# CAPACITY BUILDING IN CLEAN DEVELOPMENT MECHANISM IN UGANDA

## FINAL REPORT

**Ministry of Water, Lands and Environment**

**Department of Meteorology**

**P.O Box 7025, Kampala-Uganda**

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# TABLE OF CONTENTS

# ABBREVIATIONS USED

| | | |
|---|---|---|
| ADB | - | African Development Bank |
| CBO | - | Community Based Organisations |
| CER | - | Certified Emissions Reduction |
| CERU | - | Certified Emissions Reduction Units |
| CIDA | - | Canadian International Development Agency |
| CDM | - | Clean Development Mechanism |
| CTO | - | Certifiable Tradable Offsets |
| DANIDA | - | Danish International Development Agency |
| DFID | - | Department for International Development |
| DFO | - | District Forestry Officer |
| EEF | - | Energy Efficiency Facility |
| EIA | - | Environment Impact Assessment |
| EU | - | European Union |
| FD | - | Forestry Department |
| FSC | - | Forest Stewardship Council |
| GEF | - | Global Environment Facility |
| GHG | - | Greenhouse gas |
| GoU | - | Government of Uganda |
| GTZ | - | German Technical Cooperation |
| IDA | - | International Development Agency |
| IFC | - | International Finance Corporation |
| IPCC | - | Inter governmental Panel on Climate Change |
| IRR | - | Internal Rate of Return |
| LC | - | Local Council |
| LDC | - | Least Developed Countries |
| M & E | - | Monitoring and Evaluation |
| MIS | - | Management Information System |
| MW | - | Megawatts |
| NEMA | - | National Environment Management Authority |
| NGO | - | Non-Government Organisation(s) |
| NORAD | - | Norwegian Agency for Development |
| NPV | - | Net Present Value |
| PCF | - | Prototype Carbon Fund |
| PIP | - | Public Investment Plan |
| PV | - | Photovoltaic |
| SIDA | - | Swedish International Development Agency |
| UEB | - | Uganda Electricity Board |
| UIA | - | Uganda Investment Authority |
| UNDP | - | United Nations Development Programme |
| UNEP | - | United Nations Environment Programme |
| UPPPRE | - | Uganda Photovoltaic Pilot Project for Rural Electrification |
| WB | - | World Bank |
| WNHP | - | West Nile Hydro Power Project |

# 1. BACKGROUND

## 1.1 The Clean Development Mechanism

The Clean Development Mechanism **(**CDM) is one of the three mechanisms defined under the Kyoto Protocol to support attainment of the Kyoto targets by developed country Parties and to assist developing countries achieve sustainable development. The CDM has three main objectives:

- to assist non-Annex I Parties to achieve sustainable development;
- to assist Annex I Parties to meet part of their commitments under Article 3 of the Kyoto Protocol;
- to promote attainment of the objective of the Convention (through greenhouse gas (GHG) emission reduction or avoidance).

In Uganda, sustainable development and poverty eradication are on Government's core development plans. CDM projects must therefore contribute to poverty reduction and sustainable development. GHG emissions of most African country Parties, including Uganda, are relatively small and therefore would not normally attract CDM projects. There is need to be innovative in developing project portfolio (e.g. including bundling) and develop innovative, simple, flexible and effective CDM project approval procedures. This calls for building capacity to enable Uganda develop good projects, and an institutional framework for implementation of CDM projects. It is envisaged that developing country Parties like Uganda would eventually benefit by building capacity to formulate, implement, monitor and verify CDM projects. The objective of the present work is to assist Uganda build capacity to take advantage of this sustainable development opportunity.

Although the design and operational modalities of the CDM are under negotiation, the CDM is likely to be market-driven, because of the strong lobby by business groups. This makes the playing field uneven for most of the developing countries, particularly in Africa, countries because of their low level of emissions and weak private sectors. GHG emission reduction must therefore be viewed in a wider context. In this regard the concept of emission avoidance must be incorporated into the definition of GHG emission reduction.

## 1.2 The UNEP Funded CDM Study

The United Nations Environment Project (UNEP), through the UNEP Collaborating Centre on Energy and Environment (UCCEE), formulated a regional project to build such capacity in four African countries: The Gambia, Ghana, Uganda and Zimbabwe. The UCCEE and the Government of Uganda signed a Memorandum of Understanding to support the implementation of the project. The total sum for implementing the Ugandan project was US $50,000.00. The project began in March 2000 and was completed in June 2001.

## 1.3 Objectives of the Project

The specific objectives of this project in Uganda were:

- to build technical capacity between key and relevant institutions, including the private sector, which will play an important role in the implementation of the CDM;
- to raise the level of awareness of the public, Government institutions, NGOs and private sector, and identify specific strengths, weaknesses and needs of these institutions.

# 2. IMPLEMENTATION STRATEGY

## 2.1 Taskforce Approach

The primary objective of the CDM Study was to build technical capacity in key and relevant institutions in Uganda to enable early implementation of the CDM. In line with this objective the

task force[1] approach was adopted for implementing the project. This approach had been used in the GHG Inventory and Vulnerability and Adaptation Studies and proved successful and has various advantages over the consultant approach:

- the capacity of more persons is built;
- more institutions and therefore more sectors are included in the study;
- there is better input because of specialized skills;
- establishment of dialogue and improvement of coordination among the participating institutions;
- increased awareness on climate change and related problems.

## 2.2 Sectors Considered for the Study

The forestry, energy and transport sectors were identified as providing best opportunities for CDM projects. In addition to these sectors it was also thought that a task force on socio-economic aspects of potential CDM projects was necessary, because CDM projects must satisfy sustainable development criteria.

# 3. IMPLEMENTATION OF THE PROJECT: ACTIVITIES AND OUTPUTS

Although the signing of the project document was completed by early December 1999, the project activities did not commence until March 2000. However, the establishment of a supportive framework, such as project account, designation of Project Manager (from the climate change focal point) commenced in January 2000.

## 3.1 Designation of Task Force Members

Members of the four task forces were drawn from key and relevant institutions where GHG emission reduction potential is greatest. Initially each task force was limited to three technical officers. This number was later increased to four in the socio-economic sector to enable participation of the private sector. (Details of membership are given in Annex B.)

Members of the task forces were designated by their Permanent Secretaries or Heads of institutions, upon formal request from the Permanent Secretary of the Ministry of Water, Lands and Environment. Each task force identified a leader whose main task was to convene meetings of the task force and to ensure that each member fulfils their obligations.

## 3.2 Terms of Reference for the Task Forces

The Project Manager developed terms of reference (TOR) for the Task Forces and members of the task teams were consulted on the TOR through discussions in a meeting. The broad TOR include:

1. To review existing national development master plans and programmes in the study sectors and select 8 to 10 projects for the study.
2. To review the existing funding mechanisms (bilateral, multilateral, national, Global Environment Facility (GEF) and CDM).
3. To review and modify screening tools developed by the UCCEE and modify these tools to fit the Ugandan situation.
4. To screen the selected projects and classify them into categories of funding mechanisms.
5. To assess the technological, organisational, GHG emissions reduction and financial sustainable development viability (or benefits) of all the projects screened and classified under the alternative funding mechanisms.

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[1] With additional financing from the European Union and United Kingdom for CDM Study activities in Uganda, the number of officers in each task force is being expanded to include more members from private sector. In this project only one private sector member participated in the teams.

6. To review institutional and legal, if any, arrangements for the implementation of the Convention and CDM projects in Uganda and identify key and relevant institutions required for implementation of a CDM project.
7. To identify further technical and institutional capacity building needs and suggest ways of addressing them.
8. To develop CDM project implementation guidelines and approval procedures.
9. To present an interim report for discussion at the second national workshop before the final country report.

Note that the socio-economic team was responsible for the review and assessment of the identified projects from the other three teams in light of the sustainable development policies of the country.

## 3.3 Summary of Task Force Activities

Several meetings were held to familiarise the members of the task force on the capacity building CDM Study aspects and to raise their level of understanding of climate change, the Kyoto Protocol and the CDM in particular. This involved among others, literature-oriented approaches, discussions with the UCCEE programme leader, Mac Callaway, during a mission to Uganda from 7$^{th}$ to 12$^{th}$ May 2000. Members of the task forces have gained a relatively good understanding of the Convention and the CDM.

Each of the three sectoral teams was mandated with the task of identifying potential CDM projects, which involved undertaking GHG emissions and financial analysis of the projects. The initial stage of project identification selection required basic understanding of the CDM project characteristics. Preliminary selection of the projects was then done using UCCEE-designed screening criteria guidelines. Each team used this as a basis for drafting sector specific criteria for screening projects. Each of the task forces hence developed screening criteria for its sector. The fourth team was mandated with the task of designing the project sustainable development criteria and identifying alternative funding windows for proposed projects. The Government National Development Plan and relevant policy documents were studied to understand the emphasized national sectoral priorities, which would be central to sustainable development criteria.

The task forces produced progress reports and a final report of their work. It is on the basis of these reports, the training and policy workshops, that this report has been prepared. (The mitigation analyses for the selected sectoral projects are presented as Annex A.)

## 3.4 Stakeholders' Workshop

A CDM Stakeholders' Workshop was held in Kampala on 5-5 July 2000 with over fifty participants from a wide cross section (both private and public sectors). The main objectives of the workshop were to:

- raise level of awareness in climate change and investment opportunities under the CDM;
- seek views from the workshop participants on how best Uganda can prepare itself to benefit from the CDM; and
- solicit inputs on potential CDM opportunities in Uganda.

Several papers, including a paper on implementation framework, were presented and discussed in the workshop (refer to proceedings of the CDM national stakeholders' workshop). The following are the highlights of the realised and expected outputs of the workshop and project:

***Realised outputs***

- Raising the level of awareness in the private and public sector so that these institutions can take advantage of the opportunities in the CDM.
- Development of capacity to enable Uganda to participate effectively in the implementation of the CDM was recognized as a critical and important process.
- Recognition that enhancement and protection of natural resources such as forestry have multiple benefits.

***Expected outputs***

- Assisting the private sector and public institutions to develop bankable projects.
- Increased level of investment in Uganda and hence increased economic development leading to poverty reduction.
- Enhanced cooperation with the developed countries.
- Technology transfer.
- Employment opportunities through industrialisation.
- Avoiding emissions for a cleaner environment in future.

## 3.5 Mitigation Analysis Training Workshop

An in-country mitigation analysis training for two and half days (25-27 July 2000) was organized by the UCCEE for all the taskforce members. It was a successful hands-on session, which has enabled task force members to run test mitigation analyses for some of the selected projects. However, after completion of the training, members expressed a need for additional tutorial sessions while working on real projects, in order to gain confidence in their analyses.

## 3.6 Public Awareness and Policy Makers Workshop

In each of the project activities an element of public awareness was incorporated through media coverage. Although the Members of the task forces have gained reasonable understanding of CDM issues, a lot more work needs to be done focusing on the private sector and the NGO community to increase the potential for CDM financing.

Through the work of each task force, some level of awareness has been raised within the respective sectors. The activities and the outputs of the task forces are discussed in the subsequent sections. A workshop was held on 13 June 2001 to raise awareness on CDM among policy makers, mainly through presentation of the project report. The Minister of State of Water opened the workshop.

# 4. TRANSPORT SECTOR

## 4.1 Background

The transport sector in Uganda spans a number of ministries and institutions. The Ministry of Works, Housing and Communication (MOWHC), is the key Ministry responsible for the general policy framework for the transport sector in Uganda. The Ministry of Energy and Mineral Development is responsible for energy provision and utilization policy, while the Ministry of Finance, Planning and Economic Development is responsible for the taxation policy aspects of the sector. Until July 1998, development and maintenance of rural feeder roads has been the prerogative of the Ministry of Local Government, when operations shifted to the MOWHC. This fragmentation does not make it easy to develop a comprehensive and integrated policy for the transport sector.

The MOWHC managed 9,700 km of the roads prior to 1998, representing 10% of the total road network. The Ministry of Local Government was responsible for 24,326 km of the roads (26%) prior to 1998. In 1998, 24,000 km of the Ministry of Local Government's road network was transferred to MOWHC. The remaining 64% of the total road network is managed by local communities. It should be noted that most of the roads (if not all), were not designed to take the current load and therefore have deteriorated rather rapidly. This, coupled with poor maintenance, has led to higher fuel consumption.

Road, rail, water and air constitute the principal modes of transport in Uganda. Uganda is land-locked and its railway network is poor and inadequate, so that it relies on road transport as the main mode of transport for both goods and people. Mini-buses (Kamunyes) and taxicabs dominate passenger transport while pick-ups and light lorries dominate goods transport.

Kampala, the capital city, is the hub for political, economic, commercial, government and transport services. The city is experiencing rapid growth, and its population rose from 330,700 in 1969 to 775,000 in 1989. It is projected that with the estimated growth of 4.9% the population will reach 1.5

million by 2004. The city is approximately 176 $km^2$, and a significant proportion of the population resides in the outlying divisions of Makindye, Nakawa, Lubaga and Kawempe. Most of its people, and a lot more from surrounding Mpigi District, commute daily to and from the city centre as well as within the respective divisions.

The only mode of transport available for city movement is by road: by motorised transport, bicycles or pedestrian – the last two are, however, declining and being replaced by motorised transport. The main mode of city passenger transport is by minibuses (para-transit type), and supplemented by private cars and special hire cars (taxi cabs). The use of commercialised motorcycles (popularly known as *boda-boda*) is rapidly growing. Buses are more prominent on long distance routes for upcountry destinations.

Trucks of various capacities, motorcycles, bicycles, and pedestrians also ply the city roads in increasing numbers. It is estimated that there are approximately 200,000 vehicles in the country, as shown in Table 1, with a potential of additional 10,000 vehicles per year. Of this total, it is estimated that over 70% are located in Kampala and ply the city roads daily.

The growth rate of motor vehicles is high, as shown by Figure 1. It is to be noted that the growth rate is higher for small vehicles and motorcycles. The high growth rate coupled with narrow roads designed for low traffic is causing serious congestion in the city.

**Table 1: Recorded number of vehicles on the road (1991-1999)**

| *Year* | *Trucks* | *Pick ups & 4wds* | *Buses* | *M/buses S/wagon* | *Cars* | *M/cycles* | *Ag/ tractors* | *Others* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| 1991 | 7224 | 13000 | 342 | 4680 | 17804 | 5226 | 988 | 838 | **50,102** |
| 1992 | 7397 | 13791 | 382 | 5283 | 18998 | 6213 | 1222 | 981 | **54,267** |
| 1993 | 7554 | 15035 | 401 | 6489 | 20464 | 7646 | 1331 | 1080 | **60,000** |
| 1994 | 7957 | 17776 | 464 | 8809 | 24208 | 12142 | 1541 | 1150 | **74,047** |
| 1995 | 8531 | 22039 | 591 | 11158 | 28941 | 21988 | 1785 | 1179 | **96,212** |
| 1996 | 9189 | 27365 | 617 | 13261 | 35361 | 36994 | 2043 | 1386 | **126,216** |
| 1997 | 9850 | 33120 | 625 | 13400 | 42000 | 48000 | 2100 | 1400 | **150,495** |
| 1998 | 11451 | 37199 | 686 | 15143 | 46930 | 61044 | 2289 | 1424 | **176,166** |
| 1999 | 12801 | 41365 | 770 | 15272 | 48392 | 63769 | 2427 | 1448 | **186,244** |

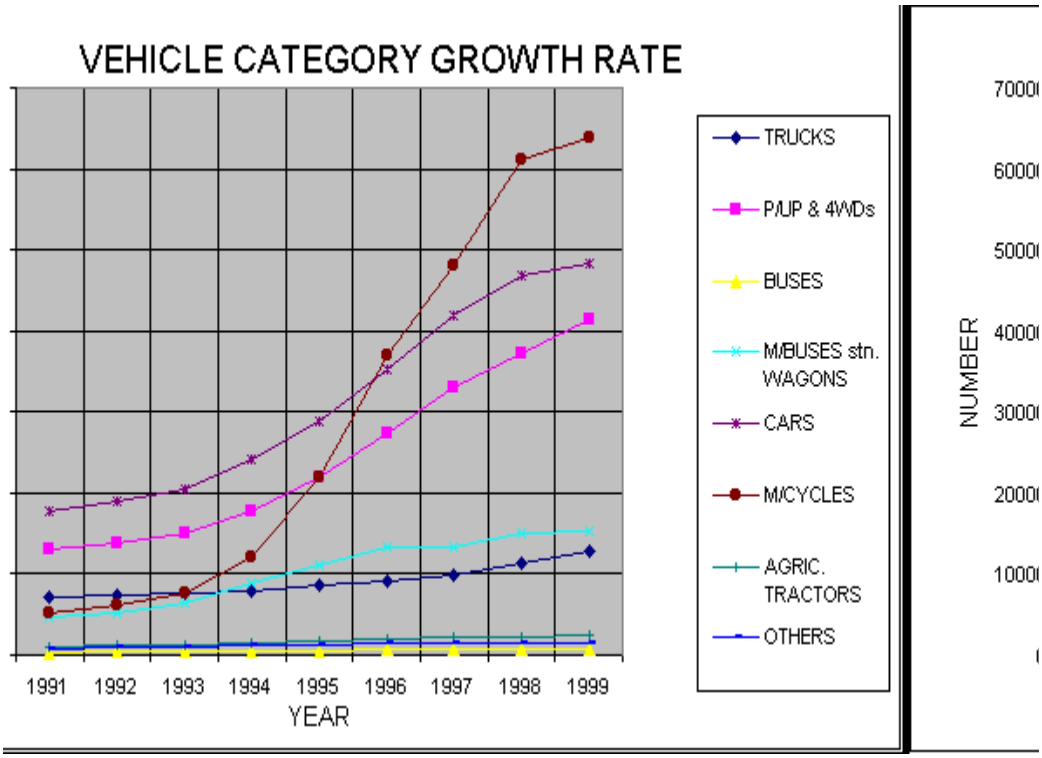


**Figure 1: Vehicle growth rate**

## 4.2 GHG Emissions in the Transport Sector

The transport sector accounts for 27% of the total global energy consumption and the consumption is increasing. Fossil fuels contribute about 25% of global carbon emissions. In Uganda the transport sector accounts for 75% of GHG emissions. The dominant transport mode in the region is road transport, which is responsible for the bulk of the emissions, as shown in Table 2. Mitigation options in Uganda should therefore focus on the transport and energy sectors.

The total fuel consumption in the sub-sectors of road, rail and air transport is represented by the sales of petroleum products. Figure 2 shows the consumption of petroleum products in the period 1985 to 1995. Although there was a decline in the period 1989 to 1992 the consumption trend increased from 1992 to 1995. This increase is consistent with the increase in the motor vehicle fleet. The increase in motor vehicles and in petroleum product consumption, coupled with increase in urban population, will have a negative impact on human health in the urban areas, particularly in Kampala.

Motor spirit dominates the petroleum product sales, as shown in Figure 3. The demand for transportation energy is continuously growing, in line with an expanding economy whose average growth rate is 7% per annum. GHG emissions will, therefore, continue to increase.

**Table 2: $CO_2$ emissions estimates in the transport sector**

| *Activity* | *Emissions from gasoline (Gg)* | *Emissions from gasoil (Gg)* |
|---|---|---|
| Total emissions[2] (All) | 263.66 | 269.15 |
| Road transport | 238.51 | 245.709 |
| Locomotives | 6.78 | N/A |
| Marine vessels | 6.97 | N/A |
| Motor boats | N/A | 7.980 |
| Piston aircrafts | N/A | 1.2058 |
| Thermal generator | 1.48 | N/A |

*Source: Greenhouse Gas Emissions in the Transport Sector, Uganda; Magezi S.A.K., February 1998*

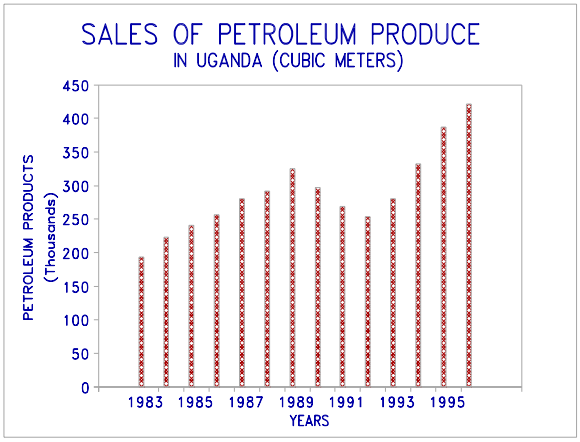


**Figure 2: Consumption of petroleum products**

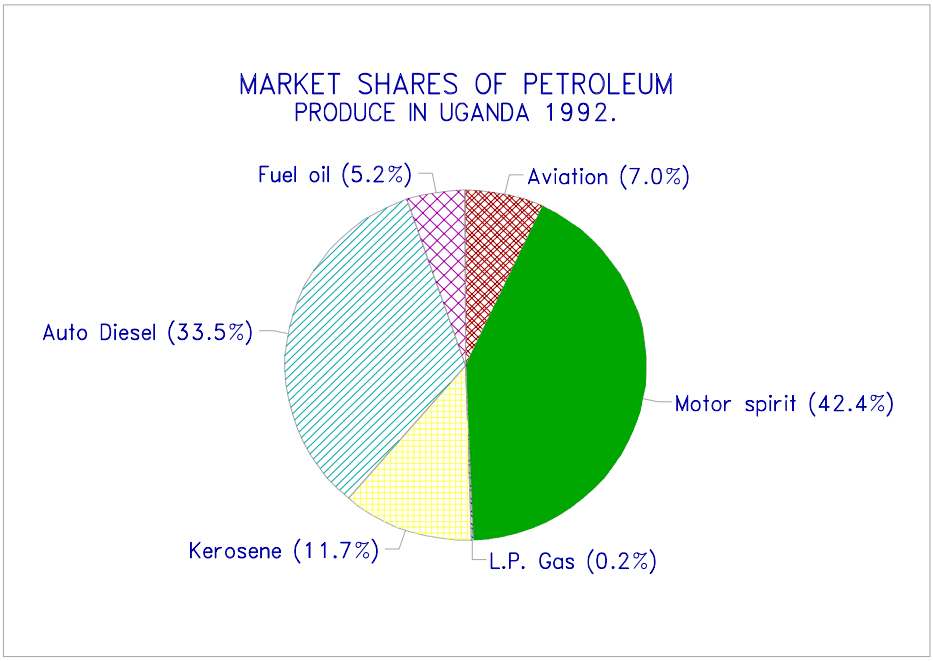


**Figure 3: Sales of petroleum products in Uganda in $m^3$**

The market share is dominated by motor spirit, which was 42.4% in 1992, followed by auto diesel, (33.5%) and kerosene (11.7%). The least-used petroleum product is liquefied petroleum gas (LPG). In 1996, motor spirit was 43% followed by auto-diesel at 29.8% and kerosene at 11.0%. The sale of

[2] Top-down method was used to estimate total emissions, while bottom-up approach was used for the rest.

motor spirit and auto diesel grew steadily between 1983 and 1989 at an average rate of 9% per annum, and then started declining from 1989 to 1992. They grew significantly, at average rates of 19.8% and 20.2% respectively, between 1993 and 1995 (Statistics Department, 1997). The other petroleum products showed no significant growth or decline over the same period. A key characteristic of the energy sector is the large expenditure of export earnings on petroleum imports, most of which is used in transportation.

## 4.3 Policy

Government's medium-term transport sector policy aims at promoting efficient transport services as a means of providing effective support to increased agricultural and industrial production, trade, tourism, social and administrative services. An efficient transport sector plays a critical role in the development of an integrated and self-sustaining economy, enhancing Government strategies for the eradication of poverty and economic integration of the country. Among others, the following objectives are to be met:

a) decrease of congestion through provision of adequate road capacity; (de-congesting of Kampala by modelling of some of the major junctions, by installing traffic lights at some junctions, and by designing and constructing by-passes);

b) improvement of the capacity of local governments to manage district and urban road networks;

c) road safety improvement and mitigation of negative impacts to the environment;

d) competitive private sector participation in the provision of transport services;

e) inter-model transportation and interface.

The task force also reviewed the transport sector policy developed by the MOWHC and noted the absence of climate change elements in the policy. This is to be expected, because climate change concerns are relatively new and have not been incorporated in national sectoral policies

## 4.4 Legal Frameworks

For investment in the road transport sector the following legislation applies:

***The Traffic and Road Safety Act, 1998.***

The Traffic and Road Safety Act, 1998 provides a legal framework to consolidate and amend the law relating to road traffic. The Act, among other things, provides for the establishment of the National Road Safety Council and Transport Licensing Board, for revising the penalties prescribed in relation to the road traffic offences, and for other purposes connected with road traffic and road safety.

The Act provides for procedures for obtaining operators' licences for omnibuses under Section 73 Sub-section 2 and 3, which provides that any person who wishes to carry passengers for hire or reward over such routes not being fixed and at such rates as may be agreed upon by that person and the passengers shall apply to the board in the prescribed form accompanied by the prescribed fee for a contract omnibus operator's licence. Section 73 Sub-section 3 provides that an applicant for any class of an omnibus operator's licence shall comply with any matters that may be prescribed and any other forms shall accompany the application or documents as may be prescribed. Further to the above, the Act provides for omnibus and country taxicab operator's licences under section 74.

***Sub-section 1***

Subject to the provision of this Act, a public omnibus and a country taxicab operator's licence shall authorise the holder of the licence:

a) To run service for the carriage of passengers over such fixed route(s) as the Board may direct,

b) To run a scheduled service over such routes at such frequency and regularity as the Board may direct,

c) To incorporate such intermediate stops on any route as the Board may direct.

***Sub section 2***
A private omnibus operator's licence shall authorise the holder of the licence to run an omnibus for the carriage of passengers subject to the condition specified in the licence.

***Sub-section 3***
A contract omnibus operator's licence shall authorise the holder of the licence:

a) To contract with any person or group of persons to carry passengers between such places as the Board may direct.

b) To charge such fixed amount for the hire of omnibus to carry passengers between different places as the Board may direct.

## 4.5 Consultations with Key Stake Holders

Consultations were made with the following organisations/associations:

- Uganda Tax Operators and Drivers' Association (UTODA);
- Uganda Bus Operators' Association (UBOA);
- Kampala City Council (KCC);
- Free line taxi operators;
- Passengers on board.

The general advice advanced from the stakeholders was the gradual introduction of the big bus to replace the taxicabs.

## 4.6 Studies Already Carried out in the Sector

Only a few relevant studies could be identified as having been carried out in the country. They include the following:

- Inland Water Transport Ministry of Works Study: This was background material for the transport and communication, 1995 consultancy.
- An Inventory of Sources and Sinks of Greenhouse Gases in Uganda, by the Ministry of Natural Resources.
- An Assessment of African Policy Options and Responses – Uganda country report. This was an assessment of the policy options to implement the UNFCCC in Uganda in 1994.
- Transport Policy and Planning Project Road and Rail Cost Recovery. This was a comprehensive inventory of the motor vehicle fleet in Uganda (1994) as well as fuel consumption characteristics.
- Green House Gas Emission in the Transport Sector in Uganda. This was a study detailing the possible response options for the implementation of the UNFCCC in Uganda (1998).
- The Kampala Urban Study

## 4.7 Potential Projects for CDM in the Transport Sector

The Task Force reviewed projects in the transport sector, out of which the Kampala City Traffic Flow Improvement Project was selected for detailed analysis (Annex-A). The analysis indicated that the project is financially viable without CDM consideration. The CDM would therefore make it more attractive to investors. The design of this project would need to take into full consideration the social benefits/losses in the shifting from kamunyes to buses in Kampala. Owners of the kamunyes are critical to the success of implementing the project.

***Proposals***
Seven proposals were initially identified from the Ministry of Works, Housing and Communications (MOWHC) and the Ministry of Finance, Planning and Economic Development (MOFPED). These are:

- road maintenance in Eastern Uganda;

- rehabilitation and maintenance of rural feeder roads;
- improvement of ferry and ferry landings;
- southwest road maintenance;
- maintenance of gravel roads in Western Uganda;
- Kampala city traffic flow in Uganda.

The taskforce has also reviewed the Kampala Urban Study and identified suitable projects aimed at reducing traffic congestion in Kampala City. These include:

- improvement of intersections;
- by pass routes;
- provision of one way streets; and
- establishment of a traffic management unit with parking section

## 4.8 Selection Criteria

The main source of manmade GHG emissions in Uganda is the transport sector through the combustion of petroleum fuels. Most of the imported petroleum fuel goes to the transport sector. The CDM project should target reducing the GHG emissions. The following steps were part of the selection criteria:

- The selected project should be sustainable.
- The project should be environmentally sound, economically viable, socially equitable, and financially viable.
- Selected indicators included the cost-benefit ratio, government priority programme, and actual level of GHG reduction.

## 4.9 Mitigation Options

There are two main mitigation options: transport management, and improved vehicle standards. Transport management could take various forms including:

- shifting from kamunyes to larger capacity transport such as buses;
- switching from road to rail using trams;
- improving traffic flow in the major cities, particularly Kampala, through redesigning roads, including road junctions within the cities, and introducing traffic lights.

# 5. ENERGY SECTOR

## 5.1 Background and Policy

The Ministry of Energy is the key ministry responsible for the general policy framework for energy. The Ministry of Finance, Planning and Economic Development is responsible for taxation elements. The role of the Ministry of Water, Lands and Environment in energy issues is bound to grow because of its environmental concerns, particularly in the climate change aspects. Energy, like transport, spans a number of ministries; hence the need for close coordination and collaboration in the implementation of energy-related policies.

Uganda's per capita commercial energy consumption is relatively small. However, if Uganda is to develop then its energy consumption will have to increase substantially. The economic growth in the last few years has witnessed significant increase in the consumption of petroleum products.

Uganda has an enormous potential for renewable energy (solar, hydro, wind and thermal). Despite this, very little of it has been exploited – mainly in hydropower, while the other sources remain relatively unexploited.

Uganda depends heavily on imported petroleum products for its energy needs, and they consume a large portion of Uganda's foreign exchange earnings. There is small installed hydropower capacity

operated by the Uganda Electricity Board (UEB). Despite the huge expenditure on petroleum products very little of it is used in power generation. The bulk of the petroleum products is used in the transport industry. However, the use of petroleum products in power generation is increasing, particularly in those areas not connected to the national grid. Individuals or private institutions to fill the power gap operate a large number of the diesel generators. Such operations do not optimise the generators because their full capacities are rarely utilised.

The Government of Uganda has committed itself to eradicate poverty and has developed the Poverty Eradication Action Plan (PEAP). Several programmes have been developed by ministries to support the PEAP. In response to the needs of PEAP, the Ministry of Energy and Mineral Development has developed a comprehensive energy policy and a rural electrification strategy. It is expected that an electrification master plan will be developed in the near future.

The main policy goal in the energy sector is to meet the energy needs of the population and of the economic and social sectors through a diverse range of strategies aimed at supporting the goals of social equity, rural, industrial development and environmental sustainability on a long-term basis. The overall policy objectives are:

- to improve the quality and quantity of energy supply through appropriate sector reforms and establishment of enabling legislation;
- the promotion of efficient utilisation of energy resources;
- the execution of rural electrification programmes;
- the promotion of private sector participation in the development of both conventional and renewable energy resources; and
- maximization of power export opportunities to the neighbouring countries once the internal demand has been adequately met.

The power sector has been monopolized by the parastatal UEB. In order to achieve the policy goals and be consistent with government goals on the liberalisation of the economy, Government passed the Electricity Act of 1999 to govern investment and regulate investors in the power sector. The main elements of the Act are to:

- develop a legal framework for operations in the power sector;
- remove monopoly from UEB by establishing the generation, transmission, distribution entities;
- promote private sector participation in the power industry;
- establish the Electricity Regulatory Authority, ERA;
- provide for a comprehensive rural electrification strategy.

The ERA has already been instituted, and a Chairman and five Commissioners were appointed in May 2000. The UEB has now been unbundled into Uganda Electricity Generation, Uganda Electricity Distribution and Uganda Electricity Transmission companies.

Other relevant legal frameworks include:

- ***The National Management Environment Statute No. 4/95***

This gives the framework for all environmental issues in the country. Developments of big projects, which have potential environmental impacts, require an environmental impact assessment (EIA) to be conducted. A list of projects or activities which require EIA are listed in the NEMA guidelines.

- ***The Water Statute No. 9/93***

All developments which require abstraction of water need to have permits issued by the Water Development Directorate.

- ***The Land Act No. 16/98***

Land in Uganda belongs to the people. The Land Act provides for the acquisition of land for development activities.

- ***The Investment Code, 1991***

The Investment Code details the incentives due to investors.

The broad policy objectives are summarised in the matrix shown in Table 3.

**Table 3: Policy objectives matrix**

| *Policy* | *Objective* | *Strategy* | *Remarks* |
|---|---|---|---|
| 1. Establish energy resources potential and consumption in the country. | To widen the base of exploited energy resources including renewable e.g. mini and micro hydros, solar, wind, geothermal and crop residues. | Prepare a database on all available energy resources and the consumption patterns and package for development.<br>Build local capacity to assess and evaluate energy resources.<br>Promote to the private sector for development. | |
| 2. Increase access to affordable and reliable energy services. | Contribute to poverty eradication.<br>Stimulate productive capacity and therefore enhance socio-economic development. | Transform the utility (UEB) into commercially viable entity through reforms geared towards promotion of efficient services and increase of financial viability.<br>Promotion of private sector participation to increase generation capacity.<br>Put in place a conducive environment to accelerate rural electrification.<br>Apply smart subsidies on capital investment.<br>Apply light-handed regulation.<br>Have differentiated tariffs for different areas to reflect investment costs.<br>Formulate guidelines on organising rural communities to enable them to access better provision of energy services.<br>Intensify provision of consumer information, education and technical advice in the use and conservation of energy.<br>Work with financial institutions to establish sustainable financing mechanisms for energy programmes. | |
| 3. Maximise electricity exports to the region after satisfying local needs. | To earn foreign exchange.<br>To address trade balance issues.<br>To address issues of regional co-operation. | Bi-lateral discussions between Kenya, Tanzania, Rwanda and Uganda under way.<br>Participation in east African Co-operation meetings. | Bankable export sales agreements envisaged. |
| 4.Improve energy governance and administration. | To have the Energy Sector operate efficiently and play its role in the social and economic development of the country. | Clarify the roles and functions of the various institutions involved in the energy sector<br>Create a transparent legal and regulatory framework.<br>Build capacity at the national and local levels for better formulation and implementation of energy policies and programs.<br>Involve all stakeholders in the formulation of policies in the energy sector. | Electricity Act, 1999 in place. |
| 5. Manage energy-related environmental impacts. | To ensure sustainable development.<br>Ameliorate the negative health impacts arising from the use of wood fuels and the impact on forests. | Promote the use of alternative energy resources and technologies.<br>Sensitise energy suppliers and users about energy related environmental issues.<br>Work towards the establishment and acceptance of broad targets for reduction of energy related emissions that are harmful to the environment.<br>Promote efficient utilisation of energy resources.<br>Strengthen the environment-monitoring unit in the energy sector. | |

## 5.2 GHG Emissions in the Energy Sector

The total capacity of UEB-generated electricity (183.4MW) has remained constant in the period 1995 to 2001. Hydropower generation accounts for 180MW of the total capacity while diesel generation accounts for about 3.4MW. The total capacity is expected to increase to 263.4 MW by the year 2006. The demand for electricity has been increasing, however, particularly in the rural areas., and this is met by private diesel generation. Surveys conducted by the World Bank's Energy for Rural Transformation team found that there are currently over 180 independent diesel generator sets and a further 42 medium-to-large diesel grain mills, with a total installed capacity of about 2.86 MW. This brings the known total of diesel-generated electricity to 6.26MW. This is likely to increase since UEB or other private sector cannot meet the demand for electricity. GHG emissions are mainly from diesel used for generating the electricity, and petroleum products used to transport the diesel.

## 5.3 Some Studies Already Conducted in the Energy Sector

The studies outlined below are some of those which have been conducted in the energy sector.

- Hydro power development master plan; by Kennedy & Donkin.
- Optimisation study; by Electricité de France.
- Hydrology of the River Nile.
- Load forecast.
- Uganda: Rural electrification strategy study – ESMAP, 1999.
- Uganda energy assessment – ESMAP, 1996.
- National electrification planning study – Electricité de France International; 1992.
- Evaluation of small hydropower sites in the range of 0.5 MW – 50 MW.

No national study has been done to determine the quantity of petroleum products used for electricity generation. However, the study in West Nile conducted for the Prototype Carbon Fund Project does indicate an increase in the use of diesel for generating electricity. It is expected that GHG emissions from electricity generation will increase on two counts:

- demand for electricity from areas not connected to national grid; and
- liberalization of the power sector could attract independent power producers who are likely to use diesel to generate electricity for affluent customers in areas not connected to grid.

## 5.4 Mitigation Options

The task force reviewed studies done in the energy sector and power projects within the sector.

***Selected projects for analysis***

Initially the group identified 25 projects out of which the following projects were selected for analysis and determining where they fall in terms of the different funding mechanisms. These were selected basing on the sectoral policy priorities and the national core drivers for the CDM and were categorised into three.

- ***Solar energy projects***
  - Uganda photovoltaic pilot project for rural electrification (UPPPRE)
  - Energy demonstration centers
  - Bridges of light
- ***Small hydro power projects***
  - Paidha mini hydro project
  - Olewa micro hydro project
  - Ishasha mini hydro project

- ***Energy efficiency projects***
  - Ethanol production project
  - Sustainable energy use in house holds and industry
  - Kakira sugar works co- generation project

Members of the task force analysed two projects (the Paidha mini hydro project and the Photovoltaic pilot project) considering both the baseline and mitigation cases. (See Annex for the detailed analyses.)

The West Nile Region comprises the districts of Nebbi, Arua, Yumbe, Moyo and Adjumani. The Uganda Bureau of Statistics estimates the population of the region to be 1,498,100 in 2000 and projected to be 1,684,000 by 2005. The region has a high economic potential which is inhibited by poor infrastructure including electricity. The West Nile hydropower project (WNHP) is limited to some parts of the districts of Nebbi and Arua.

The UEB operates five diesel generators in the project area, providing a total capacity of 776KW. Four of the diesel generators are installed in Arua. The UEB power supply is erratic, limited in quantity and time coverage (only available between 7-11 p.m.). The current capacity is not adequate to meet the estimated demand of about 3.5MW.

Surveys conducted by the World Bank's ERT team found that there are currently over 180 independent diesel generator sets and a further 42 medium-to-large diesel grain mills, with a total installed capacity of about 2.86 MW, generating over 7.65 GWh per year. It is estimated that West Nile's urban consumers spend over $6.5 million per year on petroleum fuels for lighting and power. This high expenditure could be significantly reduced, resulting in both economic and environmental gains, if renewable energy is used. The WNHP aims to provide the solution to this high cost of electricity. It will comprise the following:

- Construction and operation of two small hydropower facilities at Nyagak and Olewa by a private entity to be selected through competitive bidding.
- Selling of UEB assets in the area.
- Construction of transmission line from Nebbi to Arua.
- Upgrading the existing grid.

Small hydropower plants are expensive and would not be attractive to private investors. It is also necessary to bring the high tariffs of small hydropower plants down to affordable levels. This therefore calls for an innovative financial engineering to make small hydropower projects attractive to potential private investors. Government wishes to take advantage of climate change opportunities such as the CDM or the World Bank Prototype Carbon Fund (PCF) to complement financing of the WNHP.

The Nyagak hydropower of 5.1MW will be developed in the first phase while the Olewa hydropower of 1.5MW in the second phase of the project. The total project cost is about US$16.5 million.

The existing baseline is diesel. Table 4 shows $CO_2$ emissions in the baseline case for the year 2000 and projections for 2012 and 2021 as well as aggregates for the period 2002-12 and for the assumed 20-year project lifetime taken as 2001-21. Since hydropower is a $CO_2$-free energy source, emissions in the baseline case are equal to direct emission reductions achieved by the project.

The detailed analysis indicates the project is not attractive without CDM or PCF financing because of the relatively high capital costs of "small" renewable energy plants. The World Bank PCF has indicated interest in this project and reasonable progress has been made in advancing the its implementation.

**Table 4: Emissions and emission reductions for selected years and periods**

| | *2000* | *2012* | *2021* | *2002-2012* | *2001-2021* |
|---|---|---|---|---|---|
| KWh generated/yr | 8,456,020 | 62,265,502 | 177,214,746 | | |
| Total petroleum fuel for gensets & engines in tons | 4,407.9 | 31,008.2 | 88,252.9 | | |
| Total petroleum fuel used for West Nile Power | 5,991.0 | 31,008.2 | 101,722.1 | | |
| Annual fuel combustion TJ/yr | 259.6 | 1,343.6 | 3,824.0 | | |
| Carbon emissions (tC) | 5,244 | 27,140 | 77,245 | | |
| Combustion efficiency of diesel | 0.99 | 0.99 | 0.99 | | |
| Adjusted carbon emissions (tC/yr) | 5,191 | 26,869 | 76,472 | | |
| Cumulative adjusted carbon emissions (tC) | | | | 178,592 | 631,253 |

At present Uganda has a population of about 22.2 million. According to the Households Survey 1999/2000, the total number of households in Uganda has increased from 3.4 million to an estimated 4.2 million in the last decade. About 16%, or 0.7 million, of households are in the urban areas while 84%, or 3.5 million, households are in the rural areas. ('Urban' is used for settlements with over 1,000 households.) The average size of the household in Uganda is 5.2: 4.4 in urban areas, and about 5.4 in rural areas. Households with a monthly income above Ushs 200,000 are 38% in the urban areas, but this drops to 15% in the rural areas. This implies that over half a million households earn over 2.4 million shillings annually.

## 5.5 The Sources of Energy for Lighting

It is estimated that 80% of the rural areas use tadooba (locally made wick lamp), 11% use kerosene/lantern and about 1% use electricity. Other sources of lighting (solar, genset, candle and firewood) contribute about 8% of the total energy needs for the rural areas. In the urban areas, 19% use tadooba, 30% use kerosene/lantern and about 40% use electricity.

## 5.6 Assumptions

A typical high-income household earning over 2.4 million shillings per year in the rural areas will have one tadooba, one small kerosene lamp and one standard kerosene lamp. In peri-urban and urban setting a similar household can have one small kerosene lantern and two standard kerosene lanterns. The fuel consumption of these lighting sources was measured in the laboratory. It is assumed that lamps were used for about 3-4 hours a day. Table 5 shows that the larger the lamp, the higher the consumption. Since the people with higher income will be the target group, it implies that with appropriate assistance the solar modules can find a market.

**Table 5: Fuel consumption for different sources**

| *Light Source* | *Rate of Fuel Consumption* | | *Time of Usage (hours a day)* |
|---|---|---|---|
| | *Grams per hour* | *Litres per year* | |
| Tadooba | 5.24 | 4.78 | 2 |
| Small kerosene lamp | 14.34 | 19.63 | 3 |
| Standard kerosene lamp | 18.36 | 33.51 | 4 |

**Table 6: Typical household number of appliances and their kerosene consumption**

| | *Rural* | | *Urban* | | *Total* |
|---|---|---|---|---|---|
| | *No.* | *Litres/year* | *No.* | *Litres/year* | *Average* |
| Tadooba | 1 | 4.78 | | | |
| Small kerosene lamp | 1 | 19.63 | 1 | 19.63 | |
| Standard kerosene lamp | 2 | 67.03 | 3 | 100.53 | |
| Total | 4 | 91.43 | 4 | 120.12 | 105.80 |

Table 6 illustrates that the use of tadooba is widespread in the rural areas. The lowest income groups use the least amount of kerosene per household per annum. It was estimated that the average consumption per household is 105.80 litres per annum, weighing about 84.64 kg.

## 5.7 Priority

It is a priority of the government to increase the access to electricity in the rural areas from the present 1% to about 10% in the next ten years. The government offers subsidy of about 30% to attract investors in PV systems.

## 5.8 The Base Case

The use of kerosene is widespread both in the urban and the rural areas. This is due to the fact that the level of electrification is still very low. Rural areas are targeted. We assume that, as the income of the rural population increases, the higher is the possibility of acquiring a PV system.

The consumption of the kerosene in the base case is about 79,223 tonnes over the 13 years of the life of the project period as shown in Table 1 in the Appendix.

The assumptions are:

- The areas under consideration will not be receiving other forms of electric energy for lighting other than PV.
- The consumption patterns remain the same, but with slight increase during the project period.
- The service providers, i.e. the private sector, and other stakeholders will co-operate to ensure that the aims and goals of the project are met. There will be lending institutions that will assist both the private sector and the public towards achievement of the goals of the project.
- The cost of fuel will remain stable and at constant prices. There will neither be a dramatic decrease nor an increase in kerosene prices.
- The electricity generated will be basically for household and lighting use only.
- The running cost and maintenance of the PV system will be borne by the user of the system. There will be free advice from the Government and other institutions to assist the consumer if need be.

The installation will be slow at the beginning and pick up towards the end. By that time the population would have gained confidence in the system and the financial institutions may open a window for soft loans if backed by the government.

## 5.9 In the CDM Case

The firms operating the CDM over the entire life of the project will switch the households from the use of kerosene to PV systems. That means there will be reduction in the use of kerosene and reductions in the emission of $CO_2$. In the CDM case the kerosene consumption is 50593.6 tonnes as show in Table 2 in the Appendix. The reduction from the base case is 79,223 - 50593.6 = 28,629.4 tonnes of kerosene. During the lifetime of this project, at least 72,000 solar panels would have displaced kerosene as light provider.

## 5.10 Emission Reduction

It is important to estimate the amount of GHG that will be emitted in the base case. The calculation was done using the generic equations.

Kerosene consumption for households is given in Tables 5 and 6.

GHG emissions = activity * emission factor (1)

On average the household uses 105 litres of kerosene per year.

Emission of $CO_2$ from households using kerosene.

$CO_2$ emissions = number of litres of kerosene (l) *IPCC emission factors (tC/TJ) * conversion factor for C to $CO_2$ ($CO_2$/C) * calorific value per litre (TJ/l)

IPCC emission values * conversion factors: 19.6 kg(C/GJ)*44/12 = 71.867 kg $CO_2$ /GJ

Caloric value* density: 43.5 (GJ/t)* 0.8 (t/$m^3$) = 34.8 (GJ/ $m^3$) kg $CO_2$ /GJ* GJ/ $m^3$ :

34.8 (GJ/ $m^3$) * 71.867 kg $CO_2$ /GJ = 2500.9716 kg $CO_2$ / $m^3$

Emission from 100 litres of kerosene is: 2500.9716 kg $CO_2$ / $m^3$ * 100/1000 = 250.9716 kg $CO_2$ / l

Emission per litre of kerosene is 2.5 kg $CO_2$ / l. The standard value for the emissions taken is 2.8 kg $CO_2$ per litre. The target group in this study are the households with income more that 2.4 million shillings per annum. Their average consumption is 105 litres of kerosene per annum.

The emissions from the household 105 (l/ (household* per annum)) * 2.8 kg ($CO_2$ / l) = 294 kg $CO_2$ /(household* per annum)

## 5.11 Calculating Project Net Returns

All the components of the good PV systems are imported. There is a local battery production but the efficiency is not as high as the imported. In order to encourage private firms to participate in the electrification programme, the government will introduce a subsidy of about 30%. It is assumed that the household will be equipped with one 50 W PV system.

| | |
|---|---|
| Panel (polycrystalline) | 500 |
| Charge Controller | 70 |
| Battery (five year life time) | 300 |
| Installation costs | 150 |
| **Total** | **1020** |

If the government made a subsidy of 30% per system, then the unit cost of the systems will be reduced to US$714 from US$1020. The total cost of the system during the project period would be US$51,408,000 as illustrated in Table 6 in the appendix.

The present value of the cost of PV assuming at a discount rate of 10% is US$22,067,388. If the discount rates were increased to 20%, the present value would be US$11,006,153 as illustrated in Table 7 in the Appendix.

The future price of certified emission reductions (CERs) is not fixed as yet. The maximum can be assumed to be US$50. The lowest is about US$15. Assuming that the value of CERs is US$50 and the discount rates were 20%, the present value of the CERs from the project would be US$864,973. But if the value of CERs is US$15 and the discount rates were 20%, the present value of the CERs from the project would be US$259,491.8. The details of the calculations are illustrated in Table 8 in the appendix.

# 6. FORESTRY SECTOR

## 6.1 Background and Policy

Forests are of immense value to the Ugandan economy and the welfare of the Ugandan people. Forests provide a wide range of resources in addition to enhancing conservation of natural resources such as the ecosystem (including biodiversity), the environment, agriculture and balancing the carbon cycle. In Uganda fuelwood accounts for about 95% of the energy needs. This use must be

balanced with supply so as to perpetuate its use for present and future generation. In this context a general policy framework must be put in place for sustainable management of forests.

The Department of Forestry, under the Ministry of Water, Lands and Environment (MWLE) is responsible for development of forestry policy and legislation. Policy on forestry spans across the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). Development of forestry policy therefore requires close coordination and collaboration with the MAAIF.

The following broad policy objectives guide investment in the forestry sector:

- Uganda's forests shall be owned as a national asset and heritage and managed to enhance mutual respect and dignity of all its' people irrespective of culture and social group status or gender.
- A permanent forest estate shall be maintained.
- All forests and tree resources shall be managed to yield a sustainable stream of social, economic and ecological goods and services.
- A competitive value-added forest-based industry in which there will be progressive reduction of the dominance of primary production and artisanal wood-based products shall be promoted.
- Capacity at all levels of governance and for all interested parties to develop and manage the forestry sector shall be enhanced.
- Urban and peri-urban forestry initiatives shall be promoted throughout Uganda to secure economic, environmental, aesthetic and social benefits for the affected people.
- On-farm tree growing by individuals, households, communities and organisations shall be promoted in all farming systems to boost land productivity, increase income and improve food security.

The Forestry Department has also identified priority actions to ensure sustainable management of forests in Uganda and to reduce the rate of deforestation. The priority actions include the following:

- reduce the rate of deforestation;
- protect forest outside gazetted forests;
- increase the area under tree cover through afforestation and reforestation;
- promote private investment in the forestry sector;
- conservation of biological diversity;
- reforestation of degraded land;
- protection of bare hills, riverbanks and water-sheds;
- promote collaborative forest management;
- promote peri-urban forestry.

A national forest action plan, which aims at identifying the role of various stakeholders and appropriate strategies to achieve forest policy goals, is under development.

## 6.2 Guidelines for Investment in Forest Reserves

Due to the increasing demand for investment in forest reserves, the Forest Department prepared the following guidelines, applicable to investors in areas where the Forest Act 1964 provides for licenses and permits. The guidelines can be used with a wide range of investments including tree farming, harvesting, conversion and non-consumptive use of forest reserves. A permit or licence may be issued by the Forest Department on careful consideration of the following:

a) The capacity of the investor will be assessed on the basis of:

- Company/Association Registration Certificates, Company Profiles and/or Articles of Association/Constitution.
- Comments of the LC3, LC5 and DFO of the relevant district in which the forest reserve is located. Applicants will be required to route their application papers through them.

- An operational plan detailing activities in the short and long term, capital inputs, environmental/social considerations. Documents to be analysed include costed activity schedules, business plan, environmental impact assessment report and social impact assessment report.
- Evidence of funding and capital outlay over time and areas to be progressively utilised.
- Competency in respect of socio-economic and technical aspects of the operational plan. This will normally be reflected in the CVs of the leadership and employees of the organisation or individual.

b) The ethical reliability of the investor will be assessed on the basis of:

- Comments of the referees, which the applicant will be required to include in their application letter. The FD can request for these comments if it wishes.
- Comments of the LC3, LC 5 and DFO of the relevant district.
- Detailed description of the past and current engagements of the organisation or individual. The FD will carry out investigations to validate the ethical authenticity of the investor and past track record.

c) Technology used by the investor will be assessed based on the following:

- Ecological, economical and social sustainability.
- Promotion of professionally acceptable standards.
- Commensurate with the abilities of the national human resource. If this is not possible, then a comprehensive training programme may be required as part of the investment programme.

d) Fees and other charges payable will be calculated according to average prevailing market prices and published in the manner appropriate. However, lower fees/charges may be considered in the interest of boosting communities, households or CBOs with limited funding opportunities.

e) Once the permit is granted, the permit holder in accordance with the forest Department Management Plan will manage the area permitted. The operational plan in (1) above should harmonise into the FD management plan. Where the investor applies for the whole reserve, the FD may require them to prepare the management plan, which, nevertheless, will require approval by the FD before it is adopted.

f) The additional conditions on the permit will spell out minimum technical, environmental and social standards to be maintained by the investor. The conditions will also clearly describe sanctions and rewards due for poor or exemplary performance, respectively. The Forest Department will prepare and publish minimum standards for investments in:

- Management of natural forests including woodlands.
- Establishment and management of timber, pole and fuel plantations
- Harvesting and conversion of timber and other products from all types of forests.
- Equipment to be used in the above.
- The permits will clearly spell out milestones, which the investor must reach during the permit life in order for the permit to continue being valid.

These guidelines may be modified for forest edge communities, forest villages and forest dwellers to enable them get full developmental benefits from the forest.

## 6.3 GHG Emissions in the Forestry Sector

The Forestry Sector is both a source and a sink for GHGs. Indeed many countries are arguing that increasing forest cover should be a major activity for meeting commitments under the Kyoto Protocol. As stated earlier, 95% of the energy needs is met by the forestry sector. Combustion of this energy is a source of GHG emissions. In addition to use of wood for energy, deforestation rate is increasing due to extraction of wood for other purposes. Deforestation leads to GHG emissions.

Reforestation and afforestation activities lead to absorption of GHGs and thus contribute to the removal of GHGs in the atmosphere. However, these cannot be used as the principal way to abate GHG emissions. The long-term solution to the concentration of GHGs in the atmosphere is reduction of fossil fuel consumption and development of better and cleaner technologies. Nevertheless, it must be recognized that selective forestry activities under the CDM can provide a win-win situation because such activities provide both environmental and socio-economic benefits to communities.

## 6.4 Proposed CDM Screening Criteria for Forestry Projects

In addition to a conventional EIA, a good CDM project for Uganda should meet the following criteria:

***Political:***

- Meet national development objectives and enhance sustainable development.
- Contribute to poverty eradication.
- Contribute to modernization of agriculture.
- Attract private sector involvement.
- Must conform to the Ugandan laws and regulations such as taxation and Immigration laws; and carbon trading (once the law is enacted).
- Approval by both the host and the investor home country until international standards are agreed upon.

***Socio-economic:***

- Attract support from the local community, local authorities.
- Financial viability.
- Transfer of appropriate, affordable, environmentally sound and sustainable technology.
- Capacity building.
- Reduction of GHG emissions as an added or secondary benefit.
- Modalities for sharing CERU revenues agreed upon between local and external investor.

***Environmental:***

- In conformity with the Uganda Forestry policy guiding principles.
- Fit within the NEMA sustainability criteria for plan and project formulation.
- Meet established Forest Stewardship Council (FSC) principles.

***Technical:***

- Credible methodologies for baseline, emissions reductions, additionality and monitoring.
- The regulatory requirements of the project are manageable under the current practices, laws and regulations.
- Reliable CERUs that will pass certification and validation.

***Organizational:***

- Credibility of the enterprise.
- Quality of the business plans.

***Project Size:***

- Small enough to prevent a monopoly.
- The magnitude of emissions reductions.
    - Emissions reductions should be large enough to attract investors.
    - Bundling of small projects so as to generate reasonable amounts of emissions reductions.

- Economies of scale.
- Risk and uncertainty.
- Recovery from failure.

## 6.5 Screened Projects

A number of project proposals were screened and evaluated on the basis of the contribution towards sustainable development and GHG reduction. The evaluation was independently done by each member of the task force and results compared. A number of projects was then reduced to two projects that were taken further for economic and mitigation analysis. The table below shows a list of projects that were initially collected and evaluated:

**Table 7: List of Collected and Evaluated Projects**

| *Project* | *Paul* | *Ali* | *Patience* | *Comments* |
|---|---|---|---|---|
| 1. The production and use of wood tar as a preservative | | Do not select | Do not select | Wood preservation may not make a substantial contribution to reducing emissions. |
| 2. Quality control of improved charcoal stoves and mechanization of liner production | | Select | Select | Use of good quality improved stoves helps reduce GHG. Project can be re-designed for private sector investment. |
| 3. Investigation of the charcoal production process aimed at improving recovery using the earth kiln | | Select | Select | Would result in GHG reduction and environmental degradation. Project should have a technology dissemination aspect. |
| 4. Potentials for Collaborative forest management in plantation forests of Uganda | | Select | Do not select | May lead to GHG reduction and better protection of plantations. Not an implementation project but a study on various options with limited investment. |
| 5. Establishment of Tetraphlepsraoi and its effectiveness in controlling the pine woolly aphid | | Do not select | Do not select | Forest pest not a serious problem and may have limited impact on carbon sequestration. |
| 6. Seasoning and preservation with respect to inadequate knowledge on durability. | Do not select | Do not select | Do not select | Using seasoned or unseasoned wood not likely to have large impact on replacement of wood. Difficult to calculate CERUs. |
| 7. Collaborative forest management programme of the Uganda Forest Department | | Select | Select | May lead to carbon sequestration but investment costs are not very clear. |
| 8. Forest Resource Management and Conservation Programme | | Select | Select | Leads to carbon sequestration but investment costs are not clear. May need to concentrate on one forest block e.g. Budongo. |
| 9. Uganda S.E and S.W Integrated Watershed Management Project | | Select | Do not select | Will contribute to emissions reduction and environmental conservation |
| 10. LVEMP Catchment Afforestation Project | | | | Project developer did not pass on the project document for review |

| | | | | |
|---|---|---|---|---|
| 11. Popularisation of Biogas technology in zero-grazing farming systems. | Select | | Select | Reduces GHG emissions and increases soil carbon if slurry is used as manure. Link to carbon sequestration by avoiding use of wood biomass |
| 12. Shea butter project | | | Select | Leads to $CO_2$ sequestration |
| 13. Bee keeping project | | | | Project developer did not pass on the project document for review |
| 14. Agro-forestry (with fruit tree component) | Select | Select | Select | Leads to GHG reduction<br>contributes to poverty eradication<br>Leads to sustainable development |
| 15. Organic farming project | | | | Project developer did not pass on the project document for review |
| 16. Horticulture project | Select | Select | Select | Project used for mitigation analysis training. Would result in carbon sequestration |
| 17. Cocoa project | | | | Project developer did not pass on the project document for review |
| 18. Improved stoves project | | | | Project developer did not pass on the project document for review |
| 19. Access to energy services in urban areas of Uganda for the urban poor | Do not select | | Do not select | Project addresses equity issues rather that reduction of GHG |
| 20. Integrated wood based energy system for powering a sawmill | Do not select | | Select | Will result in GHG emission reduction from diesel replacement and decay of waste wood. |
| 21. Performance tests of improved cook stoves | Do not select | | Do not select | More research than investment opportunity. |
| 22. Afforestation of bare hills | | | | Project developer did not pass on the project document for review |
| 23. Afforestation of grass land forest reserves | | | | Project developer did not pass on the project document for review |
| 24. Institutional stoves project | | | Select | Leads to reduction in GHG. |
| 25. Tropical Environment Foundation Eco-tourism project | | | | Non-consumptive use will result in $CO_2$ sequestration |

## 6.6 Economic and Mitigation Analysis of the Projects

A detailed economic analysis of the projects is given in Annex A.

***The base case option***

The Base Case situation has been described in the project description. This section explains the economic analysis of the project using the base case and the mitigation option.

The annual investment costs have been derived from the activities given in Table 8.

**Table 8: Annual investment costs and activities – Ajoki mixed farm and agro forestry**

| *Period* | *Activity* |
|---|---|
| Year 0 | **Purchase of Land**<br>**Land Preparation**<br>Purchase of seedlings<br>Buildings and stores<br>Drilling of boreholes<br>Purchase and installation of water tank<br>Electrical installations including a transformer<br>Furniture and fittings<br>Acquisition of a generator<br>Fencing<br>Insurance |
| Year 1 | **Planting**<br>Acquisition of knapsack sprayer<br>**Purchase of Machinery and Equipment**<br>**Purchase of Vehicles and Accessories** |
| Continuous activities from Year 1 to Final Year | Weeding<br>Slashing<br>Tending<br>Watering/irrigation<br>Pest and disease control<br>Management /labour<br>Maintenance<br>Utilities |
| Year 3 | **Installation of Cold Storage Facilities**<br>Acquisition of delivery truck/pickup<br>Road construction |
| Continuous activities from Year 4 to Final Year | Road Maintenance<br>Harvesting |

***Discounting of costs and benefits:***
Costs and benefits have been discounted to the present value using the formula:

$$\textit{Discounted cost/benefit} = P/(1+r)^t$$

Where P is the cost or benefit during a particular year,

r is the discount rate,

t is the discounting period

A discounting rate of 15% has been used to calculate the internal rate of return (IRR) and the net present value (NPV) of the project. These are shown in Table A3 in the Appendix. The NPV has been calculated by subtracting the discounted costs of the entire project period from the discounted benefits. IRR is the rate at which the NPV is zero or near zero. It has been calculated by adjusting the discount rate until the lowest NPV is attained.

## 6.7 Project Benefits

Project benefits have been computed based on returns from the sale of fruits. It is assumed that harvesting will commence in year 4 of the investment. Fruit production per harvesting period is

assumed to be 2 tons/ha. Harvesting will be done 3 times a year, bringing the mean annual production to 6 tons/ha. A steady annual increment of 2 tons/ha is assumed up to year 15, after which production will remain constant for the rest of the investment period.

Benefits from fruits will start accruing in year 4 with an annual output of 6 tons/ha an equivalent of 600 tons at an assumed price of $278/ton of fruit. This will generate a discounted annual income of about $95,292. This amount can then be ploughed back as investment cost. By the end of the project lifetime, an estimated discounted figure of $1,847,597 would have been realised from the sale of fruits as seen in Annex A.

## 6.8 Mitigation Options

The project is expected to contribute to the reduction of Green house gases by generating CERs, which can be sold to enhance project benefits. Apart from benefits from the sale of fruits, carbon fixation is an added value from the project. The project is expected to sequester about 300 tons of Carbon per hectare per year, which amounts to 7,500 tons of carbon fixed which would generate discounted benefits of $291,977 during the project period. Though this appears to be a small figure, a number of similar projects could be initiated and bundled together to increase on the amount of CERs generated.

Without the project, the grasslands would fix 1 ton/ha/yr x 100 hectares = 100 tons x 25 years = 2500 tons of carbon. With the project, the trees would fix 3 tons/ha/yr x 100 tons = 300 tons x 25 years = 7,500 tons of carbon. This implies that an additional 5,000 tons of carbon will be fixed when the project is implemented.

Annex A shows the discounted costs and benefits resulting from the mitigation analysis of the project. Introduction of carbon benefits enhances the project in the following way:

| *Variable* | *Without carbon benefits* | *With carbon benefits* |
|---|---|---|
| NPV ($) | 1,468,280 | 1,630,489 |
| IRR (%) | 45.7 | 48.7 |

# 7. SOCIO-ECONOMIC SECTOR

## 7.1 Background Information

Uganda is one of the least developed countries. In the last few years the level of poverty has increased so much that it became a concern of the world community to find ways and means of addressing the problem. Several multi-lateral institutions incorporated into their programmes poverty alleviation requirements. Poverty eradication is one of the core programmes of the government developed the Poverty Eradication Action Plan (PEAP). The PEAP is supported by the Plan for Modernisation of Agriculture (PAM).

One of the main objectives of the CDM is to assist developing countries achieve sustainable development. In view of government's programmes it was thought necessary to have a Socio-economic Task Force whose main function would be to develop a sustainable development criteria and screen the analysed selected projects. In addition, the task force was required to identify different funding mechanisms and summarise the procedural requirements and guidelines for accessing the respective resources. The task force was also mandated to develop a paper on institutional framework for implementation of the Convention and the Kyoto Protocol.

## 7.2 Review of Existing Funding Mechanisms

***Foreign debt policy and strategy of Uganda Government***

Faced with a heavy debt burden and the need to continuously service the existing debts, Uganda Government is committed to implementing all possible measures that will enable it reduce its foreign debt obligations and minimize any further accumulation. The government has refrained from guaranteeing debt contraction for any private organization or NGO. The government promptly services its debts upon maturity. The government has also implemented debt buy-back measures and

negotiated debt rescheduling with various donor agencies. Furthermore, the government insists that no other institution is legible to borrow money on behalf of the government except the Ministry of Finance, Planning and Economic Development. The terms of borrowing should be highly concessional like that under IDA or, if possible, it should be completely a grant, or it should consist of a big portion of a grant element equivalent to US$8m grant out of US$10m contracted.

Any donor funding of government projects in Uganda should pass through Ministry of Finance, Planning and Economic Development and should be highly concessional or grant in order not to impose more unmanageable debt burden on the government. Funds for financing various government programmes are derived from the following sources:

- Multilateral
- Bilateral
- National
- Global Environment Facility
- Clean Development Mechanism

**Table 9: Position of Uganda's external debt in millions of US$:**

| | *1986* | *1987* | *1988* | *1989* | *1990* | *1991* | *1992* | *1993* | *1994* | *1995* |
|---|---|---|---|---|---|---|---|---|---|---|
| *Medium and long term* | 1359 | 1881 | 1892 | 2142 | 2516 | 2689 | 2866 | 2551 | 3092 | 2585 |
| *Multilateral* | 868 | 1095 | 1136 | 1219 | 1568 | 1766 | 1919 | 2073 | 2156 | 2488 |
| *Bilateral* | 296 | 488 | 474 | 654 | 684 | 688 | 763 | 780 | 720 | 788 |
| *Private* | 195 | 298 | 282 | 269 | 264 | 235 | 184 | 98 | 70 | 112 |
| *Principal arrears* | 64 | 70 | 106 | 142 | 230 | 327 | 302 | 202 | 189 | |
| *Interest arrears* | 28 | 29 | 41 | 60 | 96 | 117 | 97 | 81 | 92 | |
| *Total arrears* | 92 | 99 | 147 | 202 | 326 | 444 | 399 | 283 | 281 | 233.4 |

***(table continued)***

| | *1996* | *1997* | *1998* | *1999* | *2000* |
|---|---|---|---|---|---|
| *Medium and long term* | 3516.6 | 4121.5 | 3631.1 | 3494.4 | 3612.63 |
| *Multilateral* | 2655 | 2763 | 2826.8 | 2782.6 | 2930.5 |
| *Bilateral* | 756 | 1252.9 | 748 | 649.9 | 628.14 |
| *Private* | 106 | 105.6 | 56.3 | 61.9 | 53.9 |
| *Principal arrears* | | | | | |
| *Interest arrears* | | | | | |
| *Total arrears* | 250.3 | 316.6 | 275.5 | 241.5 | 270.2 |

## 7.3 Multilateral Funding

These funds are raised from contributions of member countries in form of membership fees and annual subscriptions. Under multilateral funding there are basically three active institutions in the case of Uganda, namely the World Bank (WB); International Monetary Fund (IMF); and African Development Bank (ADB). Besides these, others include the Prototype Carbon Fund (PCF) and the Energy Efficiency Facility (EEF)

## 7.4 World Bank

Under the WB there are three main lending windows: International Finance Corporation (IFC), International Development Association (IDA) and International Bank of Reconstruction and Development (IBRD). The lending interest rate of IFC is basically commercial, while that of IBRD is slightly lower than the commercial level. IBRD lends money to any legible institution including private business or government. The lending rate under IDA is highly concessional with lending interest rates of 0.75 percent including 10 years period of grace and 40 years of maturity. Most of funds from WB are long-term (5 years and above) and are for financing infrastructure development, social sector development and environmental activities. A country qualifies for funding from IDA when it has successfully implemented a Structural Adjustment Programme for a considerable period.

## 7.5 International Monetary Fund

For a country to qualify for funding from IMF it must have a running programme supervised by the Institution. IMF provides interest-free, short-term and medium term funding (1-3 years) mainly to facilitate macroeconomic development and stability.

## 7.6 African Development Bank

Under ADB there are two funding windows including ADB commercial window (with interest of over 7.5 percent) and the ADF concessional window, which carries similar terms like IDA window under the WB.

## 7.7 Bilateral Funding

This funding involves an agreement between any two parties including donor agency/country and the borrowing government. The terms and conditions vary with the donor country and the nature of the loan. In the case of Uganda the terms and conditions of the borrowing are similar to that of the IDA loans. The main bilateral lenders to Uganda include DANIDA, SIDA, CIDA, GTZ, DFID, NORAD, and EU etc.

## 7.8 Global Environmental Facility

GEF is a financial mechanism that provides grants and concessional funds to recipient countries for projects and activities that aim to protect the global environment. These resources are available for projects and other activities that address climate change, biological diversity, international waters, and depletion of the ozone layer. Responsibility for implementing the GEF Programme is shared by the United Nations Development Programme (UNDP), UNEP and the WB. UNDP is responsible for technical assistance activities, capacity building, and the small grants programme.

UNEP is charged with catalysing the development of scientific and technical analysis; advancing environmental management in GEF-financed activities, and managing the scientific and Technical Advisory Panel, an independent advisory body. The WB, the repository of the Trust Fund, is responsible for investment projects, and mobilizing resources from the private sector. The GEF implementing agencies may make arrangements for GEF project preparation and execution with multilateral development banks, specialized agencies.

## 7.9 Assessment of the GEF Funds

Countries may borrow funds from GEF if they are eligible to borrow from the WB (IBRD and/or IDA) receive technical assistance grants from UNDP though country programmes. The GEF implementing agencies may make arrangements for GEF project preparation and execution with multilateral development banks, specialised agencies, and programmes of the United Nations, other international organisations, bilateral development agencies, national institutions, NGOs, private sector entities, and academic institutions. The GEF also operates a small grant program for projects in the four focal points that are put forward by the NGOs in recipient countries.

## 7.10 Projects Funded by GEF Including Uganda

- People, Land Management, and Environmental Change (PLEC)
  (involving 8 countries in Africa) US$6.276m
- African NGO-Government Partnership for Sustainable Bio-diversity Action
  (including 12 countries in Africa) US$4.520m
- Institutional Support for the Protection of East African Biodiversity
  (Kenya, Tanzania, Uganda) US$10.000m
- Uganda Photo-voltaic Pilot Project for Rural Electrification US$1.756m
- Country case Studies on Sources and Sinks of Greenhouse Gases
  Global Project that includes: Argentina, Ecuador, Estonia, Hungary, Indonesia, Senegal, Mauritius, Vietnam, SADC and
  Andean Pact Countries US$4.500m
- Climate Change Enabling Activity US$0.083m
- Lake Victoria Environmental Management
  (Kenya, Tanzania, Uganda) US$35.000m
  This project is under Ministries of Lands, Water and Environment; and Agriculture, Animal Industry and Fisheries. The project is located in the Victoria basin. It started in 1997 and is ending 2002. Apart from GEF, IDA and government of Uganda are also funding the project.
- Pilot Bio-diversity Enabling Activity (Global – including 18 countries) US$2.744m
  This is a regional project, which aims at reducing the rate.

## 7.11 Clean Development Mechanism

The CDM is to be used to assist parties not included in Annex 1 in achieving sustainable development and in contributing to the ultimate objective of the convention, and to assist parties included in Annex 1 in achieving compliance with their quantified emission limitation and reduction commitments. CDM is to assist in arranging funding of certified project activities as required. Participation under the clean development mechanism includes activities resulting in certified emission reductions and the acquisition of certified emission reductions.

## 7.12 Review of Institutional and Legal Arrangements

***Legal and institutional requirements for the formulation and implementation of a government project under the Public Investment Plan (PIP)***

Before a project is approved for funding it is the duty of the Solicitor General's office to ensure that the project is in line with the established government legal guidelines and procedures. The line ministry (for instance Ministry of Lands, Water and Environment) is supposed to initiate the project. At the conceptual and formulation stages the line ministries must seek advise on the legal implications of each project from the office of the Solicitor General. When the Solicitor General gives a go-ahead the project proposal is presented to Cabinet for endorsement, after which the project is placed before parliament as a bill, for approval. When Parliament approves the project it becomes law and is ready for implementation, depending on availability of funds. The project is then submitted to the National Development Committee under the Ministry of Finance, Planning and Economic Development for further scrutiny and approval based on specific socio-economic criteria.

Before a project is submitted to the Ministry of Finance, Planning and economic Development by the line ministries, the respective institutions should ensure that social and economic viability including environmental impact assessment are carried out. The application of conventional IRR and NPV as indicators for feasibility and viability of a project should strictly be applied.

The National Development Committee consists of representatives from various government ministries and departments. The Committee normally sits monthly, but may sit whenever there are urgent issues to be addressed. The Director Budget on behalf of the Permanent Secretary/Secretary to the Treasury chairs the committee.

By the time project proposals are submitted to Ministry of Finance, Planning and Economic Development for approval and inclusion in the PIP it is assumed to have passed through the above-mentioned assessment criteria.

Once the project has been submitted to the Development Committee a meeting of all members is called to discuss the inclusion of the project in the PIP. The following issues are considered by the Development Committee:

- Project focus on poverty; whether the project directly or indirectly addresses poverty reduction/eradication. Projects that address poverty directly are given priority over others.
- Donor funding (fully funded/partly funded); donor funded projects qualify more easily.
- Government funding; depending on whether the project falls in the government priority programmes or not.

Location of project; duplication and concentration of projects in one locality should be avoided. The issue of regional balance is taken into account.

***Note:***
There is no guarantee that fully donor-funded projects will be taken aboard. A project may not be considered for inclusion in the PIP if it does not address poverty reduction/eradication directly or indirectly, even if all the funds have been secured.

There is currently no emphasis on establishment of the application of economic, social and environmental assessment of a project before its inclusion in the PIP. There is no clear quantifiable criterion used to carry out poverty assessment of each project. However, projects are considered according to their relation to poverty as follows:

- Literacy; does the project contribute to increased access to primary education and adult literacy (Vocational skills, reading, writing and counting)?
- Primary health care; contribution of the project to improvement of disease prevention and disease free environment (Vaccination, inoculation, health education, clean and vector-free surrounding).
- Provision of clean water and proper sanitation; the project may aim at provision of clean water sources, good and healthy living conditions.
- Improvement of rural feeder roads, which are essential for easing transport constraints in the villages and for creating accessibility to market for rural farmers' produce.
- Provision of agricultural extension services; this is critical as it provides education to enable improvement of agricultural production and enhancement of food security.
- Provision and improvement of security and accountability in public institutions; security is a key to development as it helps in guaranteeing safety of lives and property.
- Accountability ensures effective and efficient use of available resources minimizing losses through corruption and misallocation. This enables resources to trickle down to the intended targets especially the rural poor.

## 7.13 Financial Management

The Accounting Officer of a given line ministry on behalf of the respective project writes to the Director of Accounts seeking authority to open an account with a given bank, stating the reason for the choice of the bank. In the letter the principle and alternate signatories to the proposed project accounts must be included. To ensure proper monitoring, the project accountant is required to produce monthly or quarterly report, depending on the donor requirement. A copy of the report must be submitted to both the donor and the Director of Accounts

## 7.14 Institutional and Legal Framework for Implementation of Projects in the Private Sector

The responsibility of registering and licensing private investment lies with Uganda Investment Authority (UIA) a body which was specifically created for the purpose, to overcome the bureaucratic red tape that used to frustrate prospective investors. UIA is the focal point for promoting investment

in Uganda. The nature of the needed investment promotion activity has changed. The UIA (and Uganda's needs) has moved from image-building, general country marketing and a focus on all sectors and markets (i.e. little sectoral focus), to targeting specific investors and facilitating their investment. Most of the information including policy issues, areas of investment and related requirements are communicated to the investor at UIA on request.

There are two categories of investment: foreign and local. The shares held by both the local and foreign investors determine these categories of investments. An investment is considered to be foreign when the size of the foreign share is more than 50%; and local when the size of local share is 50% or more.

## 7.15 Conditions for Investment

UIA, on behalf of the government, has the following conditions for various types of investments:

- Minimum value of total investment should not fall below US$100,000 for foreign investors.
- Minimum value of total investment should not fall below US$50,000 for local investors.
- For jointly implemented projects to be called local, the share of the local shareholder must be 50% or more
- For jointly implemented project to be called foreign, the shares of the foreign investor has to be more than 50%
- All projects must register with relevant line ministries/institutions before registering with UIA. That is, they must ensure that the projects meet all the relevant conditions and regulations that exist in the relevant sector such as environmental impact criteria and standardisation. Secondary license must first be secured where necessary, before UIA issues the investment license.

## 7.16 Role of Uganda Investment Authority

UIA is a government institution that started operation in 1991 through the enactment of the Investment Code 1991 and has been in active operation for over 9 years. UIA is the focal point for promoting investment in the country, and is charged with promotion and facilitation of foreign and domestic investment, promotion of employment creation, and promotion and encouragement of technology transfer.

***Functions of UIA***

- Receives investment proposals and provides relevant investment guidelines to the prospective private and NGO investors.
- Ensures that the investment proposals are in line with the established regulations in the respective sectors.
- Licenses investment activities.
- Assists the investors to acquire land and the necessary utility provisions like water, electricity and telephone.
- Assists investors to sort out any disputes that may arise in the course of their activities.
- Facilitates the investors for any other formalities.

The operations of UIA with the investors should be in line with the guidelines and regulations as spelt out in the Investment Code (1991), which encompasses investment laws, and the Constitution (1995), which is the general legal and institutional document.

The following institutions have been established to ensure the smooth operation of UIA and to protect investors from unnecessary inconveniences:

- Multilateral Investment Guarantee Agency, which ensures the investments against non-financial risks;
- Commercial courts, responsible for handling disputes and complaints in business;

- The parliament, the legislative arm of the government, which monitors the establishment and their activities to ensure compliance with government regulations.

## 7.17 Proposed CDM project Registration guidelines

1. Investor submits project to relevant national authority.
2. Project forwarded to CDM secretariat for review by sector desk (or Forest Department).
3. If project meets CDM criteria it is recommended for approval and forwarded to CDM secretariat or relevant national authority.
4. If project does not meet CDM criteria, investor is advised on how to improve project or given the option of selecting a project from a portfolio of nationally developed CDM projects that meet the selection criteria.
5. Requisite contracts and agreements between host and external investor are signed before implementation (e.g. sharing of revenue from CERU).
6. Registration of the project by UIA.
7. Implementation.
8. Monitoring and evaluation by both UIA and the relevant body.
9. Certification and verification of emission reduction units by both national and international agencies.

Alternatively:

1. Sector desk (or Forest Department) assesses on-going and planned projects to see if they qualify for CDM.
2. Projects which qualify are used to issue Certifiable Tradable Offsets.
3. Guaranteed Certifiable Tradable Offsets sold to investors.

# 8. THE POSSIBLE CAPACITY BUILDING NEEDS

***General***

In creating the institutional capacity building needs for implementation of CDM projects, there is a need to realize the rapidly changing global and domestic economic environment. The role of the government in the sector has to be clearly defined and priorities identified. Financial and management rules, budget systems and work units which will enable individuals to achieve the strategic goals need to be formulated. Flexible organizational arrangements that facilitate performance and support to the implementation of CDM have to be in place. Therefore significant capacity building, in terms of promoting an environmental awareness, which could lead to reduction of GHGs and its investment, technical knowledge, and business skills, should be promoted. The national awareness campaign and capacity building programme should be established to publicize the CDM and the opportunities from it to private sector, local authorities and the communities.

Capacity building will also be provided for relevant public sector staff especially the Meteorology Department and other line ministries. This should be in conformity with the principles of the GEF. Furthermore, NGOs and other relevant stakeholders, especially local governments, should be approached to assess their willingness and capacity to participate in the development and management of CDM projects. This would provide opportunities for capacity building within the district and NGOs. Overall, capacity-building services should be available across a wide range of fields necessary for the development of CDM business. These may include market assessment, preparation of business plans, evaluation and choice of technology options, investment promotion, financial advisory services, financial analysis, support to the organization, management of tariff and setting accounting procedures.

There is also a need to establish necessary capacity for an effective monitoring and evaluation system in all CDM projects. The effective monitoring and evaluation arrangements should be integrated to CDM project design and implementation levels. Appropriate monitoring indicators such as emissions reductions and sustainable indicators should be developed and a management

information system designed that will assist tracking the progress of the CDM projects by the staff concerned.

Specific capacity building needs under CDM could be further strengthened through training the staff involved and supporting plan formulation, including the preparation of the guidelines for CDM. The focus should be on a participatory planning approach. In this regard, local professional expertise could be build in the process. A short-term technical advisor consultant would, however, be engaged to equip the necessary techniques to the local staff. Such assistance could ensure continuity and sustainability of the CDM to meet Uganda's development goals.

The actual content of the training programmes would vary according to the needs and levels of the individuals and groups. Broad areas of training could include but not be limited to climatic mitigation methods, developing a baseline, calculation of emissions, investment analysis techniques like IRR and NPV, screening methods, computer training in relevant packages like MESAP, institutional arrangements, and management of CDM projects.

To enable quick performance there will be a need to right-size staff with a coordination office for CDM projects. This will be a focal point for coordination of all CDM activities in the country. Such office should be well equipped and facilitated with the necessary tools in form of computers, relevant mitigation packages like MESAP, e-mail facilities and documents. The secretary will be trained in computer skills and operations. The stakeholders (private and public) would contribute to financial and no-financial resources (like transport) for operations of the office.

The CDM management should be administratively autonomous and should operate in accordance with the mandate of the MWL&E and Kyoto Protocol. The institutional structure should constitute of the CDM steering committee, which should provide overall policy guidance, approve CDM projects, review annual reports and ensure CDM's compliance with MWL&E and Kyoto protocol. The role of the MWLE would therefore remain as supervision, monitoring and provision of information data on climatic conditions and levels of GHG. The Ministry would, however, require further institutional capacity building support to undertake its tasks effectively. This could include but not be limited to staff training on data collection, analysis, and information management.

The Meteorology Department under MWL&E would provide the technical and planning guidance to the CDM project staff. The stakeholders like the districts and line Ministry should also establish liaison desks to facilitate the development and management of CDM activities. Under decentralization, districts would however be free to seek CDM preparation assistance from the suitably qualified institutions like MWL&E or private sector.

***Specific capacity building needs:***

- **Portfolio development**: This would involve developing national projects, which meet CDM criteria. These projects would be used to seek for external investors (from Annex 1 countries) interested in investing in Uganda. Depending on the demand for these projects, they could even be auctioned. However, we need national capacity to be able to develop good sellable projects.
- **National sector studies**: There are a number of planned projects where government lacks resources to implement. It is necessary to assess these projects to see whether they qualify for CDM. If they do then they could be sold as CDM projects to prospective investors.
- **Monitoring and evaluation:** CDM projects will have to be monitored for compliance to ensure that they adhere to the objectives to which they are set to achieve and the conditions under which they are supposed to operate. CDM Secretariat needs capacity to conduct monitoring and evaluation. Note that implementing agencies should also conduct monitoring. However, they need to be trained in how to monitor their projects.
- **Certification and verification:** Though a certification company will do certification, there is need for a technical know-how of the certification and verification process at the local level. If possible local certification could be done (track 1) before external certification (track 2).
- **Establishment of baselines:** Establishment of the pre-project situation is of paramount importance in monitoring and evaluation of any CDM project. There is need to build capacity in measurement and other data collection techniques regarding establishment of the baseline situation. During the experts meeting held in Risoe, Denmark (7-9 May 2001), guidelines for energy supply, energy demand, heavy industry and transport were agreed upon. It is imperative that once these guidelines have been approved they are used in project formulation.

Unfortunately, the forestry sector was not addressed during the meeting. It is envisaged that if COP6 agrees to include forestry projects in CDM the experts will have to design suitable guidelines. There is already a wealth of knowledge; CDM forestry practitioners only need to come to consensus on what data are required and standard formulae for baseline development.

# 9. Conclusions

The UNEP/UCCEE initiative has been very beneficial in building capacity on CDM in Uganda. Due to the mode of selecting the team members, this capacity has however focused on government staff. It is evident that this capacity needs to be build among the private sector stakeholders. Capacity building is a continuous process and dome gaps remain in the Ugandan CDM context. Some of the needs have been highlighted in section 8.

The institutional framework for implementation of CDM is yet to be established. However the project has facilitated the development of preliminary ideas on alternative frameworks. Uganda expects to embark on the process of establishing a relevant framework soon. Uganda has a EU-funded SUSAC project which will build on what UNEP/UCCEE has began.

It is recommended that future capacity building initiative be undertaken for longer periods, have sufficient resources and include all aspects and stakeholders.

# ANNEX A

# TRANSPORT SECTOR

## The Kampala Traffic Flow Improvement Project

It was observed that Kampala did not have a mass transit facility. The minibus was the most common method of transport, leading to traffic congestion and increased fuel consumption.

It is proposed in the project profile to introduce buses in the city. A ten-year cycle was considered and the project was found to be viable (benefit cost ratio of 1.32 for buses and 1.25 for minibuses). The analysis shows that by replacing half of the minibuses, the production of carbon will reduce from 92,680 Tons to 61,847 tons. This is an equivalent of savings of 49,539 tons annually.

### Problem Statement

Currently there is an increasing concentration of vehicles of all types in the city. This is due to increase in the population. Given the fact that the present road designs in the city have been overtaken by events, a big problem of traffic congestion on a number of roads and junctions has been created. This has increased GHG emissions to the atmosphere. Individuals, in an effort to avoid traffic congestion, have resorted to using motorcycles. This has un-proportionally increased the use and number of motorcycles as shown in Figure 1. However, the fuel consumption per person per km and therefore the GHG emission by motorcycles is much higher. Compared with the most common mode of transport (minibus) we require fourteen (14) motorcycles. It is clear the motorcycle option is not the desired option to either solve the congestion or reduce the emissions.

### Proposed Solutions Compatible with CDM

A viable option for reduction of the traffic congestion in the city and at the same time reducing the GHG emissions is the introduction of the City Bus mode of transport to replace the commonly used minibuses (kamunyes). The reasons for choosing this option for study are;

- Each bus has a capacity of an average of 70 passengers, which is equivalent to five Kamunyes. With this in operation the road space occupied by one bus is much smaller than that by five kamunyes.
- All buses use diesel as fuel, unlike the kamunyes, which use petrol and diesel.
- The fuel consumption per bus per km is less than that for five kamunyes per km. It follows that the fuel utilisation per passenger kilometre is less when buses are used.

### Field Studies

A study of the nature of operation, performance, costs, consumption of various types of fuel as well as the demand on the road network of the kamunyes was carried out vis-à-vis the big buses. Computations of the benefit-cost ratios indicate that both the bus system and the mini-bus system are viable options. The general advice advanced from the stakeholders was gradual introduction of the big bus in replacement of the taxicabs. The bus operators would wish the Government to make the buses affordable by reducing the taxes.

**Table A1: Field study data analysis**

| The field surveys gave pertinent information regarding fuel utilisation, frequency of trips of each type of vehicle, response of other stakeholders and various associated costs and benefits as given in the table. | | |
|---|---|---|
| *Minibus Data Costs* | *Petrol Type* | *Diesel Type* |
| | *Ushs* | *Ushs* |
| Initial cost | 10,000,000 | 12,000,000 |
| Ordinary service (annual) | 1,820,000 | 2,080,000 |
| Tyres replacement (annual) | 1,500,000 | 1,500,000 |
| Repairs and incidentals (annual) | 2,000,000 | 2,000,000 |

| | | |
|---|---|---|
| Salaries and wages (annual) | 4,500,000 | 4,500,000 |
| Transport organisation fees | | |
| Monthly sticker | 20,000 | 20,000 |
| Daily receipt | 4,000 | 4,000 |
| Charge per loading | 1,200 | 1,200 |
| Night parking fees (annual) | 365,000 | 365,000 |
| Taxes (road licence) | 150,000 | 150,000 |
| Insurance | 80,000 | 80,000 |
| PSV permit | 23,000 | 23,000 |
| Fuel costs | 12,451,765 | 9,144,000 |
| **Useful Information** | | |
| Number of trips /day | 8 | 8 |
| **BENEFITS (ANNUAL VALUES)** | | |
| Money spent on fuel | 12,451,765 | 9,144,000 |
| Money remitted to owner | 15,000,000 | 15,000,000 |
| Salaries and wages | 4,500,000 | 4,500,000 |
| UTODA + Parking Fees | 4,685,000 | 4,685,000 |
| **TOTALS** | **34,325,000** | **29,825,000** |

| *BUS DATA COSTS* | *ANNUALISED COSTS* |
|---|---|
| | *Ushs* |
| Initial cost | 180,000,000 |
| Ordinary service | 3,840,000 |
| Tyres replacement | 9,000,000 |
| Repairs and incidentals | 6,000,000 |
| Salaries and wages | 7,632,000 |
| Transport organisation fees | |
| Monthly sticker | 3,000,000 |
| Daily receipt | |
| Charge per loading | |
| Night parking fees | 720,000 |
| Taxes (road licence) | 250,000 |
| Insurance | 400,000 |
| PSV permit | 23,000 |
| Fuel Costs | 27,600,000 |
| **Useful Information** | |
| Number of trips/day | 8 |
| **BENEFITS (ANNUAL VALUES)** | |
| Money spent on fuel | 27,600,000 |
| Money remitted to owner | 120,000,000 |
| Salaries and wages | 7,632,000 |
| UBOA + parking fees | 3,720,000 |
| | 158,952,000 |

Exchange Rate: 1 US$= U.Shs.1,750

### Benefit: cost ratios

| Vehicle | | Value |
|---|---|---|
| Bus | | 1.32 |
| Kamunyes (Mini bus) | Diesel type | 1.25 |
| | Petrol type | 1.11 |

The major constraint to the introduction of the bus system has been the initial investment costs. For effective operation the system should have a number of buses to interconnect and establish regularity and reliability to cultivate passenger confidence. Without this reliability the passengers may not wait for buses, and will make the buses operate below capacity.

For a system as above, substantial amounts of initial capital is required and this is prohibitive despite a bigger benefit cost ratio.

### Case For Buses

The bus system was evaluated to be more profitable with a Benefit-Cost ratio of 1.32.

It has been analysed and found that an average Kamunye produces 18536 kg of carbon i.e. 92680 kg C for 5 No. (equivalent to 1 No. Bus) and a bus produces 61847 kg C annually. This is equivalent to 339,827 kg and 226,771kg of carbon dioxide annually respectively. The bus system therefore significantly reduces the emission of GHG gases.

Over 10,000 minibuses operate within the city. Of these 90% are operating town service (Source: UTODA). The introduction of an efficient bus system is projected to replace at-least half of the town service minibuses. This means replacing 4500 minibuses with 900 buses.

When this is done the production of carbon will move from 92,680 to 61,847 tons as a result of the 4500 kamunyes being replaced by 900 buses. This amounts to a reduction by 30,833 tons, which is equivalent to 113054 tons of carbon dioxide annually.

# ANNEX B

# ENERGY SECTOR

## The Solar Photovoltaic Project

### The Emission in Base Line Case

The total emission baseline case within the lifetime of the project without implementation of CDM project is 275,184 tonnes of $CO_2$ per annum and the details of the calculations can be seen in Table 3 in the appendix. It is envisaged that the same amount of the GHG will be displaced with implementation of the project.

With the implementation of CDM the GHG emission will be 175,739 tonnes of $CO_2$. The details if calculations are found in Table 4 in the appendix.

### The Emission Reduction from PV Project

The GHG emissions reduction achieved = emissions in the base line case - emissions in the project case line. There will be a displacement of GHG when the project is implemented. 275,184 - 175,739 = 99,445 tonnes of GHG.

The details of the emissions on year's bases can be seen in Table 5 in the appendix.

### Calculating Project Net Returns

All the components of the good PV systems are imported. There is a local battery production but the efficiency is not as high as the imported. In order to encourage private firms to participate in the electrification programme, the government will introduce a subsidy of about 30%. It is assumed that the household will be equipped with one 50 W PV systems.

| | |
|---|---|
| Panel (polycrystalline) | 500 |
| Charge Controller | 70 |
| Battery (five year life time) | 300 |
| Installation costs | 150 |
| **Total** | **1020** |

If the government made a subsidy of 30% per system, then the unit cost of the systems will be reduced to US$714 from US$1020. The total cost of the system during the project period would be US$51,408,000 as illustrated in Table 6 in the appendix.

The present value of the cost of PV assuming at a discount rate of 10% is US$22,067,388. If the discount rates were increased to 20%, the present value would be US$11,006,153 as illustrated in Table 7 in the Appendix.

The future price of certified emission reductions (CERs) is not fixed as yet. The maximum can be assumed to be US$50. The lowest is about US$15. Assuming that the value of CERs is US$50 and the discount rates were 20%, the present value of the CERs from the project would be US$864,973. But the value of CERs is US$15 and the discount rates were 20%, the present value of the CERs from the project would be US$259,491.8. The details of the calculations are illustrated in Table 8 in the appendix. (NB: The real mitigation analyses are appended as Tables in the Excel File (PV-Calculation workbook).

# Paidha Mini-hydropower Project

## Project Selection Criteria

***Environmental Additionality***
The Kyoto Protocol requires for CDM projects a reduction in emissions that is "Additional to any that would otherwise occur" (environmental additionality). The historic baseline for the West Nile is diesel used for power generation. The significant hydropower potential in the region would be the least costly power supply option. However, persistent investment risks and the absence of a long-term capital market in Uganda, makes private investment in hydropower and power grid infrastructure in the West Nile area unattractive. The project is therefore unlikely to materialise on a commercial basis at this time. Nevertheless, the valuation of the perceived investment risks as well as the dynamics of the baseline over time is important risk factors.

***Consistency with National CDM Criteria, Host Country Commitment***
The Government of Uganda has indicated its initial support for the project in a letter of endorsement, signed by the National Focal Point for the UNFCCC, the Commissioner of Meteorology. Uganda is a PCF host country and has been represented in Host Country Committee meetings by the National Focal Point. Uganda is a Party to the UNFCCC and actively participates in the UNFCCC negotiation process, but is yet to sign the Kyoto Protocol.

***Consistency with Country Assistance Strategy and Country Development Goals***
The West Nile Project is part of the Energy for Rural Transformation programme in which the World Bank and GoU participate and as such the project is consistent with Uganda's development priorities.

***Complementarity with GEF Portfolio***
The West Nile project is the first PCF project in Africa, and therefore enjoys a large interest from the donor community. This is evident from the fact that several governments had sponsored feasibility studies over several years and several attempts were made to get the project off the ground. However, sufficient concessional financing modality placing value on greenhouse gas emission reduction could not be secured. The combination of PCF funds and development assistance is likely to make the project go forward. The project has been submitted to the GEF Secretariat. The GEF has signalled that they have no objections to the PCF's involvement in the project and is expected to issue a formal no-objection soon.

***Additional national, regional and local benefits***
The project would yield substantial sustainable development benefits as compared to a continuation of the historic baseline situation and will allow the West Nile region to exploit its significant economic potential. The project would therefore improve the social conditions in the region through the creation of employment opportunities and better conditions for health care and education. In addition, it can be expected that the extensive involvement of the local business community and the local administration in project implementation and administration will boost self-governance in the region in line with Uganda's decentralisation policy.

Expected environmental benefits of the project are mainly related to the reduction of fuel wood use, reduction of indoor air pollution as well as pollution and noise from diesel generators.

***Contribution to capacity building, transfer of environmentally sound technologies***
The project's implementation will include capacity building components, which will enable the local community to administer its involvement in the project. It is also expected that the international power producer will use local labour and develop and transfer skills in the process of implementing and operating the project.

The introduction and demonstration of modern, environmentally friendly power production techniques for rural electrification and transformation are an explicit objective of the project. The project includes capacity building and other measures of assistance that together with other ERT operations should assure that renewable energy will be successfully introduced into the country and replicated in other regions.

## Calculating Project Net Returns

***Investment costs***
The estimated cost for the hydro power plant is US$12.8 million, including interest during construction. The transmission line estimated at US$4.0 million but will be constructed using finances from another source. A further US$3.5 million will be required to strengthen the distribution system.

***Maintenance costs***
Annual operating costs = 2% of the capital cost of the plant and equipment;

= 2% of US$3.8 million = US$76,000

for the civil works, these costs = 1% of US$4.927 million = US$49,000

***Purchase of vehicles***
Two cars, a lorry and two motorcycles will be procured at an estimated cost of US$145,000. This will be for the operations of the plant and system.

***Operation and maintenance of vehicles***
Annual fuel and maintenance costs are estimated at US$27,000.

***Wage bill***
Regarding staff, a manager, two plant supervisors, three operators, an accountant, a secretary, three drivers, three casual labourers will be employed to run the plant. Labour for distribution system maintenance will be contacted out. The wages and contract costs are estimated at US$110,000 per annum.

***Office expenses***
For office expenses, an allowance of US$20,000 per annum is made.

Therefore, total investment costs and recurrent costs are:

Capital costs = US$16.3 million

Recurrent costs = US$0.262 million

## Revenues
The plant will start delivering energy during the third year after construction. It is at this stage when revenues will start flowing into the project out of the energy sales. A break-even tariff for such a project is much higher than what rural consumers can afford. Consequently, funding under CDM is required to buy down the investment costs and bring down the tariff to manageable levels. It has been stated that efforts are being made to attract Proto type Carbon Funding (PCF) for this project.

## Project Feasibility
The supply of electricity to the West Nile region is of top priority since this region has been without grid electricity for a long time. There is big potential for development in this area once sufficient and reliable electric power is supplied. However, the incomes in rural areas are generally low and this may pose a difficulty in expanding demand for the power and considerable electricity consumption will be in the municipal areas initially. The demand forecasts, however, indicate that the project is feasible.

## Sustainability
The supply of reliable and adequate electricity from the power plant will inevitably stimulate overall economic growth in the region. Rural incomes will grow, as there will be several agro-processing industries coming up which will result in increase of crop production and an increase of job opportunities. Availability of electricity lighting will improve education quality as children will be able to do their homework, health facilities and other social services will likewise improve. Consumers having realised the benefits from the project will definitely see the virtue of paying for the service.

## Additionality

Implementation of the Paidha Project would be extremely difficult unless substantial subsidies are identified to bring down the cost of investment and consequently lower the tariff. On a purely commercial basis, the tariff for the power from this project would be high making it difficult for the community to afford. This would affect the expansion of demand and would make the project less attractive. The CDM project makes this attractive.

**Table A2: Summary of petroleum fuel use in West Nile for lighting and power (year 2000)**

| *Category* | *No.* | *KW* | *KWh/yr* | *Fuel consumption (litres/yr)* | *Fuel consumption (tons/yr)* | *Fuel expenditure (Ushs/yr)* | *Fuel expenditure (US $/yr)* |
|---|---|---|---|---|---|---|---|
| Business | 101 | 1,470 | 4,014,156 | 2,509,441 | 2,083 | 3,838,916,914 | 2,399,323 |
| UEB-connected | 35 | 399 | 984,042 | 618,508 | 513 | 927,762,000 | 579,851 |
| Diesel | 29 | 144 | 361,074 | 240,716 | 200 | 409,217,200 | 255,761 |
| Petrol | 29 | 844 | 2,469,450 | 1,517,157 | 1,259 | 2,275,735,714 | 1,422,335 |
| Non UEB-Connected | 8 | 83 | 199,590 | 133,060 | 110 | 226,202,000 | 141,376 |
| Diesel | | | | | | | |
| Petrol | | | | | | | |
| Institutional | 44 | 761.6 | 2,391,948 | 1,446,963 | 1,201 | 2,186,371,543 | 1,366,482 |
| UEB-connected | 28 | 534.0 | 1,309,140 | 796,234 | 661 | 1,194,351,429 | 746,470 |
| Diesel | 4 | 20.4 | 43,560 | 29,040 | 24 | 49,368,000 | 30,855 |
| Petrol | 29 | 199.0 | 963,360 | 571,097 | 474 | 856,645,714 | 535,404 |
| Non-UEB-Connected | 8 | 8.2 | 75,888 | 50,592 | 42 | 86,006,400 | 53,754 |
| Diesel | | | | | | | |
| Petrol | | | | | | | |
| Residential | 37 | 139.8 | 328,860 | 219,240 | 182 | 344,964,000 | 215,603 |
| UEB-Connected | 14 | 35.5 | 127,440 | 84,960 | 71 | 127,440,000 | 79,650 |
| Diesel | 8 | 58.2 | 67,500 | 45,000 | 37 | 76,500,000 | 47,813 |
| Petrol | 9 | 17.7 | 80,640 | 53,760 | 45 | 80,640,000 | 50,400 |
| Non-UEB Connected | 6 | 28.4 | 53,280 | 35,520 | 29 | 60,384,000 | 37,740 |
| Diesel | | | | | | | |
| Petrol | | | | | | | |
| Total Gensets | 182 | 2,371.4 | 6,734,964 | 4,175,645 | 3,466 | 6,370,252,457 | 3,981,408 |
| UEB Gensets | 5 | 776.0 | 801,256 | 333,857 | 277 | 500,785,500 | 312,991 |
| Diesel Engines | 42 | 490.0 | 919,800 | 801,256 | 665 | 1,201,884,000 | 751,178 |
| Oil & Lubes | | | | 106,215 | 88 | 382,374,545 | 238,984 |
| Kerosene | | | | 1,241,753 | 1,031 | 1,428,016,001 | 892,510 |
| Fuel Transport | | | | 420,571 | 349 | 630,856,500 | 394,285 |
| Total Petroleum Consumption | 229 | 3,637.4 | 8,456,020 | 6,973,082 | 5,876 | 10,514,169,003 | $6,571,356 |

Preliminary interpretation of the demand survey results indicates that the proposed West Nile Hydropower project can achieve a reduction of emissions of 630,000 t C in the period 2001-2021 (for a-20 year project life). If this is evaluated at US$10-15 per ton of carbon, this transfers into a PCF or CDM payment to the project in the order of US$6.3-9.5 million over 20 years. Since hydropower is a $Co_2$ free energy source, emissions in the baseline case are equal to direct emission reductions achieved by the project.

### Preliminary conclusions

Considering the entire West Nile region, replacement of diesel generation with hydropower results in substantial carbon dioxide emission reductions. It is therefore a suitable project for consideration under the CDM. Implementation of this project will depend on subsidy funding from CDM or the Proto Type Carbon Funding. Otherwise, the tariff of the generated power will be high and the intended consumers may not be able to benefit from the project.

# ANNEX C

# FORESTRY SECTOR

## Analysed Potential CDM Projects

Two projects were selected for further review:

- Horticulture project;
- Tropical Environment Foundation Eco-tourism project.

Note that not all research projects which qualified for further review were considered because CDM is mainly a private sector initiative. The summary of the results is given in the table below.

**Table A3: Summary of the Projects**

| Project | Variable | Without carbon benefits | With carbon benefits (US$20) | With carbon benefits (US$5) |
|---|---|---|---|---|
| Horticulture project | NPV (US $) | 1,468,280 | 1,630,489 | |
| | IRR (%) | 45.7 | 48.7 | |
| Tropical Environment Foundation Eco-tourism project | NPV (US $) | 24,333 | 28,449 | 25,362 |
| | IRR (%) | 18.7 | 19.3 | 18.8 |

Profiles and economic and mitigation analysis for the selected projects are presented below:

## Ajoki's Mixed Farm

### Project description

| | |
|---|---|
| Project name: | Ajoki's Mixed Farm & Agroforestry Project |
| Type of organisation: | Private sector |
| Country: | Uganda |
| Acronym: | AMFAP |
| District: | Soroti |
| County: | Soroti |
| Sub county: | Asuret |
| Parish: | Obule |
| Village: | Obule |
| Contact person: | Ojok Christopher |
| Position: | Managing Director |
| Address: | Ajoki's Supermarket, P.O. Box Soroti (Uganda) |
| Telephone: | |
| Fax: | |
| Email: | |

### Project objectives

1. Improve household incomes through the promotion of modern agricultural techniques and practices promote citrus farming by establishing more than 100 hectares of citrus and mango trees to provide raw material for the fruit/juice industry.
2. Promote tree farming as a means to combat environmental degradation as well as promoting the conservation of biological diversity.
3. Increase food security by creating a food buffer to mitigate against the unpredicted effects of climate change such as drought, famine and hunger than is prevalent in the dry Teso region.
4. Build local capacity to improve on the current agricultural practices that aim at maximising output per unit area.
5. Provide employment to the women and youth in the sub-county.

### General description (project baseline)

The project involves the following elements:

1. Expansion of the existing 5 ha of mixed citrus and mango trees to 105 ha of land currently under grassland with scattered tree shrubs i.e. add additional 100 ha will be purchased.
2. The project lifetime is 25 years.
3. Mean annual fruit production is 6 tons/ha.
4. Mean annual carbon uptake by the growing trees is assumed to be 3 tC/ha.
5. Mean annual carbon uptake in land to be purchased is assumed to be 1 tC/ha.
6. The project will generate CERs because the average annual carbon stock of fruit trees is higher than that of the existing grassland.
7. The project is additional because the CERs are additional value to the fruit growing. Fruit production is additional to current land use.
8. Fruits trees are never converted into timber, firewood or poles hence are good candidate trees for CDM projects.
9. Cost per hectare of land is estimated to be Ushs. 250,000 in the surrounding areas. Alternatively a permit could be obtained from the Forest Department to establish fruit trees in the surrounding gazetted grassland reserves at an annual rent of Ushs. 5,000/ha.
10. Exchange rate stands at $1 to Ushs 1,800.
11. Current price of carbon is $20/ton or Ushs 36,000.
12. The project will sequester 300 tC/ha/yr which amounts to 7,500 tons of carbon during the entire project period.
13. Both domestic and foreign market exist for processed and unprocessed fruit products.
14. The project satisfies the national sustainable development criteria.

# Tropical Environment Foundation Ecotourism Project

### Project description

| | |
|---|---|
| Project name: | Tropical Environment Foundation Ecotourism Project |
| Type of organisation: | NGO |
| Country: | Uganda |
| District: | Mpigi |
| County: | Butambala |
| Sub-county: | Gombe |
| Parish: | Kavule |
| Village: | Buso |
| Contact person: | Gerald Tenywa |
| Position: | Projects officer |
| Address: | c\o Buso Foundation |
| Telephone: | 256-41-232014 |
| Email: | buso@imul.com |

### Project objectives

- Promote conservation of natural forest on private land through non-consumptive use.
- Support environment education.
- Create employment opportunities.
- Increase household income through sale of handicrafts, fruits, food etc to tourist.

### Description

**The baseline:** A base case scenario (Appendix B: Table 1) is build based on "no project". This implies that there will be no costs and no project benefits. There may be benefits from sale of handicrafts, charcoal and firewood. However, since there are no costs it is not possible to carry out a cost benefit analysis for this scenario. An arbitrary rate of deforestation of 20% per annum and a mean annual increment(MAI) is used. The total biomass each year is calculated using:

Total biomass in year x = Total biomass in year x-1*(MAI*total area)*0.8

The scenario shows that the total biomass in the area would decrease over the years. Since a constant mean annual increment is used it does not give a true picture of the rate of decreases. The amount of biomass sold is based on the difference between the total biomass in preceding years. Total revenue from biomass removals is obtained based on a forest gate price of 7,500/= per cubic meter of firewood and a conversion factor of 0.42 (cubic meters to tons).

### Implementation

The project is implemented on a 12.15 ha piece of private land with natural forest cover. It is assumed that the area has about 97.6 tons/ha of biomass and a mean annual increment of 15 tons/ha. The project costs and benefits are based on information provided in the project document. Cost of land is not included because the landlord donates the land to the project. The project cost includes the establishment of market stalls for sale of non-wood forest products by the communities. However revenue from sale of these products is not included as a benefit in the analysis. This benefit goes directly to the community thus contributing to poverty alleviation. The project is expected to earn revenue from guided tours for tourists (both national and foreign), accommodation and meals for visitors, educational tours for schools and colleges; drama shows for the community and visitors.

### Cost-benefit analysis

A cost-benefit analysis conducted using the total project investment costs, operation and maintenance costs and benefits (see Appendix B) is carried out in Appendix B. The costs and benefits are discounted using:

$$\text{Discounted costs/benefits} = \frac{\text{costs or benefits}}{(1+r)^n}$$

A discount rate of 15% is used. The analysis shows an NPV of US$24,333 and an IRR of 18.7%.

### Mitigation analysis

The mitigation analysis (Appendix B: Tables 4 and 5) builds on the cost-benefit analysis done above but includes carbon benefits. The carbon benefits are considered to be constant throughout the project period since MAI is used in the calculations. The carbon benefits are calculated using:

Carbon benefits = (MAI * total area * CFA * CFB) * price/ton of carbon

Where: MAI is the mean annual increment of 15 tons/ha

CFA is conversion factor for wet biomass to dry biomass of 0.5

CFB is conversion factor for dry matter to carbon of 0.45

In Appendix B: Table 4, the price per ton of carbon used is US$20 giving an NPV of US$28,449 and an IRR of 19.3%. In Appendix B: Table 5, the price per ton of carbon used is US$5 giving an NPV of US$25,362 and an IRR of 18.8%. In both cases a discount rate of 15% is used.

### Conclusion

At a price of US$5 per ton of carbon it is not cost effective to look at CDM since the IRR is only 0.1% above the CBA for the project. However, at a price of US$20/ton the IRR is 0.6% above the CBA. It should be noted that the data (budget) provided in the project document left a lot to be desired. For instance the cost of computer maintenance is equivalent to the price of a new computer. The project leader had done a pay back period analysis, which gave a pay back of 13 years. The project is very small thus the need to bundle a number of similar projects. This would increase the costs of administration especially certification and verification. These costs are not reflected in the CBA. In order to obtain better results one needs to examine a slightly larger project such as Bwindi Impenetrable Forest, before it was converted to a forest park. (The real mitigation analyses are appended as Excel Files namely; AMFAPF~1.XLS and FINALB~1.XLS)

# ANNEX D

# COMPOSITION OF THE NATIONAL TASKFORCE

Members in the four identified sectors of the task force groups were drawn from key institutions with at least three experts per each theme group as detailed below:

**Energy sector**

| | |
|---|---|
| Eng. Adams M. Sebbit | University Lecturer, Makerere University |
| Eng. Paul Mubiru | Ass. Commissioner, Energy Efficiency, Department of Energy |
| J.B Magezi-Akiiki | Meteorologist, Department of Meteorology |
| Sarah Nalumansi | Director, Human Resource Development, Uganda Manufacturers Association |

**Forestry sector**

| | |
|---|---|
| Patience Turyareeba | Research Scientist, FORI-NARO |
| Ali Karatunga | Forest Officer, Forestry Department |
| Paul Isabirye | Senior Meteorologist, Department of Meteorology |

**Socio-cconomic sector**

| | |
|---|---|
| Bwango Apuuli | Commissioner for Meteorology, Department of Meteorology |
| Kaweesi James | Senior Economist, PQAD/MWL&E |
| Fred Onduri | Senior Economist, Ministry of Finance |
| Rosemary Mutyabule | Assistant Director, Uganda Investment Authority |

**Transport sector**

| | |
|---|---|
| S.A.K Magezi | Assistant Commissioner – Forecasting, Dept of Meteorology |
| Jennifer Lutimba | Transport Economist, Min. Works/Transport/Communication |
| Buzibwa-Luswata | Civil Engineer, Min. Works/Transport/Communication |