors. • Particular attention should be paid to the vendors who sell food on campus regarding their waste whilst ensuring that nutritious foods are provided for the Campus community. • After collection of solid waste by the collection company, the campus should be disinfected. • Possibly a student from Faculty of Technology could develop a model for solid waste management using resources from the project. • The University through the project should explore the development of alternative energy systems to reduce the amount of solid waste.
		• Library	• The staff is concerned about whether the Library would be included in the project. • Attention should be given to the repair of leaking roof, walls and floor of the Library. • There is need for remedial support for the Library building since a part of the infrastructure (Caribbean Resources Library) appears to be sinking. • Excessive dust in some sections of the building. • Chemical used to treat books sometimes negatively impact on the health status of staff.
		• Chemical and biological hazards in the laboratory	• Inadequate protective gear/clothing available to staff who work with hazardous chemicals and biological material. • In adequate or unsound disposal practices. • Need for provision of personal protective equipment (e.g., heavy duty gloves, goggle, respirators, lab coast, and safety boots) that is also appropriate for the genders. • Need for appropriate disposal of hazardous materials.
		• Poor occupational health and safety conditions	• The University's OHS practices need to be improved. • Staff members in some departments work under hazardous conditions which includes poor lighting and ventilation as well as dust pollution rendering the health status of staff members vulnerable.
		• Inadequate space (work/rest)	• Inadequate space for intermediate rest periods. • This refers to lunch room and storage facilities for food and other personal material available to staff.

3. Institutional Capacity Building	(a) • Will strengthen the existing capacity of the University with additional coordination, curricular supervision, civil works, ICT and facilities management capacities. • And finance capacity building for staff in charge of undertaking continuous review and maintenance of infrastructure and equipment. • The financial management and procurement capacities would be leveraged from the Ministry of Education's Education Sector Development Unit (ESDU).	• Compliance by the University Administration to rules and regulations	• Need to ensure that the University complies with rules and regulations (this EMP) and that University staff are involved in monitoring compliance (for instance, they could submit comments via e-mail). • University staff and students should be informed of the University's compliance or non compliance.
		• Human Resource	• The current paucity of finance impacts negatively on the filling of vacancies at the technical level, thus, staff members and students are sometimes exposed to mental stress to attain academic and other targets/assignments. • Workers are of the opinion that in institutional capacity building, the human resource is the most critical aspects since they have to produce the students who are the primary beneficiaries. We produce students who are qualified to go out and perform but that commencing from you having quality teaching staff, and support staff, and infrastructure that will go with it, so having to deal with those things.
		• Transparency (of funds and allocation of contracts/money)	• The University of Guyana should have a pivotal role in the tendering and procurement process for acquiring new equipment and materials for rehabilitation of building laboratories and classrooms to guarantee the attainment of required standards in the supply chain. • Need to improve systems of accounting.

Table 35. Summary of Scoping Session. Group: University of Guyana Student's Society (UGSS)
Date : Friday, 8th April, 2011 (pm) - Venue: CBJLR 5

Component	Sub Component	Issues	Recommendation
1. Education Quality Improvement Program	(a)Provision of technical assistance to: • Support a standardized process for updating existing and generate new curricula. • Develop new curricula to support the LCDS. • Provide stipends to UG lecturers who dedicate time, expertise and energy to this process.	• Lack of requisite technical equipment	• An inventory of the needed technical equipment should be executed to determine need specific tools/technical equipment. • Relevant technical staff from the University should have institutional involvement in the procurement process
		• Inadequate qualified staff	• Students are concerned about how the new curriculum development process will impact on the delivery of current programs and treat with timeliness if assessment. The University should therefore make greater use of down time such as semester breaks and provide incentives for collaboration to minimize disruption in the current schedule.
		• Curriculum reform	• Students are desirous of improvements in the current curriculum rather than displacement. New curricula should not displace existing curricula but rather upgrade and expand
		• Inadequate practical exposure	• Current arrangements do not provide adequate opportunities to obtain practical experiences. The reform process should provide for improved relationships between the public and the private sector by placing emphasis on the benefit of field placements. Provisions should also be made to promote innovative learning projects with corresponding academic credits to encourage the development of craft.
		• Library environment and library system	• The Library system is considered dated. The project should provide opportunities for automation.
		• Research	• Undergraduate research needs to be improved/streamlined. • Need to upgrade monitoring systems to minimize plagiarism and discourage repetition. • Need to expand the research at the graduate level. Research must be relevant to national development needs.
	(b)Research	• Research grant Management	• University should adopt a transparent and competitive system to manage the award of grants. There may be need for an independent and professional appeal structure. Students who are involved in research projects should be eligible for academic credits.

2.Infrastructure Rehabilitation	(a) Rehabilitation of 14 science buildings across Turkeyen campus	• Disruption in the learning environment due to relocation or noise.	• Adequate time should be provided to facilitate relocation and adaption.
		• Vehicle congestion on campus.	• Streamline parking arrangements. Collaborate with the Cyril Potter College of Education to reduce on campus congestion.
		• Security of plant.	• Encourage recruitment of more professional servicemen and women
		• Toilet/ Sewage/Solid waste facilities: Frequent sewage backup and cuts in water supply.	• Improve fresh water supply system. Improve systems for waste management. • Take action to minimize the presence of stray animals on campus.
		• Noise Pollution: students are concerned about the impact of noise on the learning environment.	• Trucking and offloading of build materials should be coordinated to minimize the disruption of classes and rehabilitation work should be phased.
	• Would support the establishment of a campus wide Internet network to connect all faculties to the Internet and prepare the University to connect into an international link, which will be established as part of the e-government broadband network currently under construction (scheduled to be operational by end-2011). • In conjunction with the connectivity, a set of software applications would be developed such as e-learning tools and digital content repositories to support the	• Frequent failures in the internet system.	• Improve bandwidth facilities and other infrastructural support
		• The cost for IT services on campus: it is considered prohibitive by some students.	• By expanding the facilities for IT students anticipate a reduction in the cost for services.
		• Distance learning technologies	• Need to improve opportunities for distance education delivery.

	design and delivery of the new curriculum in component 1.	• Software security	• No effort must be spared to maintain the integrity of the University's software tools. • Provide greater opportunities for interconnectivity through rapid software development. ICT students at both graduate (if applicable) and undergraduate levels should be involved.
3. Institutional Capacity Building	(a) • Will strengthen the existing capacity of the University with additional coordination, curricular supervision, civil works, ICT and facilities management capacities. • And finance capacity building for staff in charge of undertaking continuous review and maintenance of infrastructure and equipment. • The financial management and procurement capacities would be leveraged from the Ministry of Education's Education Sector Development Unit (ESDU).	• Creation of a green campus	• The campus should move incrementally towards adapting a green campus portfolio.
		• Development of Sports	• Civil works should enhance the physical infrastructure to accommodate sports activities intended to impact positively on lifestyle among students
		• Sustainability	• Management system for the execution of the project should focus on creation of investment systems to sustain the outcomes of this project. The project execution unit should be based on site provide for effective monitoring.
	• Research and Development and Business and Development	• Sustainability	• Management system for the execution of the project should focus on creation of investment systems to sustain the outcomes of this project. The project execution unit should be based on site provide for effective monitoring. The University may wish to consider the establishing of a student Advisory Bureau to facilitate participation of student across all faculties in biodiversity of other research relevant to the LCDS.

Table 36. Summary of Scoping Session. Group: NGOs/ Amerindian Groups
Date : Monday, 11th April, 2011 (am) - Venue: CBJLR 5

Component	Sub Component	Issues	Recommendation
1. Education Quality Improvement Program	(a) Provision of technical assistance to: • Support a standardized process for updating existing and generate new curricula. • Develop new curricula to support the LCDS. • Provide stipends to UG lecturers who dedicate time, expertise and energy to this process.	• Curriculum	• The University's curriculum on the LCDS should create linkages at the secondary level so that hinterland students can benefit and roll over to specializations in the sciences at the University and all other tertiary levels • The University should develop courses that target Amerindian community/population to create low carbon industries in hinterland communities. • The curriculum should also address mining since this is part of the livelihood of Amerindian communities. • The curriculum should prepare members of the Amerindian communities to perform work in areas such as environmental monitoring and evaluation. • The curriculum should provide scientific training in areas of rotating agriculture and shifting cultivation, integrated land use and landscape management. • New curriculum areas should tap into traditional/indigenous expertise and knowledge while providing intellectual property rights benefits. • The curriculum should speak to sustainable mining. Additionally, it should target miners since this type of economic activity sometimes negatively impact on the livelihood of the Amerindian people since they rely on the water systems of the hinterland. Miners should therefore be trained in water systems management and pollution control. This could be part of the outreach activities of the project. • The curriculum should also provide education on poverty reduction by taking a closer look at how this challenge can be overcome by Amerindians as a cultural group. • Curriculum should provide Amerindian groups with property right education and other such training which can improve the governance systems in Amerindian villages. • The curriculum should also focus on improving food and nutrition issues/conditions relevant to the Amerindian people. • The curriculum should provide Amerindians with the opportunity for training in sustainable forestry and the use of integrative technologies.
	(a) Research	• Research and Collaboration	• The research agenda of the University should support biodiversity and integrated natural resource management. • Research should be conducted on energy efficiency, waste management and water control. • Research should address improvements in governance systems among

			Amerindian communities. • The Amerindian people should be provided with recognition on account of their intellectual contributions of local knowledge to research. • The research agenda should not only target Amerindian communities but should also provide benefits. • Systems must be put in place to prove local groups with feedback. • There must be systems emplaced to engage Amerindians in the decision making process relating to research. The research agenda of the University must address challenges which arise out of the culture of subsistence agriculture to explore shifts to other practices since shifting and subsistence agriculture drives deforestation. • UG should foster stronger linkages between Amerindian communities and the University particularly from the standpoint of the Amerindian Research Unit. • The research agenda should also examine what are some of the other areas of functional cooperation which can be pursued with agencies such as the Guyana Forestry Commission and the Guyana Gold and Diamond Association among others.
2.Infrastructure Rehabilitation	(a) Rehabilitation of 14 science buildings across Turkeyen campus • Would support the establishment of a campus wide Internet network to connect all faculties to the Internet and prepare the University to connect into an international link, which will be established as part of the e-government broadband network currently under construction (scheduled to be operational by end-2011). • In conjunction with the connectivity, a set of software applications would be developed such as e-learning tools and digital content repositories to support the design and delivery of the new curriculum in component 1.	• Upgrading Amerindian Skills	• Training Opportunities should be provided for Amerindians using the new technologies which would be available to the University. Amerindians should be trained in general information systems and remote sensoring. • Training should also speak to improving food production and nutrition, and sustainable forestry.
3. Institutional Capacity	(a) • Will strengthen the existing	• Collaboration	• The University must collaborate with local groups so that they can benefit and not become displaced as a result of the project.

Building	capacity of the University with additional coordination, curricular supervision, civil works, ICT and facilities management capacities. • And finance capacity building for staff in charge of undertaking continuous review and maintenance of infrastructure and equipment. • The financial management and procurement capacities would be leveraged from the Ministry of Education's Education Sector Development Unit (ESDU). Research and Development and Business and Development	• Health and Safety of the Amerindian people	• The technical outcomes of the project should facilitate improvements in social services in areas such as education and health in hinterland communities. • Special attention should be directed to improving the health and safety of Amerindian people.
		• Technology	• New technologies should not be applied in such ways to displace local knowledge but rather serve to preserve that knowledge.
		• More Amerindian should have access to University-level education	• Distance learning technologies should provide Amerindian groups with improved access to University education without the need to remove from the local community.
		• Reciprocity	• There must be a benefit sharing policy.

10.2 Disclosure and consultation on draft documents

In an effort to provide project stakeholders with information on the project's potential environmental and social impacts and the environmental management plan and the overall results of the environmental assessment, there was a public disclosure and a consultation meeting.

The draft Environmental Assessment, the Environmental Management Framework, and the Indigenous Peoples Planning Framework were made public by placing them on Internet on April 21, 2011 - the University of Guyana's webpage (http://uog.edu.gy/node/528).

A stakeholder consultation meeting was held in the Education Lecture Theatre, the University of Guyana, Turkeyen Campus on April 21, 2011 at which twenty six (26) stakeholders participated. In Annex 7, there is a list of the names of all participants in the consultation process. Members of the EIA Team provided: an overview of project components and activities and predicted impacts; a summary of Mitigation Plan and Monitoring Schedule; and an overview of the Indigenous Peoples Planning Framework. Immediately following the presentations, stakeholders provided comments, asked questions and provided recommendations (see the Minutes of Consultation below).

MINUTES OF THE PUBLIC CONSULTATION FOR THE UNIVERSITY OF GUYANA/ WORLD BANK SCIENCE AND TECHNOLOGY SUPPORT PROJECT (P125288) HELD ON APRIL 21, 2011 AT 2:00 HRS IN THE EDUCATION LECTURE THEATRE, TURKEYEN CAMPUS, UNIVERSITY OF GUYANA

The public consultation commenced at 2:15 hrs.

Dr. Paulette Bynoe, Chairperson, in her opening remarks emphasized that the consultation was critical in order for the World Bank to release funds for the Project. She stated that the consultation was an opportunity to solicit the views of the stakeholders on the project and to obtain feedback as to the improvement of the delivery of the project.

Dr. P. Bynoe expressed gratitude to the team which comprised Ms. Denise Simmons and Mr. Andrew Hicks who worked tireless to get the information needed for the representatives of the World Bank.

The following presentations were delivered at the consultation:
Overview of the Project Components and Predicated Impact by Ms. D. Simmons, Summary of Environmental Management Plan and Monitoring Schedule by Dr. P. Bynoe and Overview of the Indigenous Peoples Planning Framework by Mr. A. Hicks.
Immediately following these presentations, stakeholders asked questions and made comments and recommendations on the presentations and the way forward was discussed.

Dr P. Bynoe explained the steps of the Environmental the Impact Assessment which is a process where one step leads to another. In this process, the environment was taken into account. She indicated that not only the trees and birds comprised the environment, but also the surroundings which included the physical environment such as the land, air, water, the physical infrastructure, such as the buildings. Also, there is the biotic environment and the protection of the flora and fauna and its impact on the people.
Dr. Bynoe mentioned that the team not only examined the negative impact, but also the positive impact and the current environment and what changes would be derived after the execution of the project. The mitigation measures for negative impacts and ways to enhance positive impacts were provided.

Dr. Bynoe further stated that the World Bank had looked at the project and the documents and had given the green light on May 20, 2011 and towards the end of May 2011, the Board will meet to approve the funds for the project. Hence, the consultation with the stakeholders today was of great importance in order to obtain information towards the improvement of the documents. She apologized for the short notice for the meeting and mentioned that the entire project document that was prepared could be accessed on the University's website.
It was noted by Dr. Bynoe that the project was screened by the World Bank and was placed in a category B, which meant that the overall project activities will not cause high environmental or social impacts.

The next phase was the scoping aspect which sought to solicit ideas and feedback on the project from indigenous groups, UGSS, and the Academic Board, among others.

Finally, the Environmental Management Plan which looked at the predicted impacts of the project and the mitigation measures.
Ms. D. Simmons in her presentation gave a synopsis of the project and stated that four Science Faculties were being strengthened to better prepare graduates assist in the implementation of the LCDS. She mentioned that the team examined the components of the project, namely:

- Education Quality Improvement;
- Infrastructure Rehabilitation; and
- Institutional Capacity Building.

Ms. D. Simmons stated that a number of consultative efforts were needed to review the project and get feedback on what stakeholders expected. The university staff was expected to do research to find out what has to be done to the curriculum for the implementation of the low carbon economy then develop courses and pilot them. Following this, approval had to be received from the Academic Board. She indicated that this research and development of curricula gives support for implementation of the broader University Policy.
In component II, rehabilitation of buildings and purchasing and implementation of basic science equipment would have to be done and a campus wide area network constructed. In addition to the repairs to buildings, there would be changing the current lightening system to low energy, and proper drainage.

Management support for many of these particular projects would be part of the project where the University would have the equipment and a system to maintain the buildings and equipment. The project would strengthen the ICT capabilities. Also, a hazard assessment and a laboratory safety plan will be done for the campus and a feasibility study for the establishment of the bio-diversity institute. The establishment of a Business Unit for the Campus was also a part of the project.

Ms. Simmons highlighted that during the Impact Assessment the impacts were assessed in terms of duration, likelihood of occurrence, geographic extent, reversibility and nature, and then the significance of the impact was determined. She indicated that impacts were classified as high, moderate or low. Ms. Simmons then provided an overview of the impacts that were classified as high, medium or low. Examples of high impacts mentioned by Ms. Simmons included: increase in social relevance of University of Guyana within a national context, opportunity created for design of distance education materials to respond to the interest expressed by representatives of the indigenous communities, and creation of opportunity for University of Guyana to create partnerships with other academic institutions at the regional and international levels, as well as sector agencies in Guyana.

The highest adverse impact would be traffic congestion due to the delivery of material supply. Ms. Simmons then presented the Medium Impacts, which included: increase in work load of lecturers who will be involved in the review of curricula, and increase in lecturers' income and spending power. Also, through the holding of workshops, there would be consensus building in curriculum development which in turn can enhance cross-disciplinary and inter-disciplinary collaboration. The design of the project was done with a view to improve the Health and Safety aspects arising from the improved facilities.
She alluded to some medium adverse impacts such as social conflicts (in indigenous areas) arising from different cultural norms, exploitation of indigenous peoples' traditional knowledge

and generation of dust and waste, an increase of noise and emission of gases. Regarding low impacts, Ms. Simmons identified that there can be some direct loss of animals and plants species and decrease in quality of surface water due to discharge of engine oil and transmission or hydraulic fluids into surface water.

Ms. D. Simmons stated that a lot of the mitigation measures for all negative impacts were identified and enhancement measures for all positive impacts were highlighted. And the project from the point of view of the Work Bank requires an IPPF to protect the rights of the indigenous people; hence, the need for a draft frame-work for the implementation.

Dr. P. Bynoe gave a presentation on mitigation measures for selected predicted impacts.
Mr. Hicks in his overview stated that the World Bank Policy Document OP4.10 which relates to the Indigenous People Framework IPPF can be found on the World Bank website www.org.worldbank. He further stated that all projects submitted to the World Bank for funding as a policy must be supported by an IPPF if the project develops on indigenous lands. The proposed IPPF for the UG project will be uploaded at the UG's website and persons can also give feedback to the document.

He indicated that the World Bank was aware of the potential impact which projects could have on indigenous people, and hence the bank's instrument OP4.10 document that relates to respecting the rights of the Indigenous Peoples and their involvement. It is a critical instrument that supports the rights of the Amerindian which has to go through a screening and prescreening process to determine whether the project must be carried out, then there is the evaluation in terms of the IPPF what impacts it would have on the community. All research projects which are intended to benefit from funding provided by the World Bank under the UG/Science and Technology Project must be supported by an Indigenous Peoples Plan (IPP). The policy also guarantees adherence to National and International laws as well as regulations of the University approved by the Academic Board.

Mr. Hicks explained the critical role for Amerindian research, and expressed the need to solicit funds for the indigenous research. He said that the Amerindian groups s have shared a pivotal role in the involvement of the IPPF for the University's Project. There is an equally important role facilitated by the current institutional arrangements of the University for the Amerindian Research Unit and the Research and Publication Committee in terms of monitoring all research projects. He highlighted this in a diagram which illustrated the Institutional Arrangements/Structure to be followed when soliciting funds from the project as well as implementation. He further stated that the World Bank was strict on protecting the rights and welfare of the indigenous people and hence there is the need for the proposed need for the grievance mechanisms which is available to all internal and external stakeholders. All grievances are addressed in the timely manner in keeping with the prescribed schedule outlined in the IPPF.
The presentation featured a comprehensive outline of the IPPF which is proposed for the University of Guyana. Discussions/interaction on the content of the document/presentation was later accommodated during the plenary session.

Dr. Bynoe then indicated that the document should not be treated as final since it was the objective of the consultation process to allow the writers to refine the document. The floor was then opened to questions/comments/recommendations from stakeholders.

- Mr. John Caesar, Faculty of Natural Sciences mentioned that there should be inclusion of certain pieces of legislation. At which Dr. Bynoe intervened to indicate that the section of the document that addressed the legislative framework was not shared at the consultation because of the time constraint, but that there is a section in the EA document.
- Mr. Caesar continued by indicating that the mitigation measure of erecting cubicles for office space may present an issue given the University's current financial status. He recommended that the cost for such be borne by the World Bank project. Mr. Caesar also pointed out that research may be conducted on state forest lands which fall under the domain of the Guyana Forestry Commission. Mr. Hicks injected to remind the gathering that the University recently adopted a policy on confidentiality and that the use of cubicles was in keeping with that policy.

- An individual student asked whether there was a limit to how much funds was available for research projects. In response he was told USD 600,000 was the amount available for research, but that in terms of what one could apply for would range from USD 5,000-USD15,000 was available per project. All applications to conduct research would have to pass through the screening procedures detailed in the Environmental Management Framework and the procedures detailed by UG.

- Mr. Oumardatt Ramcharran, Environment Protection Agency (EPA) mentioned that the Wildlife Conservation and Management Regulations, 2008 should be referred to as draft and queried consultations with NGOs while the institutions listed as being responsible implementation of mitigation measures were all Government agencies. He then queried whether Guyana has IPR (Intellectual Property Rights) laws and whether the IPPF Framework would seek to address that. Dr. Bynoe responded that the World Bank has IPR safeguards and that issues raised by indigenous groups were cited under the draft Bio prospecting Regulations. Regarding institutions, Dr. Bynoe noted that institutions should be interpreted as organizations with power and invited him to identify other organizations that should be included in the monitoring activities.

- The EPA representative further mentioned that regarding the IPPF, permission for granting approval for any kind of research in the county, whether on state lands or Amerindian lands, is the mandate of the EPA and this should be mentioned. Dr. Bynoe indicated that the Ministry of Amerindian Affairs informed her that EPA deals with the technical aspects, but consent is given by the local people. She further revealed that the IPPF was not a requirement of national legislation rather it was a requirement of the University of Guyana for the project to be considered by the World Bank. Mr. Ramcharran reiterated that EPA has to grant the overarching permit. It was agreed that the IPPF would reflect EPA's involvement in the research approval process.

- Mr. Curtis Bernard, Conservation International - Guyana noted the importance of the project, commended the team for the analysis done thus far, and made the following comments/questions:
    - The materials for the consultation should have been provided to participants a little earlier so that persons could have come prepared.
    - Whether the public consultation was the only forum for feedback since he wanted the opportunity to review the entire document and provide more in depth feedback.
    - Some indicators were in response to impacts as opposed to how well the impact would be addressed. For example, the indicator for the impact incidents/accidents from construction is the presence of flagmen, but flagmen may be present but asleep and accidents/incidents still occur. Therefore, indicators should relate directly to the impacts that are being addressed and not in response to the impact.
    - Whether the project would examine impacts, especially from construction, outside the confines of the campus. For example, if wood is to be used in the project whether there would be measures to ensure the use of properly certified wood and from a reputable source so that it is not harvested in an unsustainable manner. There should be considerations for design features which use less electricity and more efficient use of water in the constructed and renovated buildings.
    - Entities outside of the University, such as the NTC are listed to assist in providing monitoring. How the project would be enabling those entities to carry out the functions that the project expects of them?
    - The EPA requires a permit for all research and therefore the EPA permitting process should be mentioned in the document.
    - It is a requirement to obtain permission from the Village Council to access any titled Amerindian land.
- Dr. Bynoe responded by indicating the following:
    - At the scoping meeting it was pointed out that the EMSF would have to be completed in two weeks to meet the deadline for the project to be considered; the Team had a submission date of April 20, 2011 for a World Bank meeting at 14:00 hrs on that date.
    - The document disclosed is a draft and the opportunities are being provided to refine the document after consultations. Consultation is a continuous activity and a social engagement plan would be developed to facilitate feedback during the execution of the project. Based on the advice provided by the World Bank, for public disclosure the draft document was placed on the University's website, with the permission of the Public Relation Officer, on April 20, 2011 at 19:00 hrs.
    - The impact indicators would be refined and other indicators included.
    - The area of influence of the project was referred to as the geographic extent of the impact in assessing the nature of the impact. This was explained in the document.
    - Supplier chain in terms of sustainability is important. If the University purchases materials from a supplier, the supplier should uphold environmental rules. In the new concept of sustainability appraisal, recommendations will be given to ensure the used of certified wood, energy efficient equipment, etc.
    - Regarding how persons would be involved in the project, such as the NTC, there is a section in the document that deals with capacity building which is not being

shared at this consultation. In this section, specific groups are identified for training in order to implement the mitigation measures. Persons are invited to identify other groups for training.

- Mr. Dwayne Renville, Faculty of Natural Sciences, stated that he was expecting an environmentally friendly University and that there was the need to build up the land because of flooding and to introduce solar power. He mentioned that the current office space allows for little or no privacy, and suggested the need for added security, such as ID cards with a magnetic strip without which access to certain facilities would be prevented and the system would record who enters. He queried whether lists for laboratory equipment could still be submitted and suggested that impacts be categorized according to whether on campus or off campus. Mr. Renville was pleased to learn that the project would address the disposal of chemical waste and recommended that regulations for the use of plastics on campus be developed.

- In response, it was mentioned that the Deputy Vice Chancellor was overseeing the process of the development of the equipment lists and should be contacted regarding whether lists could still be provided. Regarding the representation of impacts according to whether they occur on or off campus, it would be examined with the World Bank specialist whether this could be done, recalling that there is a particular theoretical framework for EIAs in which the impacts are classified according to the components of the environment. With respect to building up of land, it was mentioned that the material would have to be acquired and transported which would be an impact as well. The project will address the issue of flooding and also sewage.

- Mr. Lenandlar Singh, Faculty of Natural Sciences noted that this was an opportunity for the University to embrace the idea of low carbon and going green and supported the notion of purchasing from suppliers who were "green". He further noted that there would be challenges in embracing a paper-less environment which his Department is currently experimenting with. He nevertheless was of the opinion that the University needed to practice some of these measures. Regarding the impact "difficulty of access to lecture rooms", Mr. Singh suggested that the University think about how the construction work could be structured so that it would not affect the operations, particularly teaching, for example by shifting the semester. Regarding Health and Safety risk, he mentioned that both lecturers and students should avoid worksites and that the University must treat the Health and Safety risk seriously for example by ensuring persons were dust masks or informing persons of their roles and responsibilities.

- In response, Ms. Simmons indicated that the word "lecturers" would be included in the mitigation measure to avoid worksites and pointed to use of dust masks and safety boots by the workers that was mentioned as a mitigation measure for the Health and Safety Risk. Further the worksites should be cordoned off to prevent persons from accessing these areas. Consideration would be given to the inclusion

of reduction of waste in the University's practices and move to a paper-less environment (where practical) as mitigation measures in the document.

- Ms. Petal Jetoo, Ministry of Education queried whether with the fiber optic installation and increased broad band, consideration would be given to an online library to reduce paper and to collaborate with other universities that offer similar courses which could be done locally. She further mentioned that two proposals were submitted for a review of primary and secondary curriculum to integrate low carbon aspects into science and technology. She therefore recommended that the Ministry of Education and University of Guyana collaborate in the curriculum review component of the project. Ms. Jetoo noted that the project was timely since the Ministry of Education was in the process of re-mobilizing science and technology for national development.

- Mr. Hicks responded by sharing that in the project, specifically the research component, the University would develop a system for approval of the research projects with the University's policies and procedures and that higher weightings would be given to projects that proposed to use secondary school students since this was intended to encourage the movement of these students into science and technology at the University. Ms. Simmons noted that the School of Earth and Environmental Sciences was offering a program jointed with University of Suriname Anton De Kom where some of the course were being offered by distance. As such, the University was experimenting with offering courses by distance. Ms. Simmons also noted that in curriculum review there were opportunities to offer courses that are currently offered by other Universities.

Dr. P. Bynoe in concluding stated that another version would be uploaded for stakeholders to give their feedback and further recommendations on the project. Regarding the social engagement plan, this would be developed to continue receiving feedback during construction and execution of the project. She also thanked her colleagues for the support, working overtime to gain the nod from the World Bank Officials and for a super human task that was under taken at very short notice. Finally she thanked all the institutions for their support.
The meeting ended at 17.00 hrs.

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12. List of Consultants and reviewers who helped in the preparation of this document

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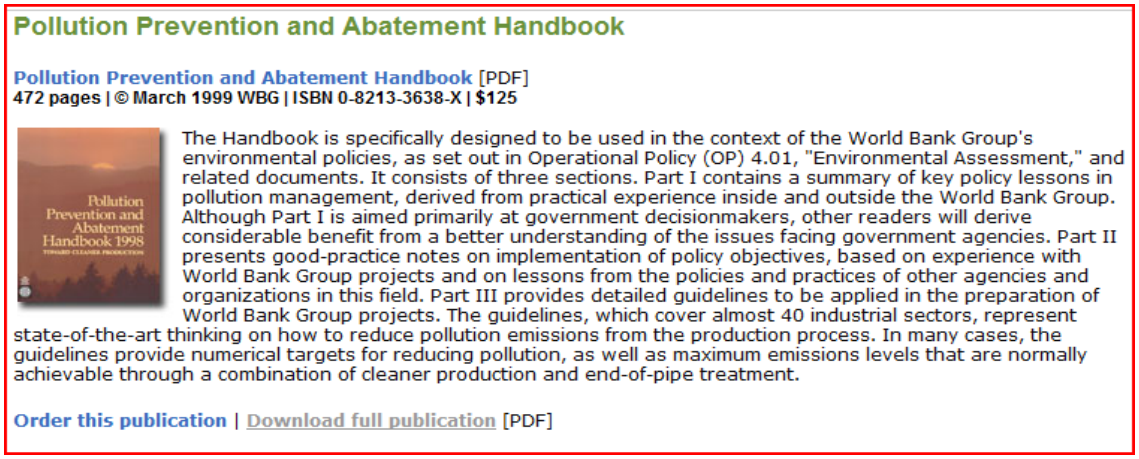
13. Annexes

Annex 1. Safeguards Policies

http://go.worldbank.org/WTA1ODE7T0

Pollution Prevention and Abatement Handbook

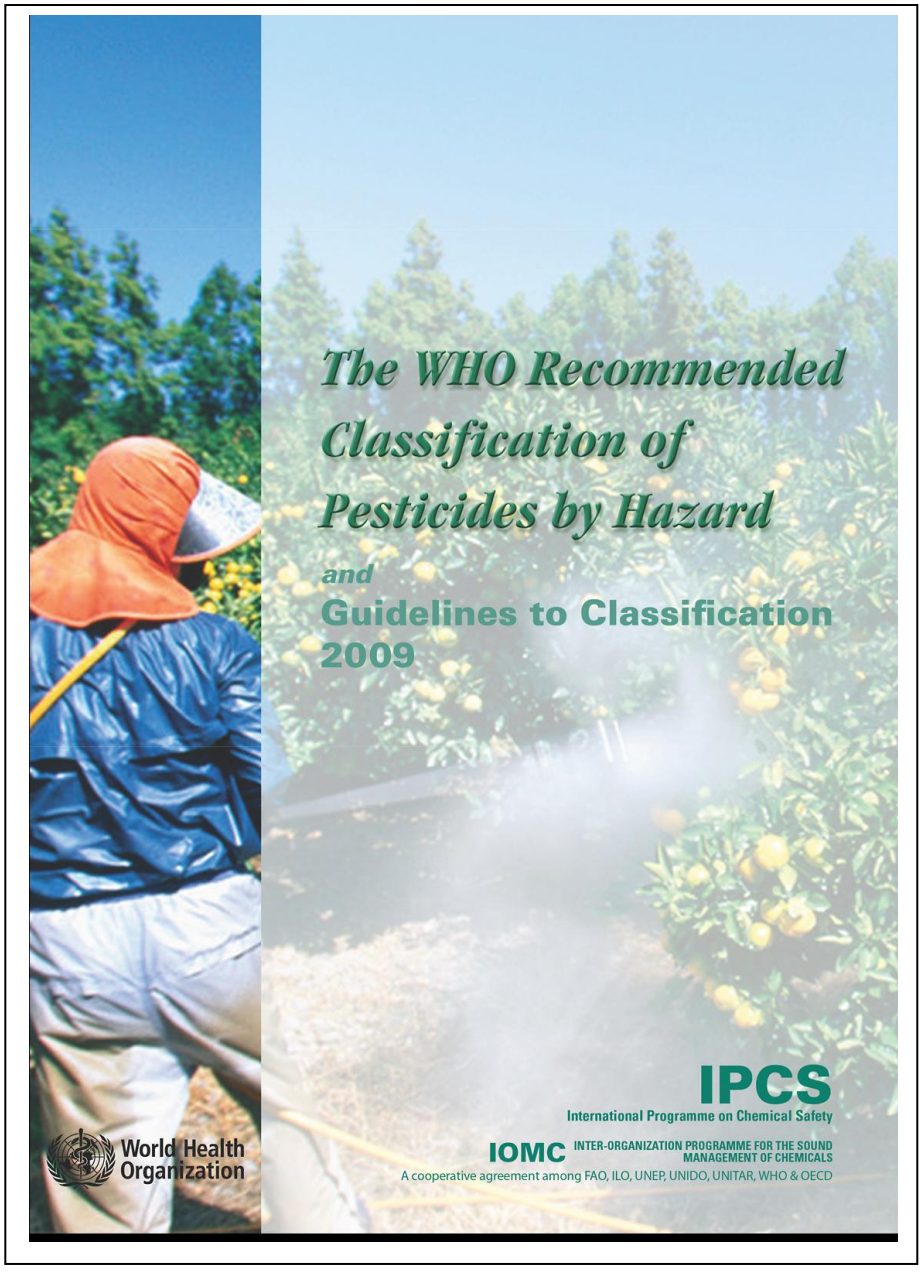
http://www.ifc.org/ifcext/sustainability.nsf/Content/Publications_Handbook_PPAH



Annex 2. WORLD HEALTH ORGANIZATION (WHO).

List of pesticides 1a and 1b and II. Please check them at:

http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf



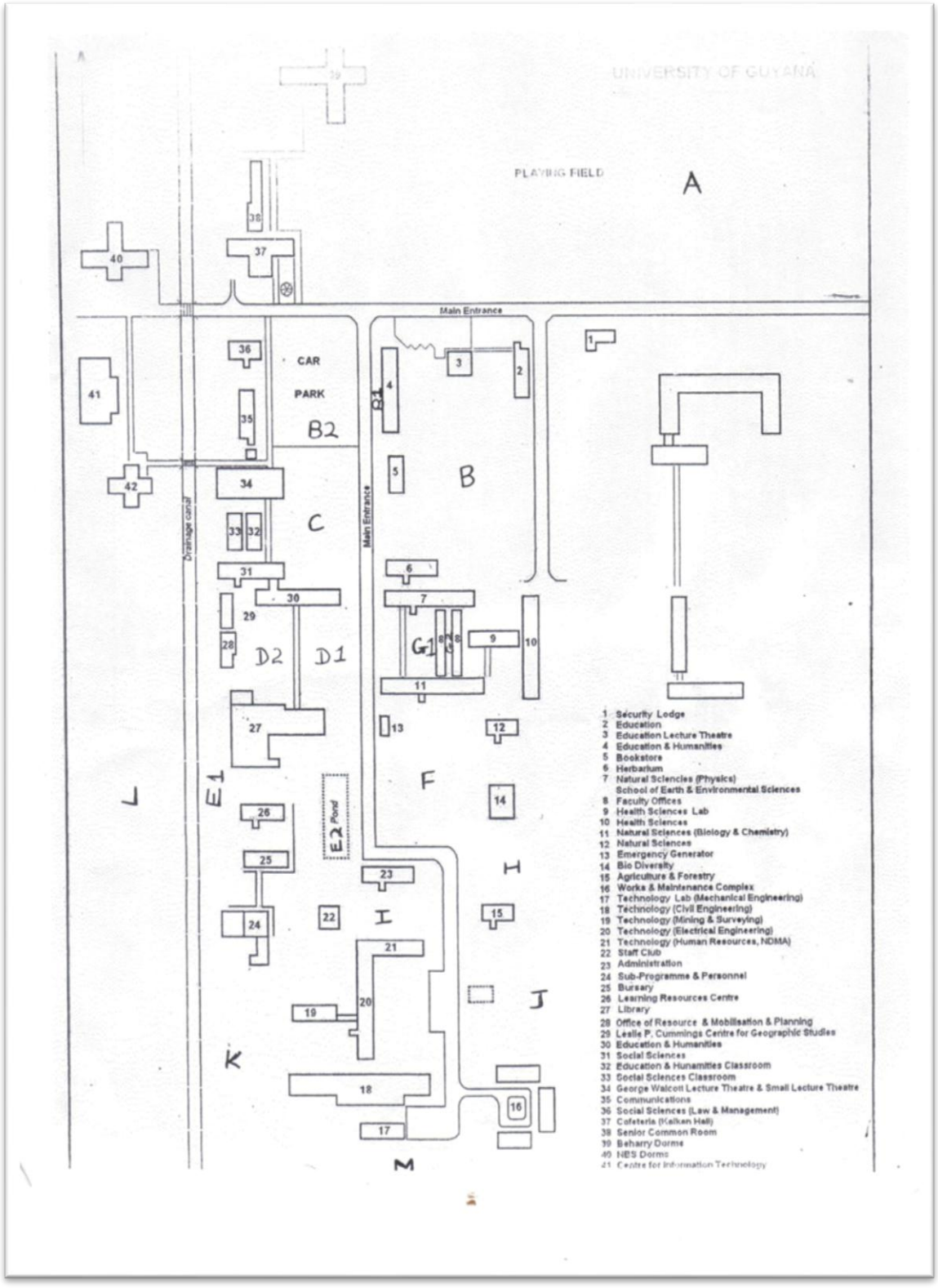
Annex 3. List of commonly used chemicals in the laboratories of the University of Guyana. Source: UG, 2011.

NAME	NAME
ACETANILIDE	1 – NAPHTHOL
ACETIC ANHYDRIDE	2 – NAPHTHOL
ACETOPHENONE (99 %)	NICKEL CHLORIDE
ACID FUCHSIN (BIO STAIN)	NICKEL NITRATE
ADIPIC ACID	NICKEL SULPHATE
ALUMINIUM METAL (FINE POWDER)	NINHYDRIN A..S REAGENT
ALUMINIUM CHLORIDE	NITRIC ACID
ALUMINIUM NITRATE	ORTHOBORIC ACID (CRYSTALS)
ALUMINIUM ORTHOPHOSPHATE	OXALIC ACID
ALUMINIUM POTASSIUM SULPHATE	PECTIN 250 GRADE APPLE
ALUMINIUM THIN SHEET	PETROLEUM SPIRITS
AMMONIUM CERIC NITRATE	PHENOL
AMMONIUM CERROUS SULPHATE	PHENOLPHTHALEIN
AMMONIUM CHLORIDE	POTASSIUM CARBONATE
AMMONIUM DICHROMATE	POTASSIUM CHLORIDE
AMMONIUM FLUORIDE	POTASSIUM BROMIDE
AMMONIUM HYDROXIDE (AMMONIA)	POTASSIUM IODIDE
AMMONIUM IRON (11) SULPHATE	POTASSIUM HYDROXIDE
AMMONIUM IRON (111) SULPHATE	POTASSIUM HEXACYANOFERRATE(11)
AMMONIUM METAVANDATE	POTASSIUM HEXACYANOFERRATE(111)
AMMONIUM MOLYBDATE	POTASSIUM NITRATE
AMMONIUM NICKEL SULPHATE	POTASSIUM PERMANGANATE
AMMONIUM PHOSPHATE	TRI-POTASSIUM PHOSPHATE
AMMONIUM SULPHATE	DI-POTASSIUM HYDROGEN PHOSPHATE
AMMONIUM THIOCYANATE	POTASSIUM DI-HYDROGEN PHOSPHATE
AMMONIUM VANADATE	POTASSIUM HYDROGEN PHTHALATE
ANILINE	POTASSIUM SODIUM TARTRATE
ANILINE SULPHATE	POTASSIUM THIOCYANATE
ANTHRACENE	PROPAN-1-OL
ANTHRANILIC ACID	PROPAN-2-OL
ANTI BUMPING GRANULES	PROPANONE
ANTIMONY TRICHLORIDE	PROPIONALDEHYDE
ANTIMONY PENTACHLORIDE	RESORCINOL
ANTIMONY POTASSIUM (+) TARTRATE	SALICYLIC ACID
ANTIMONY POWDER	SELENIUM
L -ASCORBIC ACID	SILICA GEL

BARIUM CHLORIDE	SILVER NITRATE
BARIUM NITRATE	SODA LIME
BENZALDEHYDE	DI - SODIUM HYDROGEN ORTHOPHOSPHATE (12 H_2O)
BENZOIC ACID	DI - SODIUM TETRABORATE 10 - HYDRATE (BORAX)
BORIC ACID CRYSTALS	SODIUM ACETATE - 3 - WATER
BROMOPHENOL BLUE	SODIUM AZIDE
BROMOTHYMOL BLUE	SODIUM BENZOATE
BROMOETHANE	SODIUM BROMIDE
BUTYLATED HYDROXYANISOLE	SODIUM BOROHYDRIDE
BUTHAN-1-OL	SODIUM BROMATE
BUTHAN-2-OL	SODIUM CARBONATE DECAHYDRATE
CADMIUM BROMIDE	SODIUM CARBONATE ANHYDROUS
CADMIUM CARBONATE	SODIUM CHLORIDE
CAESIUM CARBONATE	SODIUM CHLORATE
CAESIUM SULPHATE	SODIUM DICHROMATE
CALCIUM CHLORIDE	SODIUM DIHYDROGEN ORTHOPHOSPHATE
CALCIUM CHLORIDE DIHYDRATE	SODIUM DITHIONATE
CALCIUM FLUORIDE	SODIUM FLOURIDE
CALCIUM NITRATE	SODIUM FORMATE
CASEIN	SODIUM HEXAMETAPHOSPHATE FLAKE
CERIC HYDROXIDE	SODIUM HYDRIDE
CEROUS SULPHATE	SODIUM HYDROGEN CARBONATE
CHLOROETHANE	SODIUM HYDROXIDE
2-CHLOROPROPANE	SODIUM IODATE
2-CHLORO,2-METHYLPROPANE	SODIUM IODIDE
COBALTOUS NITRATE	SODIUM NITRATE
COPPER (11) CHLORIDE 2 - HYDRATE	SODIUM NITRITE
COPPER (11) SULPHATE ANHYDROUS	SODIUM NITROPRUSSIDE
COPPER (11) SULPHATE PENTAHYDRATE	SODIUM OXALATE
COPPER (KJELDAHL CATALYST TABLETS)	SODIUM PEROXIDE
CROTONALDEHYDE	SODIUM SULPHATE - 10 - HYDRATE
CYCLOHEXANE	SODIUM SULPHATE ANHYDROUS
CYCLOHEXENE	SODIUM SULPHITE HYDRATED
DEXTRIN YELLOW (PRE - ALCOHOL)	SODIUM THIOSULPHATE
DEXTRIN YELLOW (TECHNICAL)	SODIUM TUNGSTATE POWDER
2,4 - DINITROPHENOL	TRI - SODIUM ORTHOPHOSPHATE
2,4 DINITROPHENYLHYDRAZINE	STRONTIUM CHLORIDE
DIAMINO - ETHANE - TETRA -ACETIC ACID	STRONTIUM NITRATE
DIASTASE	STRONTIUM SULPHATE
DICHLOROMETHANE	SUCCINIC ACID

ERICHROME BLACK T.A.C.S	SULPHANILAMIDE
ETHANOL	SULPHUR ROLL
ETHANAL	SULPHURIC ACID
ETHYLENE DIAMINETETRA-ACETIC ACID DISODIUM SALT	TETRAMETHYL AMMONIUM CHLORIDE
FERRIC CHLORIDE	THIAMINE HYDROCHLORIDE
FERRIC SULPHATE	THYMOL
FERROUS SULPHATE	TIN FINE POWDER
FORMALDEHYDE	TIN GRANULATED
FORMIC ACID 90%	TIN (11) CHLORIDE
D - GALACTOSE PENTA ACETATE	TITANIUM TRICHLORIDE
D(+) GALACTOSE (ANHYDROUS)	TRI - n BUTHYLAMINE
D(+) GLUCOSAMINE HYDROCHLORIDE	UNIVERSAL INDICATOR
HEXANE	URANYL ZINC ACETATE
HYDROCHLORIC ACID	VANILLIN
HYDROGEN PEROXIDE	D(+) XYLOSE
INDOPHENOL DYE	m - XYLENE
INDIGO CARMINE	ZINC ACETATE
IODINE	ZINC BROMIDE
LACTOSE	ZINC CARBONATE(BASIC)
LANTHANUM CHLORIDE	ZINC CHLORIDE
LITHIUM BROMIDE	ZINC METAL POWDER
LITHIUM CHLORIDE	ZINC NITRATE
LITHIUM IODIDE	ZINC SULPHATE
LEAD NITRATE	ZINC WOOL
LEAD METAL	
MAGNESIUM CHLORIDE HEXAHYDRATE	
MAGNESIUM SULPHATE	
MALTOSE	
MANGANOUS CHLORIDE	
MANGANOUS SULPHATE	
MERCAPTOACETIC ACID	
MERCURIC BROMIDE	
MERCUROUS SULPHATE	
MERCURY	
METHANOL	
METHYL ORANGE	
METHYL RED	
METHYLENE BLUE	
NAPHTHALENE	

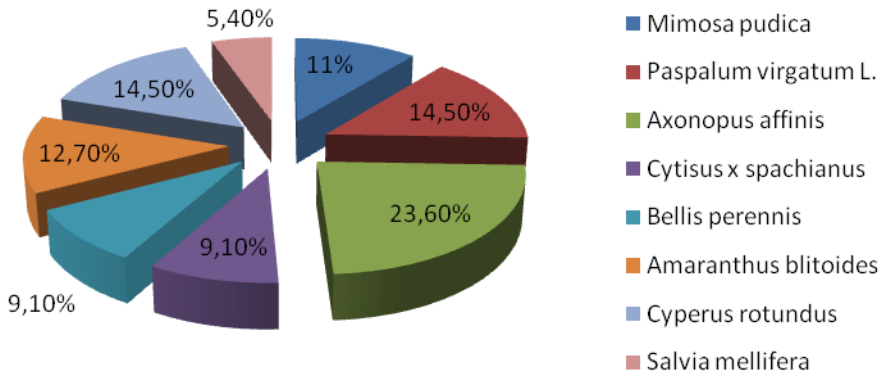
Annex 4. Additional information of the biological diagnostic. University layout, study sites and additional records.



Study Site I: This study site is located between the Administrative building and the Faculty of Technology. The main plant species were the Demerara Primrose (*Asystasia gangetica*), wild sweet broom (*Cytisus x spachianus*), *Desmodium rotundifolium*, carpet grass (*Axonopus affinis*), pig weed (*Amaranthus blitoides)*, nut grass (*Cyperus rotundus* & *Cyperus digitatus*), (Table 18). Some rain trees are also present in this site (*Samanea saman*).

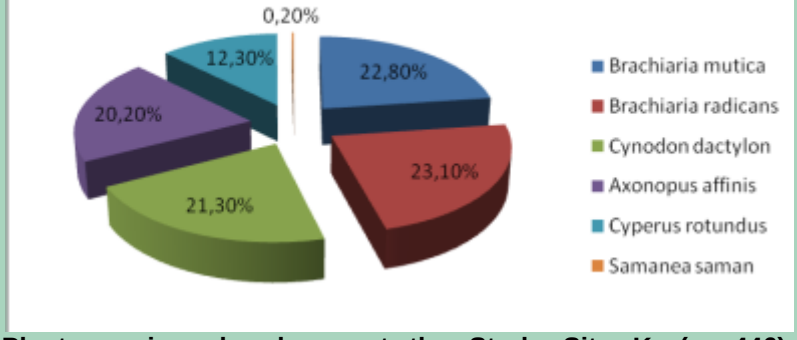
Plant species abundance in Site I: located between the Administrative building and the Faculty of Technology.				
Common name	Scientific name	Family name	Count (Total of 9 quadrats)	Total percentage (%)
Demerara primrose	*Asystasia gangetica*	Acanthaceae	35	8.7%
Wild sweet broom	*Cytisus x spachianus*	Fabaceae	45	11.1%
	Desmodium rotundifolium	Fabaceae	50	12.4%
Carpet grass	*Axonopus affinis*	Poaceae	90	22.3%
Pig weed	*Amaranthus blitoides*	Amaranthaceae	60	14.9%
Nut grass	*Cyperus rotundus*	Cyperaceae	65	16.1%
Nut grass	*Cyperus digitatus*	Cyperaceae	55	13.6%
Rain tree	*Samanea saman*	Fabaceae	3	0.74%
Total			403	100

Study Site J: This study site is located between the Faculty of Agriculture and Forestry and the Maintenance Division. The main plant species were: touch me not (*Mimosa pudica*), razor grass (*Paspalum virgatum L.)*, carpet grass (*Axonopus affinis)*, wild sweet broom (*Cytisus x spachianus)*, daisy (*Bellis perennis)*, pig weed (*Amaranthus blitoides)*, nut grass (*Cyperus rotundus*) and black sage (*Salvia mellifera)*, Figure 26. Animal species observed included butterflies (Order: Lepideroptera), dragon flies (Order: Odonata), lizards (*Naultinus elegans)*, grasshoppers (*Melanoplus differentialis)*, black carpenter ants (*Camponotus pennsylvanicus)* and red ants (*Solenopsis invicta).*



Plant species abundance at Study Site J, (n: 275). University of Guyana. Turkeyen campus.

Study site K: This study site is bordered by the Sports club, The Personnel Division and Loan Agency Building and the Faculty of Technology-Civil Engineering Building. The main species found there were para grass (*Brachiaria mutica)*, tanner grass (*Brachiaria radicans)*, bahama grass (*Cynodon dactylon*), among others (Figure 27). A rain tree (*Samanea saman*) was also registered at this site.



Plant species abundance at the Study Site K, (n: 446). University of Guyana, Turkeyen campus.

Study Site L: This Study Site is located immediately behind the Cheddie Jagan Building. This area has a high density of trees, herbs and shrubs primarily from the Fabaceae family. These include *Tamarindus indica*, *Samanea saman* and *Mimosa pudica*. Other trees included the sand box tree (*Hura crepitans*), almond nut tree (*Terminalia catappa*), *ball nut tree* (*Calophyllum inophyllum*). Grasses at the site includes: razor grass (*Paspalum virgatum L.)*, para grass (*Brachiaria mutica)*, nut grass (*Cyperus rotundus* and *Cyperus digitatus*), (Table 19).

Plant species abundance at Site L. University of Guyana, Turkeyen campus.			
Common name	Scientific name	Family name	Total (%)
Tamarind	*Tamarindus indica*	Fabaceae	20%
Rain tree	*Samanea saman*	Fabaceae	8%
Touch me not	*Mimosa pudica*	Fabaceae	25%
Sand Box tree	*Hura crepitans*	Euphorbiaceae	5%
Almond nut tree	*Terminalia catappa*	Combretaceae	5%
Ball nut tree	*Calophyllum inophyllum*	Clusiaceae	2%
Grazor grass	*Paspalum virgatum*	Poaceae	13%
Para grass	*Brachiaria mutica*	Poaceae	10%
Nut grass	*Cyperus rotundus*	Cyperaceae	8%
Nut grass	*Cyperus digitatus*	Cyperaceae	6%
Carpet grass	*Axonopus affinis*	Poaceae	3%
Bahama grass	*Cynodon dactylon*	Poaceae	4%

Study site M: This study site is located immediately behind the Technology Lab (Mechanical Engineering) and the Maintenance Division. This site has two types of habitats-the drainage canal and the large expanse of land next to the canal.

The main species within the drainage canal were: water lettuce (*Pistia stratiotes*), water hyacinth (*Eichhornia crassipes*) and duck weed (*Lemna minor*). Animal species in this canal include the black caiman (*Melanosuchus niger).*

The main species on the land next to the drainage canal were: razor grass (*Paspalum virgatum L.)* , rara grass (*Brachiaria mutica*), tanner grass (*Brachiaria radicans)*, bahama grass (*Cynodon dactylon*), carpet grass (*Axonopus*

affinis), zebra grass (*Miscanthus sinensis*), among others (Table 20). *Some trees are also found in this site:* tamarind (*Tamarindus indica*), rain tree (*Samanea saman*). Fauna species observed include: ants (*Solenopsis invicta),* earth worms (Oligochaeta), black carpernter ants (Camponotus *pennsylvanicus),* lizards (*Naultinus elegans), and* grasshoppers (*Melanoplus differentialis).*

Plant species abundance at Site M. University of Guyana, Turkeyen campus.				
Common name	Scientific name	Family name	Count (Total of 9 quadrats)	Total percentage (%)
Aquatic habitat of Study site M				
water lettuce	*Pistia stratiotes*	Araceae	45	29%
water hyacinth	*Eichhornia crassipes*	Pontederaceae	50	32.2%
duck weed	*Lemna minor*	Lemnaceae	60	39%
TOTAL			155	100
Terrestrial habitat of Study site M				
razor grass	*Paspalum virgatum*	Poaceae	105	12.9%
para grass	*Brachiaria mutica*	Poaceae	120	14.72%
tanner grass	*Brachiaria radicans*	Poaceae	125	15.33%
bahama grass	*Cynodon dactylon*	Poaceae	75	9.2 %
carpet grass	*Axonopus affinis*	Poaceae	80	9.81 %
zebra grass	*Miscanthus sinensis*	Poaceae	35	4.29%
pig weed	*Amaranthus blitoides*	Amaranthaceae	45	5.52%
black sage	*Salvia mellifera*	Lamiaceae	30	3.7%
nut grass	*Cyperus rotundus*	Cyperaceae	60	7.36%
nut grass	*Cyperus digitatus*	Cyperaceae	65	7.97%
daisy	*Bellis perennis*	Asteraceae	70	8.59%
tamarind	*Tamarindus indica*	Fabaceae	3	0.37%
rain tree	*Samanea saman*	Fabaceae	2	0.24%
TOTAL			815	100

ANNEX 5. Environmental Specialist profile.

The PIU will contract an expert on environmental management to be responsible of the overall environmental and social management of the project. This person will be selected by an open competition and the position make public in the UG, MOE websites to increase the chances of selecting the appropriate consultant for this position.

The Environmental Specialist will report to the UG Project Coordinator.

Specific Tasks

The specific tasks of the Environmental Specialist are:

- Supervise the overall environmental and social management of the project and its subcomponents. Provide guidance, support and orientation to increase environmental and social good practice and improve UG Environmental Management.
- Coordinate closely with the UG Technical –coordination Unit and the PIU at MOE anything related to the environmental, social aspects of the project, supervision, monitoring, consultations, stakeholders involvement, participation in project development in order to reduce environmental and social impacts.
- Interact with UG representatives, faculty, students, other stakeholders to maintain a clear dialogue between the project and the UG stakeholders.
- Provide support in preparation of the Environmental Section of the Operations Manual based on the Project's established environmental safeguards instruments (EA, EMP, EMF, IPP) and the World Bank's Safeguards Policies and guidelines.
- Prepare and review terms of reference for contracting environmental studies defined in the Project documents to increase UG environmental management and research development (Hazard assessment, Laboratory guidelines, waste management plan and manuals, Biodiversity Center, feasibility studies,etc).
- Participate in training workshops for use of Operations Manual under the program.
- Provide support in reviewing the Project bidding Documents, Direct Contracts, etc. to ensure the proper environmental and social management of the project by contractors.
- Maintain dialogue and report about the project advances and overall development to the UG community, local stakeholders, national agencies, collaborators, etc.
- Supervise contractors during construction and rehabilitation works and monitor compliance to the EA, EMP and EMF, Guyana National Legislation and the World Bank Safeguards policies.
- Monitor timely environmental and social performance of the project, contractors and subcontracts and other parties.
- Develop capacity building activities to increase environmental management capacity of contractors and UG counterparts.

Qualifications

The Environmental specialist should have the following qualifications:

a) A degree in Environmental Management, Environmental Engineering, Biology, Ecology or related field.
b) At least five years of experience in Environmental impact assessment of civil works and as environmental inspector and coordinator of environmental management plan.
c) The professional should have strong experience also as researcher in Guyana.
d) Must have knowledge and experience in the Guyana environmental regulations and permitting processes (both civil works, biodiversity research) in different agencies (EPA, Forestry commission, etc).
e) Demonstrated ability to work in teams and have leadership skills.
f) Fluency in English and good communication and writing skills.
g) Must be an organized person to keep track of different project activities and components.

Time frame

The Environmental specialist will be recruited for the total period of the project. He/she will be hired at least six month before the bidding process is launched.

Annex 6 EMP – Environmental Supervision Datasheets (EDS)

ENVIRONMENTAL DATA SHEET -	**EDS -1- Safety and Prevention**
Date:	
Site Inspected:	
Environmental Specialist:	**Signature:**
Objective	
Avoid conflicts with the population and ensure the safe movement people and vehicles and machinery.	
Actions creating impacts in the area	
- Traffic control or rerouting . - Movement of construction materials and contractor's vehicles	
Impacts to prevent	
- car accidents - discomfort with UG population - discomfort with UG neighbors	
Influence area of the impacts	
- The UG campus. - Public roads connecting UG campus with Georgetown, disposal sites, material purchase sites, etc.	
Measures to supervise	**Compliance YES - NO**
• Training activities to drivers by the ES of the Contractor about health, safety (speed limits, etc.) and the EMP	
• Parking lots for the contractors vehicles are marked and defined	
• Place warning signs, according to the National Highway standard. At a minimum: - Posters: work in progress (signaling the distance), caution and diversion. - Devices Pipeline: fences, cones, drums. - Lighting devices, especially at night in the campus and near parked trucks, material storage sites, other to define by the ES	
• Speed limits signs are place within the campus.	
• Traffic control at the entrance and other points of the UG is according to plan	
• All contractors vehicles have all the required permits, accident insurances, etc.	
• All contractor vehicles have carbon emissions reduction filters	
• All contractors trucks carry plastic, vinyl, or any other type of covers for covering the loads and avoid spills in the roads and potential accidents	
• All personnel performing tasks in the roads (flagmen) will have reflective vests and ponchos.	
• No open ditch, channel in the roads or shoulders will be maintained for more than 4 hours without proper safety signs to avoid any accidents.	
• Other	
• Other	
Sites of compliance	
UG campus All sites connected to the construction works	
Stage for supervisión	
All construction period	
Staff Responsible to supervise	
The PIU Environmental Specialist responsible of the environmental and social supervision of the Project	

Monitoring	
Every week the ES will fill this datasheet and report any incident associated with the traffic safety and prevention measure associated with the works.	
Compliance Indicators	
Numbers of car-vehicle accidents associated with the construction Works within UG campus	
Number of car- vehicle accidents associated with the construction Works outside the UG campus	
Number of complaints received by any stakeholder	
Other:	

Contractor's Name:	
Contractor's Environmental Inspector:	**Signature of receiving copy:**
Engineer in charge to inform of this EDS:	**Signature of receiving copy:**

ENVIRONMENTAL DATA SHEET -	EDS -2- Communication and participation
Date:	
Place:	
Name of the activity:	
Environmental Specialist:	**Signature:**
Objective	
To communicate the UG population and neighbors about the construction work plan and avoid potential impacts.	
Actions creating impacts in the area	
-overall construction and rehabilitation Works -demolition and removal activities of old materials, walls, ceilings, windows, pipelines, ventilation, electrical systems, etc.	
Impacts to prevent	
-lack of information -un-comfort and potential accidents - disruption of academic program and negative effects on university campus life	
Influence area of the impacts	
- The UG campus. - Surrounding areas around the UG campus.	
Measures to supervise	**Compliance YES - NO**
• Date and place for the Communication event is informed at least 1 weeks before.	
• Communication material is prepared (powerpoint presentations, brochures, posters, etc) for the event	
• Representatives from the PIU, Engineers Supervisors, contractors (if already contracted) are present	
• Participants have opportunity to ask, present recommendations and make any claim to the organizations and representatives of the PIU.	
• Registry of participants (attendees list, photos, etc)	
• During each event agreements, claims, recommendations given, are registered and there is a clear definition who will be responsible to do the follow up and resolve any issue.	
• Registries are posted in the project web site at the UG web site	
• Other	
• Other	
Sites of compliance	
UG campus All sites connected to the construction works	
Stage for supervision	
I-Planning and organization, 2-Construction	
Staff Responsible to supervise	
The PIU Environmental Specialist responsible of the environmental and social supervision of the Project	
Monitoring	
Every month the ES will fill this datasheet and report communication and participation activities developed by him/her, the PIU, contractors and others entities associated with the development of this project	
Compliance Indicators	
Numbers of meetings, assemblies, workshops developed	

Number and type of material prepared per each session	
Number of people who attended the activity	
Other:	
Registry of comments, recommendations, questions, claims, rise during the event	**Notes**
▪	
▪	
▪	
▪	
▪	
▪	
▪	
▪	
▪	
▪	
▪	
▪	
▪	
Fill this section if activity is developed before or during construction:	
Contractor's Name:	
Contractor's Environmental Inspector:	**Signature of reciving copy:**
Engineer in charge to inform of this EDS:	**Signature of reciving copy:**

ENVIRONMENTAL DATA SHEET -	EDS -3- SOLID WASTE MANAGEMENT
Date:	**Number:**
Site:	
Environmental Specialist:	**Signature:**
Objective	
To manage waste generated by the constructions and rehabilitation works at the UG campus	
Actions creating impacts in the area	
-overall construction and rehabilitation Works -demolition and removal activities of old materials, walls, ceilings, windows, pipelines, ventilation, electrical systems, etc.	
Impacts to prevent	
-un-comfort and potential accidents -improver management and disposition of solid wastes -generations of odors, fumes, dust which can affect workers and UG population	
Influence area of the impacts	
- The UG campus. - Surrounding areas around the UG campus, disposal sites.	
Measures to supervise	**Compliance YES - NO**
• Waste containers are properly labeled and placed in agree sites. All containers have lids which will not fall.	
• Each type of waste is properly managed as agreed with contractors, reuse and recycling of materials are according to work plan (for example: cement wastes are placed in defined areas to dry, for later disposal in agreed sites, electrical wires are collected in specific bins to proper recycling,	
• Hazardous wastes are placed in proper ventilated sites and with impermeable floors. Hazardous wastes are transported to agreed sites.	
• Final wastes are disposed in the agreed sites	
• Recycled materials are properly classified and donated to interested stakeholders	
• No isolated clumps of wastes materials are left on roads, ditches or near sidewalks for more than 24 hours.	
• Workers use protective gear to handle wastes (gloves,masks, etc). Remember some wastes may contain PCBs, asbestos and fine particulate matter which can affect UG community and workers.	
• CEI has provided periodically training to workers in waste management and Health and safety matters.	
• Truck drivers carry covert waste materials with a heavy tart cover.	
• Other	
Total of Non – Compliance activities	
Sites of compliance	
UG campus All sites connected to the construction works	
Stage for supervision	
I-Planning and organization, 2-Construction	
Staff Responsible to supervise	
The PIU Environmental Specialist responsible of the environmental and social supervision of the Project	
Staff responsible to comply	

Contractors and their personnel. CEI must supervise compliance by contractor and coordinate with ES any non-compliance issue.	
Monitoring	
Every month the ES will fill this datasheet and report compliance and non- compliance issues to the contractors, CEI and the Engineert Supervisor of the Works by the PIU.	
Compliance Indicators	
Numbers of trucks per month carrying wastes to agreed disposal sites	
Estimated Volume of recycled material donated to interested stakeholders	
Estimated Volume of hazardous waste material properly managed and disposed.	
Number of workers trained to properly handled demolished waste materials	
Informed Parties:	
Contractor's Name:	
Contractor's Environmental Inspector (CEI):	**Signature of receiving copy:**
Engineer in charge to inform of this EDS:	**Signature of receiving copy:**

ANNEX 7. LIST OF PARTICIPANTS ON THE DISCLOSURE AND DIVULGATION ACTIVITIES OF THE PROJECT. APRIL 2011.

UNIVERSITY OF GUYANA/WORLD BANK
SCIENCE AND TECHNOLOGY
STAKEHOLDERS CONSULTATION
REGISTRATION FORM

Cohort Group : University of Guyana Workers' Union (Staff)
Date: April 8, 2011
Venue: CBJLR 5
Time: 10:00 hrs

No.	NAME	DESIGNATION/ PORTFOLIO	CONTACT #	E-MAIL
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3.	Simone Daniels	Clerk/Typist		
4.	Parbattie Mangar	Library Assistant II	222-4931	elizabeth_nadrin@yahoo.com
5.	Renita Stewart	Clerk/Typist	222-4928	attisha_14@yahoo.com
6.	Dawana Bristol	Clerk/Typist	222-4928	kelsweeti4@yahoo.com
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8.	Denroy Sam	Farm Hand	259-1422	denroysuperman1@yahoo.com
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SCIENCE AND TECHNOLOGY
STAKEHOLDERS CONSULTATION
REGISTRATION FORM

Cohort Group: University of Guyana Students' Society
Date : April 8, 2011
Venue: CBJLR 5
Time : 14:00 hrs

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SCIENCE AND TECHNOLOGY
STAKEHOLDERS CONSULTATION
REGISTRATION FORM

Cohort Group: Indigenous Groups, International NGOs
Date : April 11, 2011
Venue: CBJLR 5
Time : 10:00 hrs

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UNIVERSITY OF GUYANA/WORLD BANK
SCIENCE AND TECHNOLOGY
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REGISTRATION FORM

Cohort Group: Government Representatives/Utility Agencies
Date : April 11, 2011
Venue: CBJLR 5
Time : 14:00 hrs

No.	NAME	DESIGNATION PORTFOLIO	CONTACT #	E-MAIL
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4.	Tota Mangar	Project Coordinator, GITEP	225-8580, 2251551	totamangar@yahoo.com
5.	Collin Croal	Permanent Secretary Ministry of Amerindian Affairs	223-7285; 663-3282	psmoaa@yahoo.com
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UNIVERSITY OF GUYANA/WORLD BANK
SCIENCE AND TECHNOLOGY
STAKEHOLDERS CONSULTATION
REGISTRATION FORM

Cohort Group : Academic Board
Date : April 12, 2011
Venue : CBJLR 5
Time : **11:** AM

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33.	Winslow Patterson	AR, Students' Welfare (ag).	617-4574	
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